Volume 1 of 1
Project Manual

Prudence Crandall Museum Renovations

Canterbury, CT

Project No.: BI-RR-28

Prepared By:
TLB Architecture, LLC
92 West Main Street
Chester, CT
06412

Josh Geballe – Commissioner

State of Connecticut
Department of Administrative Services
Construction Services
450 Columbus Boulevard
Hartford, CT 06103

Project Manual Date: November 19, 2019

FOR YOUR INFORMATION

IMPORTANT NOTICE

From The State of Connecticut
Department of Administrative Services - Construction Services
Office of Legal Affairs, Policy, and Procurement

THIS PROJECT MANUAL CONTAINS UPDATED REQUIREMENTS:

10/10/19: UPDATED 01 11 00 SUMMARY OF WORK:

- **Section 1.11 F: Contract Documents will no longer be provided in paper format.** One (1) set of PDF (latest version) Contract Documents on Electronic Data Storage Devices will be provided to the Contractor, at no cost, on or about the time of execution of the Contract from the Architect. Additional sets of PDF (latest version) Contract Documents on Electronic Data Storage Devices from the Architect shall be available at the cost of their reproduction, to the Contractor.

10/10/19: UPDATED 00 21 13 INSTRUCTIONS TO BIDDERS:

- **Sections 1.10.3.2, 2.7.1, 2.7.5, Named Subcontractors and Classes of Work:** In accordance with Connecticut General Statutes 4b-93, if the Bidder intends to use **more than one** Subcontractor to perform a Class of Work, then it shall provide **ALL** of the Subcontractor Names and Proposed Dollar Values for **subcontracts in excess of $100,000.** Failure to correctly state **ALL** of the **Named Subcontractor's prices within a particular Class of Work** on the Bid Proposal Form ***shall*** be cause for **rejection** of the Bid.
- **Section 2.7.8.1, 2.7.10.3, Named Subcontractor Prequalification:** For Subcontracts greater than $500,000, the three (3) Apparent Lowest Bidders shall submit within ten (10) Calendar Days after receipt of the "Set-Aside Contractor Schedule Request" current DAS Prequalification Certificate(s) and Update (Bid) Statement(s) for each Named Subcontractor in Table 2.7 of the Bid Proposal Form, to the extent the Class of Work for the Named Subcontractor is a Prequalification Classification. This information shall be considered as part of the Bid Proposal Form and failure to comply with any portion of this requirement ***shall*** cause rejection of the bid.
- **Section 2.7.10.2, Bidder Performing Work as Named Subcontractor:** In the event that the Bidder names a Subcontractor to perform some, but not all, of the separate section of the specifications for a particular Class of Work, then it will be presumed, in addition, that the Bidder intends to perform the balance of the Class of Work. Post-bid, the Bidder cannot substitute a Subcontractor for one named in the Bid Proposal Form or bring in a Subcontractor for any designated subtrade work presumed to be performed by the General Contractor's own forces, except for "Good Cause" as determined by the awarding authority.

10/10/19: UPDATED 00 41 00 BID PROPOSAL FORM:

- **Section 2.7, Named Subcontractors and Classes of Work:** In accordance with Connecticut General Statutes 4b-93, if the Bidder intends to use **more than one** Subcontractor to perform a Class of Work, then it shall provide **ALL** of the Subcontractor Names and Proposed Dollar Values for **subcontracts in excess of $100,000**. If applicable, Table 2.7 will include an extra page for listing additional named subcontractors.
- **Section 2.9, Insurance Coverages:** Descriptions have been edited to correlate with 00 72 13 General Conditions.

07/12/19: UPDATED SECTION 00 72 13 GENERAL CONDITIONS:

The following Articles of the 00 72 13 General Conditions have been revised and/or added:

- **Article 1 Definitions:** Section 1.71 and Section 1.72;
- **Article 3 Correlation of Contract Documents:** Section 3.6;
- **Article 28 Partial Payments:** Section 28.2;
- **Article 33: Owner's Right to Stop Work or Terminate Contract:** Section 33.2 and Section 33.3;
- **Article 35 Contractor's Insurance:** Section 35.1 and Section 35.6;
- **Article 36 Foreign Materials:** Section 36.3;
- **Article 40 Disclosure of Records:** Section 40.1; and
- **Article 41 Audit and Inspection of Plants, Places of Business, and Records:** Section 41.1.

02/01/19: NEW REPORTING & CONTRACTING REQUIREMENTS FOR SUBCONTRACTOR PAYMENTS:

NEW REPORTING REQUIREMENTS FOR CONTRACTOR AND SUBCONTRACTOR PAYMENTS:

- For compliance with the Connecticut General Statutes Sections 4b-95 and 49-41a, the Department of Administrative Services-Construction Services (DAS/CS) requires every Contractor (and its Subcontractors) who has been awarded a DAS/CS construction contract to log on to the State of Connecticut web-based platform, BizNet, each month and enter payments they have received from the state, from the Contractor, or from a higher tier Subcontractor (as applicable).
- The process is described as follows: The state will pay the Contractor on a monthly basis for work performed (and purchases made) by it and its Subcontractors. The Contractor will input the payment date and amount they receive from the state on a monthly basis. The Contractor's first-level Subcontractor (Tier 1 Subcontractor) will input the payment they receive from the Contractor. The second-level Subcontractor (Tier 2 Subcontractor) will input the payment they receive from the Tier 1 Subcontractor. And so on.
- Detailed instructions can be found in the DAS/CS publication, "**6002 Instructions to Contractors/Subcontractors for Entering Payments in BizNet**", available for download by going to the DAS Homepage (www.ct.gov/DAS) and selecting Doing Business With The State > State Building Construction > Publications and Forms > DAS Construction Services Library > 6000 Series.

NEW CONTRACTING REQUIREMENTS FOR CONTRACTOR AND SUBCONTRACTOR PAYMENTS:

- Contractors awarded a DAS/CS construction contract shall contain a provision in their subcontract agreements requiring their Subcontractors to enter payment receipt from the Contractor in the State of Connecticut web-based platform, BizNet, for work performed or purchases made in relation to state projects.

THE FOLLOWING DOCUMENTS HAVE BEEN REVISED TO REFLECT THE NEW REQUIREMENTS:

- Section 00 11 16 Invitation to Bid;
- Section 00 21 13 Instructions to Bidders;
- Section 00 41 10 Bid Package Submittal Requirements; and
- Section 01 11 00 Summary of Work.

END

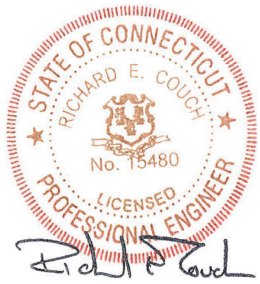
Project Title:	Restoration of Prudence Crandall Museum
Project Location:	Canterbury, Connecticut
Project Number:	BI-RR-28
Architect/Engineer:	TLB Architecture, LLC, 92 West Main Street, Chester, CT 06412

SEALS, SIGNATURES, AND DATES OF DESIGN PROFESSIONALS OF RECORD

(Seal and Signature)

Architect Professional Certification:
I hereby certify that these documents were prepared or approved by me and that I am a duly registered Architect.

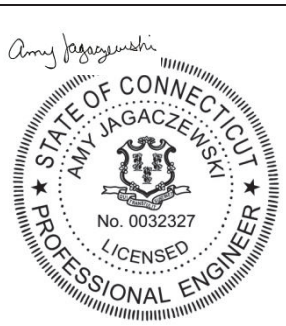
Michael P. Fortuna
(Print Consultant Name)
5143
License No.
JULY 31, 2020
Expiration Date



(Seal and Signature)

Civil Engineer Professional Certification:
I hereby certify that these documents were prepared or approved by me and that I am a duly registered Professional Engineer.

Richard E. Couch
(Print Consultant Name)
15480
License No.
January 31, 2021
Expiration Date



(Seal and Signature)

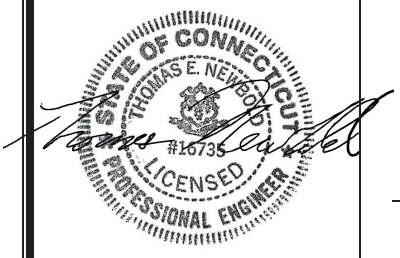
Structural Engineer Professional Certification:
I hereby certify that these documents were prepared or approved by me and that I am a duly registered Professional Engineer.

AMY JAGACZEWSKI
(Print Consultant Name)
0032327
License No.
JAN 31, 2021
Expiration Date

(Seal and Signature)

Electrical Engineer Professional Certification:
I hereby certify that these documents were prepared or approved by me and that I am a duly registered Professional Engineer.

Eleanor C. Lynn
(Print Consultant Name)
0020073
License No.
Jan 31, 2021
Expiration Date



(Seal and Signature)

Mechanical Engineer Professional Certification:
I hereby certify that these documents were prepared or approved by me and that I am a duly registered Professional Engineer.

Thomas Newbold
(Print Consultant Name)
0016735
License No.
Jan 31, 2001
Expiration Date

(Seal and Signature)

Fire-Protection Engineer Professional Certification:
I hereby certify that these documents were prepared or approved by me and that I am a duly registered Professional Engineer.

(Print Consultant Name)
License No.
Expiration Date

End of Section
00 01 07 Seals Page

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VOLUME 1 of 1

DIVISION 00 PROCUREMENT AND CONTRACTING REQUIREMENTS

TECHNICAL SPECIFICATIONS

DIVISION 50	PROJECT-SPECIFIC AVAILABLE INFORMATION	Page Count	Not Used ☐
50 10 00	Existing Conditions Information	124	☐
50 20 00	Environmental Assessment Information		☒
50 30 00	Hazardous Building Materials Inspection and Inventory	78	☐
50 40 00	Subsurface Geotechnical Report		☒
50 50 00	Elevator Agreement		☒
50 60 00	FM Global Checklist For Roofing Systems	4	☐
50 70 00	Statement of Special Inspections	8	☐
50 80 00	Drawings ASB-01, ASB-02, ASB-03 as Referenced in Asbestos and Lead Sections	6	☐

00 01 10 Table of Contents

List of Drawing Sheets	
Sheet No.	**Title**
	Cover Sheet
G-001	Code Information
V-001	Existing Land Survey / Project Limit Line
CD-101	Site Demolition Plan
CS-101	Site Layout Plan
CG-101	Site Grading and Drainage Plan
CU-101	Site Utility Plan
CJ-101	Sedimentation and Erosion Control Plan
CJ-102	Sedimentation and Erosion Control Notes and Details
CX-101	Details
CX-102	Details
CX-103	Details
S-100	Foundation and Slab on Grade
S-101	First Floor Framing Plan
S-102	Second Floor Framing Plan
S-103	Attic Floor Framing Plan
S-104	Roof Framing Plan
S-200	Photos of Existing Conditions
S-300	General Notes
A-001	General Information
A-101	Cellar Plan
A-102	First Floor Plans
A-103	Second Floor Plans
A-104	Attic Plan
A-105	Roof Plan
A-201	East Elevation
A-202	North Elevation
A-203	West Elevation
A-204	South Elevation
A-301	South-North Section
A-302	East-West Section
A-401	Enlarged Elevations
A-402	Reference Photography – First Floor
A-403	Reference Photography – Second Floor
A-501	Enlarged Plan and Elevation at Ramp
A-601	Window Schedule
A-602	Door Schedule / Casework Details

List of Drawing Sheets	
Sheet No.	**Title**
P-001	Plumbing Symbols, Notes, Schedules, and Riser
P-100	Basement Plumbing Plan
P-101	First Floor Plumbing Plan
MD-100	Basement Mechanical Demolition Plan
M-001	Mechanical Symbols Notes and Schedules
M-100	Basement Mechanical Plan
M-101	First Floor Mechanical Plan
M-102	Second Floor Mechanical Plan
M-103	Basement Mechanical Detailed Plan
M-200	Mechanical Sections
M-300	Mechanical Details
M-301	Mechanical Details
M-302	Mechanical Piping Diagram
M-400	Mechanical Control Diagram
E-100	Electrical Riser Diagram and Panel Schedules
E-101	Electrical Details
E-200	Basement Power Plan
E-201	First Floor Power Plan
E-202	Second Floor Power Plan
E-300	Basement Lighting Plan
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FA-100	Fire Alarm Riser Diagram
FA-101	Basement Fire Alarm Plan
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FA-103	Second Floor Fire Alarm Plan
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End of Section
00 01 15 List of Drawing Sheets

Advertisement No.:	20-06	Advertisement Date:	February 28, 2020

INVITATION TO BID

Connecticut Department of Administrative Services (DAS) Construction Services (CS)
Office of Legal Affairs, Policy and Procurement
450 Columbus Blvd, Suite 1302, Hartford, CT 06103-1835

Find Invitations to Bid on the State Contracting Portal:	Go to the **DAS website** www.ct.gov/das Click on **"State Contracting Portal";** Select **"Administrative Services, Construction Services";** Select the appropriate **Invitation to Bid**.
Instructions for On-Line Bidding:	Follow the instructions in 6001 Construction On-line Bidding Instructions. (http://portal.ct.gov/-/media/DAS/Construction-Services/DAS-CS-Library/6000-Series/6001-Construction-On-Line-Bidding-Instructions.pdf) For questions, call 860-713-5794.

Date and Time of Bid Opening:	**April** *(Month)*	**8** *(Day)*	**2020** *(Year)*	**Time:** **1:00** *(ET)* **PM**

This Invitation to Bid is for the following Project:

Project Title:	Prudence Crandall Museum Renovations			
Project Location:	1 South Canterbury Road Canterbury, CT			
Project Number:	BI-RR-28			
Project Description:	See **Specifications** Section 01 11 00 Summary of Work, Section 1.3			
Construction Costs:	Greater Than $500,000			
Bidding Limited To:	Contractors Prequalified by DAS for General Building Construction (Group C)			
Threshold Limits: (C.G.S. §29-276b)	This Project DOES NOT exceed Threshold Limits.			
Set Aside Requirements:	SBE Subcontractors &/or Suppliers: 25%; MBE Subcontractors &/or Suppliers: 6.25%			
Date DAS/CS Began Planning Project:	5/9/2016			
Special Requirements:	Historic specialty work shall be performed by a firm with a minimum of five (5) years successful experience with comparable restoration work including work on at least three (3) buildings listed on the National or State Registers under direction of SHPO.			
Cost Estimate Range:	**$** 1.184,919.	**To**	**$** 1,277,283.	
Date Plans & Specs Ready:	March 4, 2020			
Plans & Specs Download:	Plans & Specs are available for electronic download on the DAS State Contracting Portal.			
Contract Time Allowed:	**Calendar Days:**	180		
Liquidated Damages:	**$** 1,899.00	Per Calendar Day Beyond Substantial Completion.		
	$ 1,827.00	Per Calendar Day Beyond 90 days After Substantial Completion		

Advertisement No.:	**20-06**	**Advertisement Date:**	**February 28, 2020**

Invitation to Bid (continued)

Pre-Bid Meeting Date:	March 11,2020		
	☐	Bidders are ***strongly encouraged*** to attend the Pre-Bid Meeting.	
	☒	Bidders are ***required*** to attend a **MANDATORY** Pre-Bid Meeting.	
Pre-Bid Meeting Time:	11:00	☒ **AM**	☐ **PM**
Pre-Bid Meeting Location:	1 South Canterbury Road, Canterbury, CT – Meet on Site		
Pre-Bid Meeting Contact:	**DAS/CS Project Manager:**	Halina Harabasz	
	Phone No.:	860.713.5732	
Pre-Bid Meeting Registration:	At the Pre-Bid Meeting, all prospective bidders shall *sign* his or her name on the **official roster** and *list* the name and address of the company he or she represents. For **MANDATORY** Pre-Bid Meetings, this shall be done no later than the designated **start time** of the Pre-Bid Meeting. **No** attendee will be allowed to register *after* the advertised start time. **Bids** submitted by contractors who have *not properly* registered and attended the **MANDATORY** Pre-Bid Meeting *shall be rejected* as **non-responsive**. See **Section 00 25 13 Pre-Bid Meeting Agenda** for additional details.		
Bid Proposal Submission and Other Bid Submittal Requirements:	See **Sections 00 21 13 Instructions to Bidders, 00 41 00 Bid Proposal Form**, and **00 41 10 Bid Package Submittal Requirements** for Bid Proposal submission requirements, including requirements for Affidavits, Certifications, Addenda, Pre-Bid Equals and Substitution Requests, and other bidding documents.		
Bid Upload and Bid Opening:	Bids can be uploaded and edited electronically in BizNet **UNTIL 1:00 p.m.** on the **Bid Opening Date** and thereafter shall be locked down and publicly opened in the State Contracting Portal**.**		
Bid Results:	Within approximately two (2) days after the Bid Opening Date, the Bid Results will be posted on the State Contracting Portal.		
Guide to the Code of Ethics For Current or Potential State Contractors (for contracts greater than $500,000):	Anyone seeking a contract with a value of more than $500,000 shall electronically download the **"Guide to the Code of Ethics For Current or Potential State Contractors"** from the of Office of State Ethics (OSE) website www.ct.gov/ethics, then click on the **"Publications"** link:		
Prevailing Wage Rates:	Prevailing wages are required on this project, in accordance with the schedule provided in the bid documents, pursuant to Connecticut General Statutes (C.G.S.) Section 31-53 (a) through (h), as amended. See Section 00 73 44 Prevailing Wage Rates. Each contractor who is awarded a contract on or after October 1, 2002 shall be subject to provisions of C.G.S. § 31-55a concerning annual adjustments to prevailing wages. Wage Rates will be posted each July 1st on the Department of Labor website www.ctdol.state.ct.us. Such prevailing wage adjustment shall ***not*** be considered a matter for any contract amendment.		
To access Executive Orders:	Go to www.ct.gov > Governor Ned Lamont > Executive Orders.		
UPDATED DOCUMENTS:	Many **Division 00** and **Division 01** documents have been updated. Read all of the contents of the Project Manual c*arefully!* All Contractors are cautioned that any modifications or alterations made to either the Project Manual or any of the forms and documents contained herein may be just cause to ***reject the bid!***		

Advertisement No.:	20-06	Advertisement Date:	February 28, 2020

Invitation to Bid (continued)

NEW PROCESS FOR CONSTRUCTION STORMWATER GENERAL PERMIT:

See Section 01 50 00 Temporary Facilities and Controls.

For all DAS/CS construction projects disturbing ***one or more*** **total acres of land area** on a site regardless of project phasing, the **Architect/Engineer** shall be responsible for filing a Department of Energy and Environmental Protection (DEEP) *General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities (DEEP-WPED-GP-015)* registration and Stormwater Pollution Control Plan (SPCP) through the online DEEP ezFile Portal ***prior*** to bidding.

Once the **Contractor** is under contract with DAS/CS, and ***prior*** to the commencement of any construction activities, the Contractor (and all other contractors and subcontractors listed on the SPCP) shall assume responsibility for storm water pollution control and conform to the general permit obligations and requirements by **signing** the SPCP "Contractor Certification Statement" and License Transfer Form as directed by the Architect/Engineer.

At completion of the project, the Contractor shall file a Notice of Termination (DEP-PED-NOT-015) with the DEEP in order to terminate the Construction Stormwater General Permit. A project shall ***only*** be considered complete after all **post-construction** measures are installed, cleaned, and functioning and the site has been stabilized for at least **three (3) months** following the cessation of construction activities.

NEW PROCESS FOR CONTRACTOR AND SUBCONTRACTOR PAYMENTS REPORTING:

See Section 00 21 13 Instructions to Bidders (Subsection 3.13) and Section 01 11 00 Summary of Work (Subsection 1.11).

For compliance with **C.G.S. § 4b-95 and 49-41**, DAS/CS requires every Contractor (and its Subcontractors) who has been awarded a DAS/CS construction contract to log on to the State of Connecticut web-based platform, BizNet, **each month** and **enter payments** they have received from the state, from the Contractor, or from a higher tier Subcontractor (as applicable).

The process is described as follows: The state will pay the Contractor on a monthly basis for work performed (and purchases made) by it and its Subcontractors. The Contractor will input the payment date and amount they receive from the state on a monthly basis. The Contractor's first-level Subcontractor (Tier 1 Subcontractor) will input the payment they receive from the Contractor. The second-level Subcontractor (Tier 2 Subcontractor) will input the payment they receive from the Tier 1 Subcontractor. And so on.

Contractors awarded a DAS/CS construction contract shall contain a **provision in their subcontract agreements** requiring their Subcontractors to enter payment receipt from the Contractor in the State of Connecticut web-based platform, BizNet, for work performed or purchases made in relation to state projects.

Detailed instructions can be found in the DAS/CS manual, **"6002 Instructions to Contractors/Subcontractors for Entering Payments in BizNet"**, available for download by going to the DAS Homepage (www.ct.gov/DAS) and selecting Doing Business With The State > State Building Construction > Publications and Forms > DAS Construction Services Library > 6000 Series.

IMPORTANT NOTE:
The Commissioner of the Connecticut Department of Administrative Services reserves the right to do any of the following without liability, including but not limited to: (a) waive technical defects in the bid proposal as he or she deems best for the interest of the State; (b) negotiate with a contractor in accordance with Connecticut General Statutes Section 4b-91; (c) reject any or all bids; (d) cancel the award or execution of any contract prior to the issuance of the "Notice To Proceed"; and (e) advertise for new bids.

All Project Questions, Bid Questions, and Pre-Bid Equals and Substitution Requests must be submitted fourteen (14) Calendar Days *prior* to the Bid Due Date.

All **Project Questions** and Pre-Bid **Equals and Substitution Requests** must be emailed (not phoned) to the **Architect/Engineer** with a **copy** to the **Construction Administrator** and **the DAS/CS Project Manager** listed below.

Architect/Engineer:	TLB Architects, LLC	**Email:**	rwilliams@tlbarchitecture.com
Construction Administrator:	Dwight Bolton	**Email:**	dwight@dh-bolton.com
DAS/CS Project Manager:	Halina Harabasz	**Email:**	Halina.Harabasz@ct.gov

All **Bid Questions** must be emailed to the **DAS/CS Associate Fiscal Administrative Officer** listed below.

DAS/CS Associate Fiscal Administrative Officer:	Mellanee Walton	Email:	Mellanee.Walton@ct.gov

Instructions to Bidders

DAS | Construction Services | Office of Legal Affairs, Policy, and Procurement

1.0 General Bid Proposal Information

1.1 On-Line Bidding:

1.1.1 The Department of Administrative Services (DAS) Construction Services (CS) has streamlined the Bid process by allowing contractors to submit their **Bid Package Documents on line** through the **State Contracting Portal** and **BizNet**. Rather than submitting paper Bid Package Documents, contractors simply respond to an **Invitation to Bid** on the **State Contracting Portal** by retrieving and uploading their documents electronically through their **BizNet** account. Once completed, the Bid Proposal must be **electronically signed prior** to the date and time of the **Bid Opening**. See **Page 1** of the **Invitation to Bid** for the **Date and Time of the Bid Opening**.

1.1.2 All Bidders shall **electronically** upload their **Bid Package Documents** to BizNet following the **instructions** in the DAS/CS publication, 6001 Construction On-line Bidding Instructions, available for download here: Go to the DAS Homepage (www.ct.gov/DAS), Doing Business With The State > State Building Construction > Publications and Forms > DAS Construction Services Library > 6000 Series > **6001 Construction On Line Bidding Instructions**. For questions, call 860-713-5794.

1.2 Bid Opening:

All Bids shall be publicly opened in BizNet by the awarding authority as stated in **Section 00 11 16 Invitation to Bid.**

1.3 Withdrawal of Bid:

Any **Bid** once uploaded into BizNet cannot be deleted. A Bid may only be **withdrawn** by uploading a written **Letter of Withdrawal** to BizNet using the "**Other Solicitation Document**" link ***prior*** to the date and time of the Bid Opening.

1.4 Disqualification from Bidding:

Any contractor who violates any provision of **Connecticut General Statutes (C.G.S.) § 4b-95**, as revised, shall be **disqualified** from bidding on other contracts for a period not to exceed **twenty-four (24) months**, commencing from the date on which the violation is discovered, for each violation.

1.5 Waive Minor Irregularities:

1.5.1 The awarding authority **shall** be authorized to **waive minor irregularities** which he or she considers in the best interest of the State, provided the reasons for any such waiver are stated in writing by the awarding authority and made a part of the contract file.

1.5.2 **No** such bid shall be rejected because of the failure to submit prices for, or information relating to, any item or items for which no specific space is provided in the bid form furnished by the awarding authority, but this sentence shall not be applicable to any failure to furnish prices or information required by **C.G.S. § 4b-95,** as revised, to be furnished in the bid form provided by the awarding authority.

1.6 Minimum Percentage of Work:

The awarding authority ***may*** require in the **Bid Proposal Form** that the contractor agree to perform a stated, minimum percentage of work with its **own forces**, in accordance with **C.G.S. § 4b-95(b).**

1.7 Set-Aside Contracts:

The awarding authority ***may*** **also** require the contractor to set aside a portion of the contract for subcontractors who are eligible for **set-aside contracts**.

1.8 Connecticut Sales And Use Taxes:

1.8.1 **All Bidders *shall*** familiarize themselves with the current statutes and regulations of the **Connecticut Department of Revenue Services (DRS),** including the Regulations of Connecticut State Agencies (R.C.S.A.) §12-426-18 and all relevant state statutes. The tax on materials or supplies exempted by such statutes and regulations shall not be included as part of a bid. See the **Sales and Use Tax Exemption for Purchases by Qualifying Governmental Agencies (CERT-134),** available for download from the DRS website (www.ct.gov/drs) under "Exemption Certificates".

1.8.2 The State of Connecticut construction contract has the following tax exemptions: (1) Purchasing of materials which will be physically incorporated and become a permanent part of the project; and (2) Services that are resold by the contractor. For example, if a Contractor hires a plumber, carpenter or electrician, a resale certificate may be issued to the subcontractor because these services are considered to be integral and inseparable component parts of the building contract.

1.8.3 The following items are **not** exempt from taxes when used to fulfill a State of Connecticut construction contract: Tools, supplies and equipment used in fulfilling the construction contract.

1.9 Union Labor:

Attention is called to the fact that there may or could be construction work carried on at the site by union labor. This fact must be kept in mind by all Bidders.

1.10 Rejection of Bids:

The awarding authority ***shall reject*** every such **Bid Proposal**, including but not limited to, the following reasons:

1.10.1 A **Bid Proposal Form** that does ***not*** contain the signature of the bidder or its authorized representative.

1.10.2 A **Bid Proposal Form** that is ***not*** accompanied by the following documents in BizNet:

- **.1** **Section 00 43 16 Standard Bid Bond,** completed for *either* the **Bid Bond** option *or* **Certified Check** option;
- **.2** A **Certified Check** (if applicable) delivered to the DAS/CS Office of Legal Affairs, Policy, and Procurement ***prior*** to the date and time of the Bid Opening;
- **.3** **Section 00 45 14 General Contractor Bidder's Qualification Statement**
- **.4** A **DAS Contractor Prequalification Certificate** for the Bidder for Projects ***greater*** than **$500,000**;
- **.5** A **DAS Update (Bid) Statement** for the Bidder for Projects ***greater*** than **$500,000**;
- **.6** A **Gift and Campaign Contribution Certification – Office of Policy and Management (OPM) Ethics Form 1**;
- **.7** A **Consulting Agreement Affidavit – OPM Ethics Form 5**. **NOTE: If the Bidder fails to submit or upload** the **Consulting Agreement Affidavit** required under C.G.S. § 4a-81, such bidder shall be *disqualified* and the award shall be made to the next lowest responsible qualified bidder or new bids or proposals shall be sought;
- **.8** An **Ethics Affidavit (Regarding State Ethics) – OPM Ethics Form 6**;
- **.9** An **Iran Certification – OPM Ethics Form 7.**

1.10.3 A **Bid Proposal Form** that:

- **.1** Fails **to acknowledge** all **Addenda** in the space provided in the **Bid Proposal Form;**
- **.2** Fails **to correctly list *ALL* of** the **Named Subcontractors within a particular Class of Work** on the **Bid Proposal Form for subcontracts in excess of $100,000;**
- **.3** Fails **to correctly state** a **Named Subcontractor's price** on the **Bid Proposal Form;** and
- **.4** Fails **to list Named Subcontractors** who are **DAS Prequalified at the time of the bid.**

1.10.4 **A Bid Proposal Form** that is ***not*** submitted on the **forms furnished** for the specific project. **NOTE:** In ***no*** event will bids or changes in bids be made by telephone, telegraph, facsimile or other communication technology except through BizNet. ***All*** pages of the **Bid Proposal Form *must*** be uploaded to BizNet prior to the date and time of the Bid Opening.

1.10.5 A **Bid Proposal Form** that has omitted items, omitted pages, added items not called for, altered the form, contains conditional bids, contains alternative bids, or contains obscure bids.

1.10.6 A *paper* **Bid Package** sent to the DAS/CS Office of Legal Affairs, Policy, and Procurement. Such bids will be returned to the bidder unopened.

1.10.7 **Any Bidder** that does *not* make all required **pre-award submittals** *within* the designated time period. DAS/CS *may* reject such bids as **non-responsive**.

1.11 Pre-Bid Meeting:

1.11.1 See **Section 00 11 16 Invitation to Bid** and **Section 00 25 13 Pre-Bid Meeting Agenda** for details.

1.11.2 When a **Pre-Bid Meeting** is **"strongly encouraged"**, all attendees shall sign his or her name to the official roster and list the name and address of the company he or she represents.

1.11.3 When a **Pre-Bid Meeting** is **MANDATORY**, all attendees will be required to register. **Proper registration** means that the attendee has signed his or her name to the official roster and listed the name and address of the company he or she represents on the official roster no later than the designated start time of the **MANDATORY Pre-Bid Meeting**. Bidders are advised to register early as **no** attendee will be allowed to register *after* the advertised start time of the **MANDATORY Pre-Bid Meeting.**

All bids submitted by all contractors who have ***not*** properly registered and attended the **MANDATORY Pre-Bid Meeting shall be rejected as non-responsive.**

1.11.4 **All Bidders Attending a Pre-Bid Meeting at a Connecticut Department of Corrections (DOC) Facility: Prior to the Pre-Bid Meeting,** download the **"Security Background Questionnaire"** from the **CT DOC website** (www.ct.gov/doc under "**Forms**"), complete and submit the form as directed, and obtain approval, otherwise admission to the Pre-Bid Meeting **will be denied**. It is recommended that the approved form be brought as evidence of approval to attend the Pre-Bid Meeting.

1.12 Pre-Bid Equals and Substitution Requests Procedures:

1.12.1 All submissions requesting "Equals and/or Substitutions" shall be made by the **Bidder** in accordance with **Section 01 25 00 Substitution Procedures** of the **Division 01 General Requirements and Article 15, Materials: Standards** of **Section 00 72 13 General Conditions**. Every submission shall contain all the information necessary for DAS/CS to evaluate the submission and the request. Failure to submit sufficient information to make a proper evaluation, including submittal of data for the first manufacturer listed as well as the data for the **"Equals and/or Substitutions"** proposed, shall result in a **rejection** of the submission and request. Upon receipt of the submission and request, DAS/CS shall notify the **Bidder** that the request has been received and as soon as possible shall render a decision on such submission and request.

1.12.2 **Pre-Bid-Opening Substitution of Materials and Equipment:** The Owner will consider requests for equals or substitutions *if* received **fourteen (14) Calendar Days** *prior* to the **Bid Opening Due Date,** as stated in the **Invitation To Bid.** The **Equal or Substitute Product Request (Form 7001)** must be used to submit requests. Download **Form 7001** from the DAS Homepage (www.ct.gov/DAS) > Doing Business With The State > State Building Construction > Publications and Forms > DAS Construction Services Library > 7000 Series.

1.12.3 **Equals and/or Substitutions Requests Submittal:** Requests for Equals or Substitutions shall be submitted to the **DAS/CS Project Manager, Architect / Engineer, and Construction Administrator**.

1.12.4 **Substitution Request Deadline:** Any substitution request not complying with requirements will be denied. Substitution requests sent **after** the **Deadline** will be denied.

1.12.5 **Addendum:** An Addendum shall be issued to inform all prospective bidder of any accepted substitution in accordance with our addenda procedures.

1.12.6 **Time Extensions:** No extensions of time will be allowed for the time period required for consideration of any Substitution or Equal.

1.12.7 **Post Contract Award Substitution of Materials and Equipment:** All requests for "Equals and Substitutions" **after** the Award of the Contract shall be made **only** by the **Prime Contractor** for materials or systems specified that are no longer available. The requests will not be considered if the product was not purchased in a reasonable time after award, in accordance with **Article 15, Materials: Standards** of **Section 00 72 13 General Conditions**.

1.13 Joint Ventures:

1.13.1 **Each entity** in a Joint Venture shall submit with the Venture's bid a **letter** on their respective company letterheads stating:

- Their **agreement to bid** as a Joint Venture with the other named Joint Venture, and set forth the **name and address** of the other Joint Venture(s).
- The **respective percentage of the project work** that would be the responsibility of each of the Joint Ventures.

1.13.2 **Prequalification: Each entity** in a Joint Venture shall submit its **Prequalification Certificate** and **Update (Bid) Statement**. **Each entity** in a Joint Venture shall be **prequalified** at the time of the bid and during the entire project construction. **Each entity** in a Joint Venture shall have the **prequalification single project limit**, and **remaining aggregate capacity balance** to meet the value of its respective percentage of the joint proposed bid.

1.13.3 **Each entity** in a Joint Venture shall submit **Section 00 45 14 General Contractor Bidder's Qualification Statement**.

1.13.4 **Bonding:** The Joint Venture shall obtain the required **bonding** from a surety for the **total amount** of the contract price.

1.13.5 **Insurance: Each entity** in a Joint Venture shall have the **required insurance coverages and limits** to meet the insurance requirements of the contract. The Joint Venture shall provide **Builder's Risk insurance**.

1.13.6 **Bid Submission and Contract Signing:** If a Joint Venture submits a bid proposal, it shall be considered to be a proposal by **each** of the Joint Ventures, jointly and severally, for the performance of the entire contract as a Joint Venture in accordance with the terms and conditions of the contract. **Each entity** in a Joint Venture is required to **sign the contract** acknowledging that each Joint Venture shall be jointly and severally liable for the performance of the entire contract.

1.13.7 **Certificate of Legal Existence: Each entity** in a Joint Venture shall obtain a **Certificate of Legal Existence** and submit it with the contract documents.

1.14 Procedure for Alleged Violation(s) of Part II Chapter 60 of C.G.S. Bidding and Contracts:

1.14.1 The Regulations of Connecticut State Agencies establishes a procedure for promptly hearing and ruling on claims alleging a violation or violations of the contract bidding provisions of Part II of Chapter 60 of the Connecticut General Statutes (hereinafter "Chapter 60"). In view of the fact that time is normally of the essence in awarding construction contracts under Chapter 60, the grievance procedures are intended to be quick, informal and conclusive so as to avoid delays which can increase costs and jeopardize the very ability of the State to proceed with needed public works projects.

1.14.2 Download **"6510 Procedure for Alleged Violation(s)"** and **"6505 Petition for Alleged Violation(s)"** from the DAS Homepage (www.ct.gov/DAS) > Doing Business With The State > State Building Construction > Publications and Forms > DAS Construction Services Library > 6000 Series > Scroll down to locate documents.

1.15 Labor Market Area:

1.15.1 **All Bidders *shall*** have read **C.G.S. §§ 31-52** and **31-52a**, as revised. These sections relate to the **preference of State citizens** and the **preference of residents of the labor market area** in which the work under the contract is to be done and the **penalties for violations** thereof.

1.15.2 In order to avoid violations by the contractor and to cooperate with and assist the State in the implementation of the statutory mandates, any bidder awarded a contract with the State **shall** be required to provide the State with the following information:

- **.1** The names and addresses of employees utilized by the contractor and by its subcontractors and how long each such employee has resided in Connecticut.
- **.2** How long each employee has resided in the labor market area, as established by the State Labor Commissioner, in which the work under the contract is to be done. Labor market areas are indicated on the end of this section.
- **.3** Within thirty (30) days after the start of work, the contractor **shall** submit a signed statement setting forth the procedures the contractor and its subcontractors have taken to assure that they have sought out qualified residents of the labor market area. Also, the statement **shall** include information as to how many persons were considered for employment and how many were actually hired. Such procedures will include, but not be limited to, obtaining names of available persons from area Employment Security Offices.
- **.4** In the same manner as **Subsection 1.15.2.3** above, the statement **shall** indicate the steps taken to assure that the contractor and its subcontractors have sought out qualified residents of this State.

1.15.3 The contractor **shall** cooperate with and provide information to the DAS/CS Project Manager or their designee assigned to collect and verify the information required. The State may request that all such information be updated during the term of the contract at reasonable times.

1.15.4 All such information gathered and compiled by the State **shall** be forwarded to the Labor Commissioner.

1.15.5 **Pursuant to C.G.S. § 31-52b, as revised:**

> "The provisions of C.G.S. § 31-52 and 31-52a **shall not** apply where the State or any subdivision thereof may suffer the loss of revenue granted or to be granted from any agency or department of the federal government as a result of said sections or regulative procedures pursuant thereto."

However, no exception shall be determined to be applicable unless stated in writing by the Commissioner of the Department of Administrative Services.

1.15.6 **Website Link:** For guidance on the CT DOL Labor Market Areas (LMA) go to the CT DOL website http://www.ctdol.state.ct.us/, under "Program Services", click on "Labor Market information".

1.16 Executive Orders:

1.16.1 All Executive Orders of which are incorporated into and are made a part of the Contract as if they had been fully set forth in it. The Contract is subject to the provisions of the following**:**

- **.1** **Executive Order No. 3:** Governor Thomas J. Meskill, promulgated 06/16/71, concerning labor employment practices;
- **.2** **Executive Order No. 17:** Governor Thomas J. Meskill promulgated 02/15/73, concerning the listing of employment openings;
- **.3** **Executive Order No. 16:** Governor John G. Rowland promulgated 08/04/99, concerning violence in the workplace;
- **.4** **Executive Order No. 14:** Governor M. Jodi Rell, promulgated 04/17/06, concerning procurement of cleaning products and services; and
- **.5** **Executive Order No. 49:** Governor Dannel P. Malloy, promulgated 05/22/15, concerning the requirement for certain state contractors to disclosure campaign contributions to candidates for statewide public office or The General Assembly and to ensure convenient public access to information related to gifts and campaign contribution disclosure affidavits by state contractors.

1.16.2 All Executive Orders are available for download from the State of Connecticut website. Go to www.ct.gov, click on "Governor Ned Lamont" and scroll down to "Executive Orders".

1.17 Retaliation For Disclosure of Information:

1.17.1 Each contract between a state or quasi-public agency and a large state contractor shall provide that, if an officer, employee, or appointing authority of a large state contractor takes or threatens to take any personnel action against any employee of the contractor in **retaliation** for such employee's **disclosure** of information to the Auditors of Public Accounts or the Attorney General under the provisions of **C.G.S. § 4-61dd (a)**, the contractor shall be liable for a civil penalty of not more than five thousand dollars for each offense, up to a maximum of twenty per cent of the value of the contract. Each violation shall be a separate and distinct offense and in the case of a continuing violation each calendar day's continuance of the violation shall be deemed to be a separate and distinct offense. The executive head of the state or quasi-public agency may request the Attorney General to bring a civil action in the Superior Court for the judicial district of Hartford to seek imposition and recovery of such civil penalty.

1.17.2 Each large state contractor shall post a **notice** of the provisions of **C.G.S. § 4-61dd** relating to large state contractors in a conspicuous place that is readily available for viewing by the employees of the contractor.

1.18 Laws of the State of Connecticut:

Forum and Choice of Law. The Bidder agrees that in the event it is awarded a Contract, the Bidder and the State deem the Contract to have been made in the City of Hartford, State of Connecticut. Both parties agree that it is fair and reasonable for the validity and construction of the Contract to be, and it shall be, governed by the laws and court decisions of the State of Connecticut, without giving effect to its principles of conflicts of laws. To the extent that any immunities provided by Federal law or the laws of the State of Connecticut do not bar an action against the State, and to the extent that these courts are courts of competent jurisdiction, for the purpose of venue, the complaint shall be made returnable to the Judicial District of Hartford only or shall be brought in the United States District Court for the District of Connecticut only, and shall not be transferred to any other court, provided, however, that nothing here constitutes a waiver or compromise of the sovereign immunity of the State of Connecticut. The Bidder waives any objection which it may now have or will have to the laying of venue of any claims in any forum and further irrevocably submits to such jurisdiction in any suit, action or proceeding.

1.19 State's Sovereign Immunity:

Nothing in this Agreement shall be construed as a waiver or limitation upon the **State's sovereign immunity**. To the extent this Section is found to be inconsistent with any other part of this Agreement, this Section shall control. This Section of the Agreement shall survive the completion and/or termination of this Agreement.

2.0 Bid Proposal Form Instructions:

2.1 Bid Proposal Form:

2.1.1 **All Bidders** shall upload **ALL** pages of **Section 00 41 00 Bid Proposal Form** to BizNet, prior to the date and time of the Bid Opening.

2.2 Threshold Projects:

2.2.1 See **page 1** of the **Bid Proposal Form** to determine if this Project exceeds the **Threshold Limits**.

2.2.2 If this Project exceeds Threshold Limits, ***all*** **Bidders** shall list their Firm's **Major Contractor Registration License Number** in the **Bid Proposal Form.**

2.2.3 The **Apparent Low Bidder** shall also provide the Subcontractor(s) **Major Contractor Registration License** number(s) to the DAS/CS Office of Legal Affairs, Policy, and Procurement within **ten (10) business days after** receipt of the Letter of Intent from DAS/CS.

2.2.4 **Summary of Registration Requirements for Major Contractors:** Any person engaged in the business of construction, structural repair, structural alteration, dismantling or demolition of a structure or addition that exceeds the threshold limits provided in **C.G.S §29-276b**, or any person who, under the direction of a general contractor, performs or offers to perform any work that impacts upon the structural integrity of a structure or addition, including repair, alteration, dismantling or demolition of a structure or addition that exceeds the threshold limits shall engage in or offer to perform the work of a Major Contractor unless such person has first obtained a license or certificate of registration from the Connecticut Department of Consumer Protection (DCP). Individuals must be licensed under the requirements of **C.G.S §20-341gg "Registration of Major Contractors"**. DCP shall issue a certificate of registration to any person who is prequalified pursuant to section 4a-100 who applies for registration in accordance with this section.

2.2.5 The Bidder and all Subcontractors that engage in work that impacts upon the structural integrity of a structure or addition must register as a **Major Contractor** with DCP and obtain a **Major Contractor License** issued by DCP **PRIOR** to the date and time of the Bid Opening for this Project.

2.2.6 For further information go to the DCP Website: www.ct.gov/dcp.

2.3 Proposed Lump Sum Base Bid, Allowances, and Contingent Work:

2.3.1 The proposed **Lump Sum Base Bid** shall be set forth in the space **provided on Section 00 41 00 Bid Proposal Form.**

2.3.2 The **Proposed Lump Sum Base Bid** shall *include* all **Allowances**, all work indicated on the drawings and/or described in the specifications *except* for **Contingent Work.** See the **Bid Proposal Form, Section 01 20 00 Contract Considerations, and Section 01 23 13 Supplemental Bids** of Division 01 General Requirements for details regarding **Contingent Work**.

2.3.3 "**Contingent Work**" includes **Unit Prices** (for Earth and Rock Excavation, Environmental Remediation, and/or Hazardous Building Materials Abatement) and **Supplemental Bids**. See **Section 01 20 00 Contract Considerations** and **Section 01 23 13 Supplemental Bids,** respectively, for applicability.

2.3.4 The **Proposed Lump Sum Base Bid** shall be shown in *both* **numerical figures** and **"printed" words dollar amount**. In the event of any discrepancy the **"printed" words dollar amount** shall govern.

2.4 Addenda and Interpretations:

2.4.1 The **Number of Addenda** issued by the State of Connecticut shall be set forth in the space provided on the **Bid Proposal Form**. It shall be the Bidder's responsibility to make inquiry as to, and to obtain, the Addenda issued, if any.

2.4.2 **Addenda,** *if* issued, will be posted on the State Contracting Portal.

2.4.3 **Failure to acknowledge** all **Addenda** in the space provided in the Bid Proposal Form **shall** be cause for **rejection** of the bid.

2.4.4 Attaching **Addenda** to the **Bid Proposal Form** does **not** constitute an acknowledgement of all Addenda and does not relieve the Bidder from the requirement for the Bidder to acknowledge all Addenda in the space provided on the Bid Proposal Form.

2.4.5 **No interpretations** of the meaning of the plans, specifications or other contract documents will be made ***orally*** at any time. Every **request** for such interpretation ***shall*** be in **writing** to the awarding authority and to be given consideration ***shall*** be received at least **fourteen (14)** Calendar Days *prior* to the date fixed for the opening of bids. Any and all such **interpretations** and any **supplemental instructions** will be in the form of written **Addenda** to the specifications which, *if* issued, will be posted on the State Contracting Portal.

2.4.6 Contractors who have subscribed through BizNet to receive daily e-mail alert notices when new Bids/RFPs are issued will be notified via a daily CT DAS "**Connecticut Procurement Portal Daily Notice**".

2.5 Bidder's Qualification Statement and Objective Criteria for Evaluating Bidders:

2.5.1 **All Bidders** shall download, complete, and upload **Section 00 45 14 General Contractor Bidder's Qualification Statement** to BizNet prior to the date and time of the Bid Opening. See BizNet for a template. This information shall be considered as part of the **Bid Proposal Form.** Failure of a Bidder to answer any question or provide required information **may** be grounds for the awarding authority to **disqualify** and **reject** the bid.

2.5.2 **All Bidders** shall comply with **Section 00 45 15 Objective Criteria Established for Evaluating Qualifications of Bidders.** The **Objective Criteria Established for Evaluating Qualifications of Bidders** are to assure that the State of Connecticut will secure the "lowest responsible and qualified bidder" who has the ability and capacity to successfully complete the Bid Proposal Form and the Work. Failure to comply with any portion of this requirement **may** cause **rejection** of the bid. **Note:** Individual Specification Sections **may** contain General Contractor and/or Subcontractor Qualification requirements that *exceed* those in **Section 00 45 15 Objective Criteria Established for Evaluating Qualifications of Bidders**.

2.6 Bidder's Prequalification Requirements for Projects exceeding $500,000:

2.6.1 **All Bidders** for Projects **with estimated Construction Costs greater than $500,000** shall upload a current copy of their **"DAS Prequalification Certificate"** and **"DAS Update (Bid) Statement"** for the applicable **Class of Work** on **page 1** of **Section 00 11 16 Invitation to Bid** to Biznet ***prior*** to the date and time of the Bid Opening.

2.6.2 Pursuant to **C.G.S § 4b-91(a)(2)** and **C.G.S. §4a-100,** as revised, every contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or any other public work by the state that is **estimated** to exceed **five hundred thousand dollars ($500,000)** shall be awarded ***only*** to the lowest responsible and qualified Bidder who is **"prequalified"** by DAS in the **Class of Work for this Project,** as specified in **Section 00 11 16 Invitation to Bid**. No person who's **Contract or Subcontract** exceeds **$500,000** in value may perform work as a Contractor or Subcontractor, unless the person is **prequalified***, at the time of bid submission*, in accordance with **C.G.S. § 4a-100**, as amended, **C.G.S § 4b-91(a)(2),** and **C.G.S. §4b-91(j)**. "Prequalified" includes the contractor's or substantial subcontractor's prequalification classifications, aggregate work capacity ratings and single project limits.

2.6.3 The State may waive minor irregularities that otherwise may cause rejection of a Bid only when waiving such minor irregularities is in the best interests of the State and the minor irregularities have been corrected by the Bidder within seven (7) Calendar Days after the Bid Due Date. Failure to properly complete, sign and upload either the "**DAS Prequalification Certificate"** or **"DAS Update (Bid) Statement"** to Biznet prior to the date and time of the Bid Opening **shall** cause **rejection** of the bid and shall **not** be considered a minor irregularity under **C.G.S. § 4b-95**.

2.6.4 See **Section 00 40 15 CT DAS Prequalification Forms** for instructions on preparing and/or downloading your Firm's **"DAS Contractor Prequalification Certificate"** and **"DAS Update (Bid) Statement".**

2.6.5 **Bidder's Certification:** Within **ten (10) business days *after*** receipt of the Letter of Intent from DAS/CS, the **Apparent Low Bidder shall** submit a **Bidder's Certification** certifying that the information in the bid is true, that there has been no substantial change in the Bidder's financial position or corporate structure since its most recent **DAS Prequalification Certificate** and **DAS Update (Bid) Statement** and that the bid was made without fraud or collusion with any person. See **Section 00 92 10 Additional Forms** of this Project Manual for a sample form.

2.7 Named Subcontractor Requirements:

2.7.1 All Bid Proposals **shall** be for the complete work as specified and **shall** include the names of ***ALL*** Subcontractors for the **four (4) Classes of Work** specified in **C.G.S. § 4b-93(a)**, as revised, and for each other class of work for which the awarding authority has required a separate section pursuant to said subsection, together with the dollar amounts of their subcontracts, *if the subcontracts are in excess of* ***$100,000***. The contractor shall be selected on the basis of such bids.

2.7.2 The **Named Subcontractor Bid Price** shall be the price set forth in the space provided on the **Bid Proposal Form**.

2.7.3 No bid shall be rejected because of an error in setting forth the Name of a Subcontractor as long as the Subcontractor or Subcontractors designated are clearly identifiable.

2.7.4 No bid shall be rejected because the **Named Subcontractor's** plans and specifications do not accompany the bid or are not submitted with the bid.

2.7.5 Failure to correctly state ***ALL*** of the **Named Subcontractor's prices within a particular Class of Work** on the Bid Proposal Form ***shall*** be cause for **rejection** of the Bid.

2.7.6 **Named Subcontractor Replacement:** The awarding authority may require the **Bidder** to replace a **Named Subcontractor** whenever the awarding authority determines in their sole discretion that such **replacement** is in the **best interest of the State.**

2.7.7 **Named Subcontractor Substitution:**

.1 The awarding authority ***shall not*** permit **substitution** of a subcontractor for one **Named** in accordance with the provisions of **C.G.S. § 4b-95**, as revised, ***except*** for **"Good Cause"**.

.2 The awarding authority ***shall not*** permit **substitution** of a subcontractor for any designated sub-trade work bid to be performed by the Bidder's own forces in accordance with the provisions of **C.G.S. § 4b-95** ***except*** for **"Good Cause"**.

.3 **"Good Cause":** The term "good cause" includes but is not limited to, a subcontractor's or, **where appropriate, a Bidder's**: (1) death or physical disability, if the listed subcontractor is an individual; (2) dissolution, if a corporation or partnership; (3) bankruptcy; (4) inability to furnish any performance and payment bond shown on the bid form; (5) inability to obtain, or loss of, a license necessary for the performance of the particular category of work; (6) failure or inability to comply with a requirement of law applicable to contractors, subcontractors, or construction, alteration, or repair projects; and (7) failure to perform its agreement to execute a subcontract under C.G.S. § 4b-96, as revised.

2.7.8 **Named Subcontractor DAS Prequalification Requirement for Subcontracts exceeding $500,000:**

.1 The **Three (3) Apparent Lowest Bidders** shall receive *VIA EMAIL* a "Set-Aside Contractor Schedule Request" ("Request") from the DAS/CS Office of Legal Affairs, Policy, and Procurement. For **Subcontracts greater than $500,000,** the **Three (3) Apparent Lowest Bidders** shall submit within **ten (10) Calendar Days** after receipt of the Request current **DAS Prequalification Certificate(s) and Update (Bid) Statement(s) f**or **each Named Subcontractor** in **Table 2.7** of the **Bid Proposal Form, to the extent the Class of Work for the Named Subcontractor is a Prequalification Classification.** This information shall be considered as part of the **Bid Proposal Form** and failure to comply with any portion of this requirement ***shall*** cause **rejection** of the bid.

.2 Instructions for downloading **"DAS Contractor Prequalification Certificates"** and **"DAS Update (Bid) Statement"** can be found in **Section 00 40 15 CT DAS Prequalification Forms.**

.3 **In accordance C.G.S. §4b-91(j),** no person whose subcontract *exceeds* five hundred thousand dollars in value may perform work as a subcontractor on a project, which project is estimated to cost more than five hundred thousand dollars and is paid for, in whole or in part, with state funds, *unless, at the time of bid submission*, the person is prequalified in accordance with **C.G.S. §4a-100**, as amended. "Prequalified" includes the contractor's or substantial subcontractor's prequalification classifications, aggregate work capacity ratings and single project limits.

For **Subcontracts** estimated to **exceed $500,000,** the **Named Subcontractor *must*** be **"prequalified"** by DAS in the **Class of Work** specified in **Table 2.7** of **Section 00 41 00 Bid Proposal Form** *at the time of bid submission*, pursuant to **C.G.S. §4b-91(j)** and **C.G.S. § 4a-100,** as amended**.** This requirement also applies to the Bidder, if the Bidder is a Named Subcontractor.

2.7.9 **Named Subcontractor Bidder's Qualification Statements (Section 00 45 17)**

.1 The **Three (3) Apparent Lowest Bidders** shall receive *VIA EMAIL* a "Set-Aside Contractor Schedule Request" ("Request") from the DAS/CS Office of Legal Affairs, Policy, and Procurement. For Projects with **estimated Construction Costs greater than $500,000**, the **Three (3) Apparent Lowest Bidders** shall submit within **ten (10) Calendar Days** after receipt of the Request completed **Section 00 45 17 Named Subcontractor Bidder's Qualification Statement(s)** of this Project Manual for ***each*** **Named Subcontractor** in **Table 2.7** of the **Bid Proposal Form.** This information shall be considered as part of the **Bid Proposal Form** and failure to comply with any portion of this requirement **may** cause **rejection** of the bid.

.2 **Important Note:** Individual Technical Specification Sections **may** contain qualification requirements that ***exceed*** those from **Section 00 45 17 Named Subcontractor Bidder's Qualification Statement.**

2.7 Named Subcontractor Requirements (continued):

2.7.10 Bidder Performing Work as Named Subcontractor:

.1 In accordance with **C.G.S. § 4b-95(c)**, it shall be presumed that the **Bidder** intends to perform**,** with its own employees, all work in such **four (4) Classes of Work** and such other classes, for which ***no*** Subcontractor is named in **Table 2.7 of the Bid Proposal Form.** In accordance with **C.G.S. § 4b-92**, as revised, the **Bidder's** qualifications for performing such work shall be subject to review.

.2 In the event that the Bidder names a Subcontractor to perform some, but not all, of the separate section of the specifications for a particular Class of Work, then it will be presumed, in addition, that the Bidder intends to perform the balance of the Class of Work. Post-bid, the Bidder cannot substitute a Subcontractor for one named in the Bid Proposal Form or bring in a Subcontractor for any designated subtrade work presumed to be performed by the General Contractor's own forces, except for "Good Cause" as determined by the awarding authority.

.3 If the Bidder has listed itself as a **Named Subcontractor(s)** for a **Class(es) of Work** in **Table 2.7** of the **Bid Proposal Form** and the proposed dollar value of the Subcontract(s) is greater than $500,000, then **to the extent the Class(es) of Work is a Prequalification Classification,** the Bidder shall provide a current **DAS Prequalification Certificate** and **Update (Bid) Statement** for **each** of the applicable **Class(es) of Work** within ten (10) Calendar Days after receipt of the "Set-Aside Contractor Schedule Request" from DAS/CS. Failure to comply with this requirement **shall** cause rejection of the bid and shall not be considered a minor irregularity under **C.G.S. § 4b-95**.

2.8 Set-Aside Requirements:

2.8.1 **Bidder's DAS Set-Aside Certificate For Projects With Construction Costs Estimated To Be Less Than $500,000: All Small Business Enterprise (SBE) / Minority Business Enterprise (MBE) Bidders** shall upload a copy of their Firm's current **"DAS Set-Aside Certificate"** to BizNet prior to the date and time of the Bid Opening.

2.8.2 **Bidder Contract Compliance Monitoring Report For Projects With Construction Costs Estimated To Be Less Than $500,000:** All Firm's shall upload a completed copy of the CHRO Employment Information Form, **"Bidder Contract Compliance Monitoring Report"** ***with*** their **Bid Proposal Form** prior to the date and time of the Bid Opening. The report is posted on the **CHRO** *Webpage:*

(http://www.ct.gov/chro/cwp/view.asp?a=2525&Q=315900&chroPNavCtr=|#45679).

2.8.3 **All Bidders shall be required** to award not less than the percentage(s) stated on **page 1 of Section 00 41 00 Bid Proposal Form** to Subcontractors who are currently certified and eligible to participate under the State of Connecticut Set-Aside Program for **SBE and/or MBE** contractors, in accordance with C.G.S.§ 4a-60g. **Failure** to meet these requirements ***shall*** cause **rejection** of the bid. The MBE participation ***does*** count as part of the SBE participation.

2.8.4 **Set-Aside Contractor Schedule Request:** The SBE/MBE participation requirement *must be met* even if the Bidder is *certified* and *eligible* to participate in the **Small Business Set-Aside Program**. To facilitate compliance with this requirement for set-aside subcontractors, the **Three (3) Apparent Lowest Bidders** shall receive ***VIA EMAIL*** a "Set-Aside Contractor Schedule Request" ("Request") from the DAS/CS Office of Legal Affairs, Policy, and Procurement. As directed in the Request, the **Three (3) Apparent Lowest Bidders** shall submit within **ten (10) Calendar Days** after receipt of the Request, a **list of certified set-aside contractors** to be used on this project along with the **dollar amounts** to be paid to each. (See Section 00 73 27 Set-Aside Contractor Schedule for a sample Request.)

A copy of the **current DAS Set-Aside Certificate** for ***each*** **Subcontracted SBE and/or MBE firm(s)** listed in the **"Set-Aside Contractor Schedule"** must be attached to the Request.

This information will be considered as part of your Bid Proposal Form and **failure** to comply with any portion of this requirement within the ten (10) days, including but not limited to **failure** to list or meet the necessary dollar amount or percentage of the bid price, will be cause to **reject** your bid.

2.8.5 **Percentage of Work Performed by SBE/MBE Contractors and Subcontractors:** The percentage of the work performed by the SBE/MBE Contractors and Subcontractors on this project shall not be less than the percentage noted in **Subsection 5.1 Amount of Work Required to Be Done by "Set-Aside" Contractors** of **Section 00 73 38 Commission on Human Rights (CHRO) Contract Compliance Regulations**.

2.8.6 **To view and/or download a Set-Aside Certificate:** Go to the DAS Homepage (www.ct.gov/DAS) > Small and Minority Businesses > Apply for Small Business Enterprise or Minority Business Enterprise Certification (SBE or MBE) > View/Search SBE/MBE Directory.

2.9 Insurance Coverages:

2.9.1 The Insurance coverages required for this project shall be those listed in **Article 35 Contractors Insurance** of **Section 00 73 13 General Conditions** of this Project Manual. See **Section 00 41 00 Bid Proposal Form** and **Section 00 62 16 Certificate of Insurance** of this Project Manual for additional details.

2.9.2 The **Apparent Low Bidder *shall*** submit the Firm's **Certificate of Liability Insurance Acord® form** within **ten (10) business days *after*** receipt of the Letter of Intent from DAS/CS.

3.0 All Other Required Bid Documents, Affidavits, and Certifications:

3.1 Affidavits and Certifications:

Important Note: *The State may waive minor irregularities that otherwise may cause rejection of a Bid only when waiving such minor irregularities is in the best interests of the State and the minor irregularities have been corrected by the Bidder within seven (7) Calendar Days after the Bid Due Date. Failure to properly complete, sign and upload* ***all*** *of the following Affidavits and Certifications to Biznet prior to the date and time of the Bid Opening* ***shall*** *cause* ***rejection*** *of the bid and shall* ***not*** *be considered a minor irregularity under* ***C.G.S. § 4b-95****.*

3.1.1 Gift and Campaign Contribution Certification – OPM Ethics Form 1: All Bidders

.1 **All Bidders:** In accordance with Executive Order No. 49, and pursuant to C.G.S. §§ 4-250, 4-252(c) and 9-612(f)(2), as revised, any principal or key personnel of the person, firm or corporation submitting a bid or proposal for a contract that has a value of **$50,000** or more, shall be required to upload to BizNet a **Gift and Campaign Contribution Certification** prior to the date and time of the Bid Opening.

.2 Any bidder or proposer that **does not** upload the **Gift and Campaign Contribution Certification** to BizNet prior to the date and time of the Bid Opening as required under this section shall be ***disqualified*** and DAS shall award the contract to the next highest ranked proposer or the next lowest responsible qualified bidder or seek new bids or proposals. Failure to upload this form to BizNet **prior** to the date and time of the Bid Opening shall not be considered a minor irregularity under CGS 4b-95.

.3 Once uploaded, an updated **Gift and Campaign Contribution Certification** shall be uploaded within **30 days** of any changes to the submitted information.

.4 **Annually**, on *or* within **two (2)** weeks of the **anniversary** date of the execution of this contract, the Contractor shall upload a completed **Annual Certification** with authorizing resolution. For the purposes of this paragraph, the execution date of the contract will be the date the DAS Commissioner signs the contract.

3.1.2 Consulting Agreement Affidavit – OPM Ethics Form 5: All Bidders

.1 **All Bidders:** Pursuant to C.G.S. §§ 4a -81a and 4a -81b, as revised**,** a **Consulting Agreement Affidavit** must be completed and uploaded to BizNet prior to the date and time of the Bid Opening for contracts with a value of **$50,000** or more.

.2 In the event that a Bidder or vendor fails or refuses to upload the **Consulting Agreement Affidavit** to BizNet prior to the date and time of the Bid Opening, as required under C.G.S. § 4a-81, such bidder shall be ***disqualified*** and the award shall be made to the next lowest responsible qualified bidder or new bids or proposals shall be sought. Failure to upload this form to BizNet **prior** to the date and time of the Bid Opening shall not be considered a minor irregularity under CGS 4b-95.

.3 Once uploaded, an updated **Consulting Agreement Affidavit *shall*** be amended and uploaded not later than (1) **thirty (30) days** after the effective date of any such change or (2) upon the submittal of any new bid or proposal, whichever is earlier. For the purposes of this paragraph, the **execution date** of the contract will be the date the DAS Commissioner signs the contract.

.4 Other Contributions by Individuals. Principals of Investment Services Firms, State Contractors, Principals Of State Contractors, Prospective State Contractors Or Principals Of Prospective State Contractors. Lists. Subcontracts Study. State Officials or Employees: All acquisitions, agreements and contracts are subject to the provisions of the C.G.S. § 9-612 regarding **Campaign Contribution or Contributions**.

3.1 Affidavits and Certifications Forms (continued):

3.1.3 Ethics Affidavit – OPM Ethics Form 6: All Bidders *and* Apparent Low Bidder

.1 **All Bidders:** Pursuant to C.G.S. §§ 1-101mm and 1-101qq, as revised**,** when DAS/CS is seeking a contract for a large state construction or procurement contract having a cost of more than **$500,000**, DAS shall inform all potential consultant and contractor firms of the summary of state ethics laws developed by the Office of State Ethics (OSE) pursuant to C.G.S. § 1-81b. "Large State Contract" means an agreement or a combination or series of agreements between a state agency and a person, firm or corporation, having a total value of more than **$500,000** in a calendar or fiscal year a project for the construction, alteration or repair of any public building or public work. For a **Guide to the Code of Ethics For Current or Potential State Contractors** go to the Office of State Ethics (OSE) website (www.ct.gov/ethics), then click on the **"Publications"** link.

.2 **All Bidders:** Pursuant to C.G.S. § 1-101qq, as revised**,** DAS is also required to notify all potential consultant and contractor firms or a large state construction or procurement contract that they must upload an **Affirmation of Receipt of State Ethics Laws Summary** to BizNet prior to the date and time of the Bid Opening affirming that their key employees have read and understand the summary and agree to comply with the provisions of state ethics law.

.3 Failure to upload this affidavit to BizNet prior to the date and time of the Bid Opening ***shall*** result in **rejection** of the bid and-shall not be considered a minor irregularity under CGS 4b-95.

.4 **Apparent Low Bidder:** Furthermore, the **Apparent Low Bidder** shall provide the **Summary of the State Ethics Laws** to each **Named Subcontractor** and any other **Subcontractor** or **Subconsultant** with a contract valued over **$500,000** and obtain a **Subcontractor and Subconsultant State Ethics Affidavit** stating that the key personnel of the subcontractor have read, understand, and agree to comply with provisions of the state ethics laws. The **Apparent Low Bidder shall** submit such subcontractor(s) affidavits to the DAS/CS Office of Legal Affairs, Policy, and Procurement within **ten (10) business days after** receipt of the Letter of Intent from DAS/CS.

3.1.4 Iran Certification – OPM Ethics Form 7: All Bidders

.1 **All Bidders:** Pursuant to C.G.S. § 4-252a, when DAS/CS is seeking a contract for a large state construction or procurement contract having a cost of more than **$500,000**, an **Iran Certification** must be completed and uploaded to BizNet ***prior to the date and time of the Bid Opening*****.**

.2 Pursuant to C.G.S. § 4-252a, *"This form must always be submitted with the bid or proposal, or if there was no bid process, with the resulting contract, regardless of where the principal place of business is located. Entities whose principal place of business is located outside of the United States are required to complete the entire form, including the certification portion of the form. United States subsidiaries of foreign corporations are exempt from having to complete the certification portion of the form. Those entities whose principal place of business is located inside of the United States must also fill out the form, but do not have to complete the certification portion of the form."*

3.1.5 Nondiscrimination Certification – Form A, B, C, D, or E: All Bidders

.1 **All Bidders:** Pursuant to C.G.S. §§ 4a-60 and 4a-60a, as amended, a contractor must provide an awarding State agency with written representation or documentation that certifies the contractor complies with the State's nondiscrimination agreements and warranties prior to the award of any contract with the State. A **Nondiscrimination Certification** is required for all State contracts, regardless of type, term, cost or value. The **appropriate form** must be uploaded to BizNet prior to the date and time of the Bid Opening.

.2 Once uploaded, an updated **Nondiscrimination Certification** shall be uploaded within **30 days** of any changes to the submitted information.

.3 **Annually**, on *or* within **two (2)** weeks of the **anniversary** date of the execution of this contract, the Contractor shall upload a completed **Annual Certification** with authorizing resolution. For the purposes of this paragraph, the execution date of the contract will be the date the DAS Commissioner signs the contract.

3.1.6 For instructions on how to electronically download *and* upload **Affidavits and Non-Discrimination Forms**, go to the DAS Homepage (www.ct.gov/DAS) > Doing Business with the State > Create a BizNet Account for Doing Business with the State > Documents/Forms > Vendor Guide to Uploading Affidavits and Nondiscrimination Forms Online.

3.2 Security For Faithful Performance:

3.2.1 Certified Check or Bid Bond: All Bidders

.1 **All Bidders for bids in excess of $50,000** shall **submit** *either* a **Certified Check** *or* a **Bid Bond**, in the form required by the awarding authority. See **Section 00 43 16 Standard Bid Bond** in BizNet for a template and important instructions regarding submitting the Bid Bond or Certified Check. Complete and upload **Section 00 43 16 Standard Bid Bond** to Biznet **prior** to the date and time of the Bid Opening for **either** the Bid Bond option **or** the Certified Check option.

.2 **Certified Check Option:** The **Certified Check** shall be drawn to the order of "**Treasurer, State of Connecticut**", in which it is understood shall be cashed and the proceeds thereof used so far as may be necessary to reimburse the State of Connecticut for losses and damages arising by virtue of the Bidder's failure to file the required Bonds and execute the required contract if this proposal is accepted by the Awarding Authority.

.3 **Bid Bond Option:** The **Bid Bond** shall be in the form required by the awarding authority, having as **surety** thereto such surety company or companies acceptable to the DAS Commissioner and as are authorized to do business in this State, for an amount not less than 10 percent of the bid.

.4 **Return of Certified Check:** All **checks** submitted by **unsuccessful** Bidders shall be returned to them *after* the contract has been awarded.

.5 Failure to submit the Bid Bond **or** Certified Check **prior** to the date and time of the Bid Opening **shall** cause **rejection** of the bid and shall not be considered a minor irregularity under CGS 4b-95.

.6 **Forfeiture of Certified Check or Bid Bond: Failure** of the successful bidder to execute a contract awarded as specified and bid shall result in the **forfeiture** of the certified check or bid bond.

3.2.2 **Performance Bond: Apparent Low Bidder:** Within **ten (10) business days *after*** receipt of the Letter of Intent from DAS/CS, the **Apparent Low Bidder shall** substitute for the **certified check** or **bid bond** accompanying its bid an executed **performance bond**, in the amount not less than 100 percent of the contract price, conditioned upon the faithful performance of the contract, and having as surety thereto such surety company or companies satisfactory to the Commissioner and as are authorized to transact business in this State. This bond is to be furnished pursuant to **C.G.S. § 49-41**, as revised. See **Section 00 92 10 Additional Forms** of this Project Manual for a template.

3.2.3 **Labor and Material Bond: Apparent Low Bidder:** Within **ten (10) business days *after*** receipt of the Letter of Intent from DAS/CS, the **Apparent Low Bidder shall** submit a labor and material bond in the amount not less than 100 percent of the contract price which **shall** be binding upon the award of the contract to such bidder, with surety or sureties satisfactory to the Commissioner and as are authorized to transact business in this State, for the protection of persons supplying labor or materials in the prosecution of the work provided for in the contract for the use of each such person. Any such bond furnished **shall** have as principal the name of the successful Bidder. This bond is to be furnished pursuant to **C.G.S. § 49-41**, as revised. See **Section 00 92 10 Additional Forms** of this Project Manual for a template.

3.2.4 **The following section of the General Statutes of Connecticut, as revised, is inserted as information concerning this bond and will be incorporated into the Contract for the Work:**

C.G.S. § 49-41a. Enforcement of payment by general contractor to subcontractor and by subcontractor to his subcontractors. (a) When any public work is awarded by a contract for which a payment bond is required by section 49-41, the contract for the public work shall contain the following provisions: (1) A requirement that the general contractor, within thirty days after payment to the contractor by the State or a municipality, pay any amounts due any subcontractor, whether for labor performed or materials furnished, when the labor or materials have been included in a requisition submitted by the contractor and paid by the State or a municipality; (2) a requirement that the general contractor shall include in each of its **subcontracts** a **provision** requiring each **subcontractor** to pay any amounts due any of its subcontractors, whether for labor performed or materials furnished, within thirty days after such subcontractor receives a payment from the general contractor which encompasses labor or materials furnished by such subcontractor. **(b)** If payment is not made by the general contractor or any of its subcontractors in accordance with such requirements, the subcontractor shall set forth his claim against the general contractor and the subcontractor of a subcontractor shall set forth its claim against the subcontractor through notice by registered or certified mail. Ten days after the receipt of that notice, the general contractor shall be liable to its subcontractor, and the subcontractor shall be liable to its subcontractor, for interest on the amount due and owing at the rate of one percent per month. In addition, the general contractor, upon written demand of its subcontractor, or the subcontractor, upon written demand of its subcontractor, shall be required to place funds in the amount of the claim, plus interest of one per cent, in an interest-bearing escrow account in a bank in this State, provided the general contractor or subcontractor may refuse to place the funds in escrow on the grounds that the subcontractor has not substantially performed the work according to the terms of his or its employment. In the event that such general contractor or subcontractor refuses to place such funds in escrow, and the party making a claim against it under this section is found to have substantially performed its work in accordance with the terms of its employment in any arbitration or litigation to determine the validity of such claim, then such general contractor or subcontractor shall pay the attorney's fees of such party. **(c)** No payment may be withheld from a subcontractor for work performed because of a dispute between the general contractor and another contractor or subcontractor. **(d)** This section shall not be construed to prohibit progress payments prior to final payment of the contract and is applicable to all subcontractors for material or labor whether they have contracted directly with the general contractor or with some other subcontractor on the work.

3.2.5 **Surety Sheet: Apparent Low Bidder:** Within **ten (10) business days *after*** receipt of the Letter of Intent from DAS/CS, the **Apparent Low Bidder shall** submit a Surety Sheet that provides information regarding the Surety Company and Agent. See **Section 00 92 10 Additional Forms** of this Project Manual for a template.

3.3 Certificate (of Authority):

3.3.1 **All Bidders for bids in excess of $50,000** shall upload a signed and scanned **Section 00 40 14 Certificate (of Authority)** to BizNet prior to the date and time of the Bid Opening. See BizNet for a template.

3.3.2 The **Apparent Low Bidder** shall submit a ***second*** **Certificate (of Authority)** within **ten (10) business days *after*** receipt of the Letter of Intent from DAS/CS.

3.4 Security Requirements for CT Department of Correction (CT DOC) Facilities:

3.4.1 **All Bidders for Projects at a CT DOC Facility** shall read and comply with **Section 00 73 63 CT DOC Security Requirements** for Contract Forces on CT DOC Facilities.

3.4.2 ***NEW:*** **All Bidders for Projects at a CT DOC Facility: Prior to the Pre-Bid Meeting, all Bidders** shall download the **"Security Background Questionnaire"** from the CT DOC website (www.ct.gov/doc , under "Forms"), complete and submit the form as directed, and obtain approval, otherwise admission to the Pre-Bid Meeting **will be denied**. It is recommended that the approved form be brought as evidence of approval to attend the Pre-Bid Meeting.

3.5 Affirmative Action Plan & Employment Information Form (DAS-45): Apparent Low Bidder

3.5.1 For Projects greater than $500,000 and/or Firms with 50 or more employees, the **Apparent Low Bidder shall** submit the Firm's **Affirmative Action Plan** and **Employment Information Form (DAS-45)** to **CHRO** within **fifteen (15) calendar days after** receipt of the "Request for the *Affirmative Action Plan* and *Employment Information Form* Letter" from DAS/CS. See **Section 00 73 38 Commission on Human Rights and Opportunities/ Contract Compliance Regulations.**

3.5.2 The Apparent Low Bidder ***shall*** submit a copy of the Transmittal Letter to the DAS/CS Office of Legal Affairs, Policy, and Procurement within **fifteen (15) calendar days after** receipt of the "Request for the *Affirmative Action Plan* and *Employment Information Form* Letter" from DAS/CS.

3.6 Prevailing Wage: Apparent Low Bidder

3.6.1 The **Apparent Low Bidder shall** submit the **"Contractor's Wage Certification Form"** to CT Department of Labor (CT DOL) within **fifteen (15) calendar days *after*** receipt of the "Request for the *Affirmative Action Plan* and *Employment Information Form* Letter" from DAS/CS. See **Section 00 73 44 Prevailing Wage Rates/Contractor's Wage Certification/Payroll Certification** of this Project Manual.

3.6.2 Each contractor who is awarded a contract on or after October 1, 2002 shall be subject to provisions of **C.G.S. § 31-53**, **as revised.** See **Section 00 73 44 Prevailing Wage Rates/Contractor's Wage Certification/Payroll Certification** of this Project Manual.

3.6.3 **Annual Adjustment Of Prevailing Wage Rates:** In determining bid price, consideration should be given to **C.G.S. § 31-53 and 31-55a**, as revised, regarding **annual adjustment of prevailing wage rates.** Annual adjustments of prevailing wage rates will ***not*** be considered a matter for a contract amendment.

3.7 *NEW PROCESS:* General Permit for the Discharge of Stormwater & Dewatering Wastewaters from Construction Activities: Apparent Low Bidder

3.7.1 All DAS/CS construction projects disturbing ***one or more*** **total acres of land area** on a site **regardless of project phasing** must file a Department of Energy and Environmental Protection (DEEP) *General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities (DEEP-WPED-GP-015)* ("Construction Stormwater General Permit") registration and Stormwater Pollution Control Plan (SPCP) with the DEEP. **The DAS/CS Architect/Engineer (A/E) shall be responsible for registering the Construction Stormwater General Permit and SPCP through the online DEEP ezFile Portal prior to bidding.**

3.7.2 Once the Apparent Low Bidder is under contract with DAS/CS, and prior to the commencement of any construction activities, the Apparent Low Bidder ("Contractor") shall be required to provide the necessary information from all applicable contractors and/or subcontractors working on the Project to the DAS/CS A/E in order to finalize the SPCP and transfer the Construction Stormwater General Permit obligations to the Contractor.

3.7.3 All Contractors and Subcontractors listed on the SPCP shall be required to sign the SPCP "Contractor Certification Statement" and License Transfer Form ***prior*** to commencement of any construction activity.

3.8 Section 00 52 73 Subcontract Agreement Forms: Apparent Low Bidder

3.8.1 The **Apparent Low Bidder shall** submit a completed **Section 00 52 73 Subcontract Agreement Form** of this Project Manual for ***each*** Named Subcontractor within **ten (10) Business Days** after receipt of the "Letter of Intent" from DAS/CS. This information ***shall*** be considered as part of the **Bid Proposal Form** and failure to comply with any portion of this requirement **may** cause **rejection** of the bid.

3.8.2 Each **Named Subcontractor** shall be the matter of a **Subcontract** as required by **C.G.S. § 4b-96.**

3.9 Non-Resident Contractors and Taxation: Apparent Low Bidder

3.9.1 **Nonresident contractors** must comply with the **provisions C.G.S. § 12-430 (7)**, **Procedures for Nonresident Contractors**, and the regulations established pursuant to that section. See **Section 00 92 30 Procedures Regarding Taxation for Nonresident General/Prime Contractor and Subcontractors** of this Project Manual for additional details.

3.9.2 **Apparent Low Bidder who is a Nonresident Contractor:** Within **ten (10) business days *after*** receipt of the **"Letter of Intent"** from DAS/CS, a certificate(s) from DRS must be provided which evidences that C.G.S. §12-430 for non-resident contractors has been met. As described in Section 00 92 30 "Procedures Regarding Taxation for Nonresident General/Prime Contractor and Subcontractors", **Verified Nonresident** General/Prime Contractors must submit a copy of their **"Notice of Verified Status"** (Verification Letter) from DRS. **Unverified Nonresiden**t General/Prime Contractors must submit a copy of **Form AU-965 "Acceptance of Surety Bond"** from DRS.

3.10 Certificate of Legal Existence: Apparent Low Bidder

3.10.1 A **corporation** that is awarded the contract must comply with the laws of this State regarding the procurement of a certificate of authority to transact business in this State from the **Secretary of the State**. A **"Certificate of Legal Existence"** which is not older than **ninety (90) calendar days** from the date of the contract signing must be filed with the DAS/CS Office of Legal Affairs, Policy, and Procurement within **ten (10) business days *after*** receipt of the "Letter of Intent" from DAS/CS.

3.11 State Election Enforcement Commission (SEEC) Form 10: Apparent Low Bidder

3.11.1 The **Apparent Low Bidder** shall submit a **State Election Enforcement Commission's (SEEC) Form 10** "Notice to Executive Branch State Contractors and Prospective State Contractors of Campaign Contribution and Solicitation Limitations" within **ten (10) business days *after*** receipt of the "Letter of Intent" from DAS/CS for contracts with a value of $50,000 or more.

3.11.2 Pursuant to C.G.S. § 9-612, as revised**,** a State Contract means an agreement or contract with the state or any state agency or any quasi-public agency having a value in a calendar year of **$50,000** or more, or a combination or series of such **agreements** or **contracts** having a value of **$100,000** or more, the **authorized signatory** to this **submission** in response to the State's solicitation expressly **acknowledges receipt** of, and must submit **in writing**, the **SEEC Form 10 notice** advising prospective state contractors of the state campaign contribution and solicitation prohibitions, and will inform its principals of the contents of the **notice**.

3.11.3 For instructions on how to download "**SEEC Form 10**", go to the SEEC Homepage (www.ct.gov/seec); click on "Forms" at the top of the page; click on "Contractor Reporting Forms"; click on "SEEC Form 10" and follow the directions.

3.12 OSHA Training Course: Successful Bidder

3.12.1 Pursuant to **C.G.S. §**. **31-53b (a),** as revised, each contract entered into for the construction, remodeling, refinishing, refurbishing, rehabilitation, alteration or repair of any public building project by the state or any of its agents, or by any political subdivision of the state or any of its agents, where the total cost of all work to be performed by all contractors and subcontractors in connection with the contract is at least **one hundred thousand dollars ($100,000),** shall contain a provision requiring that, not later than **thirty (30) days** after the date such contract is awarded**, each contractor furnish proof to the Labor Commissioner** that all employees performing manual labor on or in such public building, pursuant to such contract, have completed a **course** of at **least ten (10) hours** in duration in **construction safety and health** approved by the federal Occupational Safety and Health Administration or, in the case of telecommunications employees, have completed at **least ten (10) hours** of training in accordance with 29 CFR 1910.268.

3.13 *NEW PROCESS:* Contractor and Subcontractor Payments Reporting: Successful Bidder

3.13.1 For compliance with **C.G.S. §. 4b-95 and 49-41**, DAS/CS requires every Contractor (and its Subcontractors and their Subcontractors) who has been awarded a DAS/CS construction contract to log on to the State of Connecticut web-based platform, BizNet, **each month** and **enter payments** they have received from the state, from the Contractor, or from a higher tier Subcontractor (as applicable).

The process is described as follows: The state will pay the Contractor on a monthly basis for work performed (and purchases made) by it and its Subcontractors. The Contractor will input the payment date and amount they receive from the state on a monthly basis. The Contractor's first-level Subcontractor (Tier 1 Subcontractor) will input the payment they receive from the Contractor. The second-level Subcontractor (Tier 2 Subcontractor) will input the payment they receive from the Tier 1 Subcontractor. And so on.

Contractors awarded a DAS/CS construction contract shall contain a **provision in their subcontract agreements** requiring their Subcontractors to enter payment receipt from the Contractor in the State of Connecticut web-based platform, BizNet, for work performed or purchases made in relation to state projects.

Detailed instructions can be found in the DAS/CS publication, "**6002 Instructions to Contractors/Subcontractors for Entering Payments Online**", available for download by going to the DAS Homepage (www.ct.gov/DAS) and selecting Doing Business With The State > State Building Construction > Publications and Forms > DAS Construction Services Library > 6000 Series.

4.0 Nondiscrimination and Affirmative Action

This contract is subject to Federal and state laws, including Title VII of the 1964 Civil Rights Act, 42 U.S.C. § 2000e-2(a)(1), and the Connecticut Fair Employment Practices Act, C.G.S. §46a-60 et seq., prohibit various forms of discrimination and illegal harassment in employment.

4.1 Nondiscrimination and Affirmative Action Provisions:

4.1.1 **This section is inserted in connection with C.G.S. § 4a-60, as revised.**

4.1.2 References in this section to "contract" **shall** mean this Contract and references to "contractor" **shall** mean the Contractor/Bidder.

4.1.3 **C.G.S. § 4a-60, as revised:**

(a) Every contract to which the state or any political subdivision of the state other than a municipality is a party shall contain the following provisions:

(1) The contractor agrees and warrants that in the performance of the contract such contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by such contractor that such disability prevents performance of the work involved, in any manner prohibited by the laws of the United States or of the state of Connecticut; and the contractor further agrees to take affirmative action to insure that applicants with job-related qualifications are employed and that employees are treated when employed without regard to their race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by such contractor that such disability prevents performance of the work involved;

(2) The contractor agrees, in all solicitations or advertisements for employees placed by or on behalf of the contractor, to state that it is an "affirmative action-equal opportunity employer" in accordance with regulations adopted by the commission;

(3) The contractor agrees to provide each labor union or representative of workers with which such contractor has a collective bargaining agreement or other contract or understanding and each vendor with which such contractor has a contract or understanding, a notice to be provided by the commission advising the labor union or workers' representative of the contractor's commitments under this section, and to post copies of the notice in conspicuous places available to employees and applicants for employment;

(4) The contractor agrees to comply with each provision of this section and sections 46a-68e and 46a-68f and with each regulation or relevant order issued by said commission pursuant to sections 46a-56, 46a-68e and 46a-68f; and

(5) The contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the contractor as relate to the provisions of this section and section 46a-56.

(b) If the contract is a public works contract, the contractor agrees and warrants that he will make good faith efforts to employ minority business enterprises as subcontractors and suppliers of materials on such public works project.

(c) (1) Any contractor who has one or more contracts with the state or a political subdivision of the state that is valued at less than fifty thousand dollars for each year of the contract shall provide the state or such political subdivision of the state with a written or electronic representation that complies with the nondiscrimination agreement and warranty under subdivision (1) of subsection (a) of this section, provided if there is any change in such representation, the contractor shall provide the updated representation to the state or such political subdivision not later than thirty days after such change.

(2) Any contractor who has one or more contracts with the state or a political subdivision of the state that is valued at fifty thousand dollars or more for any year of the contract shall provide the state or such political subdivision of the state with any one of the following:

(A) Documentation in the form of a company or corporate policy adopted by resolution of the board of directors, shareholders, managers, members or other governing body of such contractor that complies with the nondiscrimination agreement and warranty under subdivision (1) of subsection (a) of this section;

(B) Documentation in the form of a company or corporate policy adopted by a prior resolution of the board of directors, shareholders, managers, members or other governing body of such contractor if (i) the prior resolution is certified by a duly authorized corporate officer of such contractor to be in effect on the date the documentation is submitted, and (ii) the head of the agency of the state or such political subdivision, or a designee, certifies that the prior resolution complies with the nondiscrimination agreement and warranty under subdivision (1) of subsection (a) of this section; or

(C) Documentation in the form of an affidavit signed under penalty of false statement by a chief executive officer, president, chairperson or other corporate officer duly authorized to adopt company or corporate policy that certifies that the company or corporate policy of the contractor complies with the nondiscrimination agreement and warranty under subdivision (1) of subsection (a) of this section and is in effect on the date the affidavit is signed.

(3) Neither the state nor any political subdivision shall award a contract to a contractor who has not provided the representation or documentation required under subdivisions (1) and (2) of this subsection, as applicable. After the initial submission of such representation or documentation, the contractor shall not be required to resubmit such representation or documentation unless there is a change in the information contained in such representation or documentation. If there is any change in the information contained in the most recently filed representation or updated documentation, the contractor shall submit an updated representation or documentation, as applicable, either (A) not later than thirty days after the effective date of such change, or (B) upon the execution of a new contract with the state or a political subdivision of the state, whichever is earlier. Such contractor shall also certify, in accordance with subparagraph (B) or (C) of subdivision (2) of this subsection, to the state or political subdivision, not later than fourteen days after the twelve-month anniversary of the most recently filed representation, documentation or updated representation or documentation, that the representation on file with the state or political subdivision is current and accurate.

(d) For the purposes of this section, “contract” includes any extension or modification of the contract, “contractor” includes any successors or assigns of the contractor, “marital status” means being single, married as recognized by the state of Connecticut, widowed, separated or divorced, and “mental disability” means one or more mental disorders, as defined in the most recent edition of the American Psychiatric Association’s “Diagnostic and Statistical Manual of Mental Disorders”, or a record of or regarding a person as having one or more such disorders. For the purposes of this section, “contract” does not include a contract where each contractor is (1) a political subdivision of the state, including, but not limited to, a municipality, (2) a quasi-public agency, as defined in section 1-120, (3) any other state, as defined in section 1-267, (4) the federal government, (5) a foreign government, or (6) an agency of a subdivision, agency, state or government described in subparagraph (1), (2), (3), (4) or (5) of this subsection.

(e) For the purposes of this section, “minority business enterprise” means any small contractor or supplier of materials fifty-one per cent or more of the capital stock, if any, or assets of which is owned by a person or persons: (1) Who are active in the daily affairs of the enterprise, (2) who have the power to direct the management and policies of the enterprise, and (3) who are members of a minority, as such term is defined in subsection (a) of section 32-9n; and “good faith” means that degree of diligence which a reasonable person would exercise in the performance of legal duties and obligations. “Good faith efforts” shall include, but not be limited to, those reasonable initial efforts necessary to comply with statutory or regulatory requirements and additional or substituted efforts when it is determined that such initial efforts will not be sufficient to comply with such requirements.

(f) Determination of the contractor’s good faith efforts shall include but shall not be limited to the following factors: The contractor’s employment and subcontracting policies, patterns and practices; affirmative advertising, recruitment and training; technical assistance activities and such other reasonable activities or efforts as the commission may prescribe that are designed to ensure the participation of minority business enterprises in public works projects.

(g) The contractor shall develop and maintain adequate documentation, in a manner prescribed by the commission, of its good faith efforts.

(h) The contractor shall include the provisions of subsections (a) and (b) of this section in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the state and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the commission. The contractor shall take such action with respect to any such subcontract or purchase order as the commission may direct as a means of enforcing such provisions including sanctions for noncompliance in accordance with section 46a-56; provided, if such contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the commission, the contractor may request the state of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the state and the state may so enter.

4.2 Nondiscrimination Provisions Regarding Sexual Orientation:

4.2.1 This section is inserted in connection with C.G.S. § 4a-60a, as revised.

4.2.2 References in this section to "contract" **shall** mean this Contract and references to "contractor" **shall** mean the Contractor/Bidder.

4.2.3 C.G.S. § 4a-60a, as revised:

(a) Every contract to which the state or any political subdivision of the state other than a municipality is a party shall contain the following provisions:

(1) The contractor agrees and warrants that in the performance of the contract such contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of sexual orientation, in any manner prohibited by the laws of the United States or of the state of Connecticut, and that employees are treated when employed without regard to their sexual orientation;

(2) The contractor agrees to provide each labor union or representative of workers with which such contractor has a collective bargaining agreement or other contract or understanding and each vendor with which such contractor has a contract or understanding, a notice to be provided by the Commission on Human Rights and Opportunities advising the labor union or workers' representative of the contractor's commitments under this section, and to post copies of the notice in conspicuous places available to employees and applicants for employment;

(3) The contractor agrees to comply with each provision of this section and with each regulation or relevant order issued by said commission pursuant to section 46a-56; and

(4) The contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the contractor which relate to the provisions of this section and section 46a-56.

(b) (1) Any contractor who has one or more contracts with the state or a political subdivision of the state that is valued at less than fifty thousand dollars for each year of the contract shall provide the state or such political subdivision of the state with a written representation that complies with the nondiscrimination agreement and warranty under subdivision (1) of subsection (a) of this section.

(2) Any contractor who has one or more contracts with the state or a political subdivision of the state that is valued at fifty thousand dollars or more for any year of the contract shall provide the state or such political subdivision of the state with any of the following:

(A) Documentation in the form of a company or corporate policy adopted by resolution of the board of directors, shareholders, managers, members or other governing body of such contractor that complies with the nondiscrimination agreement and warranty under subdivision (1) of subsection (a) of this section;

(B) Documentation in the form of a company or corporate policy adopted by a prior resolution of the board of directors, shareholders, managers, members or other governing body of such contractor if (i) the prior resolution is certified by a duly authorized corporate officer of such contractor to be in effect on the date the documentation is submitted, and (ii) the head of the agency of the state or such political subdivision, or a designee, certifies that the prior resolution complies with the nondiscrimination agreement and warranty under subdivision (1) of subsection (a) of this section; or

(C) Documentation in the form of an affidavit signed under penalty of false statement by a chief executive officer, president, chairperson or other corporate officer duly authorized to adopt company or corporate policy that certifies that the company or corporate policy of the contractor complies with the nondiscrimination agreement and warranty under subdivision (1) of subsection (a) of this section and is in effect on the date the affidavit is signed.

(3) Neither the state nor any political subdivision shall award a contract to a contractor who has not provided the representation or documentation required under subdivisions (1) and (2) of this subsection, as applicable. After the initial submission of such representation or documentation, the contractor shall not be required to resubmit such representation or documentation unless there is a change in the information contained in such representation or documentation. If there is any change in the information contained in the most recently filed representation or updated documentation, the contractor shall submit an updated representation or documentation, as applicable, either (A) not later than thirty days after the effective date of such change, or (B) upon the execution of a new contract with the state or a political subdivision of the state, whichever is earlier. Such contractor shall also certify, in accordance with subparagraph (B) or (C) of subdivision (2) of this subsection, to the state or political subdivision, not later than fourteen days after the twelve-month anniversary of the most recently filed representation, documentation or updated representation or documentation, that the representation on file with the state or political subdivision is current and accurate.

4) For the purposes of this section, "contract" includes any extension or modification of the contract, and "contractor" includes any successors or assigns of the contractor. For the purposes of this section, "contract" does not include a contract where each contractor is (A) a political subdivision of the state, including, but not limited to, a municipality, (B) a quasi-public agency, as defined in section 1-120, (C) any other state, as defined in section 1-267, (D) the federal government, (E) a foreign government, or (F) an agency of a subdivision, agency, state or government described in subparagraph (A), (B), (C), (D) or (E) of this subdivision.

(c) The contractor shall include the provisions of subsection (a) of this section in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the state and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the commission. The contractor shall take such action with respect to any such subcontract or purchase order as the commission may direct as a means of enforcing such provisions including sanctions for noncompliance in accordance with section 46a-56; provided, if such contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the commission, the contractor may request the state of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the state and the state may so enter.

End of Section
00 21 13 Instructions to Bidders

Pre-Bid Meeting Agenda:

DAS ● Construction Services ● Office of Legal Affairs, Policy, and Procurement

1.0 Pre-Bid Meeting:

1.1 **The Owner and Architect will conduct a Pre-Bid Meeting.**

For the Pre-Bid Meeting Date, Time, and Location see Section 00 11 16 Invitation To Bid for this Specific Bid.

1.2 Attendance:

1.2.1	**General Contractor:**	Attendance at the Pre-Bid Meeting is **MANDATORY.** At the Pre-Bid Meeting, all prospective bidders shall *sign* his or her name on the **official roster** and *list* the name and address of the company he or she represents. For **MANDATORY** Pre-Bid Meetings, this shall be done no later than the designated **start time** of the Pre-Bid Meeting. Prospective bidders are advised to register early as **no** attendee will be allowed to register *after* the advertised start time. **Bids** submitted by contractors who have *not properly* registered and attended the **MANDATORY** Pre-Bid Meeting *shall be rejected* as **non-responsive**.
1.2.2	**Subcontractors:**	Attendance at the Pre-Bid Meeting is recommended.
1.2.3	**Pre-Bid Meeting Sign-in Sheet:**	It is **MANDATORY** that all attendees sign the **Pre-Bid Meeting Sign-in Sheet.**

1.3 Site/Facility Visit or Walkthrough: Please **do not** make any Site/Facility Visits without notifying the DAS/CS Project Manager prior to your visit.

1.3.1	☒	**A Site/Facility Visit or Walkthrough is scheduled for the Pre-Bid Meeting**
1.3.2	☐	**A Site/Facility Visit or Walkthrough is NOT scheduled for the Pre-Bid Meeting**

1.4 Bidder Questions:

1.4.1 Submit **written** questions to be discussed at the **Pre-Bid Meeting** a **minimum of two (2) Calendar Days prior** to **Pre-Bid Meeting date**. See the **Invitation to Bid** for instructions on submitting questions.

IMPORTANT NOTE: In accordance with DAS Regulations, **no** participants in any Selection, Proposal, or Bidding process, including User Agency representative(s), shall communicate with any potential Offeror prior to, during, or upon conclusion of the entire Selection, Proposal, or Bidding procedure, with the exception of information necessary to complete the administrative steps of the Selection process.

2.0 Pre-Bid Meeting Agenda:

The Pre-Bid Meeting Agenda will include a review of topics, **as applicable to the Project**, which may affect proper preparation and submittal of bids, including, but not limited to, the following:

2.1 Introduction of Participants:

2.1.1	**Architect/Engineer:** TLB Architecture, LLC
2.1.2	**CA: DH Bolton, Inc.**
2.1.3	**DAS Represenative: Halina Harabasz, Project Manager**
2.1.4	**Agency Representative: Elizabeth Shapiro, SHPO**

2.0 Pre-Bid Meeting Agenda (continued):

2.2 Project Summary:

2.2.1	**Summary of Work:** See General Requirements Section 01 11 00
2.2.2	**Temporary Facilities and Controls:** See General Requirements Section 01 50 00
2.2.3	**Work Sequence:** See General Requirements Section 01 11 00
2.2.4	**Contractor Use of Premises:** See General Requirements Section 01 11 00
2.2.5	**Project Schedule**
2.2.6	**Contract Time**
2.2.7	**Liquidated Damages:** See General Conditions Section 00 73 13, Articles 1 and 8, and 00 41 00 Bid Proposal Form.

2.3 Procurement and Contracting Requirements:

2.3.1	**Section 00 11 16 – Invitation to Bid**
2.3.2	**Section 00 21 13 – Instructions to Bidders**
2.3.3	**Section 00 41 00 – Bid Proposal Form**
2.3.4	**Section 00 41 10 – Bid Package Submittal Requirements**
2.3.5	**Section 00 30 00 – General Statements for Available information**
2.3.6	**Division 50 – Project-Specific Available Information**
2.3.7	**Bonding**
2.3.8	**Insurance**
2.3.9	**Bid Security**
2.3.10	**Notice of Award**

2.4 Communication During Bidding Period:

2.4.1	**Obtaining Bid Documents**
2.4.2	**Access to DAS Website, BizNet, and State Contracting Portal**
2.4.3	**Bidder's Requests for Information:** See General Requirements Sections 01 26 00
2.4.4	**Substitution Procedures (Prior to Bid):** See General Requirements Section 01 25 00 & General Conditions Section 00 73 13, Article 15. The Owner will consider Pre-Bid Equals or Substitutions Requests, if made **fourteen (14)** Calendar Days **prior** to the **Bid Due Date.** The information on all materials shall be consistent with the information herein.
2.4.5	**Substitutions following Contract Award:** See General Requirements Section 01 25 00 & General Conditions Section 00 73 13, Article 15. Subject to the Architect or Engineer's determination, if the material or equipment is Equal to the one specified or pre-qualified and the DAS/CS Project Manager's approval of such determination, Substitution of Material or Equipment may be allowed after the Letter of Award is issued, as specified in the Conditions Section 00 73 13, Article 15.
2.4.6	**Addenda Procedures:** See Item No. 2.7 of this form

2.0 Pre-Bid Meeting Agenda (continued):

2.5 Contract Considerations:

2.5.1	**Allowances:** See General Requirements Section 01 20 00
2.5.2	**Unit Prices:** See General Requirements Section 01 20 00
2.5.3	**NA**

2.6 Separate Contracts:

2.6.1	**Work by Owner**
2.6.2	**Work of Other Contracts**

2.7 Post Pre-Bid Meeting Addendum:

2.7.1	**No Interpretations** of the meaning of the plans, specifications or other contract documents will be made orally at any time. Every bidder **request** for such interpretation ***shall*** be in writing to the awarding authority and to be given consideration ***shall*** be received at least **fourteen (14)** Calendar Days ***prior*** to the Bid Due Date. Any and all such **interpretations** and any **supplemental instructions** will be in the form of written **addenda** to the specifications which, *if* issued, will be posted on the State Contracting Portal.
2.7.2	**Other Bidder Questions**

2.8 Other Agenda Topics and Notes:

2.8.1	Historic Treatment Procedures
2.8.2	

.0 Pre-Bid Meeting Minutes:

3.1 Recording and Distribution of Pre-Bid Meeting Minutes:

3.1.1	The **Architect** is responsible for recording and distributing Pre-Bid Meeting meeting minutes to attendees and others known by the issuing office to have received a complete set of Procurement and Contracting Documents.

3.2 Pre-Bid Meeting Minutes as "Available Information"

3.2.1	Minutes of the Pre-Bid Meeting are issued as "Available Information" and **do not** constitute a modification to the Procurement and Contracting Documents. **Modifications to the Procurement and Contracting Documents are issued by written Addendum only.**

3.3 Pre-Bid Meeting Sign-in Sheet:

3.3.1	Minutes will include the list of meeting attendees.

3.4 List of Planholders:

3.4.1	Minutes will include the list of planholders.

End of Section
00 25 13 Pre-Bid Meeting Agenda

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00 30 00 GENERAL STATEMENTS FOR AVAILABLE INFORMATION NOT USED ☐

A. **Summary:** This Section is **not** a Bidding Document, but directs Bidders to **Division 50 00 00 Project-Specific Available Information** that provides project-specific information available for review by Bidders.

B. **Bidder Responsibility:** The Bidder is responsible for information, including but not limited to, any interpretations and opinions of information contained in any plans, reports, evaluations, and logs, or shown on any drawings, or indicated on any drawings. **Division 50 00 00 Project-Specific Available Information** is provided to Bidders for their use in the preparation of a Bid.

C. **Measurement: Division 50 00 00 Project-Specific Available Information shall** be utilized for determination of payment for the Work during construction of the project.

D. **Payment: No** separate payment will be made for **any** Work under **Division 50 00 00 Project-Specific Available Information**.

E. **Related Sections:** Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section. **See Division 50 00 00 Project-Specific Available Information** for information that is available for this Project.

F. Please read the following **General Statement(s)** that describe the type of project-specific information that is available in **Division 50 00 00 Project-Specific Available Information:**

00 30 00	General Statements For Available Information Table Of Contents	Not Used
00 30 10	General Statement for Existing Conditions Information	☐
00 30 20	General Statement for Environmental Assessment Information	☒
00 30 30	General Statement for Hazardous Building Materials Inspection and Inventory	☐
00 30 40	General Statement for Subsurface Geotechnical Report	☒
00 30 50	General Statement for Elevator Agreement	☒
00 30 60	General Statement for FM Global Checklist for Roofing Systems	☐
00 30 70	General Statement for "Statement of Special Inspections"	☐
00 30 80	General Statement for Other Information	☐

00 30 10 GENERAL STATEMENT FOR EXISTING CONDITIONS INFORMATION Not Used ☐

A. **"Existing Conditions Information"** for this project is located in **Division 50 00 00 Project-Specific Available Information, Section 50 10 00 Existing Conditions Information** at the end of the Technical Specification Sections.

1. The information is made available for the convenience of all Bidders and is not a part of the Contract.

2. All Bidders must interpret this information according to their own judgment and acknowledge that they are not relying upon the information shown as accurately describing the conditions which may be found to exist.
3. Other components of the information, including but not limited to recommendations, may not be relied upon by the Bidders. The Owner shall not be responsible for any interpretation.
4. All Bidders further acknowledge that they assume all risk contingents upon the nature of the existing conditions which shall be actually be encountered by them.
5. All Bidders should visit the site and become acquainted with all existing conditions in relationship to this information and may make their own investigations to satisfy themselves as to the existing conditions. Such investigations shall be conducted only under time schedules and arrangements approved in advance by the Owner.

B. **Survey Information:** Includes information on existing building and site conditions at Project site.

C. **Final Report – Assessment and Recommendations, dated March 23 2017** Includes photographic documentation on existing conditions at Project site.

D. **Interior 3-D Model and Exterior Drone Hi-Rez Photos:** Existing Conditions as of January 2019. A link to these can be found in 50 10 00.

00 30 20 GENERAL STATEMENT FOR ENVIRONMENTAL ASSESSMENT INFORMATION Not Used ☒

00 30 30 GENERAL STATEMENT FOR HAZARDOUS BUILDING MATERIALS INSPECTION AND INVENTORY Not Used ☐

A. **Related Documents:**

- **Section 01 20 00 Contract Considerations**
- **Section 01 35 16 Alteration Project Procedures**
- **Section 02 41 20 Selective Site Demolition**
- **Section 02 82 13 Asbestos Abatement**
- **Section 02 83 13 Lead Paint Activity**

B. **Description of Work:**

1. Work Involving Asbestos Containing Material (ACM):

1.1 Testing for asbestos has been conducted at the facility scheduled for renovation, demolition, reconstruction, alteration, remodeling, or repair. Results of the asbestos testing are summarized in **Division 50 00 00 Project-Specific Available Information, Section 50 30 00 Hazardous Building Materials Inspection and Inventory** at the end of the Technical Specification Sections.

1.2 Under no circumstance shall this information be the sole means used by the Contractor for determining the extent of asbestos. The Contractor shall be responsible for verification of all field conditions affecting performance of the Work.

2. Work Involving Lead-Based Paint (LBP):

2.1 If this facility was constructed **prior to 1978** it is likely to have painted surfaces containing lead-based paint (LBP).

2.2 Testing for lead-based paint has been conducted at the facility scheduled for renovation, demolition, reconstruction, alteration, remodeling, or repair. Results of the LBP testing are summarized in **Division 50 00 00 Project-Specific Available Information, Section 50 30 00 Hazardous Building Materials Inspection and Inventory** at the end of the Technical Specification Sections. Under no circumstance shall this information be the sole means used by the Contractor for determining the extent of LBP.

2.3 The Contractor shall be responsible for verification of all field conditions affecting performance of the Work.

00 30 40 GENERAL STATEMENT FOR SUBSURFACE GEOTECHNICAL REPORT Not Used ☒

00 30 50 GENERAL STATEMENT FOR ELEVATOR AGREEMENT Not Used ☒

00 30 60 GENERAL STATEMENT FOR FM GLOBAL CHECKLIST FOR ROOFING SYSTEMS Not Used ☐

A. Related Documents:

1. Section 07 31 29 Wood Shingles and Shakes

2. Section 07 71 00 Roof Specialties

B. Description of Work:

1. Work Involving FM Global requirements for Existing Roof Removal and Replacement With New Roof:

1.1 The Contractor shall be responsible for adhering to FM Global Checklist Requirements for Roof Removal and Replacement With New Roof. See Section 01 35 16 Alteration Project Procedures, Section 07 31 29 Wood Shingles and Shakes, and Section 07 71 00 SBS Roof Specialties for additional technical specifications and Contractor responsibilities.

1.2 Refer to the **FM Global Data Sheet Website** (http://www.fmglobal.com/fmglobalregistration/) and the **FM Global Roof Design / Approval Web Tool - RoofNav** (https://roofnav.fmglobal.com/RoofNav/Login.aspx).

1.3 A sample of the FM Global Checklist is located in **Division 50 00 00 Proje**ct-Specific Available Information, 50 60 00 FM Global Checklist For Roofing Systems at the end of the Technical Specification Sections.

00 30 70 GENERAL STATEMENT FOR "STATEMENT OF SPECIAL INSPECTIONS" Not Used ☐

A. The "Statement of Special Inspections" for this project is located in **Division 50 00 00 Project-Specific Available Information, Section 50 70 00 Statement of Special Inspections** at the end of the Technical Specification Sections.

00 30 80 GENERAL STATEMENT FOR OTHER INFORMATION Not Used ☐

A. Drawings ASB-01, ASB-02, ASB-03 as Referenced in Asbestos and Lead Sections can be found in **Section 50 80 00**.

End of Section
00 30 00 General Statements for Available Information

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Certificate (of Authority)

DAS Construction Services Project No.: _____

I _____ , _____
(Signer's Name)[1] *(Signer's Title)*

of _____ , an entity lawfully organized and existing under the laws
(Name of Entity)

of _____ , do hereby certify that the following is a true and correct
(Name of State or Commonwealth)

copy of a resolution adopted on the _____ day of _____ , 20 _____ by the governing body of
(Day)[2] *(Month)*[2] *(Year)*[2]

_____ , in accordance with all of its documents of governance and
(Name Of Entity)

management and the laws of _____ and further certify that such resolution has not
(Name of State or Commonwealth)

been modified, rescinded or revoked, and is at present in full force and effect.

RESOLVED: that _____ , _____
(Name of Signer of Contract Documents)[3] *(Title of Signer of Contract Documents)*[3]

of _____ is empowered and authorized, on behalf of the entity,
(Name of Entity)

to execute and deliver contracts and amendments thereto, and all documents required by the Governor, the Connecticut Department of Administrative Services, the Connecticut State Properties Review Board and the Office of the Attorney General associated with such contracts and amendments.

IN WITNESS WHEREOF, the undersigned has executed this certificate this _____ day of _____ , 20 _____ .
(Day)[4] *(Month)*[4] *(Year)*[4]

_____
(Signature)

_____ _____
(Print Name) *(Title)*

Reference Notes:

1 The signer of this certificate must be someone *other than* the signer of the contract documents *except for* a sole managing member of an LLC or the sole officer or sole principal of a corporation. *If* the signer is a sole managing member of an LLC, *then* along with this certificate the signer must provide a letter on company letterhead that indicates the signer is a sole member and managing member. If the signer is the sole officer or sole principal of a corporation, then the signer must provide with the certificate a letter on company letterhead setting forth this fact.

2 This date must be on or before the **date of signing** of the Bid Proposal (or Contract).

3 This person shall sign the Contract and other required documents.

4 This date must be on or after the **date of signing** of the Bid Proposal (or Contract).

For Your Information:

Certificate (of Authority)

All Bidders:
Complete page 1, **print, sign, and scan** to **PDF**. Upload the **PDF** form to BizNet.

What the **Certificate** is saying is that the organization authorized the signatory to sign the pertinent **documents other than** the Certificate (of Authority) and that, as of the date of **execution** of the CERTIFICATE (i.e., the date set forth in the "In Witness Whereof" blanks) there has been no change in that authorization.

Instructions For Completing The Certificate (of Authority)

The Certificate (of Authority) to Accompany the Bid Proposal Form:

1. **1st Paragraph:**
   - **1.1** First, enter the name and title of the individual signing the Certificate (of Authority).
   - **1.2** Second, enter the legal name of the entity (exactly as it is shown on the Secretary of State registry).
   - **1.3** Third, enter the name of the state or commonwealth the entity is registered in.
   - **1.4** Fourth, enter the **date** the **resolution** was adopted by the governing body. This **date** is **on** or **before** the date the **Bid Proposal** is signed.
   - **1.5** Fifth, enter the name of the state or commonwealth the entity is registered in.
2. **2nd Paragraph:**
   - **2.1** First, enter the name and title of the individual signing bid documents for the entity.
   - **2.2** Second, enter the legal name of the entity (exactly as it is shown on the Secretary of State registry).
3. **Last Paragraph:**
   - **3.1** Enter the **Witness Date**[1]. This date will likely be the date of execution of the **Bid Proposal form**.

[1] ***This* Witness *Date Should Not Be Before The Date Of Execution Of The Bid Proposal***.

The Certificate (of Authority) to Accompany the Contract:

1. **1st Paragraph:**
   - **1.1** First, enter the name and title of the individual signing the Certificate (of Authority).
   - **1.2** Second, enter the legal name of the entity (exactly as it is shown on the Secretary of State registry).
   - **1.3** Third, enter the name of the state or commonwealth the entity is registered in.
   - **1.4** Fourth, enter the **date** the **resolution** was adopted by the governing body. This **date** is **on** or **before** the date the **Contract** is signed.
   - **1.5** Fifth, enter the name of the state or commonwealth the entity is registered in.
2. **2nd Paragraph:**
   - **2.1** First, enter the name and title of the individual signing contract documents for the entity.
   - **2.2** Second, enter the legal name of the entity (exactly as it is shown on the Secretary of State registry).
3. **Last Paragraph:**
   - **3.1** Enter the **Witness Date**[1]. This date will likely be the date of execution of the **Contract**.

[1] ***This Witness Date Should Not Be Before The Date Of Execution Of The Contract***.

End of Section 00 40 14 Certificate (of Authority)

State of Connecticut
Department of Administrative Services (DAS)
Contractor Prequalification Forms

IMPORTANT INFORMATION – PLEASE READ

For Projects with estimated Construction Costs greater than $500,000

WHEN YOU SUBMIT A BID YOU MUST INCLUDE WITH YOUR OTHER DOCUMENTS THE FOLLOWING:

1. **A copy of your "DAS Contractor Prequalification Certificate".**

   This document may be found at the DAS Contractor Prequalification Search:

   Go to the DAS Homepage (www.ct.gov/DAS), click on "Doing Business with the State", click on "Apply for DAS Construction Contractor Prequalification", click on "How To", and then click on "Search Prequalified Companies".

   To search for your company, just type in your company name and click on "Go" to pull up your company. When your company information appears you will notice that your company name is shown as a blue link. Just click on this link and it will take you to your Prequalification Certificate.

2. **A "DAS Update (Bid) Statement".**

   This document may be found and completed on-line at the Bid Statement Online Application.

   Go to the DAS Homepage (www.ct.gov/DAS), click on "Doing Business with the State", click on "Apply for DAS Construction Contractor Prequalification", click on "Documents/Forms", click on "Update Bid Statement", and then click on "Bid Statements".

   Follow instructions in the "Instructions for Prequalification".

   Go to the DAS Homepage (www.ct.gov/DAS), click on "Doing Business with the State", click on "Apply for DAS Construction Contractor Prequalification", click on "How To", and then click on "View Instructions for Prequalification".

Should you have any questions or concerns, please call (860) 713-5280.

State of Connecticut
Department of Administrative Services

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» DAS Contractor Prequalification Certificate

Contractor Prequalification Company Information

Company: Sample Corporation

Address: 165 Capitol Avenue
Hartford, CT 06106

Prequalification Contact: John T. Reed

Telephone: (860) 111-2222 **Fax:** (860) 111-3333

Email: Jreed@samplecorp.com

Web Addr: www.samplecorp.com

Contractor Prequalification History

Active Date	Expiration Date	Single Project	AWC
Oct 8, 2004	Oct 7, 2005	$20,000,000.00	$50,000,000.00

Prequalification Classification(s)

Classification	Description
GENERAL BUILDING CONSTRUCTION (GROUP C)	The undertaking of general contracts for the construction of buildings (i.e. new construction, renovation, rehabilitation, alteration, addition, etc.). The contract must include a variety of construction practices and supervision of a minimum of three sub-trades. Includes buildings that are truly custom, requiring extensive detailing, or that have large amounts of integrated scientific or complex mechanical/electrical equipment in order for them to function. Examples include hospitals, chemistry buildings, special collections buildings, historic preservation to a landmark structure, and/or any other structure that is truly one of a kind within the State's inventory. Note: If you are prequalified for General Building Construction under Group C, you are automatically prequalified for Group A and Group B.

Prequalification Licenses

License #	Trade	Active	Expire
000009	Asbestos Contractor	Sep 8, 2004	Aug 31, 2005
900235	Major Contractor	Jul 1, 2004	Jun 30, 2005
667 Class A	Demolition Contractor	Apr 1, 2004	Mar 31, 2005

This certificate prequalifies the named company to bid solely. It is not a statement of the company's capacity to perform a specific project. That responsibility lies with the awarding authority.

It is the Department of Administrative Services' (DAS) recommendation that all awarding authorities verify the above information by visiting the DAS website: http://www.das.state.ct.us - click on contractor prequalification (under the business section).

For information regarding the DAS Contractor Prequalification Program visit the above mentioned website or call (860) 713-5280.

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Need to contact us? Send e-mail to das.webmaster@po.state.ct.us

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State of Connecticut
Department of Administrative Services (DAS) Contractor Prequalification
Update Bid Statement

(Statement to be included with the bid)

Public Act No. 04-141 - AN ACT REVISING PREQUALIFICATION REQUIREMENTS FOR STATE CONSTRUCTION CONTRACTS.

On and after October 1, 2004, each bid submitted for a contract shall include a copy of a prequalification certificate issued by the Commissioner of Administrative Services. The bid shall also be accompanied by an update statement in such form as the Commissioner of Administrative Services prescribes. The form for such update statement shall provide space for information regarding all projects completed by the bidder since the date the bidder's prequalification certificate was issued or renewed, all projects the bidder currently has under contract, including the percentage of work on such projects not completed, the names and qualifications of the personnel who will have supervisory responsibility for the performance of the contract, any significant changes in the bidder's financial position or corporate structure since the date the certificate was issued or renewed, any change in the contractor's qualification status and such other relevant information as the Commissioner of Administrative Services prescribes. Any bid submitted without a copy of the prequalification certificate and an update statement shall be invalid.

Name of Project that company		
Project Number:		
Name of Company:		
FEIN:		
Company Address:		
Prequalification Contact and Telephone Number		
Date of Prequalification with the DAS:	**Single Limit:**	**Aggregate Work Capacity (AWC):**
* This amount equals your company's AWC minus the Total $ Amount of Work Remaining.		*** Remaining Aggregate Work Capacity:**

Please list all of your company's (100%) completed projects since date of Prequalification:
(Please add additional page(s) if required)

Name of Project	Owner of Project	Date Project Completed	Total Contract Amount

(Please add additional page(s) if required. Please total the Work Remaining column)

Name of Project	Owner of Project	Total Contract Amount	% Complete	Work Remaining ($)
			Total $ Amount of Work Remaining →	

Please list the names and titles of the personnel who will have supervisory responsibility for the performance of the contract being bid on:
(Please add additional page(s) if required)

Individual Name	ndividual

Have there been a business organization, which might affect your company's ability to successfully complete this contract?

Yes or No

If yes, please explain:

I, certify under penalty of law that all of the information contained in this Update Statement is true and accurate to the best of my knowledge as of the date below.

_____ _____
Signature **Date**

It is the responsibility of the Awarding Authority to determine if any of the information provided above will impact the contractor's performance on this project.

The DAS' Contractor Prequalification Program can be reached at (860) 713-5280

Rev.12.22.2004

Bid Proposal Form

DAS ● Construction Services ● Office of Legal Affairs, Policy, and Procurement
450 Columbus Boulevard, Suite 1302 ● Hartford, CT 06103

Date and Time of Bid Opening:	**See page 1 of Section 00 11 16 Invitation To Bid.**
Instructions for On-Line Bidding:	Follow the instructions in 6001 Construction On-line Bidding Instructions, available for download from the DAS/CS Library (http://portal.ct.gov/DASCSLibrary) > 6000 Series – Bid Phase Forms. For questions, call 860-713-5794 or 860-713-5783.

Instructions for Completing This Bid Proposal Form:

- **Download** and **save** the Bid Proposal Form to your computer. Close the form. Open your *saved* Bid Proposal Form and type required information in blue boxes. (Remember to keep saving to your computer.)
- On your Word Toolbar, **click "View" then "Edit Document" or "Print Layout"** in order to edit the form.
- When your Bid Proposal Form is complete, perform a final "save" to your computer! **Print *ALL*** pages **and sign** your Bid Proposal Form. **Scan *ALL*** pages of your Bid Proposal Form to **PDF**. Upload the **PDF** Bid Proposal Form to BizNet.
- **Duly Authorized Signature:** A duly authorized representative of the Bidder or Bidder's partnership, firm, corporation or business organization must sign the Bid Proposal Form.
- **No Facsimile Signature** is permitted. **All information below** is to be filled in by the **Bidder.**
- *If* an Addendum is issued that **changes** the **Bid Proposal Form** *then* the **Revised Bid Proposal Form** (issued with the Addendum) **must** be uploaded instead.
- Upload to BizNet ***only*** the additional **Bid Package Documents** as described in **Table 1** of **Section 00 41 10 Bid Package Submittal Requirements**.
- A signed and scanned ***Certificate (of Authority)*, Section 00 40 14, *must*** be uploaded to Biznet ***prior*** to the date and time of the Bid Opening.
- *Any* **Bid Proposal Form** that has omitted or added items, altered the form, contains conditional, alternative, or obscure bids, or is submitted *without* the signature of the bidder or its authorized representative, ***will be rejected***.
- See **Section 00 21 13 Instructions to Bidders** for additional information.

1.0 General Bid Proposal Information:

Project Title:	Prudence Crandall Museum Renovations
Project Location:	1 South Canterbury Road Canterbury, CT
Project Number:	**BI-RR-28**
Construction Costs:	Greater Than $500,000
Bidding Limited To :	Contractors Prequalified by DAS for General Building Construction (Group C)
Threshold Limits: (C.G.S. §29-276b)	This Project DOES NOT exceed Threshold Limits.
Set Aside Requirements:	SBE Subcontractors &/or Suppliers: 25%; MBE Subcontractors &/or Suppliers: 6.25%
Pre-Bid Meeting:	See **Section 00 11 16 Invitation to Bid** and **Section 00 25 13 Pre-Bid Meeting**.
Plans and Specifications prepared by A/E:	TLB Architecture, LLC, 92 West Main Street, Chester, CT 06412

1.1 Commencement and Acceptance: (See Section 00 73 13 General Conditions, Article 4 - Commencement and Progress of Work and Article 1 - Definitions)

The Selected Bidder shall commence Work within **fourteen (14) Calendar Days *after*** receiving a **"Construction Start Date and Notice to Proceed"** by the Commissioner or authorized representative and continue for **180** **Calendar Days** for **"Substantial Completion"** of the project; **and** then continue **90** **Calendar Days** for **"Acceptance"** of the Work**.**

1.2 Liquidated Damages: (See Section 00 73 13 General Conditions, Article 8 – Damages & Article 1 - Definitions)

1.2.1 Liquidated Damages – Substantial Completion:

The Selected Bidder shall be assessed **$** **1,899.00** per **Calendar Day *beyond*** the date established for Substantial Completion of the Contract according to the **Contract Time** as defined in **Article 1.28** of **Section 00 73 13 General Conditions,** and not otherwise excused or waived pursuant to the Contract Documents, as defined in **Article 1.23** of **Section 00 73 13 General Conditions**.

1.2.2 Liquidated Damages – Acceptance:

The Selected Bidder shall be assessed **$** **1,827.00** per **Calendar Day *beyond ninety (90) days after*** the date of said Substantial Completion that the Selected Bidder fails to achieve **Acceptance**, as defined in **Article 1.1** of **Section 00 73 13 General Conditions** and not otherwise excused or waived as described above.

1.3 Bid Proposal Statements and Conditions: This **Bid Proposal Form** shall be submitted according to, and in compliance with, the foregoing and following statements, conditions, and/or information:

1.3.1 This Bid Proposal Form is submitted in accordance with Chapter 60 Construction And Alterations Of State Buildings, Part II Bidding And Contracts of the Connecticut General Statutes (C.G.S.), as amended, particularly C.G.S. § 4b-91(a)(5)(A) – (C), and pursuant to, and in compliance with, the **Invitation to Bid** (Section 00 11 16), the **Instructions to Bidders** (Section 00 21 13), the **Bid Package Submittal Requirements** (Section 00 41 10), and the **Contract** (Section 00 52 03).

1.3.2 The Bidder proposes to furnish the labor and/or materials, installed as required for the Project named and numbered on this **Bid Proposal Form**, submitted herein, furnishing all necessary equipment, machinery, tools, labor and other means of construction, and all materials specified in the manner and at the time prescribed strictly in accordance with the provisions of the **Contract** including, but not limited to, the specifications and/or drawings together with all **Addenda** issued by the Awarding Authority and received by the Bidder, prior to the scheduled **Date and Time of the Bid Opening** as stated on **page 1** of the **Invitation To Bid**, and in conformity with requirements of the Awarding Authority and any laws or Departmental regulations of the State of Connecticut or of the United States which may affect the same, for and in consideration of the price(s) stated on this **Bid Proposal Form**, hereof.

1.3.3 The Bidder acknowledges that the **Proposed Lump Sum Base Bid** submitted on this **Bid Proposal Form** includes all work indicated on the drawings and/or described in the specifications, **except** for the **Contingent Work** described in **Subsection 2.4**.

1.3.4 The Bidder acknowledges and agrees to furnish all labor and materials required for this **Project**, in accordance with the accompanying **Plans and Specifications** prepared by the **Architect/Engineer** listed on **page 1** of this Bid Proposal Form, for the **Contract Sum** specified in the **Proposed Lump Sum Base Bid** in **Subsection 2.1** of this Bid Proposal Form, subject to **additions** and **deductions** according to the terms of the specifications, and including the number of **Addenda** stated in **Subsection 2.2** of this Bid Proposal Form.

1.4 Award:

1.4.1 All Bid Proposals shall be subject to the provisions of **Section 00 21 13 Instructions to Bidders** and for purpose of award, consideration shall be given only to Bid Proposals submitted by qualified and responsible Bidders.

1.4.2 The award shall be made on the **lowest Lump Sum Bid** and any or all **Supplemental Bid(s)** as stated in **Subsection 2.4.2** of this **Bid Proposal Form**, taken sequentially, as applicable, provided funds are available.

1.4.4 In the event of any **discrepancy** between the amount written in words and the amount written in numerical figures, the amount written in words shall be controlling.

2.0 Bid Proposal Requirements:

Bidder Information:

Bid Uploaded On: _____ (Month) _____ (Day) _____ (Year)

Proposal Of: _____
(Complete Bidder's Legal Company Name As Registered With the CT Secretary of State)

Firm Address: _____ (Avenue / Street) , _____ (Town / City) , _____ (State) _____ (Zip Code)

Contact Person: _____ (Name) _____ (Title)

Contact Information: _____ (Phone Number) _____ (Fax Number) _____ (Email Address)

Threshold Project: **Major Contractor Registration License No.:** _____

All Bidders for Projects that exceed Threshold Limits (see page 1 of this Bid Proposal Form): Insert your Firm's **Major Contractor Registration License Number** in the space provided above. **NOTE:** If this Project does **NOT** exceed Threshold Limits, insert **"Not Applicable"** in the blue box above. Delete this note by **pressing the spacebar.**

2.1 Proposed Lump Sum Base Bid:

2.1.1 **All Bidders:** Insert the **Proposed Lump Sum Base Bid** in the spaces provided below, including **both numerical figures** and **"printed words" dollar amount**. The **Proposed Lump Sum Base Bid** shall *include* all **Allowances**, all work indicated on the drawings and/or described in the specifications *except* for **Contingent Work**.

2.1.2 The **Proposed Lump Sum Base Bid** shall be shown in **both numerical figures** and **"printed words" dollar amount**. In the event of any discrepancy the **"printed" words dollar amount** shall govern.

2.1.3 The **Proposed Lump Sum Base Bid** is:

$ _____
(Place Numerical Figures in the Box Above)

_____ **Dollars**
(Insert "Printed Words" Dollar Amount in the Box Above)

2.2 Number of Addenda:

2.2.1 **All Bidders:** Insert the **Number of Addenda** issued by the State of Connecticut in the space provided below.

2.2.2 Failure to acknowledge the **correct number** of all **Addenda** in **the box below** in this **Bid Proposal Form shall** cause **rejection** of the bid.

2.2.3 The Bidder acknowledges that their **Proposed Lump Sum Base Bid Proposal includes:**

_____ **Number of Addenda. If none, enter "0".**

2.3 Allowances:

See Section 01 20 00 Contract Considerations in Division 01 General Requirements for Allowances for applicability.

2.4 Contingent Work:

2.4.1 **Base Bid Quantities and Defined Unit Prices:** See **Section 01 20 00 Contract Considerations** in Division 01 General Requirements **for applicability** regarding Base Bid Quantities and Defined Unit Prices for Earth and Rock Excavation, Miscellaneous Items, Alterations Items, Environmental Remediation, and/or Hazardous Building Materials Abatement.

2.4.2 **Supplemental Bids:**

.1 See **Section 01 23 13 Supplemental Bids** in Division 01 General Requirements **for applicability.**

.2 **All Bidders: If Supplemental Bids are applicable** to this Project, insert the **Supplemental Bids** in the spaces provided below. Any **Supplemental Bids** listed below, *if* accepted by the Owner, will be taken cumulatively and in numerical order as scheduled. No Supplemental Bid will be skipped or taken out of numerical order as scheduled.

Supplemental Bid No. 1: NOT APPLICABLE

ADD: $ _____ _____ **Dollars**

(Insert Numerical Figures) *(Insert "Printed Words" Dollar Amount)*

Supplemental Bid No. 2: NOT APPLICABLE

ADD: $ _____ _____ **Dollars**

(Insert Numerical Figures) *(Insert "Printed Words" Dollar Amount)*

Supplemental Bid No. 3: NOT APPLICABLE

ADD: $ _____ _____ **Dollars**

(Insert Numerical Figures) *(Insert "Printed Words" Dollar Amount)*

Supplemental Bid No. 4: NOT APPLICABLE

ADD: $ _____ _____ **Dollars**

(Insert Numerical Figures) *(Insert "Printed Words" Dollar Amount)*

2.5 Bidder's Qualification Statement and Objective Criteria for Evaluating Bidders:

2.5.1 **All Bidders:** Download **Section 00 45 14 General Contractor Bidder's Qualification Statement** from BizNet for a template and instructions. Complete and upload **Section 00 45 14 General Contractor Bidder's Qualification Statement** to Biznet ***prior*** to the date and time of the Bid Opening. Information with regards to the **General Contractor's Bidder's Qualification Statement** is submitted and is made part of this **Bid Proposal Form**. Failure of a Bidder to answer any question or provide required information ***shall*** be grounds for the awarding authority to **disqualify** and **reject** the bid, pursuant to Connecticut General Statutes §4b-92.

2.5.2 **All Bidders** shall comply with **Section 00 45 15 Objective Criteria Established for Evaluating Qualifications of Bidders. Note:** Individual Specification Sections may contain General Contractor and/or Subcontractor Qualification requirements that exceed those in **Section 00 45 15 Objective Criteria Established for Evaluating Qualifications of Bidders.**

2.6 Prequalification Requirements for Projects Exceeding $500,000:

2.6.1 **All Bidders for Projects with estimated Construction Costs <u>greater</u> than $500,000:** Upload to BizNet a current copy of your Firm's **"DAS Contractor Prequalification Certificate"** *and* **"Update (Bid) Statement"** for the applicable **Class of Work** on **page 1** of this **Bid Proposal Form** ***prior*** to the date and time of the Bid Opening. Failure to comply with this requirement **shall** cause rejection of the bid and shall not be considered a minor irregularity under **C.G.S. § 4b-95**. See **Section 00 40 15 CT DAS Prequalification Forms** for instructions on preparing and/or downloading your Firm's **"DAS Contractor Prequalification Certificate"** and **"DAS Update (Bid) Statement".**

2.6.2 **Named Subcontractor(s) for Subcontracts exceeding $500,000:** The **Named Subcontractor(s)** ***must*** be **"prequalified"** by DAS in the **Class of Work** specified in **Table 2.7** of this **Bid Proposal Form** *at the time of bid submission*, pursuant to **C.G.S. §4b-91(j)** and **C.G.S. § 4a-100,** as amended, to the extent the Class of Work for the Named Subcontractor is a Prequalification Classification. This requirement also applies to the Bidder, if the Bidder is a Named Subcontractor. Failure to comply with this requirement **shall** cause rejection of the bid and shall not be considered a minor irregularity under **C.G.S. § 4b-95**.

2.7 Named Subcontractors and Classes of Work:

2.7.1 **All Bidders for Projects with <u>one or more</u> Classes of Work <u>checked</u> in Table 2.7 below:** Complete **Table 2.7** according to the instructions below. Failure to properly provide **<u>all</u>** of the **required information** in **Table 2.7** may cause **rejection** of the bid.

Table 2.7: Named Subcontractors and Classes of Work:

☐ **Electrical Work: NOT APPLICABLE**		
Complete Subcontractor Name:		
Proposed Dollar Value of Subcontract:	**$**	
☐ **HVAC Work: NOT APPLICABLE**		
Complete Subcontractor Name:		
Proposed Dollar Value of Subcontract:	**$**	
☐ **Masonry Work: NOT APPLICABLE**		
Complete Subcontractor Name:		
Proposed Dollar Value of Subcontract:	**$**	
☐ **Plumbing Work: NOT APPLICABLE**		
Complete Subcontractor Name:		
Proposed Dollar Value of Subcontract:	**$**	
☐ **Environmental Remediation: NOT APPLICABLE**		
Complete Subcontractor Name:		
Proposed Dollar Value of Subcontract:	**$**	
☐ **Hazardous Materials Abatement: NOT APPLICABLE**		
Complete Subcontractor Name:		
Proposed Dollar Value of Subcontract:	**$**	

2.7.2 Instructions For Table 2.7:

.1 Each **Class of Work** set forth in a separate section of the specifications pursuant to this Section shall be a **subtrade** designated in **Table 2.7** of this **Bid Proposal Form** and shall be the matter of a **subcontract**.

.2 For each **Class of Work** checked in **Table 2.7**, the Bidder shall insert the name of each **Subcontractor** with their **Proposed Dollar Value of Subcontract;** this is known as the **"Named Subcontractor"**. If the Bidder intends to use **more than one** Subcontractor to perform a Class of Work, then it shall provide ***<u>ALL</u>*** of the Subcontractor Names and Proposed Dollar Values of **each Subcontract in excess of $100,000**.

.3 *If* a **Bidder** intends to use **<u>one or more</u> Subcontractors** to perform ***any portion*** of the Named **Classes of Work**, including circumstances where the Subcontractor is a Small Business Enterprise (SBE) or a Minority Business Enterprise (MBE), *then* it must list **<u>ALL</u>** of the Subcontractors or SBE/MBE Subcontractors as the case may be, for such Class of Work. A **Bidder** may **not** substitute itself for any of the Named Classes of Work. The Bidder **<u>should not list itself</u>** as the **Named Subcontractor** if it intends to use a **Subcontractor** to perform any portion of the Classes of Work listed in **Table 2.7**. The Bidder should name the Subcontractor.

.4 If a Bidder customarily performs any of the specified Classes of Work and is Prequalified by DAS for the Class of Work *at the time of the Bid Opening Date* ***if*** the work is greater than $500,000, the Bidder may list **itself** as a Subcontractor together with its **price** in the space provided in **Table 2.7**. Failure to properly provide **<u>all</u>** of the **required information** in **Table 2.7** ***shall*** cause **rejection** of the bid.

.5 If the Bidder does **not** name **itself** or a **Subcontractor** for a specified Class of Work, it shall be presumed that the Bidder intends to perform with its own employees **all work** in such specified classes. The Bidder shall be required to perform with its own employees **all** of the work of the specified class. Subcontracting any portion of such specified class of work subsequently, will be considered a violation of **C.G.S. § 4b-95** and subject the Bidder to disqualification under **C.G.S. § 4b-95(e).**

6. In the event that the Bidder names a Subcontractor to perform some, but not all, of the separate section of the specifications for a particular Class of Work, then it will be presumed, in addition, that the Bidder intends to perform the balance of the Class of Work. Post-bid, the Bidder cannot substitute a Subcontractor for one named in the Bid Proposal Form or bring in a Subcontractor for any designated subtrade work presumed to be performed by the General Contractor's own forces, except for "Good Cause" as determined by the awarding authority.

.7 In the event the Bidder either lists itself or is presumed to perform with its own employees all work in a specified class, no such sub-bid by a Bidder shall be considered unless the Bidder can show to the satisfaction of the awarding authority, based on objective criteria established for such purpose, that it customarily performs such subtrade work and is qualified to do the character of work required by the applicable section of the specifications.

2.8 Set Aside Requirements: (see Section 00 73 38 "CHRO Contract Compliance Regulations")

2.8.1 **For Projects Less Than $500,000:** Submit a current copy of your Firm's **"DAS Set-Aside Certificate"** ***with*** your **Bid Proposal Form** *prior* to the date and time of the Bid Opening.

2.8.2 **For Projects Less Than $500,000:** Upload a completed copy of the CHRO Employment Information Form, **"Bidder Contract Compliance Monitoring Report**" ***with*** your **Bid Proposal Form** *prior* to the date and time of the Bid Opening. The report is on the **CHRO** Webpage (http://www.ct.gov/chro/cwp/view.asp?a=2525&Q=315900&chroPNavCtr=|#45679).

2.8.3 **All Bidders shall be required** to award not less than the percentage(s) stated on **page 1 of this Bid Proposal Form** to Subcontractors who are currently certified and eligible to participate under the State of Connecticut Set-Aside Program for **SBE and/or MBE** contractors, in accordance with C.G.S.§ 4a-60g. **Failure** to meet these requirements ***shall*** cause **rejection** of the bid.

2.9 Insurance Coverages:

The **limits of liability** for the Insurance required for this project shall be those listed in **Article 35 Contractors Insurance** of **Section 00 73 13 General Conditions**. Also see Section 00 62 16 Certificate of Insurance.

2.9.1 **Commercial General Liability Insurance:** The Bidder **shall** maintain Commercial General Liability Insurance. **NOTE:** All selected firms are required to provide an endorsement to the CGL insurance stating that the State of Connecticut, the Department of Administrative Services, and their respective officers, agents, and employees shall be named as an Additional Insured. Please be advised that a blanket endorsement **may not** be acceptable. Products/Completed Operations insurance shall be maintained for the duration of the Project and shall be maintained for a minimum of **three (3) years** after certification by the Owner that all Work has been completed and accepted by the Owner in accordance with the Contract Documents. CGL coverage may include **Special Hazards Insurance,** as described below**.**

2.9.2 **Special Hazards Insurance:**

☐ None is Required.

☐ The Bidder **shall** maintain Special Hazards Insurance, including coverage for **explosion, collapse or underground damage (X-C-U)**. .

☒ The Bidder **shall** maintain Special Hazards Insurance, including coverage for **Asbestos Abatement and Lead Liability.**

2.9.3 **Owner's and Contractor's Protective Liability Insurance:** The Bidder **shall** maintain Owner's and Contractor's Protective Liability Insurance. This coverage shall be for and in the name of the State of Connecticut.

2.9.4 **Automobile Liability Insurance:** The Bidder **shall** maintain Automobile Liability Insurance for the operation of all motor vehicles including those owned, non-owned and hired or used in connection with the Contract. Should the Bidder not own any automobiles, the automobile & liability requirement shall be amended to allow the Bidder to maintain only hired and non-owned liability coverage.

2.9.5 **Umbrella Liability Insurance:** The Bidder **shall** maintain Umbrella Liability Insurance. The Bidder shall provide an endorsement to the Umbrella Liability Insurance stating that the State of Connecticut is an additional insured.

2.9.6 **Workers Compensation/Employer Liability Insurance:** The Bidder **shall** maintain Workers Compensation/Employer Liability Insurance.

2.9.7 **Builder's Risk Insurance:**

☐ None is Required.

☒ The Bidder **shall** maintain Builder's Risk Insurance providing coverage for the entire Work at the project site, portions of the Work located away from the site but intended for use at the site, and portions of the Work in transit. Coverage shall be written on an All-Risk, Replacement Cost, and completed Value Form basis in an amount at least equal to the projected completed value of the Work Prior to the Owner's issuance of a Notice to Proceed, the Contractor shall provide coverage for the entire Work in an amount equal to the total contract amount and any additional modifications. The Owner and its officers, agents and employees shall be listed as loss payee subject to the prior review of the Owner, and not as an additional insured for these coverages. The Builder's Risk Insurance policy shall state it is for the benefit of and payable to the State of Connecticut. The **Period of Coverage** shall be the number of Calendar Days from Construction Start Date to Substantial Completion as stated in the Bid Proposal Form of the Project Manual, plus ninety (90) Calendar Days to Acceptance of the Work.

2.9.8 **Inland Marine/Transit Insurance (Transportation Insurance):**

☒ None is Required.

☐ The Bidder **shall** maintain Inland Marine/Transit Insurance (Transportation Insurance) provided the coverage is not afforded by a Builder's Risk policy**.** The Inland Marine/Transit Insurance policy shall endorse the State of Connecticut as a Loss Payee and the policy shall state it is for the benefit of and payable to the State of Connecticut.

3.0 Bid Proposal Acknowledgements:

The Bidder *acknowledges* and *agrees* to the following:

3.1 To Upload to BizNet Submit the Bid Proposal Form (all pages), All Other Bid Documents, Affidavits, and Certifications:

3.1.1 The Bidder acknowledges and agrees to electronically upload to DAS BizNet **all pages** of the **Bid Proposal Form,** and all other **Bid Documents, Affidavits, and Certifications** as directed in **Section 00 11 16 Invitation to Bid, Section 00 21 13 Instructions to Bidders,** and **Section 00 41 10 Bid Package Submittal Requirements.**

3.1.2 The State may waive minor irregularities which it considers in the best interest of the State and, when applicable, are corrected by the Bidder within seven (7) Calendar Days after the Bid Due Date. Failure to properly complete, sign and upload any of the items marked with an asterisk (*) in **Table 1** of **Section 00 41 10 Bid Package Submittal Requirements *shall*** cause rejection of the bid and ***shall not*** be considered a minor irregularity under **C.G.S. § 4b-95.**

3.1.3 If there are any delays in the receipt of other documents then the Bid shall remain valid for the same additional number of days. For example, if the documents are submitted four (4) Calendar Days later; then the bid shall remain valid for ninety-four (94) Calendar Days.

3.1.4 Failure to submit the documents before the stated deadline **may** result in rejection of the bid at the sole discretion of the Commissioner of Administrative Services.

3.2 To Hold Bid Price:

The Bidder acknowledges and agrees to hold the **Proposed Lump Sum Base Bid** in **Subsection 2.1** of this Bid Proposal Form for **ninety (90) Calendar Days** and any extensions caused by the Bidder's delays in required submissions. The Bidder and the State may mutually agree to extend this period. The agreement to extend the **ninety (90) Calendar Day** period may occur after the expiration of the original **ninety (90) Calendar Day** period.

3.3 To Use and Accept Allowances:

When applicable to this Project, the Bidder **acknowledges and agrees** to accept and use the **Allowances** as shown in **Section 01 20 00 Contract Considerations** of Division 01 General Requirements as part of the **Proposed Lump Sum Base Bid** listed in **Subsection 2.1** of this Bid Proposal Form.

3.4 To Use and Accept the Following Contingent Work:

3.4.1 **Unit Prices:** When applicable to this Project, the Bidder **acknowledges and agrees** to accept and use the **Units, Add Unit Prices, and Deduct Unit Prices** as shown in **Section 01 20 00 Contract Considerations** of Division 01 General Requirements in evaluating either additions to or deductions from the Work.

3.4.2 **Supplemental Bid:** When applicable to this Project and if accepted by the Owner, the Bidder **acknowledges and agrees** to provide all labor, material and equipment to complete the Work in accordance with the **Supplemental Bid** described in **Section 01 23 13 Supplemental Bids** of Division 01 General Requirements and provided by the **Bidder** in **Subsection 2.4.2** of this Bid Proposal Form.

3.5 To Use the Named Subcontractors Listed in Table 2.7:

3.5.1 The Bidder **agrees** that each of the **Named Subcontractors** stated in **Table 2.7** of this Bid Proposal Form will be used for the **Class of Work** indicated, for **the Proposed Total Subcontract Value dollar amount stated**, **unless** a **substitution** is permitted by the awarding authority as provided for in and in accordance with C.G.S. § 4b-96, as amended.

3.5.2 **For Named Subcontractor(s) with Subcontracts exceeding $500,000,** the Bidder acknowledges that the **Named Subcontractor(s) *must*** be **"prequalified"** by DAS in the **Class of Work** specified in **Table 2.7** of this **Bid Proposal Form** *at the time of bid submission*, pursuant to **C.G.S. §4b-91(j)** and **C.G.S. § 4a-100,** as amended, to the extent the Class of Work for the Named Subcontractor is a Prequalification Classification. In addition, the Bidder agrees to submit within *ten (10) Calendar Days* after receipt of the "Set-Aside Contractor Schedule Request" the current DAS Prequalification Certificate(s) and Update (Bid) Statement(s) for each Named Subcontractor in Table 2.7 of this Bid Proposal Form.

3.0 Bid Proposal Acknowledgements (continued):

3.6 To Make Good Faith Efforts to Employ MBEs:

The Bidder acknowledges and agrees to make **good faith efforts** to employ **Minority Business Enterprises (MBEs)** as **Subcontractors** and **Suppliers** of materials under such Contract.

3.7 To Submit a Certified Check or Bid Bond (if required):

The Bidder acknowledges and agrees to submit a **Certified Check** or **Standard Bid Bond *prior*** to the due date and time of the Bid Opening (if required). Download **Section 00 43 16 Standard Bid Bond** from BizNet for a template and instructions.

3.8 To Accept the Current Prevailing Wage Rate Schedule:

The U. S. Secretary of Labor's latest decision and the State of Connecticut Department of Labor (DOL) Prevailing Wage Rate Schedule are all incorporated in the documents. The higher rate (Federal or State) for any given occupation shall prevail. At the time of bidding, the Bidder agrees to accept the current Prevailing Wage Rate Schedule, as well as the annual adjustment to the prevailing wage rate that is in effect each July 1st, as provided by DOL. See **Section 00 73 44 Prevailing Wage Rates/Contractor's Wage Certification/Payroll Certification.** Annual adjustments of prevailing wage rates will ***not*** be considered a matter for a contract amendment with DAS/CS.

3.9 To Comply With CHRO Requirements:

If applicable, the Apparent Low Bidder acknowledges and agrees to provide the Commission on Human Rights and Opportunities with such information as is requested by the Commission concerning their **employment practices and procedures** as they relate to the current provisions of the Connecticut General Statutes governing Contract requirements within **fifteen (15) calendar days *after*** receipt of the "Request for the *Affirmative Action Plan* and *Employment Information Form* Letter" from the DAS/CS Office of Legal Affairs, Policy, and Procurement.

3.10 To Ensure Executive Order No. 11246 for Equal Employment Opportunity & Non-Segregated Facilities Has Been Met:

The Apparent Low Bidder acknowledges and agrees to ensure that Executive Order No. 11246 for Equal Employment Opportunity & Non-Segregated Facilities has been met for their firm and their Subcontractors. The Apparent Low Bidder also agrees to certify (if required) to the compliance of non-segregated facilities.

3.11 To Obtain and Maintain Required Insurance Coverages:

The Bidder acknowledges and agrees to obtain and maintain the required Insurance Coverages and submit the Firm's **"Certificate of Liability Insurance Acord® form"** within **ten (10) business days *after*** receipt of the "Letter of Intent" from the DAS/CS Office of Legal Affairs, Policy, and Procurement, as discussed in **Section 00 62 16 Certificate of Insurance** and **Article 35, "Contractors Insurance"** in **Section 00 73 13 General Conditions**.

3.12 To Comply With Security Requirements for CT Department of Correction Facilities:

When applicable to this Project, the Bidder acknowledges and agrees to comply with **Section 00 73 63 CT Department of Correction (CT DOC) Security Requirements** for Contract Forces on CT DOC Facilities.

3.13 To Ensure C.G.S. § 12-430 for Non-Resident Contractors Has Been Met:

If applicable, the Apparent Low Bidder acknowledges and agrees to provide either a copy of the **"Notice of Verified Status"** (Verification Letter) from the Connecticut Department of Revenue Services (DRS) (for **Verified Nonresident** General/Prime Contractors) or a copy of **Form AU-965 "Acceptance of Surety Bond"** from DRS (for **Unverified Nonresiden**t General/Prime Contractors) within **ten (10) business days *after*** receipt of the "Letter of Intent" from the DAS/CS Office of Legal Affairs, Policy, and Procurement which evidences that **C.G.S. § 12-430** for non-resident contractors has been met, as described in **Section 00 92 30 Procedures Regarding Taxation for Nonresident General/Prime Contractor and Subcontractors.**

3.14 To Execute Contract:

If selected as the Prime Contractor, the Bidder acknowledges and agrees to **execute a Contract** in accordance with the terms of this **Bid Proposal Form** and the **Contract** within **ten (10) Calendar Days** (legal State holidays excluded) ***after*** notification thereof by the awarding authority. See **Section 00 52 03 Contract** for a sample.

4.0 Confidentiality of Documents:

4.1	The **undersigned** agrees that if not selected as the Prime Contractor for this project, all plans and specifications in their possession for the project shall be destroyed.
4.2	The **undersigned** agrees that if selected as the Prime Contractor for this project:
4.2.1	The **plans and specifications** shall not be disseminated to anyone except for construction of this project.
4.2.2	The **following provision** shall be included in all of its contracts with subcontractors and sub-consultants:

"Any and all drawings, specifications, maps, reports, records or other documents associated with the contract shall only be utilized to the extent necessary for the performance of the work and duties under this contract. Said drawings, specifications, maps, reports, records and other documents may not be released to any other entity or person except for the sole purpose of the work described in this contract. No other disclosure shall be permitted without the prior written consent of DAS Construction Services. When any such drawings, specifications, maps, reports, records or other documents are no longer needed, they shall be destroyed."

4.2.3	Upon completion of the construction and the issuance of a certificate of occupancy, the plans and specifications shall be returned to DAS Construction Services, or destroyed, or retained in a secure location and not released to anyone without first obtaining the permission of DAS Construction Services.

5.0 Bid Proposal Declarations:

I (we), the undersigned, hereby declare that I am (we are) the only person(s) interested in the Bid Proposal and that it is made without any connection with any other person making any Bid Proposal for the same work. No person acting for, or employed by, the State of Connecticut is directly or indirectly interested in this Bid Proposal, or in any Contract which may be made under it, or in expected profits to arise therefrom. This Bid Proposal is made without directly or indirectly influencing or attempting to influence any other person or corporation to bid or refrain from bidding or to influence the amount of the Bid Proposal of any other person or corporation. This Bid Proposal is made in good faith without collusion or connection with any other person bidding for the same work and this proposal is made with distinct reference and relation to the plans and specifications prepared for this Contract. I (we) further declare that in regard to the conditions affecting the Work to be done and the labor and materials needed, this Bid Proposal is based solely on my (our) own investigation and research and not in reliance upon any representations of any employee, officer or agent of the State.

6.0 Duly Authorized Signature:

Type of Business: *(Check Applicable Box)*

☐ **Limited Liability Corporation (LLC)**

☐ **Partnership**

☐ **Sole Proprietor**

☐ **Doing Business As (d/b/a)**

(If d/b/a box is checked provide complete name below)

(Doing Business As Name)

☐ **Corporation** *(If Checked, Provide Corporate Seal Below)*

(Provide exact corporate name from corporate seal below)

(Name On Corporate Seal)

Signed: *(Month)* *(Day)* *(Year)*

Bidder's Signature: *(Duly Authorized)* *(Title)*

(Print Named) *(Date)*

Bid Package Submittal Requirements:

DAS | Construction Services | Office of Legal Affairs, Policy, and Procurement

450 Columbus Boulevard, Suite 1302 | Hartford, CT 06103

1.1 On-Line Bidding:

1.1.1 All Bidders shall **electronically** upload their **Bid Package Documents** to BizNet following the **instructions** in the DAS/CS publication, 6001 Construction On-line Bidding Instructions, available for download here: Go to the DAS Homepage (www.ct.gov/DAS) > Doing Business With The State > State Building Construction > Publications and Forms > DAS Construction Services Library > 6000 Series > **6001 Construction On Line Bidding Instructions**.

1.1.2 For questions, call 860-713-5794.

1.2 Bid Package Submittal Requirements:

All Bidders are required to **electronically upload Bid Package Documents** to BizNet ***prior*** to the date and time of the Bid Opening. Additional documents must be either **electronically uploaded** to BizNet **or** submitted as **paper copies** to the **appropriate Agency**. See Tables 1, 2, and 3 for specific submittal requirements.

1.2.1 **All Bidders:** See Table 1. ***All Documents* in Table 1 must be *electronically uploaded* to BizNet.**

1.2.2 **Three (3) Apparent Lowest Bidders:** See Table 2.

1.2.3 **Apparent Low Bidder:** See Table 3.

1.3 Deadlines for Receipt of Bid Package Documents:

1.3.1 **Table 1:** Bid Package Documents must be uploaded to BizNet ***prior*** to the date and time of the Bid Opening. The State may waive minor irregularities that otherwise may cause rejection of a Bid only when waiving such minor irregularities is in the best interests of the State and the minor irregularities have been corrected by the Bidder within seven (7) Calendar Days after the Bid Due Date. Failure to properly complete, sign and upload to BizNet any of the items **marked with an asterisk (*)** in **Table 1 prior** to the date and time of the Bid Opening **shall** cause **rejection** of the bid and shall **not** be considered a minor irregularity under **Connecticut General Statutes (C.G.S.) § 4b-95**.

1.3.2 **Tables 2 and 3:** See the tables for additional deadlines. Failure to submit the documents before the stated deadlines **may** result in rejection of the bid at the sole discretion of the Commissioner of Administrative Services.

1.4 Delays in Receipt of Supportive Documents from the Three Apparent Lowest Bidders:

1.4.1 If there are any delays in the receipt of the supportive documents specified in Tables 2 and 3, then the Bids shall remain valid for the same additional number of days.

.1 For example, since the **Three (3) Apparent Lowest Bidders** are required to **Hold The Bid Price** for **ninety (90) calendar days**, if supportive documents are submitted **four (4) calendar days later**, then the bid shall remain valid for **ninety-four (94) calendar days.**

1.4.2 Failure to submit the documents before the stated deadline **may** result in rejection of the bid at the sole discretion of the Commissioner of Administrative Services.

Objective Criteria Established for Evaluating Qualifications of Bidders:

CT DAS | Construction Services | Office of Legal Affairs, Policy, and Procurement

The following items are established pursuant to Sections 4b-92, 4b-94 and 4b-95a of the Connecticut General Statutes (C.G.S.) as amended.

The **Objective Criteria Established for Evaluating Qualifications of Bidders** (Section 00 45 15) are to assure that the State of Connecticut will secure the "lowest responsible and qualified bidder" who has the ability and capacity to successfully complete the Bid Proposal Form and the Work. Failure to comply with any portion of this requirement **may** cause **rejection** of the bid. **Note:** Individual Specification Sections **may** contain General Contractor and/or Subcontractor Qualification requirements that *exceed* those in **Section 00 45 15 Objective Criteria Established for Evaluating Qualifications of Bidders.**

THE BIDDER MUST HAVE OR HAVE COMPLETED THE FOLLOWING:

1.1 DAS Prequalification Requirements:

For Projects with Construction Costs greater than $500,000, **all Bidders** shall upload to BizNet a valid Department of Administrative Services (DAS) **Prequalification Certificate** and **Update (Bid) Statement *prior*** to the date and time of the Bid Opening.

1.2 Evaluation:

1.2.1	**All Bidders** shall upload to BizNet **Section 00 45 14 General Contractor's Bidder Qualifications Statement *prior*** to the date and time of the Bid Opening.
1.2.2	If applicable, the **Three (3) Lowest Bidders** shall submit **Section 00 45 17 Named Subcontractor's Bidder Qualification Statement(s)** to DAS Construction Services (DAS/CS) Office of Legal Affairs, Policy, and Procurement within **ten (10)** calendar days ***after*** receipt of the "Set-Aside Contractor Schedule Request" ***from*** DAS/CS.
1.2.3	The Bidder must demonstrate that the Bidder and, if applicable, its Named Subcontractors, meet the **objective criteria** for this specific project.
1.2.4	The **responses** to the Statement(s) must identify two (2) **projects completed** – single project contracts that have reached substantial completion, not aggregate projects – of commercial and/or institutional construction work (this includes compliance with general requirements) during the past five (5) years within the Cost Estimate Range stated in Section 00 11 16 **Invitation to Bid** for this project, and of the size and complexity of this project. The failure to identify to such projects shall result in rejection of the bid.
1.2.5	If the Bidder identifies two projects that meet the above criteria, the **State's evaluation** shall be based on the **performance record** of the prospective Bidder as a general, prime contractor and its named subcontractors during the course of the two (2) comparable projects, and not just the end result. The state will conduct the evaluation based on its interpretation of its objective criteria. **Evaluation criteria** shall include: Faithful and efficient performance; fulfilment of contract obligations; financial, managerial and technical abilities; and integrity and the absence of any conflicts of interest. Any one or all of the factors noted in this paragraph as well as in the other criteria set forth in this **Section 00 45 15** may be grounds for the determination by the State, in its sole discretion, of the Bidder's responsibility and qualifications necessary for the faithful performance of the work required of this project.

1.3 References:

Furnished **references from architects, engineers or owners** indicating that it has satisfactorily completed in a timely manner contract work for projects and provide explanations where delays have occurred. This information should cover work done over the **past five years**. Review of DAS/CS projects shall be included in the evaluation of the bidder's qualifications and anticipated future performance.

1.4 Qualified Personnel:

1.4.1 Shown that it customarily employs or has on its payroll **supervisory personnel**, **qualified** to perform the work required for this project and to coordinate the work called for in the Bid Specifications.

1.4.2 If the project is for $5 Million or more, submit the **name**, **resume** and **references** of the **Construction Scheduler** in accordance with the requirements called for in **Section 01 32 16.13 Critical Path Method Schedules** of the General Requirements.

1.5 Past Performance:

Demonstrated a good track record of **past performance** on State or other projects relative to quantity, quality, timeliness, cost, cooperation and harmonious working relationships with subcontractors, suppliers and client agencies. DAS/CS will review the Bidders past performance ratings prepared by DAS/CS or prepared as part of the DAS Contractor Prequalification Program. This review may focus on the comments relative to: Quality of Supervision, Adherence to Contract Documents, On Time Project Completion, Subcontractor performance, and the handling of Change Orders. Unacceptable ratings for several criteria shall be sufficient cause to deem a bidder not responsible.

1.6 Financial Responsibility:

Shown that it is **financially responsible** to perform the work as bid. If requested, additional financial information shall be provided. Prompt and proper payments to its subcontractors and material suppliers is a critical factor to be considered by DAS/CS.

1.7 [Left Blank]

1.8 Equipment Requirements:

Shown that it owns or possesses, rented, or leased **equipment** of the type customarily required by contractors in the performance of contract work and that such equipment, if needed, is available for this project.

1.9 Materials and Suppliers:

Purchased **materials** over the past three years from suppliers who customarily sell such materials in quantity to contractors.

1.10 Physical Facilities:

Control of adequate **physical facilities** from which the work can be performed.

1.11 Compliance with Subcontractor Requirements:

Demonstrated that on **previous state projects** the bidder complied in good faith with the requirements of listing subcontractors as outlined in C.G.S. Sections 4b-93 and 4b-95.

1.12 Threshold Building and Major Contractor Requirements:

Demonstrated that **all major subcontractors** are in compliance with the provisions of C.G.S. Section 20-341gg, as revised, concerning licensure requirements to perform work on any structure that exceeds the threshold limits contained in C.G.S. Section 29-276b, as revised.

1.13 OSHA Requirements:

Proven that the Bidder has not been found to be in violation of three or more willful or serious violations of Occupational Safety and Health Administration (OSHA) regulations in the past three years.

1.14	**Criminal Convictions and Injuries or Death of Employees:**
	Not received a **criminal conviction** related to the injury or death of any employee in the three-year period preceding the bid.
1.15	**Legal or Administrative Proceedings:**
	Listed all **legal** (court and/or arbitration) or **administrative proceedings** currently pending as well as any legal (court and/or arbitration) or administrative proceeding related to procurement or performance of any public or private construction contracts which has concluded adversely within the last three years.
1.16	**Contract Performance and Surety:**
	Identified any situations where: (1) the bidder failed to complete a construction contract; or (2) bonds were called during the past three years. If applicable, attach a sheet providing explanation including date(s) and location(s).
1.17	**State Tax Requirements:**
	Not been found to be in violation of any **state tax** requirements of the Connecticut Department of Revenue Services in the five (5)-year period preceding the bid.
1.18	**State and Federal Labor Requirements:**
	Not been found to be in violation of any State or Federal **labor laws** as required through the Department of Labor including violations of prevailing wage laws in the five (5)-year period preceding the bid.
1.19	**Change Order Pricing and State Ethics:**
	Been found to be in compliance with all statutory and regulatory requirements. This Item shall include, but not be limited to, any DAS/CS determinations related to improper Change Order pricing relative to C.G.S. Section 1-101nn of The State Ethics Statutes.
1.20	**Internal Revenue Services (IRS) Requirements:**
	Not been found in violation of any of the **Internal Revenue Service Tax Requirements** regarding classification of employees and independent contractors in the five (5)-year period preceding the bid.
1.21	**Workers Compensation and Insurance Requirements:**
	Not been found to be in any violation of C.G.S. Section 31-288 relating to employee classification for purposes of Workers' Compensation insurance premiums in the five (5)-year period preceding the bid.

NOTE: The foregoing Item Numbers **1.13** and **1.14** are meant to comport with C.G.S. Section 31-57b.

End of Section
00 45 15 Objective Criteria Established for Evaluating Qualifications of Bidders

General Contractor
Bidder's Qualification Statement

DAS ● Construction Services ● Office of Legal Affairs, Policy, and Procurement

Instructions:

- All Bidders are **required** to **upload this form to BizNet**, properly completed, ***prior* to the date and time of the Bid Opening**.
- Failure of a Bidder to answer any question or provide required information ***shall*** be grounds for the awarding authority to disqualify and reject the bid, pursuant to Connecticut General Statutes §4b-92.
- If a question or request for information does not pertain to your organization in any way, use the symbol "NA" (Not Applicable).
- Attach additional information on 8 ½" x 11" sheets with your letterhead as necessary and reference specific section and subsection numbers.
- **NOTE:** The Department reserves the right to request any additional or supplemental information necessary to complete its evaluation of a Bidder's qualification.

1.0 Project Information:

1.1	**DAS/CS Project Number:**	
1.2	**Project Name:**	
1.3	**Project Location:**	

2.0 Projects with Construction Costs Estimated To Be Greater than $500,000:

- Select the applicable **Class of Work** as stated in the **00 11 16 Invitation to Bid**.
- Select **YES** if your Firm has the applicable the **DAS Prequalification Certificate** and **Update (Bid) Statement** or **NO** if it does not.
- If **YES**, upload the applicable **DAS Prequalification Certificate** and **Update (Bid) Statement** to BizNet ***prior*** to the date and time of the Bid Opening.

☐ **Not Applicable - Construction Costs Less than $500,000**

		Class of Work:	Does your Firm have the applicable DAS Prequalification Certificate and Update (Bid) Statement?	
2.1	☐	**General Building Construction (Group A):**	**YES** ☐	**NO** ☐
2.2	☐	**General Building Construction (Group B):**	**YES** ☐	**NO** ☐
2.3	☐	**General Building Construction (Group C):**	**YES** ☐	**NO** ☐
2.4	☐	**General Trades (Interior Work Only):**	**YES** ☐	**NO** ☐
2.5	☐	**CPS Projects ONLY:** Insert Class of Work	**YES** ☐	**NO** ☐

3.0 **Firm's Present Legal Name:** (the *complete* **legal name** *exactly* as it appears with the **Secretary of State registry**. The appropriate **title** must be used throughout the documents, for example: General Partner, Member, Manager, Sole Member, etc.)

Name:

4.0 How many years has your Firm been in business under its **Present Legal Name**?

Years:

5.0 How many years has your Firm been in business as a General Contractor?

Years:

6.0 Indicate **all** other **names** by which your Firm has been known and the **length of time** known by each name:

		Years	Months
6.1			
6.2			
6.3			

7.0 This Firm's **Certification** with the CT Secretary of State:

Check Box	Type of Business Entity:	Certification Year
☐	**Corporation**	
☐	**Partnership**	
☐	**Sole Proprietorship**	
☐	**Limited Liability Company (LLC)**	
☐	**Other:**	

8.0 Attach resumes of all **supervisory personnel**, such as **Principals, Project Managers, and Superintendents**, who will be directly involved with the project on which you are now a bidder. Indicate their construction related training, certifications and licenses and the number of years of actual construction experience. Indicate the number of years of this actual construction experience which were in a Supervisory capacity.

9.0 Named Subcontractor – Bidder Intends to Self-Perform:

Check **YES** or **NO** for each "Named Subcontractor" **Class of Work** which your firm intends to perform with its own employees for this Contract; see **Section 2.7** of **Section 00 41 00 Bid Proposal Form.**

NOTE: For Projects with Construction Costs estimated to be greater than $500,000, complete **Section 00 45 17 Named Subcontractor Bidder's Qualification Statement** for each **Named Subcontractor Class of Work** checked **YES** and submit within ten (10) calendar days ***after*** receipt of the "Set-Aside Contractor Schedule Request" from DAS/CS Office of Legal Affairs, Policy, and Procurement.

☐	**Not Applicable – No Named Subcontractors &/or Not Self-Performing**

	Named Subcontractor Class of Work	Does your Firm intend to self-perform this Named Subcontractor Class of Work?	
9.1	**Electrical:**	**YES** ☐	**NO** ☐
9.2	**HVAC:**	**YES** ☐	**NO** ☐
9.3	**Masonry:**	**YES** ☐	**NO** ☐
9.4	**Plumbing:**	**YES** ☐	**NO** ☐
9.5	**Environmental Remediation:**	**YES** ☐	**NO** ☐
9.6	**Hazardous Materials Abatement:**	**YES** ☐	**NO** ☐

10.0 Named Subcontractor - Class of Work Greater than $500,000 and Self-Performing:

- Select the applicable **Named Subcontractor Class of Work** which your firm intends to perform with its own employees for this Contract.
- Select **YES** if your Firm has the applicable the **DAS Prequalification Certificate** and **Update (Bid) Statement** or **NO** if it does not.
- If **YES**, submit the applicable **DAS Prequalification Certificate** and **Update (Bid) Statement** within ten (10) calendar days ***after*** receipt of the "Set-Aside Contractor Schedule Request" from DAS/CS Office of Legal Affairs, Policy, and Procurement.

☐	**Not Applicable – No Class of Work Greater $500,000 &/or Not Self-Performing**

		Named Subcontractor Class of Work Greater Than $500,000	Does your Firm have the applicable DAS Prequalification Certificate and Update (Bid) Statement?	
10.1	☐	**Electrical:**	**YES** ☐	**NO** ☐
10.2	☐	**HVAC:**	**YES** ☐	**NO** ☐
10.3	☐	**Masonry:**	**YES** ☐	**NO** ☐
10.4	☐	**Plumbing:**	**YES** ☐	**NO** ☐

11.0 **List all** construction projects your Firm has completed in the **past five (5) years.** Provide **all** of the information listed below. DAS/CS *may* reject a bid as **non-responsive** if the bidder does not make **all** required pre-award submittals within the designated time period. Attach additional sheets as necessary **using the following format**:

IMPORTANT NOTE: **Two (2)** of the construction projects completed in the past five (5) years shall be (1) single project contracts that have reached substantial completion, not aggregate projects; (2) of commercial and/or institutional construction work (this includes compliance with general requirements); (3) within the Cost Estimate Range stated in Section 00 11 16 Invitation to Bid for this project; and (4) of the size and complexity of this Project. Failure to identify to ***two*** such projects ***shall*** result in rejection of the bid.

11.1	**Project Title:**	
11.2	**Project Location:**	
11.3	**Construction Start Date:**	
11.4	**Construction Finish Date:**	
11.5	**Describe the Scope of Work your Firm performed:**	
11.6	**Original Contract Amount:**	
11.7	**Final Contract Amount:**	
11.8	**Original Contract Duration** (Calendar Days)**:**	
11.9	**Final Contract Duration** (Calendar Days)**:**	
11.10	**Owner:**	
11.11	**Owner's Representative:**	*(Name)* / *(Phone Number)*
11.12	**Design Firm:**	
11.13	**Design Firm's Representative:**	*(Name)* / *(Phone Number)*

12.0 **References:**

Furnish references from **architects, engineers or owners** indicating that your Firm has satisfactorily completed in a timely manner contract work for projects within the cost estimate range, size and complexity of this project. Provide explanations where delays have occurred. This information should cover work done over the past five years.

13.0 **Construction Scheduler:**

For Projects greater than $5 Million: Submit the **name, resume and references** of the **Construction Scheduler** in accordance with the requirements called for in Section **01 32 16.13 Critical Path Method Schedules** of the General Requirements.

☐ Not Applicable – Project Less Than $5 Million

14.0 List and explain if your Firm has ever failed to complete a contract or if any officer or partner of your Firm has ever been an officer or partner of another organization that failed to complete a contract. Indicate below the circumstances leading to the project failure and the name of the company which provided the bonding for the failed contract(s):

☐ Not Applicable

15.0 List and explain if your Firm has ever had a contract terminated, indicating the circumstances leading to the project termination of contract(s):

☐ Not Applicable

16.0 List and explain all legal or administrative proceedings against your Firm or any officers, principals, partners, members, or employees of the organization currently pending or concluded adversely within the last five years, and any judicial or administrative sanctions that are still in effect against such organization, and any of its officers, principals, partners, members, or employees. (Exclude Occupational Safety and Health Act [OSHA] violations which are called for elsewhere in this statement). Add attachments as necessary.

☐ Not Applicable

17.0 List and explain any disbarments or suspensions that have been imposed on your Firm in the past five years or that were still in effect during the five year period or that are still in effect. Such list must include disbarments and suspensions of officers, principals, partners, members, and employees of your Firm:

☐ Not Applicable

18.0 List and explain any other reason(s) that precludes your Firm or any officer, principal, partner, member, or employees thereof from bidding on a contract in Connecticut or any other jurisdiction:

☐ Not Applicable

19.0 List and explain all willful or serious violations your Firm has had of any OSHA or of any standard, order or regulation promulgated pursuant to such act, during the three year period preceding the bid, provided such violations were cited in accordance with the provisions of any State Occupational Safety and Health Act or Occupational Safety and Health Act of 1970. Indicate whether these were abated within the time fixed by the citation or whether the citation was appealed. If appealed what is the status or disposition. Add attachments as necessary.

☐ Not Applicable

20.0 List and explain any criminal convictions your Firm has had related to the injury or death of any employee in the three-year period preceding the bid: Add attachments as necessary.

☐ Not Applicable

21.0 List and explain any changes in your Firm's financial condition or business organization, which might affect your Firm's ability to successfully complete this contract:

☐ Not Applicable

22.0 ***NEW:*** List and explain if your Firm has ever failed to submit an Affirmative Action Plan to the Commission on Human Rights and Opportunities (CHRO). Indicate below the circumstances leading to the failure to submit the Affirmative Action Plan to CHRO:

☐ Not Applicable

23.0 ***NEW:*** List and explain if your Firm's Affirmative Action Plan has ever been disapproved by CHRO or determined to be noncompliant. Indicate below the circumstances leading to the disapproval or finding of noncompliance of your Affirmative Action Plan by CHRO:

☐ Not Applicable

24. Signature

Dated at

Signed this **day of** , **20**

Name of Firm:

Firm Address:

Signature:

Print or Type Name:

Title:

25. Notary Statement

Mr./Mrs./Ms. **being duly sworn**

deposes and says that he/she is the **of**

(Position or Title)

, and that the answers to the foregoing

(Firm Name)

questions and all statements therein contained are true and correct.

Subscribed and sworn before me this **day of** , **20**

Notary Public

My Commission Expires , **20**

00 45 14 General Contractor Bidder's Qualification Statement

Contract

DAS | Construction Services | Office of Legal Affairs, Policy, and Procurement

Contract For:	

Dated as of _____ by and between the **State of Connecticut** (herein called the
(Month, Day, Year)
"State") acting herein by its Commissioner, Department of Administrative Services under the provisions of the Connecticut General Statutes (C.G.S.) Sections 4-8, 4a-1, 4a-2, 4b-1, and 4b-3, as revised, and _____ (herein called the "Contractor").
(Print Name of Contractor)

WITNESSETH, that the State and the Contractor in consideration of the hereinafter contained mutual promises and covenants, do hereby agree as follows:

1. CONTRACT AND CONTRACT DOCUMENTS:

The **Invitation for Bids**, the enumerated **Plans**, the **Specifications** and **Amendments** thereto, the **Addenda**, the **Bid Proposal** as accepted by the Commissioner, Department of Administrative Services, **Order of Award**, which Order is made a part of this **Contract**, the **General Conditions**, the **Supplementary Conditions,** the **General Requirements**, the **Contract** and the **Bonds** shall form part of this **Contract** and the **provisions** thereof shall be as binding upon the parties as if they were fully set forth herein. The tables of contents, titles, headings, running headlines and marginal notes contained herein and in said Documents, are solely to facilitate to various provisions of the Contract Documents and in no way affect, limit, or cast light upon the interpretations of the provisions to which they refer. Whenever the term **"Contract Documents"** is used, it shall mean and include this **Contract**, the **Invitation for Bids**, the enumerated **Plans**, **Specifications** and **Amendments** thereto, the **Addenda**, the **Bid Proposal** as accepted by the Commissioner, Department of Administrative Services, the **General Conditions**, the **General Requirements**, the **Bonds**, the **Instructions to Bidders**, the **Wage Scales**, the **Supplementary Conditions**, and the **Insurance Certificates**.

2. SCOPE OF THE WORK:

The Contractor shall furnish all plant, labor, materials, supplies, equipment, and other facilities and things necessary or proper for or incidental to the work contemplated by this Contract as required by and in strict accordance with applicable Plans, Specifications and Amendments thereto, and Addenda (hereinafter enumerated), and as required by and in strict accordance with such changes as are ordered and approved pursuant to this Contract, and will perform all other obligations imposed on him by this Contract.

3. ENUMERATION OF PLANS, SPECIFICATIONS AND ADDENDA:

The following is an enumeration of the Plans, Specifications, and Addenda:

Prepared By:	
	(Print Name of Architect/Engineer Firm)
Plans and Specifications:	
Addenda:	

4. COMPENSATION TO BE PAID THE CONTRACTOR

The State will pay and the Contractor will accept in full consideration for the performance of the Contractor's obligation hereunder the sum of:

Dollars and 00/100 ($ **)**

5. PROVISIONS REQUIRED BY LAW DEEMED INSERTED

Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party, the Contract shall forthwith be physically amended to make such insertion.

For all State contracts as defined in the **C.G.S. §9-612(f)(1)(C),** having a value in a calendar year of $50,000 or more or a combination or series of such agreements or contracts having a value of $100,000 or more, the authorized signatory to this Agreement expressly acknowledges receipt of the State Elections Enforcement Commission's notice advising state contractors of campaign contribution and solicitation prohibitions, and will inform its principals of the contents of the notice. See **SEEC Form 10**.

Contractor hereby irrevocably assigns to the State of Connecticut all rights, title and interest in and to all **Claims* associated with this Contract** that Contractor now has or may or will have and that arise under the antitrust laws of the United States, **15 USC Section 1, *et seq.*** and the antitrust laws of the State of Connecticut, **C.G.S. §35-24, *et seq.*,** including but not limited to any and all Claims for overcharges. This assignment shall become valid and effective immediately upon the accrual of a Claim without any further action or acknowledgment by the parties.

***Definition of Claims associated with this Contract**: "All actions, suits, claims, demands, investigations and proceedings of any kind, open, pending or threatened, whether mature, unmatured, contingent, known or unknown, at law or in equity, in any forum."

IN WITNESS WHEREOF, the Commissioner, Department of Administrative Services for and on behalf of the State of Connecticut, and the Contractor have executed this contract on the day and year first written.

State Of Connecticut Attested By:

WITNESS: _____
(Signature)

Print Name: _____

WITNESS: _____
(Signature)

Print Name: _____

State Of Connecticut:

By: _____
(Signature)

Print Name: Noel Petra

Its: Deputy Commissioner
Department of Administrative Services

Date Signed: _____

Contractor Attested By:

WITNESS: _____
(Signature)

Print Name: _____

WITNESS: _____
(Signature)

Print Name: _____

Contractor:

Firm Name: _____

By: _____
(Signature)

Print Name: _____

Its: _____ , **Duly Authorized**

Date Signed: _____

Office of the Attorney General:
Approved as to form:

By: _____
(Signature)

Print Name: _____

Its: Attorney General /
Assistant Deputy Attorney General /
Associate Attorney General /
Assistant Attorney General

Date Signed: _____

SEAL

End of Section
00 52 03 Contract

ACORD

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: PHONE (A/C, No, Ext): FAX (A/C, No): E-MAIL ADDRESS:
	INSURER(S) AFFORDING COVERAGE / NAIC #
INSURED Contractor's Legal Name and Address	INSURER A:
	INSURER B:
	INSURER C:
	INSURER D:
	INSURER E:
	INSURER F:

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	GENERAL LIABILITY ☑ COMMERCIAL GENERAL LIABILITY ☐ CLAIMS-MADE ☑ OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: ☐ POLICY ☑ PRO-JECT ☐ LOC			Policy Number must be provided	Policy Effective Date must be provded	Policy Expiration Date must be provided	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 100,000 $ 5,000 $ 1,000,000 $ 2,000,000 $ 2,000,000
	AUTOMOBILE LIABILITY ☑ ANY AUTO ALL OWNED AUTOS HIRED AUTOS SCHEDULED AUTOS NON-OWNED AUTOS			Policy Number must be provided	Policy Effective Date must be provded	Policy Expiration Date must be provided	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000
	☐ UMBRELLA LIAB ☐ OCCUR ☐ EXCESS LIAB ☐ CLAIMS-MADE ☐ DED ☐ RETENTION $						EACH OCCURRENCE AGGREGATE	
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y / N ☐ (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		Policy Number must be provided	Policy Effective Date must be provided	Policy Expiration Date must be provided	☑ WC STATU-TORY LIMITS ☐ OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ 100,000 $ 100,000 $ 500,000
	Owner's and Contractor's Protective Liability Builder's Risk (include here when applicable)						Bodily Injury or Death (per occ.) Total Property Damages Total (aggregate)	$ 1,000,000 $ 2,000,000 Completed Value

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

Indicate Project Number and Title here

The State of Connecticut is an Additional Insured with respect to General Liability and Umbrella/Excess Liability Insurance coverage.

If Builder's Risk and or Inland Marine/Transit Insurance is required then the State is endorsed as a Loss Payee.

CERTIFICATE HOLDER	CANCELLATION
State of Connecticut Department of Administrative Services, Construction Services Office of Legal Affairs, Policy and Procurement 450 Columbus Boulevard, Suite 1302 Hartford, CT 06103-1838	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE Agent of Producer

End of Section
00 62 16 Certificate of Insurance

Asbestos Abatement Liability Insurance

DAS | Construction Services | Office of Legal Affairs, Policy, and Procurement

Contractor shall provide Asbestos Abatement Liability insurance **with limits of no less than $1,000,000.00 per occurrence**. Such insurance shall include all operations associated with hazardous materials removal and shall be written on an **occurrence basis form**. The State of Connecticut shall be named as an Additional Insured.

Asbestos abatement coverage may alternatively be provided under a Commercial General Liability policy provided the policy is specifically endorsed to provide asbestos abatement coverage.

End of Section
00 62 16.1 Asbestos Attachment To Accord Form

General Conditions of the Contract for Construction
For Design-Bid-Build
Connecticut Department of Administrative Services

TABLE OF CONTENTS

ARTICLE 1
DEFINITIONS

WHENEVER THE FOLLOWING TERMS, OR PRONOUNS IN PLACE OF THEM, ARE USED THE INTENT AND MEANING SHALL BE AS FOLLOWS:

1.1 ACCEPTANCE: The Owner's acknowledgement of the Work from the Contractor upon certification by the Construction Administrator and Architect or Engineer that all Work has been completed.

1.2 ADDITIONAL OR DELETED WORK: Work required by the Department that, in the judgment of the Com-missioner, involves any addition to, deduction from, or modification of the Work required by the Contract Documents.

1.3 AGENCY: The (User) Agency of the State of Connecticut having administrative authority of the facility in which the Work is being performed.

1.4 APPLICATION FOR PAYMENT, PARTIAL PAYMENT OR REQUISITION: Contractor's certified request for payment for completed portions of the Work and, if the Contract so provides, for materials or equipment suitably stored pending their incorporation into the Work.

1.5 ARCHITECT OR ENGINEER: A sole proprietor, partnership, firm, corporation or other business organization under Contract with the Owner, commissioned to prepare Contract Drawings and Specifications, to advise the Owner and in certain cases, to perform regular inspections during construction and when authorized to perform the duties of the Construction Administrator.

1.6 AS-BUILT DRAWINGS: Construction Drawings revised by the Contractor to show all significant Modifications made during the construction process.

1.7 BASE BID: Monetary value stated in the Bid Proposal Form as the sum for which the Bidder offers to perform the Work described in the Bidding Documents, exclusive of adjustments for Supplemental Bids.

1.8 BID BOND: Form of Bid Security executed by the Bidder as Principal and by a Surety to guarantee that the Bidder will enter into a Contract within a specified time and furnish any required bond as mandated by Connecticut General Statute Section 4b-92.

1.9 BIDDER: A sole proprietor, partnership, firm, corporation or other business organization submitting a Bid on the Bid Proposal Form for the Work contemplated.

1.10 BIDDING DOCUMENTS: Collectively, the Bidding Requirements and the proposed Contract Documents, including any addenda issued prior to receipt of Bids.

1.11 BID OR BID PROPOSAL FORM: A complete and duly signed proposal to perform Work (or a designated portion thereof) for a stipulated sum submitted in accordance with the Bidding Documents.

1.12 BID SECURITY: Certified check or Bid Bond submitted with Bid Proposal Form, which provides that the Bidder, if awarded the Contract, will execute such Contract in accordance with the requirements of the Bidding Documents.

1.13 BUILDER'S RISK INSURANCE: A specialized form of property insurance which provides coverage for loss or damage to the Work pursuant to the Contract Documents.

1.14 CASH ALLOWANCE: An amount established in the Contract Documents for inclusion in the Contract Sum to cover the cost of prescribed items not specified in detail, and as shown in the Allowance Schedule.

1.15 CERTIFICATE OF ACCEPTANCE: A document issued by the Owner to the Contractor stating that all Work specified in the Certificate of Acceptance has been completed and accepted by the Owner.

1.16 CERTIFICATE OF COMPLIANCE: A document stating that for the portion of the Project completed, either the design portion or the construction portion, has been performed in substantial compliance with all applicable building codes.

1.17 CERTIFICATE OF OCCUPANCY: Document is-sued by the authority having jurisdiction certifying that all or a designated portion of a building is approved for its designated use.

1.18 CERTIFICATE OF SUBSTANTIAL COMPLE-TION: A document prepared by the Architect or Engineer and approved by the Owner on the basis of an inspection stating:

1.18.1 that the Work, or a designated portion thereof, is determined to be Substantially Complete;

1.18.2 the date of Substantial Completion;

1.18.3 the responsibilities of the Owner and the Contractor for security maintenance, heat, utilities, damage to the Work and insurance; and

1.18.4 the time within which the Contractor shall complete the remaining Work.

1.19 CHANGE ORDER: Written authorization signed by the Owner, authorizing a modification in the Work, an adjustment in the Contract Sum, or an adjustment in the Con-tract Time.

1.20 COMMISSIONER: The State of Connecticut, Department of Construction Services (CT DCS) Commissioner acting directly or through specifically authorized CT DCS personnel or agent(s) having authority to perform duties defined in Article 25.

1.21 COMMISSIONING AGENT (CxA): An independent entity under contract directly with the Owner or Owner's Representative responsible for performing the specified commissioning procedures.

1.22 CONSTRUCTION ADMINISTRATOR: A sole proprietor, partnership, firm, corporation or other business organization, under Contract or employed by the Owner commissioned and/or authorized to oversee the fulfillment of all requirements of the Contract Documents. The authorized Construction Administrator may be a Department of Construction Services Assistant Project Manager, Department of Construction Services Project Manager, a Clerk of the Works, an Architect, a Consulting Architect, a Consulting Construction Administrator, a Consulting Engineer etc. or any other designee as authorized and identified by the Owner.

1.23 CONSTRUCTION CHANGE DIRECTIVE: A written authorization signed by the Owner, directing a modification in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum, Contract Time or both. Any Construction Change Directive effecting an adjustment to the Contract Sum or Contract Time shall result in a Change Order.

1.24 CONTRACT DOCUMENTS OR CONTRACT: The Agreement between Owner and Contractor, Conditions of the Contract (General Conditions, Supplementary Conditions, General Requirements and other Conditions), Drawings, Specifications, and Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract, all of which shall constitute the Contract.

1.25 CONTRACTOR OR GENERAL CONTRACTOR: A sole proprietor, partnership, firm or Corporation, under direct Contract with the Department of Construction Services, responsible for performing the Work under the Contract Documents. Whenever the words "Contractor" or "General Contractor" are used it shall be understood to mean Contractor.

1.26 CONTRACTOR'S LIABILITY INSURANCE: Insurance purchased and maintained by the Contractor that insures the Contractor for claims for property damage, bodily injury or death.

1.27 CONTRACT START DATE OR DATE OF COMMENCEMENT OF THE WORK: The date, specified by the Owner in the Notice to Proceed, on which the Contractor is required to start the Work.

1.28 CONTRACT SUM: The sum stated in the Contract, which is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

1.29 CONTRACT TIME: The period of time allotted in the Contract Documents for Substantial Completion of the Work, including authorized adjustments thereto. The Contract Time is the sum of all Working Days and Non-Working Days as further defined herein and specified in the Contract Documents.

1.30 DAY: Whenever the word Day is used it shall be understood to mean calendar day stated on the Bidding Documents, unless stated otherwise.

1.31 DEPARTMENT OF CONSTRUCTION SERVICES (CT DCS) PROJECT MANAGER: The individual employed by the Owner, designated and authorized by the Commissioner, to be responsible for the overall management and oversight of the Project, and to represent the (User) Agency.

1.32 DIESEL VEHICLE EMMISSIONS CONTROL: The reduction of air pollution emissions from diesel powered vehicles through the use of diesel engine emission control technologies.

1.33 EQUAL(S): Any deviation from the Specification which is defined as follows: A replacement for the specified material, device, procedure, equipment, etc., which is recognized and accepted as substantially equal to the first listed manufacturer or first listed procedure specified after review by the Architect/Engineer, and may be rejected or approved at the sole discretion of the Owner. All equals must be substantially equivalent to the first manufacturer or first procedure listed in the Specifications with reference to all of the following areas: the substance and function considering quality, workmanship, economy of operation, durability, and suitability for purposes intended; size, rating, and cost. The equal does not constitute a modification in the scope of Work, the Schedule, or Architect/Engineer's design intent of the specified material, device, procedure, equipment, etc.

1.34 FINAL INSPECTION: Review of the Work by the Architect or Engineer and Owner to determine whether Acceptance has been achieved.

1.35 FINAL PAYMENT: The last payment made by the Owner to the Contractor, made after notice of the Acceptance. Payment shall include the entire unpaid balance of the Contract Sum as adjusted by modifications.

1.36 GENERAL CONDITIONS: The General Conditions of the Contract for Construction, part of Division 00 of the Specifications.

1.37 GENERAL REQUIREMENTS: That part of the Contract Documents entitled General Requirements, which is Division 01 of the Specifications.

1.38 GUARANTEE: See Warranty.

1.39 LIQUIDATED DAMAGES: A sum established in a Contract, usually as a fixed sum per Day, as the predetermined measure of damages to be paid to the Owner due to the Contractor's failure to complete the Work within the Contract Time.

1.40 LUMP SUM: An item or category priced as a whole rather than broken down into its elements.

1.41 MOBILE SOURCE: A source designed or constructed to move from one location to another during normal operation except portable equipment and includes, but is not limited to, automobiles, buses, trucks, tractors, earth moving equipment, hoists, cranes, aircraft, locomotives operating on rails, vessels for transportation on water, lawnmowers, and other small home appliances.

1.42 NON-WORKING DAYS: All Saturdays, Sundays, Legal State Holidays (12), and any other Days identified in the Contract Documents that the Contractor is not permitted to execute the Work. The restriction of Non-Working Days may be suspended upon the approval or direction of the Commissioner.

1.43 NOTICE TO BIDDER: A notice contained in the Bidding Document informing prospective Bidders of the opportunity to submit Bids on a Project.

1.44 NOTICE TO PROCEED: Written notice, issued by the Commissioner or the Commissioner's authorized representative, to the Contractor authorizing the Contractor to proceed with the Work and establishing the date for commencement of the Contract Time.

1.45 OWNER OR DEPARTMENT: The State of Connecticut, Department of Construction Services acting through its Commissioner or specifically authorized Department personnel or agent.

1.46 OVERHEAD: Indirect costs including: supervision (any position over the foreman), field and home office expense, insurance, and small tools and consumables.

1.47 PAYMENT, BOND, LABOR BOND OR MATERIAL BOND: A bond in which the Contractor and the Contractor's surety guarantee to the Owner that the Contractor will pay for labor and materials furnished for use in the performance of the Contract, as required by Connecticut General Statutes Section 49-41.

1.48 PERFORMANCE BOND OR SURETY BOND: A bond in which the Contractor and the Contractor's surety guarantee to the Owner that the Work will be performed in accordance with the Contract Documents, as required by Connecticut General Statutes Section 49-41.

1.49 PERFORMANCE SPECIFICATION: A description of the desired results or performance of a product, material, assembly, procedure, or a piece of equipment with criteria for identifying the standard.

1.50 PLANS OR DRAWINGS: All Drawings or reproductions of Drawings pertaining to the construction of the Work contemplated and its appurtenances.

1.51 PROJECT: The total construction of which the Work performed under the Contract Documents may be the whole or a part.

1.52 PROJECT MANUAL: The set of documents assembled for the Work which includes, but is not limited to, Contract Documents, Bidding Requirements, Sample Forms, General Conditions of the Contract for Construction, General Requirements, and the Specifications.

1.53 PROPRIETARY SPECIFICATION: A specification that describes a product, procedure, function, material, assembly, or piece of equipment by trade name and/or by naming the manufacturer(s) or manufacturer's procedure, exact model number, item, etc., of those products acceptable to the Owner.

1.54 RETAINAGE: A percentage of each Application for Payment and a percentage of the total Contract Sum retained by the Owner.

1.55 SCHEDULE: A Critical Path Method (CPM) or Construction Schedule as required by the Contract Documents which shall be a diagram, graph or other pictorial or written Schedule showing all events expected to occur and operations to be performed and indicating the Contract Time, start dates, durations and finish dates as well as Substantial Completion and Acceptance of the Work, rendered in a form permitting determination of the optimum sequence and duration of each operation.

1.56 SCHEDULE OF VALUES: A document furnished by the Contractor to the Architect or Engineer and Owner stating the portions of the Contract Sum allocated to the various portions of the Work, which is to be used for reviewing the Contractor's Applications for Payment.

1.57 SECONDARY SUBCONTRACTOR: A sole proprietor, partnership, firm or Corporation under direct Contract with the Subcontractor to the General Contractor.

1.58 SENSITIVE RECEPTOR SITES: Areas where concentrations of diesel emissions may be harmful to sensitive populations, including, but not limited to, hospitals, school and university buildings being occupied during a student semester, residential structures, daycare facilities, elderly housing, and convalescent facilities.

1.59 SHOP DRAWINGS: Drawings provided to Architect or Engineer and Owner by a Contractor that illustrate construction, materials, dimensions, installation, and other pertinent information for the incorporation of an element or item into the construction as detailed Contract Documents.

1.60 SPECIFICATIONS: The description, provisions and other requirements pertaining to the method and manner of performing the Work and/or to the quantities and quality of materials to be furnished under the Contract.

1.61 SUBCONTRACTOR: A sole proprietor, partnership, corporation or other business organization under direct Contract with the Contractor supplying labor and/or materials for the Work at the site of the Project.

1.62 SUBMITTALS: Documents including, but not limited to, samples, manufacturer's data, Shop Drawing, or other such items submitted to the Owner and Architect or Engineer by the Contractor for the purpose of approval or other action, as required by the Contract Documents.

1.63 SUBSTANTIAL COMPLETION: The stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents.

1.64 SUBSTITUTION: Any deviation from the specified requirements, which is defined as follows: A replacement for the specified material, device, procedure, equipment, etc., which is not recognized or accepted as equal to the first manufacturer or procedure listed in the Specification after review by the Architect/Engineer, and may be rejected or approved by the Owner. The Substitution is not equal to the specified requirement in comparison to the first manufacturer or first procedure listed in the Specifications in one or more of the following areas: the substance and function considering quality, workmanship, economy of operation, durability, and suitability for purposes intended; size, cost, and rating. The Substitution constitutes a modification in the scope of Work, the Schedule, or the Architect/Engineer's design intent of the specified material, device, procedure, equipment, etc.

1.65 SUPERINTENDENT: The Contractor's representative at the site who is responsible for continuous field supervision, coordination, in, completion of the Work, and, unless another person is designated in writing by the Contractor to the Owner and the Construction Administrator, for the prevention of accidents.

1.66 SUPPLEMENTAL BID: The monetary value stated in the Bid to be added to the amount of the Base Bid if the corresponding Work, as described in the Bidding Documents, is accepted.

1.67 SUPPLEMENTARY CONDITIONS: An extension in the Bid to be added to the amount of the Base Bid if the corresponding Work, as described in the Bidding Documents, is accepted.

1.68 THRESHOLD LIMIT BUILDING: Any proposed (new) structures or additions as defined by the Connecticut General Statutes Section 29-276b.

1.69 UNIT PRICE: The monetary value stated by the Owner or the Contractor, as a price per unit of measurement for materials or services as described in the Contract Documents and/or Bidding Documents.

1.70 WARRANTY: A written, legally enforceable assurance of specified quality or performance of a product or Work or of the duration of satisfactory performance.

1.71 WORK: The construction and services required by the Contract Documents, and including all labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project and "Work Phase".

1.72 WORK PHASE: Construction of the Project by sequence or time intervals, which may include but not be limited to separate Construction Start Dates, Substantial Completion Dates, Application for Payments, Change Orders, Liquidated Damages**,** Retainage, and Subcontractors for each Work Phase.

ARTICLE 2
CONDITIONS OF WORK

2.1 The Contractor shall carefully examine and study the conditions under which the Work is to be performed and the site of the Work, and compare the Contract Documents with each other and to information furnished by the Owner including but not limited to the Plans and Specifications, the form of the Contract, General Conditions, Supplementary Conditions, General Requirements, Bonds and all other Contract Documents associated with the Work.

2.2 The Contractor shall report to the Construction Administrator all errors, inconsistencies or omissions discovered. The Contractor shall not be liable to the Owner for damage resulting from errors, inconsistencies or omissions in the Contract Documents unless the Contractor recognized such errors, inconsistencies or omission and failed to report it to the Construction Administrator. If the Contractor performs any actions or construction activity knowing it involves an error, inconsistency or omission in the Contract Documents without notice to the Construction Administrator, the Contractor shall assume responsibility for such performance and related costs for the correction and shall not be allowed to submit any claim related to error, inconsistencies or omission.

2.3 The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Construction Administrator at once; and it will be assumed that the Contractor has been satisfied as to all requirements of the Contract Documents. Any deterrent conditions at the site of the Work which are obvious and apparent upon examination of the site but are not indicated on the Plans shall be corrected by the Contractor without additional compensation.

2.4 In performing the Work, the Contractor must employ such methods or means as will not cause any interruption of or interference with the Work of any other Contractor, nor any inordinate disruption with the normal routine of the Owner, institution or Agency operating at the site.

2.5 No claims for additional compensation will be considered when additional costs result from conditions made known to, discovered by, or which should have been discovered by, the Contractor prior to Contract signing.

2.6 All Communications from the Contractor concerning proposed changes to the Contract Sum, Contract Time, or Work shall be in writing.

2.7 The Contractor shall perform the Work in accordance with the Contract Documents and approved Submittals pursuant to Article 5.

ARTICLE 3
CORRELATION OF CONTRACT DOCUMENTS

3.1 The Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all. Where discrepancies or conflict occur in the Contract Documents the following order of precedence shall be utilized:

3.1.1 Amendments and addenda shall take precedence over previously issued Contract Documents.

3.1.2 The Supplementary Conditions take precedence over the General Conditions.

3.1.3 The General Conditions take precedence over the General Requirements.

3.1.4 The Specifications shall take precedence over the Plans.

3.1.5 Stated dimensions shall take precedence over scaled dimensions.

3.1.6 Large-scale detail Drawings shall take precedence over small-scale Drawings.

3.1.7 The Schedules contained in the Contract Documents shall take precedence over other data on the Plans.

3.2 Neither party to the Contract shall take advantage of any obvious error or apparent discrepancy in the Contract Documents. The Contractor shall give immediate written notification of any error or discrepancy discovered to the Construction Administrator, who shall take the necessary actions to obtain such corrections and interpretations as may be deemed necessary for the completion of the Work in a satisfactory and acceptable manner. The Contractor shall then promptly proceed under the direction of the Owner and the provisions of Article 13. The Contractor's failure to provide immediate notice shall mean the Contractor will not be entitled to any additional compensation, either monetary or Contract Time adjustment, with respect to any discrepancy.

3.3 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

3.4 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings, shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

3.5 Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

3.6 In accordance with C.G.S. Section 4a-1, wherever the term "Commissioner of Construction Services" is used in the "Bidding Documents" or "Project Manual" the term "Commissioner of Administrative Services" shall be substituted in lieu thereof; and wherever the term "Department of Construction Services" is used in "Bidding Documents" or "Project Manual", the term "Department of Administrative Services" shall be substituted in lieu thereof.

ARTICLE 4
COMMENCEMENT AND PROGRESS OF WORK

4.1 The Work shall start upon the date given in the Notice to Proceed. The Contractor shall complete all the Work necessary for Final Payment, including but not limited to Substantial Completion, Contract close-out, testing and demonstration of all systems as required for Acceptance, punchlist Work, training and submission of Record Documents, manuals, Guarantees and Warranties as stated in the Contract Document.

4.2 Time is of the essence with respect to the Contract Time. By executing the Contract, the Contractor confirms and agrees that the Contract Time is a reasonable period to perform the Work. The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time. The Contractor may, at his discretion, plan to complete the Work and achieve Substantial Completion in less time than the Contract Time.

4.3 The Contractor's early completion Schedule notwithstanding, the Owner reserves the right to order Modifications to the Work in accordance with Article 13 at any time during the Contract Time.

4.4 The Contractor shall not be entitled to costs for delay due to Owner ordered Modifications or any other circumstances for the period of time between the Contractor's elected early completion and the end of the Contract Time. Such costs include, but are not limited to, extended home office costs, field office costs, or supervisory and management costs incurred in performance of the Work. Early completion of the Work shall not merit additional compensation.

4.5 If the Contractor is delayed at any time in the progress of Work by acts of God, such as fire or flood or any action, injunction or stop order issued by any court, judge or officer of the court or any other court action beyond the Owner's control, then the Contract Time may be extended by Change Order for such reasonable time as demonstrated by the Contractor's Schedule and as the Owner may determine that such event has delayed the Work. In any event, the granting of an extension of time shall be solely within the discretion of the Owner.

4.6 Except as otherwise may be provided herein, extensions of time shall be the Contractor's sole remedy for such delay. No payment or compensation of any kind shall be made to the Contractor for damages because of hindrance in the orderly progress of Work caused by the aforesaid causes.

4.7 The Contractor acknowledges that the Contract amount includes and anticipates any and all delays, whether avoidable or unavoidable, from said orders, which may issue from any court, judge, court officer, or act of God, and that such delays shall not, under any circumstances, be construed as compensable delays.

4.8 Any extension of the Contract Time shall be by Change Order pursuant to Article 13.

4.9 The Contractor shall employ a competent project manager who shall represent the Contractor. Communications given to the project manager shall be binding as if given to the Contractor. The project manager will be employed full time on the Project and be located and assigned to the Project site during and for the duration of the Work.

4.10 The Contractor shall employ a competent Superintendent and necessary assistants who will be in attendance at the project site during the performance of the Work.

4.11 Upon execution of the Contract, materials may be purchased. No material escalation costs will be valid or compensable unless the Owner directs, in writing, a delay in the procurement.

ARTICLE 5
SUBMITTALS, PRODUCT DATA, SHOP DRAWINGS AND SAMPLES

5.1 Contractor shall review, approve, and submit to the Construction Administrator all Submittals including but not limited to, product data, Shop Drawings, and samples, with such promptness as to cause no delay in the Work.

5.2 Correction or approval of such Submittals, Shop Drawings, product data and samples will be made with reasonable promptness by the Architect or Engineer. Approval will be general only and shall not relieve the Contractor from responsibility for errors in dimensions, for construction and field coordination of the Work or for any departure from the Contract Documents, unless such departure has received the Owner's written approval.

5.3 No Work governed by such Shop Drawings, Schedules or samples shall be fabricated, delivered or installed until approved by the Architect or Engineer.

5.4 No damages for delays or time extensions will be granted, even if approvals deviate from the approved Schedule.

ARTICLE 6
SEPARATE CONTRACTS

6.1 The Owner reserves the right to perform Work in connection with the Contract with the Owner's own forces, or to let separate contracts relating to the Contract (Project) site or in connection with Work on adjoining sites. In such cases, the Contractor shall afford such parties reasonable opportunity for storage of materials and equipment and coordinate and connect the Work with the work on adjoining sites or other Projects, and shall fully cooperate with such parties in the matter required under Article 7 herein.

6.2 Contractors working in the same vicinity shall cooperate with one another and, in case of dispute, decision of the Owner shall be final and binding to all Contractors involved, including Contractors under separate Contracts.

6.3 The Contractor shall assume all liability, financial or otherwise, in connection with this Contract and shall protect and hold harmless the Owner from any and all damages or claims that may arise because of inconvenience or delay which the Contractor may cause other Contractors. If the Contractor experiences a loss because of the presence and operations of other Contractors working adjacent to or within the limits of the same Project, then as between the Owner and the Contractor, the Contractor shall bear such loss.

6.4 Insofar as possible, the Contractor shall arrange the Work and shall place and dispose of the materials being used so as not to interfere with the operations of other Contractors adjacent to or within the limits of the same Project. The Contractor shall join its Work with that of others in an acceptable manner, and perform the Work in proper accordance with that of the others.

6.5 In no event shall the Owner be responsible for any claim or damages that are the result of the Contractor's failure to coordinate the Work with any other Contractor or Subcontractor.

ARTICLE 7
COOPERATION OF TRADES

7.1 The Contractor shall be responsible for and shall control all activities of their Subcontractors. The Subcontractors shall consult and cooperate with one another. Each Subcontractor shall furnish all necessary information to other Subcontractors and shall lay out and install their own Work so as to avoid any delays or interference with the Work of others.

7.2 Any cost or changes, cutting and/or repairing, made necessary by the failure to observe the above requirements shall be borne by the party or parties responsible for such failure or neglect or their faulty Work installed.

ARTICLE 8
DAMAGES

8.1 The Liquidated Damages, provided in the Bidding Documents, will be assessed at two distinct times, as follows:

8.1.1 Liquidated Damages – Substantial Completion:
If the Contractor fails to achieve Substantial Completion of the Work by the Substantial Completion Date, and such delay is not otherwise excused under this Contract, then the Contractor agrees to pay to the Owner Liquidated Damages for the dollar amount specified in the Bid Proposal Form for this Project, for each Day beyond Substantial Completion that the Contractor fails to achieve Substantial Completion. The parties to this Contract acknowledge and agree that the actual damages that are to be anticipated as a result of the neglect, failure, or refusal of the Contractor to substantially complete the Project by the established Substantial Completion Date are uncertain in amount or extremely difficult to determine. Accordingly, the parties to this Contract do intend and in fact now agree to liquidate damages in advance and stipulate that the amount set forth in this subparagraph is reasonable and an appropriate remedy and is intended to constitute compensatory damages and does not constitute a penalty of any kind. The parties understand and agree that, by including a provision for Liquidated Damages in this Contract, or in pursuing any relief pursuant to such provision:

.1 the parties do not intend to set a price for the privilege not to perform;

.2 the availability of Liquidated Damages may not be relied upon as a basis for argument that the Owner has an adequate remedy at law; and

3 the remedies available to the Owner under this Agreement are cumulative and not exclusive.

8.1.2 Liquidated Damages – Acceptance:
If the Contractor fails to complete all of the Work required for Acceptance of the Work within ninety (90) Days of Substantial Completion then the Contractor agrees to pay to the Owner Liquidated Damages for the dollar amount specified in the Bid Proposal Form for each Day in excess of ninety (90) Days beyond the Substantial Completion Date that the Contractor fails achieve Acceptance. The parties to this Contract acknowledge and agree that the actual damages that are to be anticipated as a result of the failure of the Contractor to complete all of the Work required for Acceptance within ninety (90) Days of the established Substantial Completion Date are uncertain in amount or extremely difficult to determine. Accordingly, the parties to this Contract do intend and in fact now agree to liquidate damages in advance and stipulate that the amount set forth in this subparagraph is reasonable and an appropriate remedy and is intended to constitute compensatory damages and does not constitute a penalty of any kind. The parties understand and agree that, by including a provision for Liquidated Damages in this Contract, or in pursuing any relief pursuant to such provision:

.1 the parties do not intend to set a price for the privilege not to perform;

.2 the availability of Liquidated Damages may not be relied upon as a basis for argument that the Owner has an adequate remedy at law; and

.3 the remedies available to the Owner under this Agreement are cumulative and not exclusive.

8.2 The Liquidated Damages or any portion thereof may be waived at the sole discretion of the Commissioner.

8.3 No payment by the Owner, either partial or final, shall be construed to waive the Owner's right to seek Liquidated Damages.

8.4 In the event a court determines that the Contract herein is null and void for any reason, Contractor agrees that Contractor will not seek or pursue any lawsuit or claim for damages, including, but not limited to, claims for loss of Overhead or anticipated profits, against the Owner and the Owner shall not be liable for any damages which Contractor may incur as a result of such decision. In addition, if the court enjoins the Owner from entering into or proceeding with the Contract herein, the Owner shall not be liable for any damages arising out of or relating to the award of such Contract which Contractor may have incurred as a result of the injunction.

ARTICLE 9
MINIMUM WAGE RATES

9.1 In accordance with the provisions of the Connecticut General Statutes Section 31-53, the following applies:

> "The wages paid on an hourly basis to any person performing the work of any mechanic, laborer, or worker on the work herein contracted to be done and the amount of payment or contribution paid or payable on behalf of each such person to any employee welfare fund, as defined in subsection (h) of this section, shall be at a rate equal to the rate customary or prevailing for the same work in the same trade or occupation in the town in which such public works project is being constructed. Any contractor who is not obligated by agreement to make payment or contribution on behalf of such persons to any such employee welfare fund shall pay to each mechanic, laborer or worker as part of such person's wages the amount of payment or contribution for such person's classification on each payday."

9.2 Each Contractor who is awarded a Contract on or after October 1, 2002 shall be subject to provisions of the Connecticut General Statutes, Section 31-53 as amended by Public Act 02-69, "An Act Concerning Annual Adjustments to Prevailing Wages." No wage adjustment will be made to the Contract for any wage increase under this Article.

ARTICLE 10
POSTING MINIMUM WAGE RATES

10.1 The Contractor shall post at conspicuous points on the site of the Contract a Schedule showing all determined wage rates for all trades and all authorized deductions, if any, from wages to be paid.

10.2 The Contractor shall provide weekly certified payrolls to the Owner for all persons working on the site.

ARTICLE 11
CONSTRUCTION SCHEDULES

11.1 Unless otherwise specified in the Contract Documents, within twenty-one (21) Days from the Contract Start Date, the Contractor shall submit the following to the Owner for approval:

> **11.1.1** A comprehensive Schedule of Submittals required by the Specifications. Said Schedule shall include Submittal dates, required approval dates and date material must be on site.
>
> **11.1.2** The Contractor shall allow a minimum of 14 Days for the Owner and its agents' review of Submittals. No extension of the Contract Time shall be granted for revisions and resubmission. Further, the Contractor shall allow a minimum of eight weeks for testing and Acceptance of the Work by the Owner.
>
> **11.1.3** When the Contract Documents specify a "CPM Schedule" a detailed Critical Path Method Schedule is required using software approved by the Owner and/or Construction Administrator with as many activities as necessary to make the Schedule an effective tool for planning and monitoring the progress of the Work. The Contractor shall show all pertinent activities requiring coordination between trades.
>
> **11.1.4** When the Contract Documents specify a "Construction Schedule" a detailed Construction Schedule is required using software approved by the Owner as a horizontal bar chart with a separate bar for each major portion of the Work or operation to make the Schedule an effective tool for planning and monitoring the progress of the Work.

11.2 Unless otherwise specified under the Contract Documents, the Contractor shall provide a monthly update of the CPM Schedule or Construction Schedule in the format required by the Owner as well as a disk of the updated Schedule and program. If, in the opinion of the Owner, the Work is falling behind Schedule, the Contractor shall submit a revised Schedule demonstrating a recovery plan to ensure Substantial Completion of the Work within the Contract Time.

11.3 Overtime, increased manpower, and additional shifts: If ordered by the Owner in writing, the Contractor shall work overtime, and/or add additional manpower and/or shifts:

11.3.1 If the Contractor is not behind Schedule, the Owner will pay the Contractor the actual additional premium portion of the wages for overtime or additional shift work not included in the Contract price, but the Contractor shall not be entitled to Overhead and Profit.

11.3.2 If the Contractor, through its sole or partial fault or neglect is behind Schedule, the Owner may order the Contractor, at the Contractor's expense, to increase its manpower or to work any overtime or additional shifts or take other action necessary to expedite the Work to meet the Project Schedule.

11.3.3 If the Schedule is shown to be more than 21 Days behind in any critical activity, overtime, increase manpower and/or additional shifts shall be implemented immediately regardless of who is at fault. A disagreement over the cause of the impact will not relieve the Contractor from the obligation of complying with this Article. Once liability for the impact is determined, compensation will be determined in accordance with 11.3.1 or 11.3.2.

11.3.4 The Owner reserves the right to suspend activity under Paragraph 11.3. Suspension shall be in writing and at the sole discretion of the Commissioner.

11.4 Requisitions for partial payment will not be processed until the Contractor has complied with this requirement.

ARTICLE 12
PREFERENCE IN EMPLOYMENT

12.1 Should this Contract be for the construction or repair of any building, then in the employment of labor to perform the Work specified herein, preference shall be given to citizens of the United States, who are, and continuously for at least three (3) months prior to the date hereof, have been residents of the labor market area, as established by the State of Connecticut Labor Commissioner, in which such Work is to be done, and if no such qualified person is available, then to citizens who have continuously resided in the county in which the Work is to be performed for at least three (3) months prior to the date hereof, and then to citizens of the state who have continuously resided in the State at least three months prior to the date hereof.

12.2 Should this Contract be for a public works project other than for the construction, remodeling or repairing of public buildings covered by Connecticut General Statutes 31-52, then in the employment of mechanics, laborers or workmen to perform the Work specified herein, preference will be given to residents of the state who are, and continuously for at least six (6) months prior to the date hereof have been residents of this State, and if no such person is available then to residents of other states.

12.3 The provisions of this Article shall not apply where the state or any subdivision thereof may suffer the loss of revenue granted or to be granted from any Agency or Department of the federal government as a result of this Article or regulations related thereto.

ARTICLE 13
COMPENSATION FOR CHANGES IN THE WORK

13.1 At any time, without invalidating the Contract and by a written order and without notice to the sureties, the Owner, through the Construction Administrator, may order modifications in the Work consisting of additions, deletions or other revisions. Upon request, the Contractor shall supply the Construction Administrator promptly with a detailed proposal for the same, showing quantities of and Unit Prices for the Work and that of any Subcontractor involved.

13.2 Modifications to the Work will be authorized by a written Change Order, or if necessary to expedite the Work, a written Construction Change Directive, issued by the Owner as provided for in Article 25. Change Orders and Construction Change Directives shall be processed in accordance with the terms of the Contract Documents. Upon receipt of the written Change Order, the Contractor shall proceed with the Work when and as directed.

13.3 If a Change Order makes the Work less expensive for the Contractor, the proper deductions shall be made from the Contract Sum, said deductions to be computed in accordance with the provisions listed in this Article 13.

13.4 The Contractor shall not be entitled to an extension of time if in the opinion of the Owner the Additional Work in conjunction with the Work can be performed without impact on the Contract Time.

13.5 The Contractor may request, and the Owner may grant additional Contract Time when, in the opinion of the Owner, the Contractor has demonstrated that the Additional Work cannot be performed in conjunction with the Work without impact on the original Substantial Completion and/or Acceptance (if applicable) date.

13.6 The amount of compensation to be paid to the Contractor for any Additional or Deleted Work that results in a Change Order shall be determined in one of the following manners:

13.6.1 AMOUNT OF COMPENSATION FOR CHANGE ORDER COSTS: LABOR, EQUIPMENT, BENEFITS AND MATERIAL:

13.6.1.1 Unit Price: As stated in the Contract Documents.

13.6.1.2 Unit Price: As subsequently agreed upon by the Contractor and Owner

13.6.1.3 Lump Sum: Agreed upon sum by the Owner and the Contractor. The Owner may rely on costs, prices, and documentation provided by the Contractor or Subcontractor in agreeing to a Lump Sum. If the Owner believes that additional information is necessary to substantiate the accuracy of the cost, the Owner reserves the right to request and receive additional information from the Contractor. The Lump Sum must be based upon the following itemized costs:

13.6.1.3.1 Labor: (Contractor's or Subcontractor's own forces) No Change Order Proposal shall be negotiated if the request is solely for the increased labor rate over those originally carried by the Contractor in its original bid. Additional foreman hours shall not be included unless additional crews are added and/or a compensable time extension is granted. Project Executive time shall not be included as a direct cost as it is part of the overhead mark-up allowed. Project manager hours shall not be included unless a compensable time extension is granted.

13.6.1.3.2 Material: (Actual cost to the Contractor or Subcontractor) Cost shall not be based upon list pricing unless it reflects the actual prices being paid and no discounts or other offsets are being received by the Contractor or Subcontractor. No Change Order Proposal shall be negotiated if the request is solely for the escalation of material prices over those originally carried by the Contractor in its original bid.

13.6.1.3.3 Benefits: (The established rates of the following benefit costs inherent to the particular labor involved):

13.6.1.3.3.1 Workers Compensation.

13.6.1.3.3.2 Federal Social Security.

13.6.1.3.3.3 Connecticut Unemployment Compensation.

13.6.1.3.3.4 Fringe Benefits.

13.6.1.4 Rented Equipment: (Used directly on the Work and by the Contractor's or Subcontractor's own forces).

13.6.1.5 Owned Equipment: (Used directly on the Work and by the Contractor's or Subcontractor's own forces). Daily rate is not to exceed 3% of the monthly rental rate as identified by a nationally recognized construction cost estimating guide or service.

13.6.1.6 Small Tools:
Include items such as shovels, picks, rakes, ladders, and power tools which are expected to be utilized on a project. Trade related equipment, hand tools, and power tools normally supplied with the labor or are normally expected to be owned in the performance of the typical work for a trade are not compensable. These costs shall not be approved as part of the Direct Cost of a Change Order as they are included in the Contractor's overhead mark-up percentage.

13.6.2 OVERHEAD AND PROFIT PERCENTAGES: (Maximum allowable percentages applied to labor, equipment, and material)

13.6.2.1 Contractor's mark-up for Work performed by its own forces:

Change Order Amount	Overhead and Profit
$0 to $5,000	20%
$5,001 to $15,000	17%
$15,001 to $25,000	15%
$25,000 and greater	12%

13.6.3 OVERHEAD AND PROFIT PERCENTAGES: (Maximum allowable percentages applied to labor, equipment, benefits and material)

13.6.3.1 Contractor's mark-up for Work performed by its Subcontractor's forces and not allowable for any subsidiary in which the Contractor has a majority ownership:

Change Order Amount	Overhead and Profit
$0 and greater	6%

13.6.4 OVERHEAD AND PROFIT PERCENTAGES: (Maximum allowable percentages applied to labor, equipment, benefits and material) Subcontractor's mark-up for Work performed by its own forces:

Change Order Amount	Overhead and Profit
$0 to $5,000	20%
$5,001 to $15,000	17%
$15,001 to $25,000	15%
$25,000 and greater	12%

13.6.5 OVERHEAD AND PROFIT PERCENTAGES: (Maximum allowable percentages applied to labor, equipment, benefits and material)

13.6.5.1 Subcontractor's mark-up for Work performed by its Secondary Subcontractor's forces. Limited to one level (tier) below the Subcontractor and not allowable for any subsidiary in which the Subcontractor has a majority ownership.

Change Order Amount	Overhead and Profit
$0 and greater	6%

13.7 BOND COSTS

13.7.1 Actual additional bonding costs associated with the value of the Change Order will be compensable only when supported by written documentation by the bonding company that the Change Order requires an increase to the original Performance, Payment, Labor or Material Bond.

13.7.2 The Contractor shall notify the bonding company at each $500,000 increase to the contract value as the cumulative result of change orders. A copy of the Consent of Surety must be provided to the Owner prior to the execution of any change order which exceeds each cumulative $500,000.

13.8 Trade discounts, rebates, and amounts received from the sales by the Contractor of surplus materials and equipment shall accrue to the Owner.

13.9 If the parties cannot agree upon a Lump Sum, then the Commissioner, through the Project Manager, may at the option of the Commissioner take the following action(s):

13.9.1 Issue a Construction Change Directive for the Additional or Deleted Work. The amount of compensation shall be computed by the actual net costs to the Contractor determined by time and material or Unit Prices based upon the same information required in Subparagraphs 13.6.1.3.3.1 through 13.6.1.5:

13.9.1.1 Labor: (Contractor's or Subcontractor's own forces).

13.9.1.2 Material: (Used by Contractor's or Sub- contractor's own forces).

13.9.1.3 Benefits: (The established rates of the following benefit costs inherent to the particular labor involved):

13.9.1.3.1 Workers Compensation.

13.9.1.3.2 Federal Social Security.

13.9.1.3.3 Connecticut Unemployment Compensation.

13.9.1.3.4 Fringe Benefits.

13.9.1.4 Rented Equipment: (Used directly on the Work and by the Contractor's or Subcontractor's own forces).

13.9.1.5 Owned Equipment: (Used directly on the Work and by the Contractor's or Subcontractor's own forces). Daily rate is not to exceed 3% of the monthly rental rate that can be identified by a nationally recognized construction cost estimating guide or service.

13.9.2 Issue a Change Order adjusting the Contract Sum in the amount as determined by the Commissioner.

13.10 For any Change Order or Construction Change Directive the Contractor shall, when requested, promptly furnish in a form satisfactory to the Construction Administrator and the Owner a complete detailed accounting of all costs relating to the Additional Work, including but not limited to certified payrolls and copies of accounts, bills and vouchers to substantiate actual costs. Further, the Owner reserves the right to access and make copies of the Contractor's records at any time upon written request from the Commissioner.

13.11 Failure of the Contractor to negotiate in good faith issues of time and costs or failure to provide requested documentation within fourteen (14) Days, or a time period accepted by the Commissioner, shall constitute a waiver by the Contractor of any claim. In such cases the Owner may elect to issue a unilateral Change Order in an amount deemed to be fair and equitable by the Commissioner. The provisions hereof shall not affect the power of the Contractor to act in case of emergency, threatened injury to persons, or damage to Work on any adjoining property. In this case the Commissioner, through the Project Manager, shall issue a Change Order for such amount as the Commissioner finds to be reasonable cost of such Work.

ARTICLE 14
DELETED WORK

14.1 Without invalidating any of the terms of the Contract, the Commissioner may order deleted from the Contract any items or portions of the Work deemed necessary by the Commissioner.

14.2 The compensation to be deducted from the Contract Sum for such deletions shall be determined in the manner provided for under the provisions of Article 13 or in the event none of the provisions of Article 13 are applicable then by the value as estimated by the Owner.

ARTICLE 15
MATERIALS: STANDARDS

15.1 Unless otherwise specifically provided for in the Specifications, all equipment, materials and articles incorporated in the Work are to be new and of the best grade of their respective kinds for the purposes. Wherever in the Contract Documents a particular brand, make of material, device, or equipment is shown or specified, the first manufacturer listed in the specification section is to be regarded as the standard. When the specification is proprietary and only one manufacturer is listed, the Contractor shall use the named manufacturer and no Substitutions or Equals will be allowed.

15.2 Any other brand, make of material, device, equipment, procedure, etc. which is a deviation from the specified requirement is prohibited from use, but may be considered by the Owner for approval as an Equal or Substitution. The Contractor is to adhere to the specific requirements of the Contract Documents. Substitutions are discouraged and are only approved by the Commissioner as an exception.

15.3 Submittals – Equals and Substitution Requests:

15.3.1 Substitution of Materials and Equipment before Bid Opening. The Owner will consider requests for Equals or Substitutions, if made prior to the receipt of the Bid. The information on all materials shall be consistent with the information herein.

15.3.1.1 Statement of Variances – a statement of variances must list all features of the proposed Substitution which differ from the Drawings, Specifications and/or product(s) specified and must further certify that the Substitution has no other variant features. A request will be denied if submitted without sufficient evidence.

15.3.1.2 Substitution Denial – any Substitution request not complying with the above requirements will be denied. Substitution request sent after the deadline established in the Notice to Bidder will be denied.

15.3.1.3 An addendum shall be issued to inform all prospective Bidders of any accepted Substitution in accordance with Owner's addenda procedures.

15.3.2 Substitution of Materials and Equipment After Bid Opening: Subject to the Architect or Engineer's determination, if the material or equipment is Equal to the one specified or pre-qualified and the CT DCS Project Manager's approval of such determination, Substitution of Material or Equipment may be allowed after the Letter of Award is issued only:

15.3.2.1 If the specified or pre-qualified item is delayed by unforeseeable contingencies beyond the control of the Contractor which would cause a delay in the Project completion;

15.3.2.2 If any specified or pre-qualified item is found to be unusable or unavailable due to a change by the manufacturer or other circumstances; or

15.3.2.3 If the Contractor desires to provide a more recently developed material, equipment, or manufactured model from the same named manufacturer than the one specified or pre-qualified; or

15.3.2.4 If the specified material and/or equipment inadvertently lists only a single manufacturer.

15.4 Contractor shall submit each request for Equal or Substitution to the Architect or Engineer who shall review each request and make the following recommendations to the Owner:

15.4.1 Acceptance or non-acceptance of the adequacy of the submission and required back-up,

15.4.2 Determination of the category of the request for Substitution or Equal, and

15.4.3 Overall recommendation for approval or rejection of the Substitution or Equal. The determination of the category as a Substitution may be grounds for an immediate rejection by the Owner.

15.5 Approval of the Owner for each Equal or Substitution shall be obtained before the Contractor proceeds with the Work. The decision of the Commissioner, in this regard, shall be final and binding on the Contractor.

15.6 No extension of time will be allowed for the time period required for consideration of any Substitution or Equal. No extension of time will be allowed and no responsibility will be assumed by the Owner when a Contractor submits a request for Substitution or Equal, whether such request be approved or denied, and the Contractor shall not be entitled to any claim for damages for delay.

15.7 If the Contractor submits any request for an Equal or a Substitution, he shall bear the burden of proof that such requested Equal or Substitution meets the requirements of the Plans and Specifications.

15.8 The Contractor shall purchase no materials or supplies for the Work which is subject to any chattel mortgage or which are under a conditional sale or other agreement by which an interest is retained by the seller. The Contractor warrants that the Contractor has good title to all materials and supplies used by him in the Work.

15.9 All products and systems supplied to the State as a result of a purchase by a Contractor shall be certified that, to the best of the supplier's knowledge, there are no materials that are classified as hazardous materials being used within the assembly. Hazardous materials include, but are not limited to, products such as asbestos, lead, and other materials that have proven to cause a health risk by their presence.

ARTICLE 16
INSPECTION AND TESTS

16.1 The purpose of the inspections will be to assure that the Work is performed in accordance with the Contract Documents. These inspections shall include, but not be limited to, all inspections and testing as required by the Owner, and any authorities have jurisdiction.

16.2 All material and workmanship, if not otherwise designated by the Specifications, shall be subject to inspection, examination and test by the Commissioner at any and all times during manufacture and/or construction and at any and all places where such manufacture and/or construction is carried on. The Contract Documents additionally identify the parties responsible for performing and paying for the required testing and inspections. All required tests performed in a laboratory will be obtained and paid for by the Owner, except when the tests show the Work to be defective. The Contractor shall pay for all the costs associated with re-tests and re-inspections for all tests and inspections which fail. The Owner will issue a deduct Change Order to recover said retesting costs from the Contractor. All other tests, unless otherwise specified, shall be made at the Contractor's expense. Notice of the time of all tests to be made at the site shall be given to all interested parties, including the Owner.

16.3 Without additional cost to the Owner, the Contractor shall promptly furnish facilities, labor and materials necessary to coordinate and perform operational tests and checkout of the Work. The Contractor shall furnish promptly all reasonable facilities, labor, and materials necessary to make all such testing safe and convenient.

16.4 If, at any time before final payment and Acceptance of the Work, the Commissioner considers it necessary or advisable to examine of any portion of the Work already completed by removing or tearing out the same, the Contractor shall, upon request, furnish promptly all necessary facilities, labor, and materials. If such Work is found to be defective in any material respect, as determined by the Owner, because of a fault of the Contractor or any of the Contractor's Subcontractors, or if any Work shall have been covered without the approval or consent of the Commissioner (whether or not it is found to be defective), the Contractor shall be liable for testing costs and all costs of correction, including removal and/or demolition of the defective Work, including labor, material, and testing, including labor, material, re-testing or re-inspecting, services of required consultants, additional supervision, the Commissioner's and the Construction Administrator's administrative costs, and other costs for services of other consultants.

16.5 Cost of Systems Commissioning Retesting: The cost to retest a pre-functional or functional test, if the Contractor is responsible for the deficiency, shall be the Contractor's. If the Contractor is not responsible, any cost recovery for retesting costs shall be negotiated with the Contractor.

16.5.1 For a deficiency identified, not related to any pre-functional checklist or start-up fault, the following shall apply: The Commissioning Agent (CxA) and Construction Administrator will direct the retesting of the equipment once at no "charge" to the Contractor for their time. However, the Commissioning Agent's and Construction Administrator's time for additional testing will be charged to the Contractor.

16.5.2 The time for the Systems Commissioning Agent and Construction Administrator to direct any retesting required because a specific pre-functional checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be back charged to the Contractor.

16.5.3 Any required retesting by any Subcontractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.

ARTICLE 17
ROYALTIES AND PATENTS

17.1 If the Contractor desires to use any design, device, material or process covered by a patent or copyright, the Contractor shall provide for such use by suitable legal agreement with the holder of said patent or copyright. The Contractor shall furnish a copy of this legal agreement to the Owner.

17.2 The Contractor shall indemnify and hold harmless the Owner and Construction Administrator for any costs, expenses and damage which it may be obliged to pay by reason of any infringement of a patent or a copyright, at any time during the prosecution or after the Final payment of the Work.

ARTICLE 18
SURVEYS, PERMITS AND REGULATIONS

18.1 Unless otherwise provided for, the Contractor shall furnish surveys necessary for the execution of the Work. The Owner will furnish the Contractor with two base lines and a benchmark.

18.2 The Contractor shall obtain and pay for permits and licenses necessary for the execution of the Work and the occupancy and use of the completed Work.

18.3 The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations including building and fire safety codes relating to the performance of the Work.

18.4 If underground utilities may be involved in part of the Work the Contractor is required to request "Call-Before-You-Dig" to verify the location of underground utilities at least (3) Working Days, as further defined under Paragraph 1.71 herein, prior to the start of any excavation. The Contractor shall also notify the Owner and Agency at least (3) Working Days prior to the start of any excavation. If "Call-Before-You-Dig" fails or refuses to respond to the Contractor's request, then the Contractor shall obtain the services of a qualified underground utility locating firm, at no additional cost to the Owner, to verify locations of underground utilities prior to the start of any excavation. The Contractor shall be held responsible for providing safety, protecting the Work and protecting workmen as necessary to perform the Work. The Contractor shall be responsible for maintaining and protecting all original utility mark-out at no additional cost to the Owner.

ARTICLE 19
PROTECTION OF THE WORK, PERSONS AND PROPERTY

19.1 The Contractor shall continuously and adequately protect the Work against damage from any cause, and shall protect materials and supplies furnished by the Contractor or Subcontractors, whether or not incorporated in the Work, and shall make good any damage unless it be due directly to errors in the Contract Documents or is caused by agents or employees of the Owner.

19.2 To the extent required by law, by public authority, or made necessary in order to safeguard the health and welfare of the personnel or occupants of any of the state institutions, the Contractor shall adequately protect adjacent property and persons, and provide and maintain all facilities, including but not limited, to passageways, guard fences, lights, and barricades necessary for such protection.

19.3 The Contractor shall take all necessary precautions for the safety of employees on the Work and shall comply with applicable provisions of federal and state safety laws and building codes to prevent accidents or injury to persons on, about, or adjacent to the premises where the Work is being performed. The Contractor shall also comply with the applicable provisions of the Associated General Contractors' "Manual of Accident Prevention in Construction", the standards of the Connecticut Labor Department and Occupational Safety and Hazard Association (OSHA).

19.4 The Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the Work, all necessary safeguards for the protection of employees of the State and the public, and shall post danger signs warning against any dangerous condition or hazard created by such things as protruding nails, well holes, elevator hatchways, scaffolding, window openings, excavations, tripping hazards or slipping, stairways and falling materials.

19.5 The Contractor shall designate a qualified and responsible on-site staff person, whose duty shall be the prevention of accidents. The name and position of the designated person shall be reported to the Owner by the Contractor at the commencement of the Contract.

19.6 The Contractor shall at all times protect excavations, trenches, buildings, and all items of Work from damage by rain, water from melted snow or ice, surface water run off and subsurface water usual for the vicinity at the time of operations; and provide all pumps and equipment and enclosures to insure such protection.

19.7 The Contractor shall construct and maintain all necessary temporary drainage and provide all pumping necessary to keep excavation, basements, footings and foundations free of water.

19.8 The Contractor shall remove all snow and ice as may be required for access to the site and proper protection and prosecution of the Work.

19.9 The Contractor shall install bracing, shoring, sheathing, sheet piling, caissons and any other underground facilities as required for safety and proper execution of the Work, and shall remove this portion of the Work when no longer necessary.

19.10 During cold weather the Contractor shall protect all Work from damage. If low temperature makes it impossible to continue operations safely in spite of cold weather precautions, the Contractor may cease Work upon the written approval of the Commissioner.

ARTICLE 20
TEMPORARY UTILITIES

20.1 Unless expressly provided for otherwise in the Contract Documents, the Contractor shall include in the proposed contract bid price as stated on the Bid Proposal Form, the costs of all temporary utilities required for Project completion and protection of the Work. Said temporary utilities include, but are not limited to, lighting, heating, cooling, electrical power, water, telephone, sanitary facilities, and potable water.

ARTICLE 21
CORRECTION OF WORK

21.1 The Contractor shall promptly and without expense to the Owner remove from the premises all materials rejected by or unacceptable to the Commissioner as failing to conform to the Contract Documents, whether incorporated in the Work or not.

21.2 The Contractor shall promptly and without expense to the Owner replace any such materials, which do not conform to the Contract Documents, and shall bear the expense of making good all Work of other Contractors or Subcontractors destroyed or damaged by such removal or replacement.

21.3 If the Contractor, after receipt of notice from the Owner, shall fail to remove such rejected or unacceptable materials within a reasonable time as fixed in said notice, the Owner may remove and store such materials at the expense of the Contractor.

21.4 Such action shall not affect the obligation of the Contractor to replace and complete assembly and installation of the Work and to bear the expenses referred to above. Prior to the correction of rejected or unacceptable Work or if the Commissioner deems it inexpedient or undesirable to correct any portion of the Work which was rejected, deemed unacceptable, or not done in accordance with the Contract Documents, the Contract Sum shall be reduced by such amount as, in the judgment of the Commissioner, shall be equitable.

21.5 No extension of time will be given to the Contractor for correction of rejected or unacceptable Work. All significant punchlist Work shall be completed before Substantial Completion is determined. The remaining minor punchlist Work, as determined by the Commissioner, shall be completed within **ninety (90) Days** of established Substantial Completion date.

21.6 Final Payment shall not relieve the Contractor of responsibility for the defects in material or workmanship.

21.7 Unless expressly provided for otherwise in the Contract Documents, the Contractor shall remedy any rejected or unacceptable Work, and any Work found to be not conforming to the Contract Documents which is discovered within 18 Months after the date of Substantial Completion. The Contractor shall pay for any damage to other Work caused by such nonconforming Work or any damage created in correcting the nonconforming Work.

ARTICLE 22
GUARANTEES and WARRANTIES

22.1 Unless expressly provided for otherwise in the Contract Documents, the Contractor shall provide a Warranty on the Work for an **18-Month** period from the date of Substantial Completion. The Contractor shall warrant that the equipment, materials and workmanship are of good quality and new, unless permitted elsewhere by the Contract Documents, and that the Work shall be free from defects not inherent in the quality required or permitted and that the Work conforms to the Contract Documents.

22.2 Disclaimers and limitations from manufactures, Subcontractors, suppliers or installers to the Contractor shall not relieve the Contractor of the Warranty on the Work. The Contract Documents detail the related damages, reinstatement of Warranty, replacement cost and Owner's recourse.

ARTICLE 23
CUTTING, FITTING, PATCHING, AND DIGGING

23.1 The Contractor will perform or will cause the Subcontractors to perform all cutting, fitting, or patching of the portion(s) of the Work that may be required to make the several parts thereof joined and coordinated in a manner satisfactory to the Commissioner and in accordance with the Plans and Specifications.

23.2 The responsibility for defective or ill-timed Work shall be with the Contractor, but such responsibility shall not in any way relieve the Subcontractor who performed such Work. Except with the consent of the Commissioner, neither the Contractor nor any of its Subcontractors shall cut or alter the Work of any other Contractor or Subcontractor.

ARTICLE 24
CLEANING UP

24.1 The Contractor shall, on a daily basis, keep the premises free from accumulations of waste material or rubbish.

24.2 Prior to Acceptance of the Work, the Contractor shall remove from and about the site of the Work, all rubbish, all temporary structures, tools, scaffolding, and surplus materials, supplies, and equipment which may have been used in the performance of the Work. If the Commissioner in his sole discretion determines that the Contractor has failed to clean the work site, the Owner may remove the rubbish and charge the cost of such removal to the Contractor. A deduct Change Order will be issued by the Owner to recover such cost.

ARTICLE 25
ALL WORK SUBJECT TO CONTROL OF THE COMMISSIONER

25.1 The Commissioner hereby declares that the CT DCS Project Manager is the Commissioner's only authorized representative to act in matters involving the Owner's, and/or Architect's or Engineer's, ability to revoke, alter, enlarge or relax any requirement of the Contract Documents; to settle disputes between the Contractor and the Construction Administrator; and act on behalf of the Commissioner. In all such matters, the provisions of Articles 13 and 14 herein shall guide the CT DCS Project Manager.

25.2 In no event may the Contractor act on any instruction of the Agency without written consent of the Owner. In the event the Contractor acts without such consent, he does so at his own risk and at his own expense, not only for the Work performed, but for the removal of such Work as determined necessary by the Commissioner.

25.3 In the performance of the Work, The Contractor shall abide by all orders, directions, and requirements of the Commissioner at such time and places and by such methods and in such manner and sequence as the Commissioner may require.

25.4 The Commissioner shall determine the amount, quality, acceptability and fitness of all parts of the Work, shall interpret the plans, Specifications, Contract Documents and extra work orders and shall decide all other questions in connection with the Work.

25.5 The Contractor shall employ no plant, equipment, materials, methods, or persons to which the Commissioner objects and shall remove no plant materials, equipment, or other facilities from the site of the Work without the permission of the Commissioner. Upon request, the Commissioner shall confirm in writing any oral order, direction, requirement or determination.

25.6 In accordance with Section 4b-24 of the Connecticut General Statutes, the public auditors of the State of Connecticut and the auditors or accountants of the Commissioner of Construction Services shall have the right to audit and make copies *of* the books of any Contractor employed by the Commissioner.

ARTICLE 26
AUTHORITY OF THE CONSTRUCTION ADMINISTRATOR

26.1 The Construction Administrator employed by the Commissioner is authorized to inspect all Work for conformance to the Contract Documents. The Construction Administrator is authorized to reject all Work found to be defective, unacceptable and nonconforming to the Contract Documents. Such inspections and rejections may extend to all or any part of the Work, and to the preparation or manufacture of the material to be used.

26.2 The Construction Administrator is not empowered to revoke, alter, enlarge, or relax any requirements of the Contract Documents, or to issue instructions contrary to the Contract Documents. The Construction Administrator shall in no case act as foreman or perform other duties for the Contractor, nor shall the Construction Administrator interfere with the management of the Work by the Contractor. Any advice, which the Construction Administrator may give the Contractor, shall in no way be construed as binding the Commissioner or Owner in any way, nor releasing the Contractor from the fulfillment of the terms of the Contract.

26.3 In any dispute arising between the Contractor and the Construction Administrator with reference to inspection and rejection of the Work, the Construction Administrator may suspend Work on the non-compliant portion of the Work until the dispute can be referred to and decided by the Commissioner.

ARTICLE 27
SCHEDULE OF VALUES, APPLICATION FOR PAYMENT

27.1 Immediately after the signing of the Contract, the Contractor shall furnish for the use of the Commissioner, as a basis for estimating partial payments, a certified Schedule of Values, totaling the Contract Sum and broken down into quantities and unit costs, as outlined in the Contract Documents and as directed by the Owner. The Schedule of Values must reflect true costs and be in sufficient detail to be an effective tool for monitoring the progress of the Work Upon request of the Commissioner; the Contractor shall supply copies of signed Contracts, vendor quotations, etc. as back up to the Schedule of Values.

27.2 Approval of the Schedule of Values by the Commissioner is required prior to any payment by the Owner.

27.3 The Schedule of Values shall include a breakdown of the Contractor's general condition costs.

27.3.1 Non-recurring costs, (i.e. Mobilization costs, utility hook-ups, temporary heat) will be paid at the time of occurrence.

27.3.2 Reoccurring costs will be paid in proportion to the percent of completion of the Project.

27.3.3 Further detail can be found in the General Requirements 01.29.76; paragraphs 1.3.B.4 for this project.

27.4 The Schedule of Values shall include a breakdown of Contract closeout costs including systems certification testing and acceptance, training, Warranties, Guarantees, As-Built Drawings and attic stock**.**

27.5 The Contractor shall make periodic applications for payment, which shall be subdivided into categories corresponding with the approved Schedule of Values and shall be in such numbers of copies as may be designated by the Commissioner.

ARTICLE 28
PARTIAL PAYMENTS

28.1 Commissioner will examine the Contractor's Applications For Payments to determine, in the opinion of the Commissioner, the amounts that properly represent the value of the Work completed and the materials suitably stored on the site.

28.2 In making such Application For Payment for the Work, there shall not be more than **seven and five-tenths percent (7.5%)** deducted from the amount of each Application for Payment to be retained by the Owner as Retainage until Acceptance of the Work.

28.2.1 The following criteria shall be utilized in the reduction of Retainage withheld: At fifty percent (50%) completion of the Work the Retainage shall be reduced to **five percent (5%).** All subsequent Applications for Payment shall be subject to **five percent (5%)** Retainage. Upon Substantial Completion, and in the Commissioner's sole discretion and based upon the factors set forth in **Section 28.3**, the Retainage may be reduced upon the request of the Contractor and recommendation of the DAS Project Manager. In the event of a reduction in Retainage to **below five percent (5%),** the minimum Retainage withheld shall not be less than the DAS Project Manager's estimate of the remaining Work or **two and five-tenths percent (2.5%),** whichever is greater. All requests for Retainage Reduction shall be done on **CT DAS Form 7048 General Contractor Retainage Reduction Request**, a sample of which can be found at the end of these General Conditions.

28.2.2 Subsequent to Substantial Completion, in limited circumstances, at the sole discretion of the Commissioner and based upon factors set forth in Section 28.3, a reduction of Retainage below **two and five-tenths percent (2.5%)** may be considered.

28.2.3 A "Good" Contractor's Performance Evaluation score shall be defined as a minimum total score of sixty percent (60%).

28.3 The decision of the Commissioner to reduce the Retainage rate will be based upon the **Contractor's Performance Evaluation** score for completed portions of the Work as set out above and other factors that the Commissioner may find appropriate as follows:

28.3.1 The Contractor's timely submission of an appropriate and complete CPM Schedule or Construction Schedule and Schedule of Values, in compliance with the Contract requirements and the prompt resolution of the Owner's and/or Architect's or Engineer's comments on the submitted material resulting in an appropriate basis for progress of the Work.

28.3.2 The Contractor's timely and proper submission of all Contract Document required submissions: including, but not limited to, Shop Drawings, material certificates and material samples and the prompt resolution of the Owners and/or Architect's or Engineer's comments on the submitted material, resulting in an appropriate progress of the Work.

28.3.3 The Contractor's provision of proper and adequate supervision and home office support of the Project.

28.3.4 The Work completed to date has been installed or finished in a manner acceptable to the Owner.

28.3.5 The progress of the Work is consistent with the approved CPM Schedule or Construction Schedule.

28.3.6 All approved credit change orders have been invoiced.

28.3.7 All Change Order requests for pricing are current.

28.3.8 The Contractor has and is maintaining a clean worksite in accordance with the Contract Documents.

28.3.9 All Subcontractor payments are current at the time of reduction request.

28.3.10 Contractor is compliant with set-aside provisions of the contract.

28.3.11 Pursuant to C.G.S. Sec. 4a-101, the General Contractor shall compile evaluation information during the performance of the contract on each of its subcontractors who are performing work with a value in excess of five hundred thousand dollars ($500,000.00). The General Contractor shall complete and submit to the State of Connecticut Department of Construction Services (CT DCS) evaluations of each such subcontractor upon fifty percent (50%) completion of the project and upon Substantial Completion of the project. The General Contractor acknowledges that its failure to complete and submit these evaluations in a timely manner may, by statute; result in a delay in project funding and, consequently, payment to the General Contractor.

28.4 No payments will be made for improperly stored or protected materials or unacceptable Work.

28.5 At his or her sole discretion, the Commissioner may allow to be included in the monthly requisitions payment requests for materials and equipment stored off the site.

28.5.1 In the event the Commissioner allows the Contractor to include in its requisitions payment requests for materials and equipment stored off the site, the Contractor shall also submit any additional bonds and/or insurance certificates relating to off-site stored materials and equipment, and follow such other procedures as may be required by the State to obtain the Commissioner's approval of such requests.

28.5.2 The Architect or Engineer, or Construction Administrator shall have inspected said materials and equipment and recommended payment therefore. The Contractor shall pay for the cost of the Architect's or Engineer's, or Construction Administrator's time and expense in performing these inspection services.

ARTICLE 29
DELIVERY OF STATEMENT SHOWING AMOUNTS DUE FOR WAGES, MATERIALS, AND SUPPLIES

29.1 For each Application for Payment under this Contract, the Owner reserves the right to require the Contractor and every Subcontractor to submit a written verified statement, in a form satisfactory to the Owner, showing in detail all amounts then due and unpaid by such Contractor or Subcontractor for daily or weekly wages to all laborers employed by it for the performance of the Work or to other persons for materials, equipment or supplies delivered at the site.

29.2 The term "laborers" as used herein shall include workmen, workwomen, and mechanics.

29.3 Failure to comply with this requirement may result in the Owner withholding the Application for Payment pursuant to Article 28.

ARTICLE 30
SUBSTANTIAL COMPLETION AND ACCEPTANCE

30.1 Substantial Completion:

30.1.1 When the Contractor considers that the Work or a portion thereof is Substantially Complete, the Contractor shall request an inspection of said Work in writing to the Construction Administrator. The request shall certify that the Contractor has completed its own inspection prior to the request and that the Contractor is compliant with all requirements of Section 01 77 00 of the General Requirements. The request must also include a statement that a principal or senior executive of the Contractor is ready, willing and able to attend a walk through inspection with the Architect or Engineer.

30.1.2 Upon receipt of the request, the Architect or Engineer, Construction Administrator and Owner, will make an inspection to determine if the Work or designated portion thereof is Substantially Complete. A principal or senior executive of the Contractor shall accompany the Architect or Engineer during each inspection/re-inspection. If the inspection discloses any item, whether or not included on the inspection list, which is not in accordance with the requirements of the Contract Documents, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item.

30.1.3 The Contractor shall then submit a request for another inspection. The determination of Substantial Completion is solely within the discretion of the Owner. Any costs for re-inspection beyond one, shall be at the expense of the Contractor and such costs will be recovered by issuance of a credit Change Order. When the Work or designated portion thereof is determined to be Substantially Complete, the Contractor will be provided a Certificate of Substantial Completion from the Owner. The Certificate of Substantial Completion shall establish the date when the responsibilities of the Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, are transferred to the Owner and shall fix the time within which the Contractor shall finish all items on the inspection list accompanying the Certificate. If the punch list is not complete in **90 Days**, the Owner reserves the right to complete the outstanding punch list items with their own forces or by awarding separate contracts and to deduct the cost thereof from the amounts remaining due to the Contractor.

30.1.4 The Certificate of Substantial Completion shall be signed by the Construction Administrator, Owner, and Architect or Engineer. Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and certification by the Construction Administrator and Architect or Engineer, the Owner shall make payment reflecting adjustment in Retainage, if any, for such Work or portion thereof as provided in the Contract Documents.

30.2 Acceptance:

30.2.1 Upon completion of the Work, the Contractor shall forward to the Construction Administrator a written notice that the Work is ready for inspection and Acceptance.

30.2.2 When the Work has been completed in accordance with terms and conditions of the Contract Documents as determined by the Owner a Certificate of Acceptance shall be issued by the Owner.

ARTICLE 31
FINAL PAYMENT

31.1 The Owner reserves the right to retain for a period of thirty (30) Days after filing of the Certificate of Acceptance the amount therein stated less all prior payments and advances whatsoever to or for the account of the Contractor.

31.2 All prior estimates and payments, including those relating to extra or additional Work, shall be subject to correction by the Final Payment.

31.3 No Application for Payment, Final or Partial, shall act as a release to the Contractor or the Contractor's sureties from any obligations under this Contract.

31.4 The Architect or Engineer and Construction Administrator will promptly issue the Certificate for Payment, stating that to the best of their knowledge, information and belief, and on the basis of their observations and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in said Final Payment is due and payable.

31.5 Final Payment shall not be released until a Certificate of Acceptance and a Certificate of Compliance have been issued.

31.6 Neither Final Payment nor any Retainage shall become due until the Contractor submits to the Owner the following:

31.6.1 An affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied.

31.6.2 A certificate evidencing that insurance required by the Contract Documents to remain in force after Final Payment is currently in effect and will not be canceled or allowed to expire without at least 30 Days prior written notice to the Owner.

31.6.3 A written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents.

31.6.4 Written consent of surety, if any, to Final Payment.

31.6.5 If required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorney's fees.

ARTICLE 32
OWNER'S RIGHT TO WITHHOLD PAYMENTS

32.1 The Commissioner may withhold a portion of any Payment due the Contractor that may, in the judgment of the Commissioner, be necessary:

32.1.1 To assure the payment of just claims then due and unpaid to any persons supplying labor or materials for the Work.

32.1.2 To protect Owner from loss due to defective, unacceptable or non-conforming Work not remedied by the Contractor.

32.1.3 To protect the Owner from loss due to injury to persons or damage to the Work or property of other Contractors, Subcontractors, or others caused by the act or neglect of the Contractor or any of its Subcontractors.

32.2 The Owner shall have the right to apply any amount withheld under this Article as the Owner may deem proper to satisfy protection from claims. The amount withheld shall be considered a payment to the Contractor.

32.3 The Owner has the right to withhold payment if the Contractor fails to provide accurate submissions of Submittals, up date the status including but not limited to the following: As-Built Drawings, request for information (RFI) log, Schedule, submittal log, Change Order log, certified payrolls and daily reports and all other requirement of the Contract Documents.

32.4 If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorney's fees.

ARTICLE 33
OWNER'S RIGHT TO STOP WORK OR TERMINATE CONTRACT

33.1 The Commissioner shall have the authority to suspend the Work wholly or in part, for such period or periods as the Commissioner considers being in the best interests of the State, or in the interests of public necessity, convenience or safety. During such periods the Contractor shall store all materials and equipment, in such a manner to prevent the materials and equipment from being damaged in any way, and the Contractor shall take precautions to protect the Work from damage.

33.1.1 If the Commissioner, in writing, orders the performance of all or any portion of the Work to be suspended or delayed for an unreasonable period of time (i.e. not originally anticipated, customary, or inherent in the construction industry) and the Contractor believes that additional compensation and/or Contract Time is due as a result of such suspension or delay, the Contractor shall submit to the Commissioner in writing a request for a Contract adjustment within 7 Days of receipt of the notice to resume Work. The request shall set forth the specific reasons and support for said adjustment.

33.1.2 The Commissioner shall evaluate any such requests received. If the Commissioner agrees that the cost and/or time required for the performance of the Contract has increased as a result of such suspension and that the suspension was caused by conditions beyond the control of and not the fault of the Contractor, its suppliers, or Subcontractors, and was not caused by weather, then the Commissioner will make a reasonable adjustment, excluding profit, of the Contract terms. The Commissioner will notify the Contractor of the determination as to what adjustments of the Contract, if any, that the Commissioner deems warranted.

33.1.3 No Contract adjustment will be made unless the Contractor has submitted the request for adjustment within the time prescribed.

33.1.4 No Contract adjustment will be made under this Article to the extent that performance would have been suspended or delayed by any other cause within the Contractor's control or by any factor for which the Contractor is responsible under the Contract; or that such an adjustment is provided for or excluded under other term or condition of this Contract.

33.2 Termination for Convenience: Notwithstanding any provision or language in the Contract to the contrary, the State may terminate the Contract for convenience whenever the Commissioner determines at his sole discretion that such termination is in the best interests of the State. Any such termination shall be effected by delivery to the Contractor of a written Notice of Termination for Convenience specifying the extent to which performance of Work under the Contract is terminated, and the date upon which such termination shall be effective.

33.2.1 In the event of such termination, the Contractor shall be entitled to reasonable compensation as determined by the Commissioner, however, no claim for lost Overhead or Profits shall be allowed.

33.2.2 All Work and materials obtained by the Contractor for the Work, that have been incorporated into the Work, inspected, tested as required, accepted by the Commissioner, and paid for by the State, shall become the property of the State.

33.2.3 Materials obtained by the Contractor for the Work that have been inspected, tested as required, and accepted by the Commissioner, and that are not incorporated into the Work, shall, at the option of the Commissioner, be purchased from the Contractor at actual cost as shown by receipted bills. To this cost shall be added all actual costs for delivery at such points of delivery as may be designated by the Commissioner, as shown by actual cost records.

33.2.4 Termination of the Contract for convenience shall not relieve the Contractor or its surety of their responsibilities for the completed Work, nor shall it relieve the Contractor's surety of its obligations to ensure completion of the Work and to pay legitimate claims arising out of the Work.

33.3 Termination for Cause:

33.3.1 The Commissioner may give notice in writing to the Contractor and its surety of any particular delay, neglect, or default of the Contractor due to one or more of the following:

33.3.1.1 Failure to begin the Work within the time specified for same in the Contract Documents.

33.3.1.2 Failure to perform the Work with sufficient workmen, equipment or materials to ensure the prompt completion of the Work within the time specified in the Contract*.*

33.3.1.3 Unsuitable performance of the Work or failure to remedy or redo such work as DAS Project Manager shall reject as defective, unsuitable, or noncompliant with Contract requirements.

33.3.1.4 Failure or refusal to remove material rejected as defective, unsuitable, or noncompliant with Contract requirements.

33.3.1.5 Discontinuance of the suitable prosecution of the Work for a period of seventy-two (72) hours, excluding Saturdays*,* Sundays and holidays, without written authorization to do so from the DAS Project Manager.

33.3.1.6 Failure to recommence discontinued Work within forty-eight (48) hours (excluding Saturdays*,* Sundays and holidays) after being ordered to do so by the DAS Project Manager.

33.3.1.7 Insolvency, filing for bankruptcy or any act or occurrence that may render the Contractor financially incapable of completing the Work.

33.3.1.8 Failure to satisfy any final judgment against it for a period of thirty (30) days.

33.3.1.9 Making of any assignment for the benefit of creditors.

33.3.1.10 Violation of any provisions of the Contract Documents.

33.3.2 If the Contractor or its surety within a period of ten (10) days after the issuance of such notice does not proceed in conformance with the directions set forth therein, or fails to present a remedial plan of operation, satisfactory to the Commissioner, for remedying the acts or failures complained of in the notice, then the Commissioner may, at his discretion, order the surety to complete the Work or, without violating the Contract, take the right to control and prosecute the Work out of the hands of said Contractor and surety, terminating the Contract.

33.3.3 The Commissioner may appropriate or use any or all stockpiled materials and any and all equipment required by the Contract as may be suitable and necessary for completion of the Work and may enter into an agreement, either by negotiation or public letting, for the completion of said Contract by a party other than the Contractor, according to the terms and provisions thereof, or use such other methods or combinations thereof as in his or her opinion shall be required or desirable for the completion of the Work.

33.3.4 All costs and charges incurred by the Owner in connection with completing the Work, or as a result of the Contractor's default, shall be deducted from any monies due to or which may become due to the Contractor. In case such expense exceeds the sum that would have been payable under the Contract, then the Contractor and the surety shall be liable for, and shall pay to the State, the amount of the excess. Termination of the Contract shall not relieve the Contractor or its surety of their responsibilities for the completed Work, nor shall it relieve the Contractor's surety of its obligations to ensure completion of the Work and to pay legitimate claims arising out of the Work.

ARTICLE 34
SUBLETTING OR ASSIGNING OF CONTRACT

34.1 The Contract or any portion thereof, or the Work provided for therein, or the right, title, or interest of the Contractor therein may not be sublet, sold, transferred, assigned, or otherwise disposed of to any person, firm, or corporation without the written consent of the Commissioner.

34.2 No person, firm, or corporation other than the Contractor to whom the Contract was awarded shall be permitted to commence Work at the site of the Contract until such consent has been granted.

ARTICLE 35
CONTRACTOR'S INSURANCE

35.1 The Contractor shall not start Work under the Contract until they have obtained insurance as stated in SECTIONS 00 62 16 CERTIFICATE OF INSURANCE and 00 41 00 BID PROPOSAL FORM of the Project Manual and until the insurance has been approved by the Owner. The Contractor shall not allow any Subcontractor to start Work until the same insurance has been obtained by the Subcontractor and approved by the Owner or the Contractor's insurance provides coverage on behalf of the Subcontractor. The Contractor shall send Certificates of Liability Insurance to the Connecticut Department of Administrative Services/Construction Services, Office of Legal Affairs, Policy and Procurement, 450 Columbus Blvd, Suite 1302, Hartford, CT 06103-1835 unless otherwise directed in writing. For insurance definitions see Article 1 herein. Presented below is a narrative summary of the insurance required.

35.1.1 Commercial General Liability Insurance: Insurance including contractual liability, products/completed operations, broad form property damage and independent Contractors. The limits shall be no less than $1,000,000 each occurrence and $2,000,000 annual aggregate. Coverage for hazards of explosion, collapse and underground (X-C-U) and for asbestos abatement when applicable to this Contract, must also be included when applicable to the Work to be performed. The State of Connecticut, the Department of Administrative Services, and their respective officers, agents, and employees shall be named as an Additional Insured. This coverage shall be provided on a primary basis.

35.1.2 Owner's and Contractor's Protective Liability Insurance: Insurance providing a total limit of $1,000,000 for all damages arising out of bodily injury or death of persons in any one accident or occurrence and for all damages arising out of injury or destruction of property in any one accident or occurrence and subject to a total (aggregate) limit of $2,000,000 for all damages arising out of bodily injury to or death of persons in all accidents or occurrences and out of injury to or destruction of property during the policy period. This coverage shall be for and in the name of the State of Connecticut.

35.1.3 Automobile Liability Insurance: The operation of all motor vehicles including those owned, non-owned and hired or used in connection with the Contract shall be covered by Automobile Liability Insurance providing for a total limit of $1,000,000 for all damages arising out of bodily injuries to or death of all persons in any one accident or occurrence and for all damages arising out of injury to or destruction of property in any one accident or occurrence. In cases where an insurance policy shows an aggregate limit as part of the automobile liability coverage, the aggregate limit must be at least $2,000,000. This coverage shall be provided on a primary basis. Should the Contractor not own any automobiles, the automobile & liability requirement shall be amended to allow the Contractor to maintain only hired and non-owned liability coverage.

35.1.4 Umbrella Liability Insurance: Umbrella Liability Insurance, including a drop down provision covering any exhausted underlying aggregate limits in the specified amount shown below of combined single limit each occurrence in excess of the coverages described in subsections 35.1.1 Commercial General Liability Insurance, 35.1.3 Automobile Liability, and 35.1.5 Workers' Compensation and Employer's Liability. The State of Connecticut shall be named as an additional insured. The Umbrella Liability Insurance Limits for the Contractor are based on the Contract Value as specified in the following table.

Umbrella Liability Insurance Table:			
Contract Value			**Umbrella Limit**
$1.00	to	$500,000.00	$1,000,000.00
$500,000.01	to	$1,000,000.00	$2,000,000.00
$1,000,000.01	to	$10,000,000	$5,000,000.00
$10,000,000.01	to	$30,000,000	$10,000,000.00
$30,000,000.01	to	$80,000,000	$15,000,000.00
$80,000,000.01	to	$150,000,000	$20,000,000.00
$150,000,000.01	to	$300,000,000	$25,000,000.00

35.1.5 Workers' Compensation and Employer's Liability: As required by Connecticut Law and **Employers' Liability** with a limit of not less than $100,000 per occurrence, $500,000 disease policy limit and $100,000 disease each employee. When Work is on or contiguous to navigable bodies of waterways and ways adjoining, the Contractor shall include the Federal Act endorsement for the U.S. Longshoremen's and Harbor Workers Act.

35.1.6 Special Hazards Insurance: If required, will be stated in the BID PROPOSAL FORM of this Project Manual. This includes coverage for explosion, collapse or underground damage and for asbestos abatement when applicable to this Contract and shall be no less than $1,000,000 each occurrence.

35.1.7 Builder's Risk Insurance: If required, will be stated in the BID PROPOSAL FORM of this Project Manual.

35.1.8 Inland Marine/Transit Insurance: With respect to property with values in excess of $100,000 which is rigged, hauled or situated at the site pending installation, the Contractor shall maintain inland marine/transit insurance provided the coverage is not afforded by a Builder's Risk policy.

35.1.9 When required to be maintained, the Builder's Risk and/or Inland Marine/Transit Insurance policy shall endorse the State of Connecticut as a Loss Payee and the policy shall state it is for the benefit of and payable to the State of Connecticut.

35.2 Satisfying Limits Under an Umbrella Policy: If necessary, the Contractor may satisfy the minimum limits required above for either Commercial General Liability, Automobile Liability, and Employer's Liability coverage under an Umbrella or Excess Liability policy. The underlying limits may be set at the minimum amounts required by the Umbrella or Excess Liability policy provided the combined limits meet at least the minimum limit for each required policy. The Umbrella or Excess Liability policy shall have an Annual Aggregate at a limit not less than two (2) times the highest per occurrence minimum limit required above for any of the required coverages. The State of Connecticut shall be specifically endorsed as an Additional Insured on the Umbrella or Excess Liability policy, unless the Umbrella or Excess Liability policy provides continuous coverage to the underlying policies on a complete "Follow-Form" basis.

35.3 The Contractor shall, at its sole expense, maintain in full force and effect at all times during the life of the Contract or the performance of Work hereunder, insurance coverage as described herein. Certificates shall include a minimum thirty (30)-day endeavor to notify requirement to the Owner prior to any cancellation or non-renewal.

35.4 The Contractor shall be fully and solely responsible for any costs or expenses as a result of a coverage deductible, coinsurance penalty, or self-insured retention, including any loss not covered because of the operation of such deductible, coinsurance penalty, or self-insured retention.

35.5 The requirement contained herein as to types and limits of insurance coverage to be maintained by the Contractor are not intended to and shall not in any manner limit or qualify the liabilities and obligations assumed by the Contractor.

35.6 Indemnification and Hold Harmless Provisions:

35.6.1 The Contractor shall indemnify, defend and hold harmless the State and its officers, representatives, agents, servants, employees, successors and assigns from and against any and all (1) Claims arising, directly or indirectly, in connection with the Contract, including the acts of commission or omission (collectively, the "Acts") of the Contractor or Contractor Parties; and (2) liabilities, damages, losses, costs and expenses, including but not limited to, attorneys' and other professionals' fees, arising, directly or indirectly, in connection with Claims, Acts or the Contract. The Contractor shall use counsel reasonably acceptable to the State in carrying out its obligations under this section. The Contractor's obligations under this section to indemnify, defend and hold harmless against Claims includes Claims concerning confidentiality of any part of or all of the Contractor's bid, proposal or any Records, any intellectual property rights, other proprietary rights of any person or entity, copyrighted or uncopyrighted compositions, secret processes, patented or unpatented inventions, articles or appliances furnished or used in the Performance.

35.6.2 The Contractor shall not be responsible for indemnifying or holding the State harmless from any liability arising due to the negligence of the State or any third party acting under the direct control or supervision of the State.

35.6.3 The Contractor shall reimburse the State for any and all damages to the real or personal property of the State caused by the Acts of the Contractor or any Contractor Parties. The State shall give the Contractor reasonable notice of any such Claims.

35.6.4 The Contractor's duties under this section shall remain fully in effect and binding in accordance with the terms and conditions of the Contract, without being lessened or compromised in any way, even where the Contractor is alleged or is found to have merely contributed in part to the Acts giving rise to the Claims and/or where the State is alleged or is found to have contributed to the Acts giving rise to the Claims.

35.6.5 The Contractor shall carry and maintain at all times during the term of the Contract, and during the time that any provisions survive the term of the Contract, sufficient general liability insurance to satisfy its obligations under this Contract. The Contractor shall name the State as an additional insured on the policy and shall provide a copy of the policy to the Agency prior to the effective date of the Contract. The Contractor shall not begin Performance until the delivery of the policy to the Agency. The Agency shall be entitled to recover under the insurance policy even if a body of competent jurisdiction determines that the Agency or the State is contributorily negligent.

35.6.6 Such obligations shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to any party or person described in General Conditions Article 35.

35.6.7 This section shall survive the Termination of the Contract and shall not be limited by reason of any insurance coverage.

ARTICLE 36
FOREIGN MATERIALS

36.1 Preference shall be given to articles or materials manufactured or produced in the United States, Canada, and Mexico, (the members of the North American Free Trade Agreement (NAFTA)); and the products shall meet all of the referenced standards and Specifications for conditions of performance, quality, and price with duty being equal.

36.2 Only articles or materials manufactured or produced in the United States, Canada, and Mexico, (the members of the North American Free Trade Agreement (NAFTA)), will be allowed. The foregoing provisions shall not apply to foreign articles or materials required by the Contract Documents.

36.3 Buy American Act (BAA): Any "public building" or "public work" project funded by the American Recovery and Reinvestment Act of 2009 ("ARRA") requires that "all of the iron, steel, and manufactured goods used in the project" must be "produced in the United States" in accordance with the requirements of the Buy American Act (BAA).

ARTICLE 37
HOURS OF WORK

37.1 No person shall be employed to work or be permitted to work more than eight (8) hours in any Day or more than forty (40) hours in any week for any Work provided in the Contract, in accordance with Connecticut General Statute Section 31-57.

37.2 The operation of such limitation of hours of work may be suspended during an emergency, upon the approval of the Commissioner, in accordance with Connecticut General Statute Section 31-57.

ARTICLE 38
CLAIMS

38.1 General: When filing a formal claim under Section 4-61 (referred to as "Section 4-61" below) of the Connecticut General Statutes (as revised), either as a lawsuit in the Superior Court or as a demand for arbitration, the Contractor must follow the procedures and comply with the requirements set forth in this Article. This Section does not, unless so specified, govern informal claims for additional compensation which the Contractor may bring before the Department. The Contractor should understand, however, that the Department may need, before the Department can resolve such a claim, the same kinds of documentation and other substantiation that it requires under this Article. It is the intent of the Department to compensate the Contractor for actual increased costs caused by or arising from acts or omissions on the part of the Department that violate legal or contractual duties owed to the Contractor by the Department.

38.2 Notice of Claim: Whenever the Contractor intends to file a formal claim against the Department under Section 4-61, seeking compensation for additional costs, the Contractor shall notify the Commissioner in writing (in strict compliance with Section 4-61) of the details of said claim. Such written notice shall contain all pertinent information described in Paragraph 38.5 below. Once formal notice of a claim under Section 4-61(b) (as revised) has been given to the Commissioner, the claimant may not change the claim in any way, in either concept or monetary amount, (1) without filing a new notice of claim and demand for arbitration to reflect any such change, and (2) without the minimum period of six months after filing of the new demand commencing again and running before any hearing on the merits of the claim may be held. The only exception to this limitation will be for damages that continue to accrue after submission of the notice, in ways described and anticipated in the notice.

38.3 Record Keeping: The Contractor shall keep daily records of all costs incurred in connection with its Work on behalf of the Department. The daily records shall identify each aspect of the Project affected by matters related to any claim for additional compensation that the Contractor has filed, intends to file, or has reason to believe that it may file against the Department; the specific Project locations where Project work has been so affected; the number of people working on the affected aspects of the Project at the pertinent time(s); and the types and number of pieces of equipment on the Project site at the pertinent time(s). Any potential or anticipated effect on the Project's progress or Schedule which may result in a claim by the Contractor shall be noted contemporaneously with the cause of the effect, or as soon thereafter as possible.

38.4 Claim Compensation: The payment of any claim, or any portion thereof, that is deemed valid by the Department shall be made in accordance with the following provisions of this Article:

38.4.1 Compensable Items: The liability of the Department for claims will be limited to the following specifically identified items of cost, insofar as they have not otherwise been paid for by the Department, and insofar as they were caused solely by the actions or omissions of the Department or its agents (except that with regard to payment for extra work, the Department will pay to the Contractor the Overhead and profit percentages provided for in Article 13.):

38.4.1.1 Additional Project-site labor expenses.

38.4.1.2 Additional costs for materials.

38.4.1.3 Additional, unabsorbed Project-site Overhead (e.g., for mobilization and demobilization).

38.4.1.4 Additional costs for active equipment.

38.4.1.5 For each Day of Project delay or suspension caused solely by actions or omissions of the Department either:

38.4.1.5.1 an additional ten percent (10%) of the total amount of the costs identified in Subparagraphs 38.4.1.1 through 38.4.1.4 above; except that if the delay or suspension period prevented the Contractor from incurring enough Project costs under Subparagraphs 38.4.1.1 through 38.4.1.4 during that period to require a payment by the Department that would be greater than the payment described in Subparagraph 38.4.1.5.2 below, then the payment for affected home office Overhead and profit shall instead be made in the following *per diem* amount:

38.4.1.5.2 six percent (6%) of the original total Contract amount divided by the original number of Days of Contract Time. Payment under either 38.4.1.5.1 or 38.4.1.5.2 hereof shall be deemed to be complete and mutually satisfactory compensation for any unabsorbed home office overhead and any profit related to the period of delay or suspension.

38.4.1.6 Additional equipment costs. Only actual equipment costs shall be used in the calculation of any compensation to be made in response to claims for additional Project compensation. Actual equipment costs shall be based upon records kept in the normal course of business and in accordance with generally accepted accounting principles. Under no circumstances shall Blue Book or other guide or rental rates be used for this purpose (unless the Contractor had to rent the equipment from an unrelated party, in which case the actual rental charges paid by the Contractor, so long as they are reasonable, shall be used). Idle equipment, for instance, shall be paid for based only on its actual cost to the Contractor.

38.4.1.7 Subcontractor costs limited to, and determined in accordance with, Subparagraphs 38.4.1.1 through 38.4.1.5 above and applicable statutory and case law. Such Subcontractor costs may be paid for by the Department only: (a) in the context of an informal claims settlement; or (b) if the Contractor has itself paid or legally assumed, present unconditional liability for those Subcontractor costs.

38.4.2 Excusable But Not Compensable Items: The Contractor may be allowed Days but the Department will have no liability for the following non-compensable items:

38.4.2.1 Abnormal or unusually severe weather

38.4.2.2 Acts of God

38.4.2.3 Force Majeure

38.4.2.4 Concurrent Delay

38.4.3 Non-Compensable Items: The Department will have no liability for the following specifically-identified non-compensable items:

38.4.3.1 Profit, in excess of that provided for herein.

38.4.3.2 Loss of anticipated profit.

38.4.3.3 Loss of bidding opportunities.

38.4.3.4 Reduction of bidding capacity.

38.4.3.5 Home office overhead in excess of that provided for in Subparagraph 38.4.1.5 hereof.

38.4.3.6 Attorneys fees, claims preparation expenses, or other costs of claims proceedings or resolution.

38.4.3.7 Subcontractor failure to perform

38.4.3.8 Any other consequential or indirect expenses or costs, such as tort damages, or any other form of expense or damages not provided for in these specifications or elsewhere in the Contract.

38.5 Required Claim Documentation: All claims shall be submitted in writing to the Commissioner, and shall be sufficient in detail to enable the Department to ascertain the basis and the amount of each claim, and to investigate and evaluate each claim in detail. As a minimum, the Contractor must provide the following information for each and every claim and sub-claim asserted:

38.5.1 A detailed factual statement of the claim, with all dates, locations and items of Work pertinent to the claim.

38.5.2 A statement of whether each requested additional amount of compensation or extension of time is based on provisions of the Contract or on an alleged breach of the Contract. Each supporting or breached Contract provision and a statement of the reasons why each such provision supports the claim must be specifically identified or explained.

38.5.3 Excerpts from manuals or other texts which are standard in the industry, if available, that support the Contractor's claim.

38.5.4 The details of the circumstances that gave rise to the claim.

38.5.5 The date(s) on which any and all events resulting in the claim occurred, and the date(s) on which conditions resulting in the claim first became evident to the Contractor.

38.5.6 Specific identification of any pertinent document, and detailed description of the substance of any material oral communication, relating to the substance of such claim.

38.5.7 If an extension of time is sought, the specific dates and number of Days for which it is sought, and the basis or bases for the extension sought. A critical path method, bar chart, or other type of graphical schedule that supports the extension must be submitted.

38.5.8 When submitting any claim over $50,000, the Contractor shall certify in writing, under oath and in accordance with the formalities required by the contract, as to the following:

38.5.8.1 That supporting data is accurate and complete to the Contractor's best knowledge and belief;

38.5.8.2 That the amount of the dispute and the dispute itself accurately reflects what the Contractor in good faith believes to be the Department's liability;

38.5.8.3 The certification shall be executed by:

38.5.8.3.1 If the Contractor is an individual, the certification shall be executed by that individual.

38.5.8.3.2 If the Contractor is not an individual, the certification shall be executed by a senior company official in charge at the Contractor's plant or location involved or an officer or general partner of the Contractor having overall responsibility for the conduct of the Contractor's affairs.

38.6 Auditing of Claims: All claims filed against the Department shall be subject to audit by the Department or its agents at any time following the filing of such claim. The Contractor and its Subcontractors and suppliers shall cooperate fully with the Department's auditors. Failure of the Contractor**,** its Subcontractors, or its suppliers to maintain and retain sufficient records to allow the Department or its agents to fully evaluate the claim shall constitute a waiver of any portion of such claim that cannot be verified by specific, adequate, contemporaneous records, and shall bar recovery on any claim or any portion of a claim for which such verification is not produced. Without limiting the foregoing requirements, and as a minimum, the Contractor shall make available to the Department and its agents the following documents in connection with any claim that the Contractor submits:

38.6.1 Daily time sheets and foreman's daily reports.

38.6.2 Union agreements, if any.

38.6.3 Insurance, welfare, and benefits records.

38.6.4 Payroll register.

38.6.5 Earnings records.

38.6.6 Payroll tax returns.

38.6.7 Records of property tax payments.

38.6.8 Material invoices, purchase orders, and all material and supply acquisition contracts.

38.6.9 Materials cost distribution worksheets.

38.6.10 Equipment records (list of company equipment, rates, etc.).

38.6.11 Vendor rental agreements.

38.6.12 Subcontractor invoices to the Contractor, and the Contractor's certificates of payments to Subcontractors.

38.6.13 Subcontractor payment certificates.

38.6.14 Canceled checks (payroll and vendors).

38.6.15 Job cost reports.

38.6.16 Job payroll ledger.

38.6.17 General ledger, general journal (if used), and all subsidiary ledgers and journals**,** together with all supporting documentation pertinent to entries made in these ledgers and journals.

38.6.18 Cash disbursements journals.

38.6.19 Financial statements for all years reflecting the operations on the Project.

38.6.20 Income tax returns for all years reflecting the operations on the Project.

38.6.21 Depreciation records on all company equipment**,** whether such records are maintained by the company involved, its accountant, or others.

38.6.22 If a source other than depreciation records is used to develop costs for the Contractor's internal purposes in establishing the actual cost of owning and operating equipment, all such other source documents.

38.6.23 All documents which reflect the Contractor's actual profit and overhead during the years that the Project was being performed**,** and for each of the five years prior to the commencement of the Project.

38.6.24 All documents related to the preparation of the Contractor's bid**,** including the final calculations on which the total proposed Contract bid price as stated in the Bid Proposal Form was based.

38.6.25 All documents which relate to the claim or to any sub-claim, together with all documents that support the amount of damages as to each claim or sub-claim.

38.6.26 Worksheets used to prepare the claim, which indicate the cost components of each item of the claim, including but not limited to the pertinent costs of labor, benefits and insurance, materials, equipment, and Subcontractors' damages, as well as all documents which establish the relevant time periods, individuals involved, and the Project hours and the rates for the individuals.

38.6.27 The name, function, and pertinent activity of each Contractor's or Subcontractor's official, or employee, in volved in or knowledgeable about events that give rise to, or facts that relate to, the claim.

38.6.28 The amount(s) of additional compensation sought and a break-down of the amount(s) into the categories specified as payable under Paragraph 38.4 above.

38.6.29 The name, function, and pertinent activity of each Department official, employee, or agent involved in or knowledgeable about events that give rise to, or facts that relate to, the claim.

ARTICLE 39
DIESEL VEHICLE EMISSIONS CONTROL

39.1 The Contractor shall be responsible for compliance with the following provisions:

39.1.1 All Contractor and Subcontractor diesel powered non-road construction equipment with engine horsepower (HP) ratings of 60 HP and above, that are on the Project or are assigned to the Contract for a period in excess of 30 consecutive Days, shall be retrofitted with emission control devices in order to reduce diesel emissions. In addition, all motor vehicles and/or construction equipment (both on-highway and non-road) shall comply with all pertinent State and Federal regulations relative to exhaust emission controls and safety.

39.1.2 Retrofit emission control devices shall consist of oxidation catalysts, or similar retrofit equipment control technology that is:

39.1.2.1 Included on the U.S. Environmental Protection Agency (EPA) "Verified Technology List," as may be amended from time to time http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm and

39.1.2.2 Verified by EPA to provide a minimum emissions reduction of 20% particulate matter (PM_{10}), 40% carbon monoxide (CO), and 50% hydrocarbons (HC).

39.1.3 Construction shall not proceed until all diesel powered non-road construction equipment meeting the criteria in provision 39.1.1 have been retrofitted, unless the Commissioner grants a waiver under provision 39.2.

39.1.4 The Contractor shall at least monthly, assess which diesel powered non-road construction equipment are subject to these provisions. The Contractor shall notify the CT DCS Project Manager of any violations of these provisions.

39.1.5 Idling of delivery and/or dump trucks, or other diesel powered equipment shall be limited to three (3) minutes during non-active use in accordance with the Regulations of Connecticut State Agencies Section 22a-74-18(b)(3)(C), which states, in part:

"[N]o person shall cause or allow a Mobile Source to operate for more than three (3) consecutive minutes when such Mobile Source is not in motion, except as follows:

- *When a Mobile Source is forced to remain motionless because of traffic conditions or mechanical difficulties over which the operator has no control,*
- *When it is necessary to operate defrosting, heating or cooling equipment to ensure the safety or health of the driver or passengers,*
- *When it is necessary to operate auxiliary equipment that is located in or on the Mobile Source to accomplish the intended use of the Mobile Source,(To bring the Mobile Source to the manufacturer's recommended)*
- *When a Mobile Source is in queue to be inspected by U.S. military personnel prior to gaining access to a U.S. military installation."*

39.1.6 All Work shall be conducted to ensure that no harmful effects are caused to adjacent Sensitive Receptor Sites. Diesel powered engines shall be located away from fresh air intakes, air conditioners, and windows.

39.1.7 If any diesel powered non-road construction equipment is found to be in non-compliance with these provisions by the CT DCS Project Manager, the Contractor will be issued a Non-Conformance Notice and given a 24 hour period in which to bring the equipment into compliance or remove it from the Project. The Contractor's failure to comply with these provisions shall be reason to withhold payment as described in Article 33.

39.1.8 Any costs associated with these provisions shall be included in the general cost of the contract. In addition, there shall be no time granted to the Contractor for compliance with these provisions. The Contractor's compliance with these provisions and any associated regulations shall not be grounds for a Change Order.

39.2 The Commissioner reserves the right to waive all or portions of these provisions at his/her discretion. The Contractor may request a waiver to all or portions of these provisions with written justification to the Commissioner as to why the Contractor cannot comply with these provisions. A waiver, to be effective, must be granted in writing by the Commissioner.

ARTICLE 40
DISCLOSURE OF RECORDS

40.1 This Contract may be subject to the provisions of C.G.S. Section 1-218. In accordance with this statute, each contract in excess of two million five hundred thousand dollars ($2,500,000.00) between a public agency and a person for the performance of a governmental function shall (a) provide that the public agency is entitled to receive a copy of records and files related to the performance of the governmental function, and (b) indicate that such records and files are subject to the Freedom of Information Act (FOIA) and may be disclosed by the public agency pursuant to FOIA. No request to inspect or copy such records or files shall be valid unless the request is made to the public agency in accordance with FOIA. Any complaint by a person who is denied the right to inspect or copy such records or files shall be brought to the Freedom of Information Commission in accordance with the provisions of C.G.S. Sections 1-205 and 1-206.

ARTICLE 41
AUDIT AND INSPECTION OF PLANTS, PLACES OF BUSINESS, AND RECORDS

41.1 The State and its agents, including, but not limited to, the Connecticut Auditors of Public Accounts, Attorney General and State's Attorney and their respective agents, may, at reasonable hours, inspect and examine all of the parts of the Contractor's and Contractor Parties' plants and places of business which, in any way, are related to, or involved in, the performance of this Contract.

41.2 The Contractor shall maintain, and shall require each of the Contractor Parties to maintain, accurate and complete Records. The Contractor shall make all of its and the Contractor Parties' Records available at all reasonable hours for audit and inspection by the State and its agents.

41.3 The State shall make all requests for any audit or inspection in writing and shall provide the Contractor with at least twenty-four (24) hours' notice prior to the requested audit and inspection date. If the State suspects fraud or other abuse, or in the event of an emergency, the State is not obligated to provide any prior notice.

41.4 All audits and inspections shall be at the State's expense.

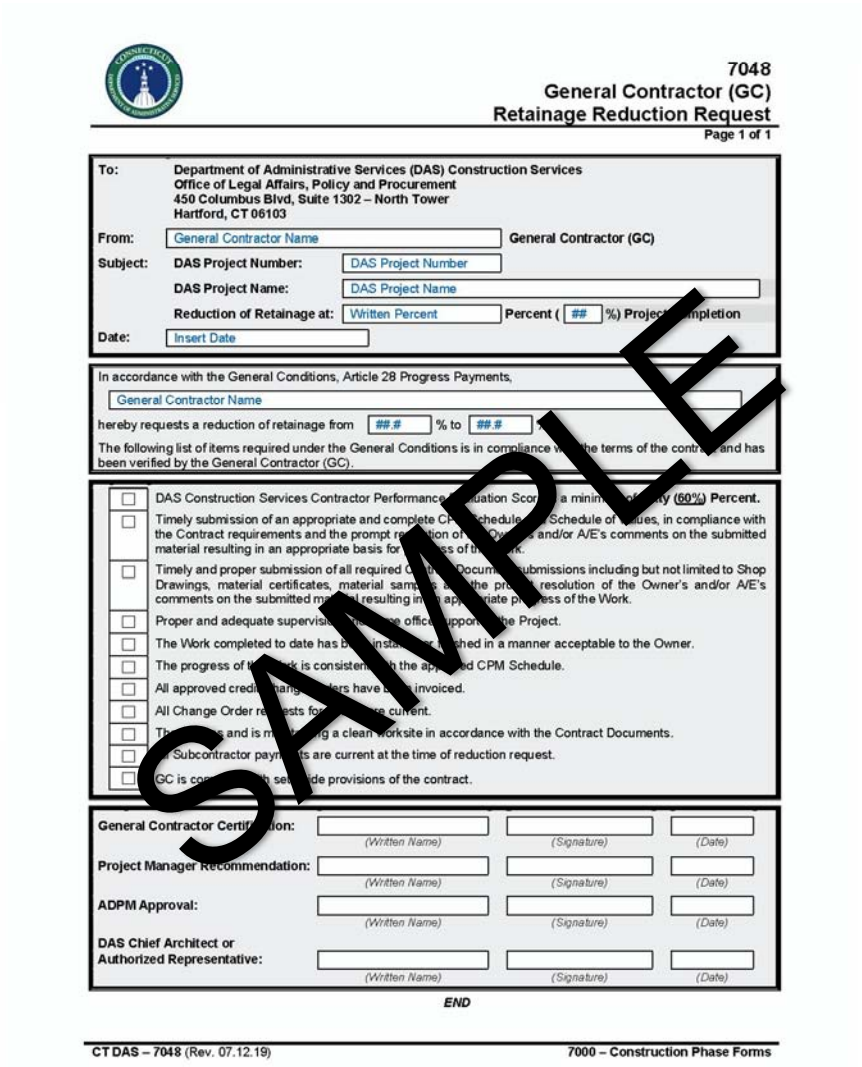
41.5 The Contractor shall keep and preserve or cause to be kept and preserved all of its and Contractor Parties' Records until three (3) years after the latter of (i) final payment under this Agreement, or (ii) the expiration or earlier termination of this Agreement, as the same may be modified for any reason. The State may request an audit or inspection at any time during this period. If any Claim or audit is started before the expiration of this period, the Contractor shall retain or cause to be retained all Records until all Claims or audit findings have been resolved.

41.6 The Contractor shall cooperate fully with the State and its agents in connection with an audit or inspection. Following any audit or inspection, the State may conduct and the Contractor shall cooperate with an exit conference.

41.7 The Contractor shall incorporate this entire Section verbatim into any contract or other agreement that it enters into with any Contractor Party.

END

Appendix 1



7048
General Contractor (GC)
Retainage Reduction Request
Page 1 of 1

To: Department of Administrative Services (DAS) Construction Services
Office of Legal Affairs, Policy and Procurement
450 Columbus Blvd, Suite 1302 – North Tower
Hartford, CT 06103

From: General Contractor Name — General Contractor (GC)

Subject: DAS Project Number: DAS Project Number
DAS Project Name: DAS Project Name
Reduction of Retainage at: Written Percent Percent (## %) Project Completion

Date: Insert Date

In accordance with the General Conditions, Article 28 Progress Payments,
General Contractor Name
hereby requests a reduction of retainage from ##.# % to ##.#
The following list of items required under the General Conditions is in compliance with the terms of the contract and has been verified by the General Contractor (GC).

- ☐ DAS Construction Services Contractor Performance Evaluation Score a minimum of Satisfactory (60%) Percent.
- ☐ Timely submission of an appropriate and complete CPM Schedule, Schedule of Values, in compliance with the Contract requirements and the prompt resolution of the Owner's and/or A/E's comments on the submitted material resulting in an appropriate basis for progress of the Work.
- ☐ Timely and proper submission of all required Shop Drawing submissions including but not limited to Shop Drawings, material certificates, material samples and the prompt resolution of the Owner's and/or A/E's comments on the submitted material resulting in an appropriate progress of the Work.
- ☐ Proper and adequate supervision and office support for the Project.
- ☐ The Work completed to date has been installed and finished in a manner acceptable to the Owner.
- ☐ The progress of the Work is consistent with the approved CPM Schedule.
- ☐ All approved credit change orders have been invoiced.
- ☐ All Change Order requests for time are current.
- ☐ The site is and is maintaining a clean worksite in accordance with the Contract Documents.
- ☐ All Subcontractor payments are current at the time of reduction request.
- ☐ GC is compliant with set aside provisions of the contract.

	(Written Name)	(Signature)	(Date)
General Contractor Certification:			
Project Manager Recommendation:			
ADPM Approval:			
DAS Chief Architect or Authorized Representative:			

END

CT DAS – 7048 (Rev. 07.12.19) 7000 – Construction Phase Forms

SAMPLE

Set-Aside Contractor Schedule [SAMPLE ONLY]

VIA EMAIL

Contractor Name
Contractor Address
City, State, Zip Code

BID OPENING DATE

Re: DAS Project Description
DAS Project Number

Date:

Dear Contractor:

Section 00 45 17 Named Subcontractor Bidders Qualification Statement(s) is / (are) required for this **project, only** for your **Named Subcontractors listed** in **Table 2.7** of your **Section 00 41 00 Bid Proposal Form.**

No person whose subcontract *exceeds* five hundred thousand dollars in value may perform work as a subcontractor on a project, which project is estimated to cost more than five hundred thousand dollars and is paid for, in whole or in part, with state funds, *unless, at the time of bid submission*, the person is prequalified in accordance with the Connecticut General Statutes Section 4a-100, as amended. This includes the contractor's or substantial subcontractor's prequalification classifications, aggregate work capacity ratings and single project limits.

In accordance with **Subsection 2.9 "Set-Aside Requirements" of Section 00 21 13 Instructions to Bidders**, you are required to *list* below the names of each *currently certified* **set-aside contractor** to be used for this project, along with the dollar *amount* to be paid each set-aside contractor.

The **responsibility** for listing a qualified and certified set-aside contractor rests solely with the **bidder** and not the State. **Listing a set-aside contractor who does not qualify may be considered the same as not listing one at all and the bid may be considered non-responsive and subject to rejection.**

Name	Address	* Amount	Indicate Whether: Subcontractor, Or Supplier, Or Both	** Class of Work
SAMPLE	SAMPLE	SAMPLE	SAMPLE	SAMPLE

***Amount:** The total dollar amount to be paid to the set aside contractors must not be less than the percentage(s) stated in the Bid Proposal Form.

****Class of Work:** Means the name of the trade work to be provided by the Subcontractor or Supplier.

ATTACHMENTS:

For Each of the Named Subcontractors:
- **Attach their Section 00 45 17 Named Subcontractor Bidders Qualification Statement(s)**

For Each of the Named Set-Aside SBE/MBE Contractors:
- **Attach their DAS Set-Aside Certificate of Eligibility (SBE and/or MBE)**

For Each of the Named Subcontractors With Subcontracts Greater Than $500,000:
- **Attach their DAS Prequalification Certificate and Update (Bid) Statement for the Class of Work**

Contractor Authorized Signature & Title _____ Date _____

This Form Must Be Received No Later Than _____ At:

State of Connecticut
Department of Administrative Services, Construction Services
Office of Legal Affairs, Policy, and Procurement
450 Columbus Boulevard, Suite 1302
Hartford, CT 06103

Attn:

State Of Connecticut
Department of Administrative Services
Construction Services

February 1, 2019

To: All Department of Administrative Services, Construction Services Contractors

Subject: Set-Aside Contract Laws

Dear Sir/Madam:

The administration of Governor Ned Lamont is committed to supporting the subject programs by encouraging all contractors on State projects to improve their efforts in these areas.

State law requires contractors doing business with the State to demonstrate non-discrimination by making "good faith efforts" in both hiring and in sub-contracting practices (Connecticut General Statutes Section [C.G.S. §] 4a-60).

What does "good faith efforts" mean? It means that you, as contractors, must act affirmatively. It is not good enough to say you can't find minorities and women. You must seek them out. That is the law, and the Department of Administrative Services (DAS) / Construction Services (CS) is committed to enforcing the law. At the same time, we are ready to assist you in making "good faith efforts."

DAS is required by C.G.S. § 4a-60g (b) and (c) to set aside projects (amounting to **twenty-five percent (25%)** of its annual contract awards) for small business and **twenty-five percent (25%)** of that amount for minority business enterprises. DAS may require any general contractor to set aside a portion of the contract for subcontractors who are small businesses or minority business enterprises in lieu of setting aside a project or in addition to setting aside a project.

Therefore, unless otherwise specified in the **Bid Proposal Form**, DAS will require contractors to subcontract **twenty-five percent (25%)** of the total contract value to small businesses certified by DAS and further will require contractors to subcontract 25% of that 25% to minority and women small contractors certified as minority business enterprises by DAS. These statutory goals represent the minimum values expected to be achieved by this program.

Together, we can meet the challenge of providing equal opportunity for minority and women-owned businesses and workers in our State. We expect superior results in the areas of affirmative action, equal employment opportunity, and set-aside contracts. The DAS standard in these areas is not just minimal effort. Our goal is to uphold the letter and the spirit of the law.

For more information on Non-Discrimination and Affirmative Action Provisions for State Contracts please visit the Commission on Human Rights and Opportunities **(CHRO)** Website at www.ct.gov/chro.

Sincerely yours,

Josh Geballe
Commissioner

PB:pb

Non-Discrimination and Affirmative Action Provisions for State Contracts

Section 1	CHRO – Contract Compliance Regulations Notification to Bidders:

1.1 The contract to be awarded is subject to contract compliance requirements mandated by:

1.1.1 The **Connecticut General Statutes (C.G.S.) § 4a-60** and **4a-60a**;

1.1.2 **C.G.S. § 46a-71(d)** and **46a-81i (d)** when the awarding agency is the State; and

1.1.3 The **Contract Compliance Regulations** codified in the **Regulations of Connecticut State Agencies (RSCA) §46a-68j-21 through 43,** which establish a procedure for awarding all contracts covered by **C.G.S. §4a-60** and **46a-71(d).**

1.2 According to the **Contract Compliance Regulations §46a-68j-30(9),** every agency awarding a contract subject to the contract compliance requirements has an obligation to "aggressively solicit the participation of legitimate minority business enterprises as bidders, contractors, subcontractors and suppliers of materials."

"Minority business enterprise" is defined in **C.G.S §4a-60**-as a small contractor or supplier of materials fifty-one **(51%)** percent or more of the capital stock or assets of which is owned by a person or persons:

1.2.1 who are active in the daily affairs of the enterprise;

1.2.2 who have the power to direct the management and policies of the enterprise; and

1.2.3 who are members of a minority, as such term is defined in subsection (a) of **C.G.S. §32-9n."**

1.3 **"Minority"** groups are defined in **C.G.S. §32-9n** as:

1.3.1 Black Americans, including all persons having origins in any of the Black African racial groups not of Hispanic origin;

1.3.2 Hispanic Americans, including all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race;

1.3.3 Persons who have origins in the Iberian Peninsula, including Portugal, regardless of race**;**

1.3.4 Women;

1.3.5 Asian Pacific Americans and Pacific Islanders; or

1.3.6 American Indians and persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification.

1.3.7 **"Individuals with a disability"** is also a minority business enterprise as provided by C.G.S. § 4a-60g (4).

1.4 The above **"Minority business enterprise"** definitions apply to the contract compliance requirements by virtue of **Contract Compliance** Regulations §46a-68j-21(11).

The awarding agency will consider the following factors when reviewing the bidder's qualifications under the contract compliance requirements:

1.4.1 the bidder's success in implementing an affirmative action plan;

1.4.2 the bidder's success in developing an apprenticeship program complying with **RSCA §46a-68-1 to 46a-68-17**, inclusive;

1.4.3 the bidder's promise to develop and implement a successful affirmative action plan;

1.4.4 the bidder's submission of employment statistics contained in the "Employment Information Form", indicating that the composition of its workforce is at or near parity when compared to the racial and sexual composition of the workforce in the relevant labor market area; and

1.4.5 the bidder's promise to set aside a portion of the contract for legitimate minority business enterprises. See **Contract Compliance Regulations § 46a-68j-30(10) (E).**

Note: The Commission on Human Rights and Opportunities **(CHRO)** "Employment Information Form" shall be submitted to the DAS/CS Office of Legal Affairs, Policy, and Procurement on behalf of the awarding agency, the Department of Administrative Services (DAS).

Section 2	**Non-Discrimination and other Contract Compliance Requirements:**

Pursuant to **C.G.S. §4a-60** and **§4a-60a** and **RSCA §46a-68j-21 to §46a-68j-43**, a contractor agrees to the following:

2.1 Not to discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, sexual orientation, mental retardation, or physical disability including, but not limited to, blindness (unless it is shown that such disability prevents performance of the work involved) in the performance of a contract, in any manner prohibited by the federal and Connecticut anti-discrimination and contract compliance laws;

2.2 To undertake affirmative action which will insure that applicants with job-related qualifications are employed and that employees are treated, when employed, without regard to whether they belong to any of the groups identified in Paragraph # 1) above;

2.3 To include a statement that the contractor is an "affirmative action-equal opportunity employer", in all solicitations or advertisements for employees placed by or on behalf of the contractor;

2.4 To provide each labor union or representative of workers with which such contractor has a collective bargaining agreement and each vendor with which such contractor has a contract, a notice advising them of the contractor's commitments under **C.G.S. §4a-60** and **§4a-60a**. The notice is available by contacting **CHRO**;

2.5 To post copies of the notice referred to in item 4) in conspicuous places available to employees and applicants;

2.6 To provide **CHRO** with such information requested by said agency, permit access to pertinent books, records, and accounts, concerning the employment practices and procedures of the contractor as relate to the provisions of **C.G.S. §4a-60, §4a-60a** and **§46a-56** and, cooperate fully with **CHRO**; and,

2.7 To include the language of **C.G.S. §4a-60 (a)** and **§4a-60a (a)** in every subcontract or purchase order executed to fulfill any obligation of the contract with DAS.

Section 3	**Affirmative Action Requirements for Certain Public Works Contracts for Construction:**

Pursuant to **C.G.S. §46a-68c** and **§46a-68d** and **RSCA §46a-68j-21 to§46a-68j-29**, the following must file an affirmative action plan with the Commission:

3.1 A successful bidder on a [1] **"public works contract"** with a value of **$500,000** or more. The plan must be filed within **thirty (30)** days after a bid has been accepted by an awarding agency but before a contract is awarded. A plan may be filed in advance of, or at the same time as, a bid is submitted.

3.2 A contractor with **fifty (50)** or more employees who has been awarded a **"public works contract"** in excess of **$50,000** in any fiscal year. A plan must be filed within **thirty (30) day**s of the date a contract is awarded.

CHRO must review a plan within **sixty (60) days** of receipt and must either approve or reject a plan. Should **CHRO** approve an affirmative action plan, **CHRO** will issue a certificate of compliance. This certificate of compliance shall be proof of a successful bidder's or a contractor's eligibility to bid or be awarded contracts for a period of **two (2)** years from the date of the certificate. This certificate does not excuse a successful bidder or contractor from being monitored by the **CHRO** for implementation of its affirmative action plan or, from its reporting requirements under C.G.S. 46a-68e and § 46a-68f. (Refer to Section 6) Also, **CHRO** may revoke the certificate if a successful bidder or contractor does not implement its affirmative action plan.

Should **CHRO** opt to disapprove an affirmative action plan, **CHRO** must notify the successful bidder or contractor in writing within **ten (10) days** of the disapproval. The notice will state the reason for disapproval and may provide necessary proposals to bring the plan into compliance. The successful bidder or contractor must then submit a new or amended plan, within **thirty (30) days** of the date the notice of disapproval is mailed by **CHRO**.

Section 3	(Continued)**:**

In addition, **CHRO** may conditionally approve an affirmative action plan for a successful bidder on a public works contract valued at **$500,000** or more. **CHRO** must notify the successful bidder in writing within **ten (10) days** of the conditional disapproval and state the reason for conditional approval and, may provide necessary proposals to bring the plan into compliance. The successful bidder must then submit a new or amended plan or, provide written assurances that it will amend its plan to conform to affirmative action requirements, within **thirty (30) days** of the date the notice is mailed by **CHRO**.

Note: The awarding agency (DAS) will provide a successful bidder or contractor with a copy of **CHRO**'s Affirmative Action Plan format. All sections of this Affirmative Action Plan format must be completed by the successful bidder or contractor and forwarded to **CHRO**. Also, the awarding agency (DAS) shall withhold **2%** of the total contract price per month from any payment made to a contractor until such time as the contractor has developed an affirmative action plan, which has been approved by **CHRO**.

[1] **"public works contract"** *means any agreement between any individual, firm or corporation and the state or any political subdivision of the state other than a municipality for construction, rehabilitation, conversion, extension, demolition or repair of a public building, highway or other changes or improvements in real property, or which is financed in whole or in part by the state, including, but not limited to, matching expenditures, grants, loans, insurance or guarantees.*-**C.G.S. *§46a-68b*.**

Section 4	**"Good Faith Efforts" to Include Minority Business Enterprises as Subcontractors":**

In addition to, or in the absence of, any other subcontractor requirements included in this project, contractors are required to make [2] **"good faith efforts"** to include minority business enterprises in the work of this project as subcontractors (for services and/or material suppliers). For the purpose of identifying minority business enterprises, a minority business enterprise shall be a subcontractor which has a valid certification as such from DAS and/or a subcontractor for which an affidavit has been submitted by the contractor attesting that the subcontractor named as a minority business enterprise meets the minority business enterprise criteria set out in. **C.G.S. §4a-60(b)**.

[2] **"Good faith efforts"** *means "that **degree of diligence** which a reasonable person would exercise in the performance of legal duties and obligations" and includes, but is not limited to, the following **factors**: the contractor's employment and subcontracting policies and practices; affirmative advertising, recruitment, training, technical assistance activities and such other reasonable activities or efforts as **CHRO** may recommend to ensure the participation of minority business enterprises in state project*s.

Section 5	Set-Aside Program:

This contract may be subject to the provisions the **Set-Aside Program for Small Contractors** found at **C.G.S. § 4a-60g** and may be awarded only to a contractor certified as a small and/or minority business enterprise by DAS. The notification as to this special provision will be found in the **Bid Proposal Form** for this contract. The listing of eligible "Set-Aside" contractors is found on the DAS Website for SBE or MBE Certification. In the event that the **Set-Aside Program for Small Contractors** applies to this contract, the following special provisions will also apply:

5.1 Amount of Work Required to Be Done by "Set-Aside" Contractors

A contractor awarded a contract on a project pursuant to the provisions of **C.G.S. §4a-60g,** as amended, shall be required to perform not less than **thirty (30)** per cent of the work with his/her own forces and shall ensure that not less than **fifty (50)** per cent of the work be performed by contractors or subcontractors who are certified as small contractors or minority business enterprises pursuant to **C.G.S. §4a-60g**.

The primary product/service performed by contractors working on a contract awarded under **C.G.S. §4a-60g** must be the same as the primary product/service described for the contractors on their "Certificate of Eligibility" which is provided to them by DAS.

5.2 Alternate Bonding Available to "Set Aside" Contractors

In lieu of a performance, bid, labor and materials or other required bond, a contractor or subcontractor awarded a contract under **C.G.S. §4a-60g** may provide to the awarding authority (DAS) and the awarding authority shall accept a "Letter of Credit". Any such "Letter of Credit" shall be in an amount equal to **ten per cent (10%)** of the contract for any contract that is less than **one hundred thousand ($100,000) dollars**, and in the amount of **twenty-five per cent (25%)** for any contract that is **one hundred thousand ($100,000) dollars** or more.

5.3 Procedures to Follow Regarding Substitution of Named Project "Set-Aside" Subcontractors.

The awarding authority (DAS) may also require the contractor to set aside a portion of the contract for subcontractors who are eligible for set aside contracts. The awarding authority shall not permit substitution of a subcontractor for one named in accordance with the provisions of **C.G.S. § 4b-95** or substitution of a subcontractor for any designated sub-trade work bid to be performed by the contractor's own forces, except for good cause.

Pursuant to **C.G.S. § 4b-95**, the term **"good cause"** includes but is not limited to a subcontractor's or, where appropriate, a general contractor's:

5.3.1 Death or physical disability, if the listed subcontractor is an individual;

5.3.2 Dissolution, if a corporation or partnership;

5.3.3 Bankruptcy;

5.3.4 Inability to furnish any performance and payment bond shown on the bid form;

5.3.5 Inability to obtain, or loss of, a license necessary for the performance of the particular category of work;

5.3.6 Failure or inability to comply with a requirement of law applicable to contractors and subcontractors, or to subcontracts for construction, alteration, or repair projects;

5.3.7 Failure to perform his/her agreement to execute a subcontract under **C.G.S. § 4b-96.**

Any general contractor who violates any provision of **C.G.S. § 4b-95** shall be disqualified from bidding on other contracts that are subject to the provisions of **Chapter 60 - Construction and Alterations of State Buildings of the C.G.S**, for a period **not to exceed twenty-four (24) months**, commencing from the date on which the violation is discovered, for each violation.

Section 6	**Contract Monitoring and Reporting:**

6.1 **CHRO** has the authority to monitor state contractors pursuant to **C.G.S. § 46a-68e** and **46a-68f** and **RSCA §46a-68j-23(3)**. In addition, under the **RSCA** §46a-68j-25(e) and 46a-68j-26 (g), **CHRO** has the authority to monitor the implementation of an affirmative action plan regarding:

6.1.1 a successful bidder who has been awarded a public works contract valued at **$500,000 or more** and;

6.1.2 a contractor with **fifty (50)** or more employees who has been awarded a public works contract **in excess of $50,000 in any fiscal year**.

6.2 In order to monitor the implementation of these plans **CHRO** requires that the following contract monitoring reports be compiled and submitted:

6.2.1 **Monthly Employment Utilization Report** (**Form CHRO: 257**): A contractor, on behalf of itself and all subcontractors who perform work on the project during a given month, is required to report on the work hour participation of minority male and female workers in each trade category on the project. The report must be submitted to the contract awarding agency **(DAS)** and to the Commission by the 15th day following the end of each calendar month during the term of the on-site construction work of the project.

Website page: http://www.ct.gov/chro, then click on **Forms,** then click on **Contract Compliance Forms and Reports.**

6.2.2 **Quarterly Small Contractor and Minority Business Enterprise Payment Status Report (Form CHRO: 258)**. A contractor is required to report on the participation of small contractors or minority business enterprises identified to participate on the project. The report must be submitted to the contract awarding agency (DAS) and to the Commission by the 15th day following the end of each calendar quarter during the term of the on-site construction work of the project.

Website page: http://www.ct.gov/chro, then click on **Forms,** then click on **Contract Compliance Forms and Reports.**

6.2.3 In addition, the Commission expects that a contractor will designate an Equal Opportunity/Contract Compliance Officer for its public works project who will compile the above monthly and quarterly reports, as well as, undertake the following responsibilities for implementation of its project Affirmative Action Plan (AAP):

.1 Maintain a project Equal Employment Opportunity (EEO) file to include all records, correspondence and other documentation relate to the project AAP.

.2 Communicate to and inform all project subcontractors, regardless of tier, and labor referral organizations (if applicable) about project equal employment and AAP commitments and performance requirements.

.3 Participate in project job meetings to inform project subcontractors about project equal employment and AAP performance requirements.

.4 Track the use of employment recruitment sources identified in the project AAP regarding all employment opportunities with all subcontractors on the project. Also, maintain documentation of all contacts with these recruitment sources and their responses.

The Commission will forward a copy of the monthly and quarterly report to each contractor on a public works project.

NOTES:	Bidders and state contractors may review the full text of the before referenced Connecticut General Statutes by accessing either the State Law Library's web site (http://www.cslib.org/psaindex.htm) or the State Legislatures' web site (http://www.cga.ct.gov).
	The full text of the RSCA 46a-68j-21 through 46a-68j-43 may be reviewed by accessing the Commission's web site: (http://www.ct.gov/chro/cwp/view.asp?a=2525&Q=315900&chroPNavCtr=|#45679) In the alternative, bidders or state contractors may request a copy of these state statutes and regulations by contacting the Commission at (860) 541-3400 (in Hartford) or 1 (800) 477-5737.

Section 7	CHRO Contract Compliance Forms:

The following CHRO Contract Compliance Forms are available on the CHRO Website:

7.1 Monthly Employment Utilization Report *(Form CHRO–257 and CHRO–257a):*

- http://www.ct.gov/chro/lib/chro/257s.pdf

7.2 Cumulative Utilization Report *(Form CHRO–257b:*

- http://www.ct.gov/chro/lib/chro/257b.pdf

7.3 Monthly Small Contractor & MBE Payment Status Report *(Form CHRO–258a)* *and* Quarterly Small Contractor & MBE Payment Status Report *(Form CHRO–258)*:

- http://www.ct.gov/chro/lib/chro/258s.pdf

End of Section
00 73 38 CHRO / Contract Compliance Regulations

Minimum Rates and Classifications
for Building Construction

Connecticut Department of Labor
Wage and Workplace Standards Division

By virtue of the authority vested in the Labor Commissioner under provisions of Section 31-53 of the General Statutes of Connecticut, as amended, the following pages are declared to be the prevailing rates and welfare payments and will apply only where the contract is advertised for bid within 20 days of the date on which the rates are established. Any contractor or sub-contractor not obligated by agreement to pay to the welfare and pension fund shall pay this amount to each employee as part of his hourly wage.

Project Number:	**BI-RR-28**	**Project Town:**	**Canterbury, CT**
Project:	**Restoration of** **Prudence Crandall Museum** **Canterbury, CT**		

The following pages contain:

Contractors Wage Certification Form	1 page
Notice to all Mason Contractors reference Section 31-53 of C.GS. (Prevailing Wages)	1 page
Prevailing Wage Rates - English	7 pages
Informational Bulletin - **Occupational Classifications**	6 pages
Informational Bulletin – **The 10-Hour OSHA Construction Safety and Health Course**	2 pages
Footnotes	2 pages
Special Notice re: Wage Rate Adjustments	1 pages
Weekly Payroll Certification Form (WWS-CP1)	1 page
Fringe Benefits Explanation (P)	1 page
Weekly Payroll Certification Form (WWS-CP2)	1 page

As of: **February 21, 2020**

THIS IS A PUBLIC WORKS PROJECT

Covered by the

PREVAILING WAGE LAW

CT General Statutes Section 31-53

If you have QUESTIONS regarding your wages
CALL (860) 263-6790

Section 31-55 of the CT State Statutes requires every contractor or subcontractor performing work for the state to post in a prominent place the prevailing wages as determined by the Labor Commissioner.

CONNECTICUT DEPARTMENT OF LABOR
WAGE AND WORKPLACE STANDARDS DIVISION

CONTRACTORS WAGE CERTIFICATION FORM

Construction Manager at Risk/General Contractor/Prime Contractor

I,_____ of _____
Officer, Owner, Authorized Rep. Company Name

do hereby certify that the _____
Company Name

_____
Street

_____
City

and all of its subcontractors will pay all workers on the

_____
Project Name and Number

_____
Street and City

the wages as listed in the schedule of prevailing rates required for such project (a copy of which is attached hereto).

_____
Signed

Subscribed and sworn to before me this _____ day of _____,_____.

_____
Notary Public

Return to:

Connecticut Department of Labor
Wage & Workplace Standards Division
200 Folly Brook Blvd.
Wethersfield, CT 06109

Rate Schedule Issued (Date): _____

November 29, 2006

Notice

To All Mason Contractors and Interested Parties Regarding Construction Pursuant to Section 31-53 of the Connecticut General Statutes (Prevailing Wage)

The Connecticut Labor Department Wage and Workplace Standards Division is empowered to enforce the prevailing wage rates on projects covered by the above referenced statute.

Over the past few years the Division has withheld enforcement of the rate in effect for workers who operate a forklift on a prevailing wage rate project due to a potential jurisdictional dispute.

The rate listed in the schedules and in our Occupational Bulletin (see enclosed) has been as follows:

Forklift Operator:

- **Laborers (Group 4) Mason Tenders** - operates forklift solely to assist a mason to a maximum height of nine feet only.

- **Power Equipment Operator (Group 9)** - operates forklift to assist any trade and to assist a mason to a height over nine feet.

The U.S. Labor Department conducted a survey of rates in Connecticut but it has not been published and the rate in effect remains as outlined in the above Occupational Bulletin.

Since this is a classification matter and not one of jurisdiction, effective January 1, 2007 the Connecticut Labor Department will enforce the rate on each schedule in accordance with our statutory authority.

Your cooperation in filing appropriate and accurate certified payrolls is appreciated.

Sec. 31-53b. Construction safety and health course. New miner training program. Proof of completion required for mechanics, laborers and workers on public works projects. Enforcement. Regulations. Exceptions. (a) Each contract for a public works project entered into on or after July 1, 2009, by the state or any of its agents, or by any political subdivision of the state or any of its agents, described in subsection (g) of section 31-53, shall contain a provision requiring that each contractor furnish proof with the weekly certified payroll form for the first week each employee begins work on such project that any person performing the work of a mechanic, laborer or worker pursuant to the classifications of labor under section 31-53 on such public works project, pursuant to such contract, has completed a course of at least ten hours in duration in construction safety and health approved by the federal Occupational Safety and Health Administration or, has completed a new miner training program approved by the Federal Mine Safety and Health Administration in accordance with 30 CFR 48 or, in the case of telecommunications employees, has completed at least ten hours of training in accordance with 29 CFR 1910.268.

(b) Any person required to complete a course or program under subsection (a) of this section who has not completed the course or program shall be subject to removal from the worksite if the person does not provide documentation of having completed such course or program by the fifteenth day after the date the person is found to be in noncompliance. The Labor Commissioner or said commissioner's designee shall enforce this section.

(c) Not later than January 1, 2009, the Labor Commissioner shall adopt regulations, in accordance with the provisions of chapter 54, to implement the provisions of subsections (a) and (b) of this section. Such regulations shall require that the ten-hour construction safety and health courses required under subsection (a) of this section be conducted in accordance with federal Occupational Safety and Health Administration Training Institute standards, or in accordance with Federal Mine Safety and Health Administration Standards or in accordance with 29 CFR 1910.268, as appropriate. The Labor Commissioner shall accept as sufficient proof of compliance with the provisions of subsection (a) or (b) of this section a student course completion card issued by the federal Occupational Safety and Health Administration Training Institute, or such other proof of compliance said commissioner deems appropriate, dated no earlier than five years before the commencement date of such public works project.

(d) This section shall not apply to employees of public service companies, as defined in section 16-1, or drivers of commercial motor vehicles driving the vehicle on the public works project and delivering or picking up cargo from public works projects provided they perform no labor relating to the project other than the loading and unloading of their cargo.

(P.A. 06-175, S. 1; P.A. 08-83, S. 1.)

History: P.A. 08-83 amended Subsec. (a) by making provisions applicable to public works project contracts entered into on or after July 1, 2009, replacing provision re total cost of work with reference to Sec. 31-53(g), requiring proof in certified payroll form that new mechanic, laborer or worker has completed a 10-hour or more construction safety course and adding provision re new miner training program, amended Subsec. (b) by substituting "person" for "employee" and adding "or program", amended Subsec. (c) by adding "or in accordance with Federal Mine
Safety and Health Administration Standards" and setting new deadline of January 1, 2009, deleted former Subsec. (d) re "public building", added new Subsec. (d) re exemptions for public service company employees and delivery drivers who perform no labor other than delivery and made conforming and technical changes, effective January 1, 2009.

Minimum Rates and Classifications for
Building Construction

ID# 20-10316

Connecticut Department of Labor
Wage and Workplace Standards

By virtue of the authority vested in the Labor Commissioner under provisions of Section 31-53 of the General Statutes of Connecticut, as amended, the following are declared to be the prevailing rates and welfare payments and will apply only where the contract is advertised for bid within 20 days of the date on which the rates are established. Any contractor or subcontractor not obligated by agreement to pay

Project Number: #BI-RR-28
Project Town: Canterbury
State#: DAS
FAP#: #BI-RR-28
Project: Prudence Crandall Museum

CLASSIFICATION	Hourly	Benefits
1a) Asbestos Worker/Insulator (Includes application of insulating materials, protective coverings, coatings, & finishes to all types of mechanical systems; application of firestopping material for wall openings & penetrations in walls, floors, ceilings	38.25	27.96
1b) Asbestos/Toxic Waste Removal Laborers: Asbestos removal and encapsulation (except its removal from mechanical systems which are not to be scrapped), toxic waste removers, blasters.**See Laborers Group 7**		
1c) Asbestos Worker/Heat and Frost Insulator	40.21	30.99
2) Boilermaker	38.34	26.01
3a) Bricklayer, Cement Mason, Concrete Finisher (including caulking), Stone Masons	35.71	33.31 + a
3b) Tile Setter	34.9	25.87
3c) Terrazzo Mechanics and Marble Setters	31.69	22.35
3d) Tile, Marble & Terrazzo Finishers	26.7	21.75
3e) Plasterer	33.48	32.06
------LABORERS------		
4) Group 1: Laborers (common or general), acetylene burners, carpenter tenders, concrete specialists, wrecking laborers, fire watchers.	30.75	20.84

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4a) Group 2: Mortar mixers, plaster tender, power buggy operators, powdermen, fireproofer/mixer/nozzleman (Person running mixer and spraying fireproof only).	31.0	20.84
4b) Group 3: Jackhammer operators/pavement breaker, mason tender (brick), mason tender (cement/concrete), forklift operators and forklift operators (masonry).	31.25	20.84
4c) **Group 4: Pipelayers (Installation of water, storm drainage or sewage lines outside of the building line with P6, P7 license) (the pipelayer rate shall apply only to one or two employees of the total crew who primary task is to actually perform the mating of pipe sections) P6 and P7 rate is $26.80.	31.75	20.84
4d) Group 5: Air track operator, sand blaster and hydraulic drills.	31.5	20.84
4e) Group 6: Blasters, nuclear and toxic waste removal.	33.75	20.84
4f) Group 7: Asbestos/lead removal and encapsulation (except it's removal from mechanical systems which are not to be scrapped).	31.75	20.84
4g) Group 8: Bottom men on open air caisson, cylindrical work and boring crew.	29.03	20.84
4h) Group 9: Top men on open air caisson, cylindrical work and boring crew.	28.49	20.84
4i) Group 10: Traffic Control Signalman	18.0	20.84
5) Carpenter, Acoustical Ceiling Installation, Soft Floor/Carpet Laying, Metal Stud Installation, Form Work and Scaffold Building, Drywall Hanging, Modular-Furniture Systems Installers, Lathers, Piledrivers, Resilient Floor Layers.	33.53	25.66
5a) Millwrights	34.94	26.19
6) Electrical Worker (including low voltage wiring) (Trade License required: E1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9)	40.0	27.67+3% of gross wage
7a) Elevator Mechanic (Trade License required: R-1,2,5,6)	53.37	33.705+a+b
-----LINE CONSTRUCTION----		
Groundman	26.5	6.5% + 9.00
Linemen/Cable Splicer	48.19	6.5% + 22.00

8) Glazier (Trade License required: FG-1,2)	38.18	21.80 + a
9) Ironworker, Ornamental, Reinforcing, Structural, and Precast Concrete Erection	36.67	35.77
----OPERATORS----		
Group 1: Crane handling or erecting structural steel or stone, hoisting engineer 2 drums or over, front end loader (7 cubic yards or over), work boat 26 ft. and over and Tunnel Boring Machines. (Trade License Required)	40.97	24.80 + a
Group 2: Cranes (100 ton rate capacity and over); Excavator over 2 cubic yards; Piledriver ($3.00 premium when operator controls hammer); Bauer Drill/Caisson. (Trade License Required)	40.64	24.80 + a
Group 3: Excavator; Backhoe/Excavator under 2 cubic yards; Cranes (under 100 ton rated capacity), Grader/Blade; Master Mechanic; Hoisting Engineer (all types of equipment where a drum and cable are used to hoist or drag material regardless of motive power of operation), Rubber Tire Excavator (Drott-1085 or similar);Grader Operator; Bulldozer Fine Grade. (slopes, shaping, laser or GPS, etc.). (Trade License Required)	39.88	24.80 + a
Group 4: Trenching Machines; Lighter Derrick; Concrete Finishing Machine; CMI Machine or Similar; Koehring Loader (Skooper).	39.48	24.80 + a
Group 5: Specialty Railroad Equipment; Asphalt Paver; Asphalt Reclaiming Machine; Line Grinder; Concrete Pumps; Drills with Self Contained Power Units; Boring Machine; Post Hole Digger; Auger; Pounder; Well Digger; Milling Machine (over 24	38.87	24.80 + a
Group 5 continued: Side Boom; Combination Hoe and Loader; Directional Driller; Pile Testing Machine.	38.87	24.80 + a
Group 6: Front End Loader (3 up to 7 cubic yards); Bulldozer (rough grade dozer).	38.55	24.80 + a
Group 7: Asphalt roller, concrete saws and cutters (ride on types), vermeer concrete cutter, Stump Grinder; Scraper; Snooper; Skidder; Milling Machine (24	38.2	24.80 + a
Group 8: Mechanic, grease truck operator, hydroblaster; barrier mover; power stone spreader; welding; work boat under 26 ft.; transfer machine.	37.79	24.80 + a
Group 9: Front end loader (under 3 cubic yards), skid steer loader regardless of attachments, (Bobcat or Similar): forklift, power chipper; landscape equipment (including Hydroseeder).	37.34	24.80 + a
Group 10: Vibratory hammer; ice machine; diesel and air, hammer, etc.	35.24	24.80 + a

Group 11: Conveyor, earth roller, power pavement breaker (whiphammer), robot demolition equipment.	35.24	24.80 + a
Group 12: Wellpoint operator.	35.18	24.80 + a
Group 13: Compressor battery operator.	34.58	24.80 + a
Group 14: Elevator operator; tow motor operator (solid tire no rough terrain).	33.41	24.80 + a
Group 15: Generator Operator; Compressor Operator; Pump Operator; Welding Machine Operator; Heater Operator.	32.99	24.80 + a
Group 16: Maintenance Engineer/Oiler.	32.32	24.80 + a
Group 17: Portable asphalt plant operator; portable crusher plant operator; portable concrete plant operator.	36.76	24.80 + a
Group 18: Power safety boat; vacuum truck; zim mixer; sweeper; (Minimum for any job requiring a CDL license).	34.26	24.80 + a
------PAINTERS (Including Drywall Finishing)------		
10a) Brush and Roller	34.62	21.80
10b) Taping Only/Drywall Finishing	35.37	21.80
10c) Paperhanger and Red Label	34.12	21.05
10e) Blast and Spray	36.62	21.05
11) Plumber (excluding HVAC pipe installation) (Trade License required: P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2)	43.62	32.06
12) Well Digger, Pile Testing Machine	37.26	24.05 + a
13) Roofer (composition)	37.6	20.65
14) Roofer (slate & tile)	38.1	20.65
15) Sheetmetal Worker (Trade License required for HVAC and Ductwork: SM-1,SM-2,SM-3,SM-4,SM-5,SM-6)	37.98	38.31

16) Pipefitter (Including HVAC work) (Trade License required: S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4, G-1, G-2, G-8 & G-9)	43.62	32.06
------TRUCK DRIVERS------		
17a) 2 Axle	29.51	24.52 + a
17b) 3 Axle, 2 Axle Ready Mix	29.62	24.52 + a
17c) 3 Axle Ready Mix	29.67	24.52 + a
17d) 4 Axle, Heavy Duty Trailer up to 40 tons	29.72	24.52 + a
17e) 4 Axle Ready Mix	29.77	24.52 + a
17f) Heavy Duty Trailer (40 Tons and Over)	29.98	24.52 + a
17g) Specialized Earth Moving Equipment (Other Than Conventional Type on-the-Road Trucks and Semi-Trailers, Including Euclids)	29.77	24.52 + a
18) Sprinkler Fitter (Trade License required: F-1,2,3,4)	45.57	24.33 + a
19) Theatrical Stage Journeyman	25.76	7.34

Welders: Rate for craft to which welding is incidental.

**Note: Hazardous waste removal work receives additional $1.25 per hour for truck drivers.*

ALL Cranes: When crane operator is operating equipment that requires a fully licensed crane operator to operate he receives an extra $4.00 premium in addition to the hourly wage rate and benefit contributions:

1) Crane handling or erecting structural steel or stone; hoisting engineer (2 drums or over)

2) Cranes (100 ton rate capacity and over) Bauer Drill/Caisson

Crane with 150 ft. boom (including jib) - $1.50 extra
Crane with 200 ft. boom (including jib) - $2.50 extra
Crane with 250 ft. boom (including jib) - $5.00 extra
Crane with 300 ft. boom (including jib) - $7.00 extra
Crane with 400 ft. boom (including jib) - $10.00 extra

All classifications that indicate a percentage of the fringe benefits must be calculated at the percentage rate times the "base hourly rate".

Apprentices duly registered under the Commissioner of Labor's regulations on "Work Training Standards for Apprenticeship and Training Programs" Section 31-51-d-1 to 12, are allowed to be paid the appropriate percentage of the prevailing journeymen hourly base and the full fringe benefit rate, providing the work

The Prevailing wage rates applicable to this project are subject to annual adjustments each July 1st for the duration of the project.

Each contractor shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.

It is the contractor's responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's website.

The annual adjustments will be posted on the Department of Labor's Web page: www.ct.gov/dol. For those without internet access, please contact the division listed below.

The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project.

All subsequent annual adjustments will be posted on our Web Site for contractor access.

Contracting Agencies are under no obligation pursuant to State labor law to pay any increase due to the annual adjustment provision.

Effective October 1, 2005 - Public Act 05-50: any person performing the work of any mechanic, laborer, or worker shall be paid prevailing wage

All Person who perform work ON SITE must be paid prevailing wage for the appropriate mechanic, laborer, or worker classification.

All certified payrolls must list the hours worked and wages paid to All Persons who perform work ON SITE regardless of their ownership i.e.: (Owners, Corporate Officers, LLC Members, Independent Contractors, et. al)

Reporting and payment of wages is required regardless of any contractual relationship alleged to exist between the contractor and such person.

As of: February 21, 2020

Project: Prudence Crandall Museum

~~Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clause (29 CFR 5.5 (a) (1) (ii)).

Please direct any questions which you may have pertaining to classification of work and payment of prevailing wages to the Wage and Workplace Standards Division, telephone (860)263-6790.

As of: February 21, 2020

Information Bulletin
Occupational Classifications

The Connecticut Department of Labor has the responsibility to properly determine *"job classification"* on prevailing wage projects covered under C.G.S. Section 31-53(d).

Note: This information is intended to provide a sample of some occupational classifications for guidance purposes only. It is not an all-inclusive list of each occupation's duties. This list is being provided only to highlight some areas where a contractor may be unclear regarding the proper classification. If unsure, the employer should seek guidelines for CTDOL.

Below are additional clarifications of specific job duties performed for certain classifications:

- ***ASBESTOS WORKERS***

Applies all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems.

- ***ASBESTOS INSULATOR***

Handle, install apply, fabricate, distribute, prepare, alter, repair, dismantle, heat and frost insulation, including penetration and fire stopping work on all penetration fire stop systems.

- ***BOILERMAKERS***

Erects hydro plants, incomplete vessels, steel stacks, storage tanks for water, fuel, etc. Builds incomplete boilers, repairs heat exchanges and steam generators.

- ***BRICKLAYERS, CEMENT MASONS, CEMENT FINISHERS, MARBLE MASONS, PLASTERERS, STONE MASONS, PLASTERERS. STONE MASONS, TERRAZZO WORKERS, TILE SETTERS***

Lays building materials such as brick, structural tile and concrete cinder, glass, gypsum, terra cotta block. Cuts, tools and sets marble, sets stone, finishes concrete, applies decorative steel, aluminum and plastic tile, applies cements, sand, pigment and marble chips to floors, stairways, etc.

- ***CARPENTERS, MILLWRIGHTS. PILEDRIVERMEN. LATHERS. RESILEINT FLOOR LAYERS, DOCK BUILDERS, DIKERS, DIVER TENDERS***

Constructs, erects, installs and repairs structures and fixtures of wood, plywood and wallboard. Installs, assembles, dismantles, moves industrial machinery. Drives piling into ground to provide foundations for structures such as buildings and bridges, retaining walls for earth embankments, such as cofferdams. Fastens wooden, metal or rockboard lath to walls, ceilings and partitions of buildings, acoustical tile layer, concrete form builder. Applies firestopping materials on fire resistive joint systems only. Installation of curtain/window walls only where attached to wood or metal studs. Installation of insulated material of all types whether blown, nailed or attached in other ways to walls, ceilings and floors of buildings. Assembly and installation of modular furniture/furniture systems. Free-standing furniture is not covered. This includes free standing: student chairs, study top desks, book box desks, computer furniture, dictionary stand, atlas stand, wood shelving, two-position information access station, file cabinets, storage cabinets, tables, etc.

- **LABORER, CLEANING**

• The clean up of any construction debris and the general (heavy/light) cleaning, including sweeping, wash down, mopping, wiping of the construction facility and its furniture, washing, polishing, and dusting.

- **DELIVERY PERSONNEL**

• If delivery of supplies/building materials is to one common point and stockpiled there, prevailing wages are not required. If the delivery personnel are involved in the distribution of the material to multiple locations within the construction site then they would have to be paid prevailing wages for the type of work performed: laborer, equipment operator, electrician, ironworker, plumber, etc.

• An example of this would be where delivery of drywall is made to a building and the delivery personnel distribute the drywall from one "stockpile" location to further sub-locations on each floor. Distribution of material around a construction site is the job of a laborer or tradesman, and not a delivery personnel.

- ***ELECTRICIANS***

Install, erect, maintenance, alteration or repair of any wire, cable, conduit, etc., which generates, transforms, transmits or uses electrical energy for light, heat, power or other purposes, including the Installation or maintenance of telecommunication, LAN wiring or computer equipment, and low voltage wiring. ****License required per Connecticut General Statutes: E-1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9.***

- ***ELEVATOR CONSTRUCTORS***

Install, erect, maintenance and repair of all types of elevators, escalators, dumb waiters and moving walks. ****License required by Connecticut General Statutes: R-1,2,5,6.***

- ***FORK LIFT OPERATOR***

Laborers Group 4) Mason Tenders - operates forklift solely to assist a mason to a maximum height of nine (9) feet only.

Power Equipment Operator Group 9 - operates forklift to assist any trade, and to assist a mason to a height over nine (9) feet.

- ***GLAZIERS***

Glazing wood and metal sash, doors, partitions, and 2 story aluminum storefronts. Installs glass windows, skylights, store fronts and display cases or surfaces such as building fronts, interior walls, ceilings and table tops and metal store fronts. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers, which require equal composite workforce.

- ***IRONWORKERS***

Erection, installation and placement of structural steel, precast concrete, miscellaneous iron, ornamental iron, metal curtain wall, rigging and reinforcing steel. Handling, sorting, and installation of reinforcing steel (rebar). Metal bridge rail (traffic), metal bridge handrail, and decorative security fence installation. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers which require equal composite workforce.

- ***INSULATOR***

• Installing fire stopping systems/materials for "Penetration Firestop Systems": transit to cables, electrical conduits, insulated pipes, sprinkler pipe penetrations, ductwork behind radiation, electrical cable trays, fire rated pipe penetrations, natural polypropylene, HVAC ducts, plumbing bare metal, telephone and communication wires, and boiler room ceilings.

- ***LABORERS***

Acetylene burners, asphalt rakers, chain saw operators, concrete and power buggy operator, concrete saw operator, fence and guard rail erector (except metal bridge rail (traffic), decorative security fence (non-metal).

installation.), hand operated concrete vibrator operator, mason tenders, pipelayers (installation of storm drainage or sewage lines on the street only), pneumatic drill operator, pneumatic gas and electric drill operator, powermen and wagon drill operator, air track operator, block paver, curb setters, blasters, concrete spreaders.

- ***PAINTERS***

Maintenance, preparation, cleaning, blasting (water and sand, etc.), painting or application of any protective coatings of every description on all bridges and appurtenances of highways, roadways, and railroads. Painting, decorating, hardwood finishing, paper hanging, sign writing, scenic art work and drywall hhg for any and all types of building and residential work.

- ***LEAD PAINT REMOVAL***

• Painter's Rate

1. Removal of lead paint from bridges.
2. Removal of lead paint as preparation of any surface to be repainted.
3. Where removal is on a Demolition project prior to reconstruction.

• Laborer's Rate

1. Removal of lead paint from any surface NOT to be repainted.
2. Where removal is on a *TOTAL* Demolition project only.

- ***PLUMBERS AND PIPEFITTERS***

Installation, repair, replacement, alteration or maintenance of all plumbing, heating, cooling and piping. ****License required per Connecticut General Statutes: P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2 S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4.***

- ***POWER EQUIPMENT OPERATORS***

Operates several types of power construction equipment such as compressors, pumps, hoists, derricks, cranes, shovels, tractors, scrapers or motor graders, etc. Repairs and maintains equipment. ****License required, crane operators only, per Connecticut General Statutes.***

- ***ROOFERS***

Covers roofs with composition shingles or sheets, wood shingles, slate or asphalt and gravel to waterproof roofs, including preparation of surface. (demolition or removal of any type of roofing and or clean-up of any and all areas where a roof is to be relaid.)

- ***SHEETMETAL WORKERS***

Fabricate, assembles, installs and repairs sheetmetal products and equipment in such areas as ventilation, air-conditioning, warm air heating, restaurant equipment, architectural sheet metal work, sheetmetal roofing, and aluminum gutters. Fabrication, handling, assembling, erecting, altering, repairing, etc. of coated metal material panels and composite metal material panels when used on building exteriors and interiors as soffits, facia, louvers, partitions, canopies, cornice, column covers, awnings, beam covers, cladding, sun shades, lighting troughs, spires, ornamental roofing, metal ceilings, mansards, copings, ornamental and ventilation hoods, vertical and horizontal siding panels, trim, etc. The sheet metal classification also applies to the vast variety of coated metal material panels and composite metal material panels that have evolved over the years as an alternative to conventional ferrous and non-ferrous metals like steel, iron, tin, copper, brass, bronze, aluminum, etc. Fabrication, handling, assembling, erecting, altering, repairing, etc. of architectural metal roof, standing seam roof, composite metal roof, metal and composite bathroom/toilet partitions, aluminum gutters, metal and composite lockers and shelving, kitchen equipment, and walk-in coolers. To include testing and air –balancing ancillary to installation and construction.

- ***SPRINKLER FITTERS***

Installation, alteration, maintenance and repair of fire protection sprinkler systems. ****License required per Connecticut General Statutes: F-1,2,3,4.***

- ***TILE MARBLE AND TERRAZZO FINISHERS***

Assists and tends the tile setter, marble mason and terrazzo worker in the performance of their duties.

- **TRUCK DRIVERS**

~How to pay truck drivers delivering asphalt is under REVISION~

Truck Drivers are requires to be paid prevailing wage for time spent "working" directly on the site. These drivers remain covered by the prevailing wage for any time spent transporting between the actual construction location and facilities (such as fabrication, plants, mobile factories, batch plant, borrow pits, job headquarters, tool yards, etc.) dedicated exclusively, or nearly so, to performance of the contract or project, which are so located in proximity to the actual construction location that it is reasonable to include them. ****License required, drivers only, per Connecticut General Statutes.***

For example:

• Material men and deliverymen are not covered under prevailing wage as long as they are not directly involved in the construction process. If, they unload the material, they would then be covered by prevailing wage for the classification they are performing work in: laborer, equipment operator, etc.
• Hauling material off site is not covered provided they are not dumping it at a location outlined above.
• Driving a truck on site and moving equipment or materials on site would be considered covered work, as this is part of the construction process.

➢ *Any questions regarding the proper classification should be directed to:*
Public Contract Compliance Unit
Wage and Workplace Standards Division
Connecticut Department of Labor
200 Folly Brook Blvd, Wethersfield, CT 06109
(860) 263-6543.

Informational Bulletin

THE 10-HOUR OSHA CONSTRUCTION SAFETY AND HEALTH COURSE

(applicable to public building contracts entered into *on or after July 1, 2007,* where the total cost of all work to be performed is at least $100,000)

(1) This requirement was created by Public Act No. 06-175, which is codified in Section 31-53b of the Connecticut General Statutes (pertaining to the prevailing wage statutes);

(2) The course is required for public building construction contracts (projects funded in whole or in part by the state or any political subdivision of the state) entered into on or after July 1, 2007;

(3) It is required of private employees (not state or municipal employees) and apprentices who perform manual labor for a general contractor or subcontractor on a public building project where the total cost of all work to be performed is at least $100,000;

(4) The ten-hour construction course pertains to the ten-hour Outreach Course conducted in accordance with federal OSHA Training Institute standards, and, for telecommunications workers, a ten-hour training course conducted in accordance with federal OSHA standard, 29 CFR 1910.268;

(5) The internet website for the federal OSHA Training Institute is http://www.osha.gov/fso/ote/training/edcenters/fact_sheet.html;

(6) The statutory language leaves it to the contractor and its employees to determine who pays for the cost of the ten-hour Outreach Course;

(7) Within 30 days of receiving a contract award, a general contractor must furnish proof to the Labor Commissioner that all employees and apprentices performing manual labor on the project will have completed such a course;

(8) Proof of completion may be demonstrated through either: (a) the presentation of a *bona fide* student course completion card issued by the federal OSHA Training Institute; *or* (2) the presentation of documentation provided to an employee by a trainer certified by the Institute pending the actual issuance of the completion card;

(9) Any card with an issuance date more than 5 years prior to the commencement date of the construction project shall not constitute proof of compliance;

(10) Each employer shall affix a copy of the construction safety course completion card to the certified payroll submitted to the contracting agency in accordance with Conn. Gen. Stat. § 31-53(f) on which such employee's name first appears;

(11) Any employee found to be in non-compliance shall be subject to removal from the worksite if such employee does not provide satisfactory proof of course completion to the Labor Commissioner by the fifteenth day after the date the employee is determined to be in noncompliance;

(12) Any such employee who is determined to be in noncompliance may continue to work on a public building construction project for a maximum of fourteen consecutive calendar days while bringing his or her status into compliance;

(13) The Labor Commissioner may make complaint to the prosecuting authorities regarding any employer or agent of the employer, or officer or agent of the corporation who files a false certified payroll with respect to the status of an employee who is performing manual labor on a public building construction project;

(14) The statute provides the minimum standards required for the completion of a safety course by manual laborers on public construction contracts; any contractor can exceed these minimum requirements; and

(15) Regulations clarifying the statute are currently in the regulatory process, and shall be posted on the CTDOL website as soon as they are adopted in final form.

(16) Any questions regarding this statute may be directed to the Wage and Workplace Standards Division of the Connecticut Labor Department via the internet website of http://www.ctdol.state.ct.us/wgwkstnd/wgemenu.htm; or by telephone at (860)263-6790.

THE ABOVE INFORMATION IS PROVIDED EXCLUSIVELY AS AN EDUCATIONAL RESOURCE, AND IS NOT INTENDED AS A SUBSTITUTE FOR LEGAL INTERPRETATIONS WHICH MAY ULTMATELY ARISE CONCERNIG THE CONSTRUCTION OF THE STATUTE OR THE REGULATIONS.

Connecticut Department of Labor
Wage and Workplace Standards Division
FOOTNOTES

⇨ Please Note: If the "Benefits" listed on the schedule for the following occupations includes a letter(s) (+ a or + a+b for instance), refer to the information below.

Benefits to be paid at the appropriate prevailing wage rate for the listed occupation.

If the "Benefits" section for the occupation lists only a dollar amount, disregard the information below.

Bricklayers, Cement Masons, Cement Finishers, Concrete Finishers, Stone Masons
(Building Construction) and
(Residential- Hartford, Middlesex, New Haven, New London and Tolland Counties)

a. Paid Holiday: Employees shall receive 4 hours for Christmas Eve holiday provided the employee works the regularly scheduled day before and after the holiday. Employers may schedule work on Christmas Eve and employees shall receive pay for actual hours worked in addition to holiday pay.

Elevator Constructors: Mechanics

a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day, plus the Friday after Thanksgiving.

b. Vacation: Employer contributes 8% of basic hourly rate for 5 years or more of service or 6% of basic hourly rate for 6 months to 5 years of service as vacation pay credit.

Glaziers

a. Paid Holidays: Labor Day and Christmas Day.

Power Equipment Operators
(Heavy and Highway Construction & Building Construction)

a. Paid Holidays: New Year's Day, Good Friday, Memorial day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day, provided the employee works 3 days during the week in which the holiday falls, if scheduled, and if scheduled, the working day before and the working day after the holiday. Holidays falling on Saturday may be observed on Saturday, or if the employer so elects, on the preceding Friday.

Ironworkers

a. Paid Holiday: Labor Day provided employee has been on the payroll for the 5 consecutive work days prior to Labor Day.

Laborers (Tunnel Construction)

a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. No employee shall be eligible for holiday pay when he fails, without cause, to work the regular work day preceding the holiday or the regular work day following the holiday.

Roofers

a. Paid Holidays: July 4th, Labor Day, and Christmas Day provided the employee is employed 15 days prior to the holiday.

Sprinkler Fitters

a. Paid Holidays: Memorial Day, July 4th, Labor Day, Thanksgiving Day and Christmas Day, provided the employee has been in the employment of a contractor 20 working days prior to any such paid holiday.

Truck Drivers

(Heavy and Highway Construction & Building Construction)

a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas day, and Good Friday, provided the employee has at least 31 calendar days of service and works the last scheduled day before and the first scheduled day after the holiday, unless excused.

STATUTE 31-55a

- SPECIAL NOTICE -

To: All State and Political Subdivisions,Their Agents, and Contractors

Connecticut General Statute 31-55a - Annual adjustments to wage rates by contractors doing state work.

Each contractor that is awarded a contract on or after October 1, 2002, for (1) the construction of a state highway or bridge that falls under the provisions of section 31-54 of the general statutes, or (2) the construction, remodeling, refinishing, refurbishing, rehabilitation, alteration or repair of any public works project that falls under the provisions of section 31-53 of the general statutes shall contact the Labor Commissioner on or before July first of each year, for the duration of such contract, to ascertain the prevailing rate of wages on an hourly basis and the amount of payment or contributions paid or payable on behalf of each mechanic, laborer or worker employed upon the work contracted to be done, and shall make any necessary adjustments to such prevailing rate of wages and such payment or contributions paid or payable on behalf of each such employee, effective each July first.

- The prevailing wage rates applicable to any contract or subcontract awarded on or after October 1, 2002 are subject to annual adjustments each July 1st for the duration of any project which was originally advertised for bids on or after October 1, 2002.
- Each contractor affected by the above requirement shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.
- It is the ***contractor's*** responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's Web Site. The annual adjustments will be posted on the Department of Labor Web page: www.ctdol.state.ct.us. For those without internet access, please contact the division listed below.

- The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project. All subsequent annual adjustments will be posted on our Web Site for contractor access.

Any questions should be directed to the Contract Compliance Unit, Wage and Workplace Standards Division, Connecticut Department of Labor, 200 Folly Brook Blvd., Wethersfield, CT 06109 at (860)263-6790.

[New] In accordance with Section 31-53b(a) of the C.G.S. each contractor shall provide a copy of the OSHA 10 Hour Construction Safety and Health Card for each employee, to be attached to the first certified payroll on the project.

In accordance with Connecticut General Statutes, 31-53
Certified Payrolls with a statement of compliance
shall be submitted monthly to the contracting agency.

PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS

WEEKLY PAYROLL

Connecticut Department of Labor
Wage and Workplace Standards Division
200 Folly Brook Blvd.
Wethersfield, CT 06109

CONTRACTOR NAME AND ADDRESS:	SUBCONTRACTOR NAME & ADDRESS	WORKER'S COMPENSATION INSURANCE CARRIER
		POLICY #
		EFFECTIVE DATE: EXPIRATION DATE:

PAYROLL NUMBER	Week-Ending Date	PROJECT NAME & ADDRESS

PERSON/WORKER, ADDRESS and SECTION	APPR RATE %	MALE/ FEMALE AND RACE*	WORK CLASSIFICATION Trade License Type & Number - OSHA 10 Certification Number	DAY AND DATE S	M	T	W	TH	F	S	Total ST Hours Total O/T Hours	BASE HOURLY RATE TOTAL FRINGE BENEFIT PLAN CASH	TYPE OF FRINGE BENEFITS Per Hour 1 through 6 (see back)	GROSS PAY FOR ALL WORK PERFORMED THIS WEEK	TOTAL DEDUCTIONS FICA	FEDERAL WITH-HOLDING	STATE WITH-HOLDING	LIST OTHER	GROSS PAY FOR THIS PREVAILING RATE JOB	CHECK # AND NET PAY
				HOURS WORKED EACH DAY								$ Base Rate $ Cash Fringe	1. $ 2. $ 3. $ 4. $ 5. $ 6. $							
												$ Base Rate $ Cash Fringe	1. $ 2. $ 3. $ 4. $ 5. $ 6. $							
												$ Base Rate $ Cash Fringe	1. $ 2. $ 3. $ 4. $ 5. $ 6. $							
												$ Base Rate $ Cash Fringe	1. $ 2. $ 3. $ 4. $ 5. $ 6. $							

12/9/2013
WWS-CP1

*IF REQUIRED

*SEE REVERSE SIDE

PAGE NUMBER _____OF

OSHA 10 ~ATTACH CARD TO 1ST CERTIFIED PAYROLL

***FRINGE BENEFITS EXPLANATION (P):**

Bona fide benefits paid to approved plans, funds or programs, except those required by Federal or State Law (unemployment tax, worker's compensation, income taxes, etc.).

Please specify the type of benefits provided:

1) Medical or hospital care _____ 4) Disability_____

2) Pension or retirement _____ 5) Vacation, holiday_____

3) Life Insurance _____ 6) Other (please specify) _____

CERTIFIED STATEMENT OF COMPLIANCE

For the week ending date of _____,

I, _____of _____, (hereafter known as

Employer) in my capacity as _____ (title) do hereby certify and state:

Section A:

1. All persons employed on said project have been paid the full weekly wages earned by them during the week in accordance with Connecticut General Statutes, section 31-53, as amended. Further, I hereby certify and state the following:

a) The records submitted are true and accurate;

b) The rate of wages paid to each mechanic, laborer or workman and the amount of payment or contributions paid or payable on behalf of each such person to any employee welfare fund, as defined in Connecticut General Statutes, section 31-53 (h), are not less than the prevailing rate of wages and the amount of payment or contributions paid or payable on behalf of each such person to any employee welfare fund, as determined by the Labor Commissioner pursuant to subsection Connecticut General Statutes, section 31-53 (d), and said wages and benefits are not less than those which may also be required by contract;

c) The Employer has complied with all of the provisions in Connecticut General Statutes, section 31-53 (and Section 31-54 if applicable for state highway construction);

d) Each such person is covered by a worker's compensation insurance policy for the duration of his employment which proof of coverage has been provided to the contracting agency;

e) The Employer does not receive kickbacks, which means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided directly or indirectly, to any prime contractor, prime contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a prime contractor in connection with a subcontractor relating to a prime contractor; and

f) The Employer is aware that filing a certified payroll which he knows to be false is a class D felony for which the employer may be fined up to five thousand dollars, imprisoned for up to five years or both.

2. OSHA~The employer shall affix a copy of the construction safety course, program or training completion document to the certified payroll required to be submitted to the contracting agency for this project on which such persons name first appears.

_____	_____	_____
(Signature)	(Title)	Submitted on (Date)

*****THIS IS A PUBLIC DOCUMENT*****
*****DO NOT INCLUDE SOCIAL SECURITY NUMBERS*****

Weekly Payroll Certification For
Public Works Projects (Continued)

PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS

Week-Ending Date:
Contractor or Subcontractor Business Name:

WEEKLY PAYROLL

PERSON/WORKER, ADDRESS and SECTION	APPR RATE %	MALE/ FEMALE AND RACE*	WORK CLASSIFICATION / Trade License Type & Number - OSHA 10 Certification Number	DAY AND DATE S	M	T	W	TH	F	S	Total ST Hours / Total O/T Hours	BASE HOURLY RATE / TOTAL FRINGE BENEFIT PLAN CASH	TYPE OF FRINGE BENEFITS Per Hour 1 through 6 (see back)	GROSS PAY FOR ALL WORK PERFORMED THIS WEEK	TOTAL DEDUCTIONS FICA	FEDERAL WITH-HOLDING	STATE WITH-HOLDING	LIST OTHER	GROSS PAY FOR THIS PREVAILING RATE JOB	CHECK # AND NET PAY
				HOURS WORKED EACH DAY																
													1. $							
												$	2. $							
												Base Rate	3. $							
													4. $							
												$	5. $							
												Cash Fringe	6. $							
													1. $							
												$	2. $							
												Base Rate	3. $							
													4. $							
												$	5. $							
												Cash Fringe	6. $							
													1. $							
												$	2. $							
												Base Rate	3. $							
													4. $							
												$	5. $							
												Cash Fringe	6. $							
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												Cash Fringe	6. $							
													1. $							
												$	2. $							
												Base Rate	3. $							
													4. $							
												$	5. $							
												Cash Fringe	6. $							

*IF REQUIRED

NOTICE: THIS PAGE MUST BE ACCOMPANIED BY A COVER PAGE (FORM # WWS-CP1)

Additional Forms to Be Submitted After Bond Commission Funding Approval

DAS | Construction Services | Office of Legal Affairs, Policy, and Procurement

PERFORMANCE BOND
Know All Men by These Presents

THAT _____ of the

Town of _____, County _____ and

State of _____, as Principal (hereinafter called the Principal),

and _____, _____

(Insert place of Business)

(a surety company authorized to transact business in the State Of Connecticut) as Surety(ies) (hereinafter called the Surety) are held and firmly bound unto the State of Connecticut (hereinafter called the Obligee) in the full penal sum of

_____

($ _____) Dollars, lawful money of the United States, to be paid to said State of Connecticut, to the which payment well and truly to be made and done, the said Principal binds himself, his heirs, executors, administrators and assigns (or itself, its successors and assigns), and the said Surety (ies) binds itself, its successors and assigns jointly and severally firmly by these presents.

Signed, sealed and delivered this _____ day of _____ 20 _____ .

THE CONDITION OF THIS OBLIGATION IS SUCH THAT

WHEREAS said Principal will enter into a certain written contract with said Obligee, to be dated the

_____ day of _____ 20 _____, which written , as amended, contract shall provide for the following:

Project Title: _____

Project Location: _____

Contract Number: _____

Project Number: _____

which contract, including any hereafter made extension, modification or alteration thereof, together with all plans and specifications now made or which may hereafter be made in extension, modification or alteration thereof, is hereby referred to, incorporated in, and made a part of this bond as though herein fully set forth.

NOW, THEREFORE, if the said Principal shall well and truly keep, perform and execute all the undertaking, covenants, terms, conditions, and agreements of said contract, as it may be extended, modified or altered, and during the *period* of any guaranty required under the contract, according to its provisions on his or its part to be kept and performed or shall indemnify and reimburse the Obligee for any loss that it may suffer through the failure of the Principal to faithfully observe and perform each and every obligation and duty imposed upon the Principal by the said contract, as it may be extended, modified or altered, at the time and in the manner therein specified, then this obligation shall be null and void, otherwise it shall remain and be in full force and effect.

Any alterations which may be made in the terms of the contract, or in the work done or to be done under it, or the giving by the Obligee of any extension of time for the performance of the contract or any other forbearance on the part of either the Obligee or the Principal, one to the other, shall not in any way release the Principal, and/or the Surety(ies) or either of them, their representatives, heirs, executors, administrators, successors or assigns from liability hereunder, and notice to the Surety(ies) of any such alteration, modification, extension or forbearance is hereby specifically and absolutely waived.

In the event that the Surety(ies) assumes the contract or obtains a bid or bids for completion of the contract, the Surety(ies) shall ensure that the contractor chosen to complete the contract is prequalified pursuant to section 4a-100 of the Connecticut General Statutes, in the requisite classification and has the aggregate work capacity rating and single project limit necessary to complete the contract.

IN TESTIMONY WHEREOF, the said Principal has hereunto set his / its hand and seal, and the said Surety(ies) has/have caused this instrument to be signed by its/their attorney in fact and its corporate seal to be hereunto affixed, the day and year first written.

Witness as to Principle **SEAL**

_____

_____ _____ **, Its** _____ **Duly Authorized**
(Print Name)

_____

_____
(Print Name)

Witness as to Surety **SEAL**

_____

_____ **by** _____
(Print Name) **Its attorney in fact**

_____

_____
(Print Name)

Note: *If more than one surety, add additional lines for additional surety name and address, person signing and title, and two witnesses. Obtain Power of Attorney for each surety.*

End Performance Bond

LABOR AND MATERIAL BOND
Know All Men by These Presents

THAT _____ of the

Town of _____, County _____ and

State of _____, as Principal (hereinafter called the Principal),

and _____, _____

(Insert place of Business)

(a surety company authorized to transact business in the State Of Connecticut) as Surety(ies) (hereinafter called the Surety) are held and firmly bound unto the State of Connecticut (hereinafter called the Obligee) in the full penal sum of

_____

($ _____) Dollars, lawful money of the United States, to be paid to said State of Connecticut, to the which payment well and truly to be made and done, the said Principal binds himself, his heirs, executors, administrators and assigns (or itself, its successors and assigns), and the said Surety (ies) binds itself, its successors and assigns jointly and severally firmly by these presents.

Signed, sealed and delivered this _____ day of _____ 20 _____ .

THE CONDITION OF THIS OBLIGATION IS SUCH THAT

WHEREAS said Principal will enter into a certain written contract with said Obligee, to be dated the

_____ day of _____ 20 _____, which written, as amended, contract shall provide for the following:

Project Title: _____

Project Location: _____

Contract Number: _____

Project Number: _____

which contract, including any hereafter made extension, modification or alteration thereof, together with all plans and specifications now made or which may hereafter be made in extension, modification or alteration thereof, is hereby referred to, incorporated in, and made a part of this bond as though herein fully set forth.

NOW, THEREFORE, if the said Principal shall promptly pay for all materials furnished and labor supplied or performed in the prosecution of the work included in and under the aforesaid contract, as it may be extended, modified or altered, and/or required by the General Statutes of Connecticut, as amended, whether or not the material or labor enters into and becomes a component part of the real asset, then this obligation shall be null and void, otherwise it shall remain and be in full force and effect. This bond is provided pursuant to Section 49-41 et seq. of the General Statutes of Connecticut and shall be governed thereby.

Any party, whether a subcontractor or otherwise, who furnishes materials or supplies or performs labor or services in the prosecution of the work under said contract, as it may be extended, modified or altered, and who is not paid therefor, may bring a suit on this bond in the name of the person suing and prosecute the same to final execution and judgment for such sum or sums as may be justly due.

Any alterations which may be made in the terms of the contract, or in the work done or to be done under it, or the giving by the Obligee of any extension of time for the performance of the contract or any other forbearance on the part of either the Obligee or the Principal, one to the other, shall not in any way release the Principal, and/or the Surety(ies) or either of them, their representatives, heirs, executors, administrators, successors or assigns from liability hereunder, and notice to the Surety(ies) of any such alteration, modification, extension or forbearance is hereby specifically and absolutely waived.

In the event that the Surety(ies) assumes the contract or obtains a bid or bids for completion of the contract, the Surety(ies) shall ensure that the contractor chosen to complete the contract is prequalified pursuant to section 4a-100 of the Connecticut General Statutes, in the requisite classification and has the aggregate work capacity rating and single project limit necessary to complete the contract.

IN TESTIMONY WHEREOF, the said Principal has hereunto set his / its hand and seal, and the said Surety(ies) has/have caused this instrument to be signed by its/their attorney in fact and its corporate seal to be hereunto affixed, the day and year first written.

Witness as to Principle **SEAL**

_____

_____ _____ **, Its** _____ **Duly Authorized**

(Print Name)

_____

_____

(Print Name)

Witness as to Surety **SEAL**

_____

_____ **by** _____

(Print Name) **Its attorney in fact**

_____

_____

(Print Name)

Note: *If more than one surety, add additional lines for additional surety name and address, person signing and title, and two witnesses. Obtain Power of Attorney for each surety.*

End Labor and Material Bond

Surety Sheet

State Of Connecticut
Department of Administrative Services, Construction Services
Office of Legal Affairs, Policy, and Procurement
450 Columbus Boulevard, Suite 1302
Hartford, CT 06103

1. Surety Company

Name of Surety Co.:

Address of Home Office:

Telephone Number:

2. Agent

Name of Surety Co.:

Address of Agency:

Telephone Number:

Attorney-In-Fact:

Telephone Number:

DAS Project Number:

Contractor's Name:

End Surety Sheet

Bidder's Certification:
Financial Position and Corporate Structure

(*Your Name*) (*Name Of Company*)

Pursuant to C.G.S. § 4b-91(e), as amended, the bidder for this contract (hereinafter "bidder"), certifies under penalty of false statement that the information in the bid is true, that there has been no substantial change in the bidder's financial position or corporate structure since its most recent prequalification certificate was issued or renewed, other than those changes noted in the update statement, and that the bid was made without fraud or collusion with any person.

(*Signature*)

(*Print Name*)

(*Date*)

(DAS Project Number)

End Bidder's Certification: Financial Position and Corporate Structure

End of Section 00 92 10
Additional Forms To Be Submitted After Bond Commission Funding Approval

Procedures Regarding Taxation For Nonresident General / Prime Contractor and Subcontractors

DAS | Construction Services | Office of Legal Affairs, Policy, and Procurement

According to Connecticut General Statutes § 12-430(7), there are two types of Nonresident Contractors and Subcontractors (*Verified* or *Unverified*) who are required to furnish security for Connecticut taxes arising from jobs performed in Connecticut.

Detailed information can be found by visiting the Connecticut Department of Revenue Services (DRS) website at www.ct.gov/drs:

- Under the "**For Businesses**" title, click on "**Withholding Tax**"";
- Click on "**Registering**";
- Click on "**5. What tax types do I need to register for with DRS";**
- Read the information for **"Out-of-State"** contractors.
- Click on "**SN 2012(2)**" for the "Procedure Governing Nonresident Contractors".

Forms can be downloaded from the DRS website (www.ct.gov/drs) as follows:

- Click on "**Forms**" at the top of the page;
- Under "**Current Year Forms**":
  - Click on "**Miscellaneous Tax Forms**";
  - Click on "**Bond Forms**"
- Download the appropriate form.

For questions regarding the nonresident contractor bond law, call **DRS** at **860-541-7538**.

1.0 Verified Nonresident Contractors and Subcontractors

Verified Nonresident Contractors are treated just like Resident Contractors. A Verified Nonresident General or Prime Contractor is not required to file a surety bond with DRS. A Verified Nonresident Subcontractor is not required for the General or Prime Contractor to hold back a portion of the amount owed the Subcontractor under the contract.

1.1 Verification Procedure for General/Prime Contractors and Subcontractors:

1.1.1	**Register with DRS** via REG-1 for all appropriate taxes.
1.1.2	Submit **Form AU-960 "Nonresident Contractor Request for Verified Contractor Status" to DRS.** If you have a 3 year filing history with DRS and no delinquencies, then just complete **Part I** & **Part I**, otherwise go to **Part III**.
1.1.3	Submit **Form AU-961 "Verification Bond" to DRS**.
1.1.4	If Verified by DRS, submit **"Notice of Verified Status"** (Verification Letter issued by DRS) to the Connecticut Department of Administrative Services / Construction Services (DAS/CS) Office of Legal Affairs, Policy, and Procurement as specified in Section 00 41 00 Bid Proposal Form.

2.0 Unverified Nonresident Contractors and Subcontractors (for Contracts Greater Than $250,000):

The requirements for Unverified Nonresident Contractors and Unverified Nonresident Subcontractors (for Contracts greater than $250,000) are different for General/Prime Contractors and their Subcontractors:

2.1 Unverified Nonresident General or Prime Contractors:

2.1.1	Submit **Form AU-964 "Surety Bond and Release" to DRS**. The Unverified Nonresident General/Prime Contractor is required to file a good and valid surety bond with DRS using Form AU-964 "Surety Bond and Release" for 5% of the contract price to secure payment of required taxes by both the General/Prime Contractor and its Subcontractors.
2.1.2	The General/Prime Contractor must provide proof to DAS/CS that they have posted a good and valid surety bond with DRS by providing a copy of **Form AU-965 "Acceptance of Surety Bond"** that verifies acceptance of the bond by DRS*****.

2.2 Unverified Nonresident Subcontractors:

2.2.1	The Resident or Verified or Unverified Nonresident General/Prime Contractor is required to hold back 5% of its payments to the Unverified Nonresident Subcontractor. The General/Prime Contractor must keep the hold-backs in a special fund in trust for the state.
2.2.2	The Unverified Nonresident Subcontractor can request that the money be released from the General/Prime Contractor by submitting **Form AU-967 "Request for Certificate of Compliance" to DRS**. It must be signed by the General/Prime Contractor and the Nonresident Subcontractor and submitted **to DRS within 90 days of the completion date**.
2.2.3	If **Form AU-968 "Certificate of Compliance"** is issued by DRS, DRS will instruct the General/Prime Contractor holding back the 5% to release the withheld amount to the Nonresident Subcontractor. If the "Certificate of Compliance" is denied or not requested within **90 days of the completion date of the contract**, the General/Prime Contractor holding back the 5% will remit the withheld amount on their own Sales & Use tax returns.
2.2.4	The 5% holdback does not take the place of any tax returns due from the Unverified Nonresident Contractor.
2.2.5	The General/Prime Contractor must give the Unverified Nonresident Subcontractor written notice of the hold-back requirements by the time the Subcontractor begins work under the contract.

***Document(s) must be submitted to the DAS/CS Office of Legal Affairs, Policy, and Procurement as specified in Section 00 41 00 "Bid Proposal Form".**

End of Section

00 92 30 Procedures Regarding Taxation
For Nonresident General/Prime Contractor & Subcontractors

PART 1 – GENERAL

1.1 DEFINITIONS

A. Contractor:
Whenever the term **"Contractor"** is used in these Division 01 General Requirements and the Contract Documents, it may be understood to mean either the **Design-Bid-Build (D-B-B) "General Contractor"** or the **Construction Manager at Risk ("CMR")** as applicable to the specific Project.

B. Subcontractor:
Whenever the term **"Subcontractor"** is used, it may be understood to mean either a **Subcontractor** or a **Supplier**, as applicable to the specific Project.

C. Contract:
Whenever the term **"Contract"** is used in these Division 01 General Requirements and the Contract Documents, it may be understood to mean either the **D-B-B General Contractor's Contract Sum** as stated in their Contract or the **CMR's Contract Sum** as stated in their CMR Agreement, as applicable to the specific Project.

1.2 RELATED DOCUMENTS

A. The Contract Documents are defined in the D-B-B and CMR Division 00 General Conditions, as applicable to the specific Project.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Delivery Method:

1. ☒ Design-Bid-Build (DBB);

2. ☐ Construction Manager at Risk (CMR)

B. Project Number: BI-RR-28

C. Project Title: Prudence Crandall Museum Renovations

D. Project Location: The Museum is located at 1 South Canterbury Road located in Canterbury, Connecticut.

E. The Project Description:

1. Restoration, structural reinforcement and systems upgrades to Historic Structure (circa 1803) and currently operated as a museum. Work includes roof replacement, hazardous materials abatement, and site improvements, including accessibility upgrades.

2. The Authorities Having Jurisdiction for, as defined by the Connecticut General Statutes, are the Connecticut Department of Administrative Services (DAS) / Construction Services (CS) Office of State Building Inspector (OSBI) and Office of State Fire Marshal (OSFM).

F. Owner:

1. Owner's Name: The Owner is the State of Connecticut, Department of Administrative Services.

2. Authorized Representative for the Owner: DAS/CS Project Manager Name: Halina Harabasz.

a. DAS/CS Project Manager's Location: The DAS/CS Project Manager is located at 450 Columbus Blvd, Suite 1201, Hartford, CT, 06103.

b. Phone: 860-713-5732

c. Fax: NA

d. Email(s): halina.harabasz@ct.gov

3. Authority: The DAS/CS Project Manager is the only authorized representative for the Department of Administrative Services Commissioner to act in matters involving revoking, altering, enlarging or relaxing any requirement of the Contract Documents.

a. Related Section: Article 25, All Work Subject To Control of the Commissioner, Division 00 General Conditions of the Contract for Construction.

G. Agency:

1. **Agency Name:** The Connecticut State (User) Agency is CT Office of the Arts and State Historic Preservation Office, DECD
2. **Agency Representative Name and Title:** Elizabeth Shapiro, Director of Arts, Preservation and Museums, Connecticut Office of the Arts and the State Historic Preservation Office, Department of Economics and Community Development.
   a. **Agency Representative Location:** The Agency Representative is located at DECD, 450 Columbus Boulevard, Suite 5, Hartford, CT 06103.
   b. **Phone:** 860-500-2360;
   c. **Fax: NA**
   d. **Email(s):** elizabeth.shapiro@ct.gov
3. **Authority:** The Agency Representative has the administrative authority for the facility and or site where the work is being performed but does not have the authority to change the Contract Documents or direct the Contractor.

H. Architect and Engineer (A/E):

1. **Architect's Name:** The Architect representing the firm for this project is Roger U. Williams, AIA; TLB Architecture, LLC.
   a. **Architect's Location:** The Architect is located at 92 West Main Street, Chester, CT 06412.
   b. **Phone:** 860-526-9448;
   c. **Fax:** 860-526-9020;
   d. **Email(s):** rwilliams@tlbarchitecture.com.
2. The Architect and Engineer (A/E) or their accredited representative is referred to in the Contract Documents as "Architect" or "Architects" or "Engineer" or "Engineers" or by pronouns which imply them. As information for the Contractor, the Architect's or Engineer's status is defined as follows:
   a. The Architect and Engineer will not make interpretations or decisions directly to the Contractor. All interpretations or decisions will be conveyed through the Construction Administrator to the DAS/CS Project Manager.
   b. As the authorized representative of the Department of Administrative Services Commissioner, the Architect and Engineer is responsible for review of shop drawings, materials, and equipment intended for the work, in accordance with the Division 00 "General Conditions" and "Supplementary Conditions".
3. Wherever the Architect or Engineer is mentioned in the documents in connection with an administrative function, it shall include the Construction Administrator in that function except for shop drawings.

I. Construction Administrator (CA):

1. **Construction Administrator Name: D.H. Bolton, Inc.**
   a. **Construction Administrator Location:** The Construction Administrator is located at 330 Main Street, 2nd Floor, Hartford**,** CT 06106
   b. **Phone:** 860-200-8551
   c. **Fax: N/A**
   d. **Email(s):** dwight@dh-bolton.com
2. **Authority:** As information to the Contractor, the Construction Administrator's status is defined as follows:
   a. The Construction Administrator (CA) is referred to in the Contract Documents as "Construction Administrator" or by pronouns which imply it. All communications concerning the project will be directed through the Construction Administrator or a designated representative(s).
   b. The Construction Administrator is the Owner's Agent who will, among other things, monitor and analyze the Contractor's performance, scheduling and construction, process shop drawings, material, and equipment submittals, review and process periodic billings, review, analyze, and recommend cost changes.
   c. **Related Section: Article 26 "Authority of the Construction Administrator"** of Division 00 "General Conditions of the Contract for Construction".

3. The Construction Administrator will process all requests for information, interpretations and decisions regarding the meaning and intent of the Contract Documents, consulting with appropriate parties prior to rendering the interpretations or decisions for the Project Manager to the Contractor. All such requests and replies shall be in writing**.**

K. Work: The Work Includes but is not limited to the following:

1 Site Construction, Landscaping;

2 Selective Site Demo.

3 Cast-in-Place Concrete;

4 Masonry Restoration;

5 Structural Steel, Miscellaneous Metals;

6 Rough Carpentry, Architectural Woodwork;

7 Exterior Clapboards and Trim Restoration

8 Waterproofing, Insulation, Roofing, Sheet metal, and Joint Sealants;

9 Doors and Frames, Window and Door Restoration and Hardware;

10 Plasterwork and Painting;

11 Plumbing, HVAC, and Controls;

12 Electrical Systems;

13 Fire Alarm System/Aspirating Smoke Detection System

L. The Contractor will include in their bid, all items required in order to carry out the intent of the Work as described, shown and implied in the Contract Documents.

M. It shall be the Contractor's responsibility upon discovery to immediately notify the Construction Administrator, in writing, of errors, omissions, discrepancies, and instances of noncompliance with applicable codes and regulations within the documents, and of any work which will not fit or properly function if installed as indicated on the Contract Documents. Any additional costs arising from the Contractor's failure to provide such notification shall be borne by the Contractor.

N. The Work will be constructed under the Contractor’s Contract as applicable to this Project.

O. The Work will be performed in accordance with the Connecticut Department of Energy and Environmental Protection’s (DEEP) **"General Permit for the Discharge of Stormwater and Dewatering Wastewater from Construction Activities"** (DEEP-WPED-GP-015) and **Stormwater Pollution Control Plan (SPCP)**, including, but not limited to, implementing, maintaining, and updating the SPCP, performing regular inspections, conducting and reporting stormwater monitoring activities, retaining records for the required period of time, and performing all post-construction measures and inspections. See **Section 01 50 00 "Temporary Facilities and Controls".**

P. The Prudence Crandall House is listed on the National Register of Historic Places and is a National Historic Landmark. All work for this renovation project shall be performed in compliance with the Secretary of the Interiors Standards for the Treatment of Historic Structures. All work activities must be undertaken with sufficient care to protect this historic resource and must be supervised by personnel who are familiar with the Secretary of Interior’s Standards for Restoration.

1.4 WORK UNDER OTHER CONTRACTS

A. Separate Contracts: The Owner has awarded a separate contract for performance of certain construction operations at the site. The contractor is responsible for coordinating with these separate contractors. The separate contracts include the following:

1. **Contract:** A separate contract has been awarded to Nationwide Security Corporation to perform the following Work: Provide a new security system.

2. **Contract:** Eversource will provide a new overhead service connection.

3. Cooperate fully with separate contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this contract.

1.5 WORK SEQUENCE (PHASES)

A. **Related Documents:** Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Site Phasing Plan: NA

C. The entire Project shall be constructed in *a single* phase. Work shall be substantially complete, ready for occupancy within **180** Calendar Days of commencement of the Work (the "Contract Time")

1.6 CONTRACTOR'S USE OF PREMISES

A. **General:** During the construction period the Contractor shall have full use of the newly constructed premises for construction operations, including use of the site. The Contractor's use of the premises is limited only by the Owner's right to perform work or to retain other contractors on portions of the Project.

B. **Use of the Site:** Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. **Owner Occupancy:** Museum will be closed to the public and Owner will not occupy the building.

2. The Contractor shall confine his operations including storage of materials, supplies, equipment, and apparatus to the areas bounded by the contract limits indicated and as directed in the Contract Documents.

3. Existing roads, drives, walks, and parking areas which are not within the contract limit line are to be kept free and clear at all times. All deliveries for the project are to enter the property from at the main entry driveway. The Contractor shall check all roadways for accessibility and clearances for deliveries of all large material and equipment. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

4. The Contractor shall be responsible for keeping the premises clean and shall pick up rubbish and debris and promptly remove from site.

5. Parking for the Contractor's employees will be limited to an area designated by the Construction Administrator, and the Contractor may be required to provide identification stickers for all employees' cars.

6. Special precautions shall be taken to protect all wetland areas designated to remain. Prevent any and all sediment, debris, or other materials from getting into these areas. Should any sediment, debris, or other materials get into these areas or if any damage occurs to the vegetation therein, the Contractor shall immediately contact the Construction Administrator for direction.

7. The Contractor shall comply with local working hour restrictions, unless specifically approved otherwise in writing by the Owner.

8. No signs, other than those approved by the Construction Administrator, will be visible on the premises.

C. **Use of the Existing Building:** Maintain the existing building in a weather-tight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period. Note: Check with Agency special types of conditions.

1.7 OCCUPANCY REQUIREMENTS

A. **No** Occupancy: Agency will not occupy the building prior to Substantial Completion of the Work.

1.8 MISCELLANEOUS PROVISIONS

A. **Examination of Site:**

1. It is not the intent of the Documents to show all existing conditions. All Contractors and Subcontractors are advised to attend the Pre-Bid Meeting prior to submitting their Bid Proposals. This is the only official opportunity to visit and examine the site with the Owner, Agency, Architect, Engineer and Construction Administrator.

2. The Contractor should investigate and satisfy himself as to the conditions affecting the work, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, uncertainties of weather, roads or similar physical conditions of the ground, the character of equipment, and facilities needed preliminary to and during the prosecution of the Work. The Contractor should further satisfy himself as to the character, quality, and quantity of

surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the Contract Documents. Any failure by the Contractor to acquaint himself with the available information shall not relieve him from the responsibility for estimating properly the difficulty and cost of successfully performing the Work.

3. If tests have been done for Asbestos Containing Material (ACM), Lead-Based Paint (LBP) Containing Material, Polychlorinated Biphenyls (PCBs) in Building Materials and/or Mold, then the results are referenced in **Section 00 30 00 Available Information and provided in Division 50 00 00 Project-Specific Available Information**. See **Section 01 35 16 "Alteration Project Procedures"** for **removal responsibility** and additional information.

B. Pre-Bid Meeting:

1. A Pre-Bid Meeting and tour of the site will be conducted as scheduled in Division 00 Section 00 11 16 “Invitation to Bid”. This scheduled meeting is the only official opportunity for the bidders to tour the site with the Owner, Architect, Engineer, Construction Administrator, and Agency.

C. Project Documents:

1. The Specifications and Drawings are intended to describe and illustrate the materials and labor necessary for the work of this Project.
2. Throughout the Drawings and Technical Specifications, the Connecticut Department of Transportation Standard Specifications for Roads, Bridges, and Incidental Construction Form 816, current edition including any interim and supplemental specifications are referenced. Where so referenced the requirements set forth therein are applicable and made a part hereof. Copies of Form 816 are available from the Connecticut Department of Transportation at a nominal charge.

E. Scope Review:

1. Prior to signing a Contract with the State, DAS/CS will conduct a full scope review with the apparent Low Bidder to ensure that all of the requirements have been included within the bid. This scope review will highlight all of the specific requirements of the project, a review of the DAS/CS procedures and all of the Technical sections of the contract documents.
2. This process will ensure that all of the scope of work included in the contract documents has indeed been included.

F. Specifications, Drawings, and Electronic Data Storage Devices Furnished:

1. The Contractor shall receive **one (1) set** of **Portable Document Format (PDF, latest version) Conformed Bid Documents** (incorporating all Addendum changes made to the Contract Documents during the official Bid Period) on Electronic Data Storage Devices on or about the time of execution of the Contract, free of charge from the Architect. If additional copies are wanted, they will be available at the direct additional cost of their reproduction, to the Contractor.
2. The Contractor shall receive **one (1)** set of **AutoCAD compatible (latest version) Conformed Set of Floor Plans** (incorporating all Addendum changes made to the Contract Documents during the official Bid Period) on Electronic Data Storage Devices at no cost on or about the time of execution of the Contract from the Architect. Additional sets of AutoCAD compatible (latest version) Floor Plans on Electronic Data Storage Devices from the Architect shall be available at the cost of their reproduction, to the Contractor.

G. Construction Responsibility:

1. The Contractor shall be responsible for his construction means, methods, techniques, sequences, and procedures employed in the performance of his work and shall have full responsibility for his failure to carry out any part of his work in accordance with the Contract Documents.

H. Overtime Requests:

1. The Contractor shall request approval from the Owner to work overtime. Said request shall be made forty eight (48) hours in advance. All costs for overtime are included in the Contract Sum as stated in Division 00 Section 00 41 00 "Bid Proposal Form."

I. PMWeb Project Management:

1. DAS/CS is using PMWeb as the project management collaborative software tool for this project.
2. The Contractor is required to utilize PMWeb for the duration of this project and shall provide all project information via this program management software. This includes, but is not limited to contracts, applications for payment, change orders, change order proposals, requests for information, etc.

3. The DAS/CS Project Manager shall arrange for training. This training is for the Contractor's Staff, the DAS/CS Project Manager, the Construction Administrator, the A/E, and their representatives.

4. DAS/CS will be establishing a project specific email "file" address for this project. The Contractor shall send an electronic "file" copy of all project documents to this email address, to include but not limited to all project correspondence, project emails, forms, etc.

5. The Contractor is required to scan all documents that contain wet (ink) signatures and send a copy of those documents electronically to the DAS/CS Project Manager and the project specific email "file" address. The hard copy of the wet signature documents shall be transmitted as directed by the DAS/CS Project Manager. This includes, but is not limited to all contracts, change orders, applications for payment, closeout documentation, etc.

J. Subcontractor Performance Evaluations:

1. Pursuant to C.G.S. Sec. 4a-101, the Contractor shall compile evaluation information during the performance of the contract on each of its subcontractors who are performing work with a value in excess of five hundred thousand dollars ($500,000.00). The Contractor shall complete and submit to DAS/CS evaluations of each such subcontractor upon fifty percent (50%) completion of the project and upon Substantial Completion of the project. The Contractor acknowledges that its failure to complete and submit these evaluations in a timely manner may, by statute, result in a delay in project funding and, consequently, payment to the Contractor. The Contractor agrees to indemnify and hold the State harmless from any loss, damage, or expense that results from or is caused by the Contractor's failure to complete and submit the evaluations to DAS/CS in accordance with this provision.

K. Reporting and Contracting Requirements for Contractor and Subcontractor Payments:

1. For compliance with **C.G.S. Sec. 4b-95 and 49-41**, DAS/CS requires every Contractor (and its Subcontractors) who has been awarded a DAS/CS construction contract to log on to the State of Connecticut web-based platform, BizNet, **each month** and **enter payments** they have received from the state, from the Contractor, or from a higher tier Subcontractor (as applicable).

2. The process is described as follows: The state will pay the Contractor on a monthly basis for work performed (and purchases made) by it and its Subcontractors. The Contractor will input the payment date and amount they receive from the state on a monthly basis. The Contractor's first-level Subcontractor (Tier 1 Subcontractor) will input the payment they receive from the Contractor. The second-level Subcontractor (Tier 2 Subcontractor) will input the payment they receive from the Tier 1 Subcontractor. And so on.

3. Contractors awarded a DAS/CS construction contract shall contain **a provision in their subcontract agreements** requiring their Subcontractors to enter payment receipt from the Contractor in the State of Connecticut web-based platform, BizNet, for work performed or purchases made in relation to state projects.

4. Detailed instructions can be found in the DAS/CS publication, "**6002 Instructions to Contractors/Subcontractors for Entering Payments in BizNet**", available for download by going to the DAS Homepage (www.ct.gov/DAS) and selecting Doing Business With The State > State Building Construction > Publications and Forms > DAS Construction Services Library > 6000 Series.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 11 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Contract Documents and general provisions of the Contract, including General and Supplementary Conditions, other Division 01 Specification Sections, and Section 00 41 00 "Bid Proposal Form" apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Allowances.

2. Unit Prices.

B. Related Sections: The following Sections contain requirements that relate to this Section:

Section 01 26 00 Contract Modification Procedures

Section 01 29 76 Progress Payment Procedures

Section 01 35 16 Alteration Project Procedures

Section 01 35 26 Government Safety Requirements

Section 01 50 00 Temporary Facilities and Controls

Section 01 77 00 Closeout Procedures

Section 02 42 96 Historic Removals and Dismantling

Section 02 82 13 Asbestos Abatement

Section 02 83 13 Lead Paint Activity

Section 31 20 00 Site Earth Moving

1.3 ALLOWANCES

A. This Section includes administrative and procedural requirements for Allowances:

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 26 00 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

C. Cash Allowances:

1. The Contractor's costs for unloading and handling, labor, installation costs, storage, insurance, overhead and profit and other expense related to the Allowance item shall be included in the Contractor's Lump Sum Base Bid Amount and not in the Allowance unless stated otherwise in the Allowance Schedule of this section.

2. Architect/Engineer Responsibilities:

a. Consult with Contractor for consideration of Products, suppliers and installers.

b. Select Products in consultation with the DAS/CS Project Manager and Agency Representatives and transmit decision to Construction Administrator.

c. Prepare Change Order.

3. Construction Administrator Responsibilities:

a. Consult with Architect/Engineer, Contractor, DAS/CS Project Manager and Agency Representatives for consideration of Products, suppliers and installers.

b. Select Products in consultation with Architect/Engineer, DAS/CS Project Manager and Agency Representatives and transmit decision to Contractor.

c. Prepare Change Order.

4. Contractor Responsibilities:

a. Assist Architect/Engineer and Construction Administrator in selection of Products and Suppliers.

b. Obtain proposals from Suppliers and offer recommendations.

c. On notification of selection by Construction Administrator execute purchase agreement with designated supplier.

d. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.

e. If the actual cost of an Allowance item is more or less than the given amount, the Contract Sum will be adjusted by Change Order.

5. Allowance Schedule:

a. Civil Sheet CD-101, note: Include the Stipulated Sum of $1800 for milling and overlaying existing pavement around ADA parking area.

b. Electrical Sheet E-200, note 2: Include the Stipulated sum of $1000 per circuit for purchase and delivery of electrical wiring upgrades in basement. Up to 30 circuits may be involved.

1.4 DEFINED UNIT PRICES - GENERAL

A. This Section includes administrative and procedural requirements for unit prices.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 26 00 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

2. Division 01 Section 01 29 76 "Progress Payment Procedures" for procedures for submitting Application for Payments.

C. Definition - Unit Price: Amount the Contractor acknowledges in the Bid Proposal Form as a price per unit of measurement for materials or services as described in the Contract Documents.

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1. Unit Prices included in the Contract Documents are to be used for determining compensation to the Contractor or Owner for changes to the scope of the work indicated in the Contract Documents, and included in the Lump Sum Contract Price. Special Unit Prices are for items complete, in place, and shall be inclusive of furnishing and installing of all material, labor, trucking, overhead, profit, equipment, hoisting, excavation, stockpiling, loading, engineering, scaffolding, power hookups, protection, shop drawings, taxes, permits, appliances, delivery, disposal, insurance, supervision, cost of bond, etc. and shall remain in effect until completion of the Contract.

2. Unit Price: Is identified by the Owner as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if the estimated quantities of Work required by the Contract Documents are increased or decreased.

3. Increases or Decreases: Should the amount of the Work required be increased or decreased because of changes in the work ordered in writing by the DAS/CS Project Manager, the Contractor agrees that the following supplemental UNIT PRICES will be decreased 10% for a reduction of work. Each Unit Price shall include all equipment, tools, labor, permits, fees, etc., incidental to the completion of the work involved. All items marked with an asterisk (*****) in the unit price schedules shall include the completion of the excavation, formation and compaction of sub-grade and the disposal of surplus or unsuitable materials in accordance with the Plans and Specifications or as directed by the Construction Administrator.

4. The Owner reserves the right to reject the Contractor's measurement of work-in-place that involves use of established unit prices, and to have this work measured, at the Owner's expense, by an independent surveyor acceptable to the Contractor.

5. Defect Assessment: Replace the Work, or portions of the Work, not conforming to the specified requirements. If, in the opinion of the Architect/Engineer, it is not practical to remove and replace the work the Architect/Engineer will direct an appropriate remedy or adjust the payment.

6. Unit Price Schedules: "Unit Price Schedules" are included in this Section. Specification Sections referenced in the Schedule sections contain requirements for materials described under each unit price.

1.5 UNIT PRICE SCHEDULE – EARTH AND ROCK EXCAVATION

This Section includes administrative and procedural requirements for the following unit prices and provisions that are to be included in and become part of this Contract to be used in evaluating additions to or deductions from the work called for in the specifications and/or plans.

A. Earth and Rock Excavation:

1. Unless otherwise specified elsewhere in these documents, Contractors are to assume that all excavation is earth; however, if unspecified rock is encountered, it will be paid for at the given unit prices listed in Paragraph "C". Rock prices are net in that allowances for reduced quantities of earth are also included in the unit prices. The prices given include all costs for overhead, profit and rock surveys.
2. Wherever rock to be excavated is encountered, the Contractor shall strip or expose the rock to such an extent that in the Owner's opinion the necessary measurements can be taken. The Contractor shall provide the Owner with a survey by a licensed land surveyor indicating top of rock elevations at points of intersection on a rectilinear grid with lines spaced sufficiently close to show accurately the rock surface contours. At the Owner's option, an additional survey may be furnished by the Owner from a licensed surveyor.
3. If the conditions of the excavation work indicated are clearly of a special nature, the Contractor may ask the Owner for reconsideration of the established unit prices and if granted, the unit prices will not apply, and prices will be negotiated in accordance with Article 13 of the General Conditions.

B. Definitions:

1. **"EARTH"** - is defined as excavation and shall include removal of all materials other than 'water' and 'rock'.
2. **"ROCK"** - is defined as a boulder of one cubic yard or more in volume (1/2 cubic yard for a boulder in trenches), rock in definite ledge formation, and masonry structures of one cubic yard or more in volume, the removal of which requires the use of mechanical equipment or the use of explosives. Rock removed by scarification or ripping method is considered as a separate classification under Paragraph 4.c.1.0.
3. **"ORIGINAL GRADE"** - is defined as being the grade which exists at the time of Contract Award.
4. **"ROUGH GRADE"** - is defined as being the completed surface of required excavations greater than 13' in width.
5. **"MASS"** - excavation is to be considered as an open area whose minimum horizontal dimensions exceed 13'.
6. **"TRENCH**" - is defined as excavation is defined as the removal of material from areas 13 feet or less in its minimal horizontal dimensions and below the elevation of rough grade or original grade, whichever is lower.

C. Procedures:

1. **Rock Excavation in Trenches: Basis for Horizontal Measurement:**
   a. **Horizontal Measurements:** Will be taken between the vertical planes as defined below.
   b. **The Minimum Width of Trenches in Rock:** Will be taken as 3' 0".
   c. **Excavation For Walls Or Piers With Footings:** The measurements will be taken parallel to and one foot outside of the edges of the concrete footings as called for in the plans (i.e. for 4' 0" footing, rock will be taken as 6' 0" in width).
   d. **Excavation For Walls Or Piers Without Footings:** The limits of the excavation will be 1' 6" outside of the line of concrete at bottom as shown or called for in the plans (i.e. for a wall with a bottom thickness of 1' 0", the width of the trench will be considered to be 4' 0"). (Caissons are excluded from these measurements).
   e. **Excavation for Pipe Lines:** Will be measured at 2' 0" more than the nominal inside diameter of **the pipe but in no case less than 3' 0" wide.**
   f. **Excavation For Tanks, Vaults, Manholes, Pits, Etc.:** Will be measured as 2' 0" greater in both length and width or diameter than the actual exterior dimensions of the structures and this excavation is considered to be trench only if any measured horizontal dimensions is 13' or less.
   g. No allowance will be made for rock removed beyond the above limits.
2. **Rock Excavation in Trenches - Basis for Vertical Measurement:**
   a. To determine depth of trench, vertical measurements will be taken from original grade or rough grade, (whichever is applicable), to the bottom of required excavation. These measurements will define the maximum depths for payments.
   b. To determine quantity of rock in trench, vertical measurements will be taken from the top of rock as encountered in the trench to 12" below the bottom of required rock excavation. Any over excavation below the required elevation shall be filled with concrete or other material as specified at no cost to the Owner.

c. No allowance will be made for rock removed beyond the above limits.

3. Earth Excavation in Trenches - Basis of Measurement: (Horizontal & Vertical): The basis of measurements and allowance limit for earth excavation in trenches is identical to that indicated for rock excavation in trenches, except that there will be no allowance for 12" below the required elevation. In addition the following will prevail:

a. Maximum allowable widths for earth excavation in trenches without shoring:

Trench Depth - Classification	Add To Nominal ID Of Pipe Or To Footing Width
0 ft. - 6 ft.	3 ft.
Over 6 ft. - 10 ft.	5 ft.
Over 10 ft. - 15 ft.	7 ft.
Below 15 ft. deep the width of the trench shall be based on the individual case. The final depth of trench will determine the actual width for payment.	

b. If shoring is required the measurement shall be taken between the exterior walls of the shoring not to exceed 4' plus the I.D. of the pipe (for all depths).

c. To determine quantity of earth in trench, vertical measurements will be taken from the original or rough grade to actual bottom of earth excavation required.

4. Unit Prices - Earth and Rock Excavation (Basis for Payment): Prices include backfill with excavated material if it is suitable. Prices also include all excavation and disposal of all surplus or unsuitable material. Where replacement with the excavated material is prohibited or a particular backfill material is specified, the cost of the delivered replacement material in a volume equal to the above excavation pay limits minus the volume of the items installed in the trench shall be paid for at a prior negotiated price. Prices do not include costs of shoring and de-watering but do include sloping for sides of excavation. Payment and credit amounts shall be determined in the following manner: Widths and depths of trench excavation as indicated. The total quantity of earth or rock excavation encountered in each depth payment category shall be paid for at its respective unit price as shown below. For example, in a 15' trench excavated by machine, the first 6' will be paid for at the 0' - 6' price; the next 4' will be paid for at the over 6' - 10' price and the next 5' will be paid for at the over 10' - 15' price. Thus three different price brackets will prevail.

1.5 Unit Price Schedule – Earth and Rock Excavation					
a.	**EARTH EXCAVATION - HAND**		**UNIT**	**$ ADD**	**$ DEDUCT**
1.0	In Trenches (0' - 6' deep)		C.Y.	36.00	28.80
2.0	In Trenches (below 6' deep)		Prices Must Be Negotiated Before Work Is Started.		
b.	**EARTH EXCAVATION - MACHINE**		**UNIT**	**$ ADD**	**$ DEDUCT**
1.0	Open Area (All Depths)		C.Y.	18.81	15.05
2.0	In Trenches:				
	2.1	In trenches (0' - 6' deep)	C.Y.	14.27	11.40
	2.2	In trenches (6' - 10' deep)	C.Y.	19.71	15.75
	2.3	In trenches (10' - 15' deep)	C.Y.	35.00	28.00
	2.4	In trenches (15' - 20' deep)	C.Y.	75.00	60.00
c.	**ROCK EXCAVATION**		**UNIT**	**$ ADD**	**$ DEDUCT**
1.0	Open Areas, Rock Removed By Ripping (Any Amount) – Net Rock		C.Y.	103.50	82.80
2.0	Open Areas, With Explosives:				
	2.1	Net Rock (Total Quantity Up To 100)	C.Y.	126.00	100.80
	2.2	Net Rock (Total Quantity Up To 1,000)	C.Y.	60.00	48.00
	2.3	Net Rock (Total Quantity More Than 1,000)	C.Y.	28.00	22.40
3.0	In Trenches, Boulders, Remove By Machine		C.Y.	45.00	36.00
4.0	In Trenches, Ripping Of Rock By Machine		C.Y.	105.00	84.00
5.0	In Trenches, With Explosives:				
	5.1	Net Rock (0' - 4' Deep)	C.Y.	95.60	76.50
	5.2	Net Rock (4' - 10' Deep)	C.Y.	125.00	100.00
	5.3	Net Rock (10' - 15' Deep)	C.Y.	150.00	120.00
	5.4	Net Rock (15' - 20' Deep)	C.Y.	200.00	160.00

	5.5 Net Rock (Over 20' Deep)	Prices Must Be Negotiated Before Work Is Started.		
6.0	Jack Holes (For Hydraulic Lift/Elevators)	L.F.	95.00	76.00
7.0	Open Or Mass Areas (If Explosives Are Prohibited): Net Rock	C.Y.	125.00	100.00
8.0	Trench Excavation With Rock Splitters and Jack Hammer or Hoe Ram (If Explosives Are Prohibited): Net Rock	C.Y.	150.00	120.00

1.6 UNIT PRICE SCHEDULE – MISCELLANEOUS ITEMS

This Section includes administrative and procedural requirements for the following unit prices and provisions that are to be included in and become part of this Contract to be used in evaluating additions to or deductions from the work called for in the specifications and/or plans.

A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Unit Price Schedule – Miscellaneous Items:

1.6 Unit Price Schedule – Miscellaneous Items					
Section Number &/or Drawing Number	**Item Description**	**Base Bid Quantity**	**Unit of Measurement**	**$ Add Unit Price**	**$ Deduct Unit Price**
04 03 22	**Historic Brick Masonry Repair**	**20**	**Per Square Foot**	$ **700**	$ **560**
04 03 23	**Historic Brick Masonry Repointing**	**110**	**Per Linear Foot**	$ **120**	$ **96**
04 03 42	**Historic Stone Masonry Repair**	**As shown**	**Per Stone**	$ **450**	$ **360**
04 03 43	**Historic Stone Masonry Repointing**	**200**	**Per Linear Foot**	$ **15**	$ **12**
06 03 12	**Historic Wood Repair**	**As shown**	**Per Square Foot**	$ **400**	$ **320**
09 03 20	**Historic Treatment of Plaster**	**As shown**	**Per Square Foot**	$ **500**	$ **400**
09 03 91	**Historic Treatment of Plain Paint**	**As shown**	**Per Square Foot**	$ **6.25**	$ **5.00**

C. The **$Add** and **$Deduct** Unit Prices shown in the table above are a **price per unit measurement** for materials, services, or work added to or deducted from the Contract Sum by appropriate modification **if the Base Bid Quantities** of the Work listed in the above Schedule and described in the corresponding Section and/or Drawing are **increased or decreased**.

D. The **Base Bid Quantities** for each type of Work listed in the above Schedule and described in the corresponding Section shall be included in the Contractor's **Lump Sum Base Bid**.

E. Unit Prices shall be negotiated if there is a change in scope of work.

1.7 UNIT PRICE SCHEDULE – ALTERATIONS

This Section includes administrative and procedural requirements for the following unit prices and provisions that are to be included in and become part of this Contract to be used in evaluating additions to or deductions from the work called for in the specifications and/or plans.

A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Unit Price Schedule – Alterations:

1.7 Unit Price Schedule - Alterations					
Section Number &/or Drawing Number	**Item Description**	**Base Bid Quantity**	**Unit of Measurement**	**$ Add Unit Price**	**$ Deduct Unit Price**
CG-101	**Asphalt Paving**	550	Per Square Foot	$ 4.00	3.92

C. The **$Add** and **$Deduct** Unit Prices shown in the table above are a **price per unit measurement** for materials, services, or work added to or deducted from the Contract Sum by appropriate modification **if the Base Bid Quantities** of the Work listed in the above Schedule and described in the corresponding Section and/or Drawing are **increased or decreased**.

D. The **Base Bid Quantities** for each type of Work listed in the above Schedule and described in the corresponding Section shall be included in the Contractor's **Lump Sum Base Bid**.

E. Unit Prices shall be negotiated if there is a change in scope of work.

1.9 UNIT PRICE SCHEDULE – HAZARDOUS BUILDING MATERIALS ABATEMENT

This Section includes administrative and procedural requirements for the following unit prices and provisions that are to be included in and become part of this Contract to be used in evaluating additions to or deductions from the work called for in the specifications and/or plans.

A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions, other Division 01 Specification Sections, and Technical Specifications apply to this Section.

B. Unit Price Schedule – Hazardous Building Materials Abatement:

1.9.1 ASBESTOS ABATEMENT		UNIT	$ ADD/ DEDUCT
AR-001	CLEAN-UP OF ACM DEBRIS BY HEPA VACUUMING	SF	$0.23
AR-002	REMOVAL OF PIPE INSULATION INCLUDING FITTINGS (FULL CONTAINMENT - < 6" DIA)	LF	$1.63
AR-003	REMOVAL OF PIPE INSULATION INCLUDING FITTINGS(FULL CONTAINMENT - 6" - 12" DIA)	LF	$2.68
AR-004	REMOVAL OF PIPE INSULATION INCLUDING FITTINGS(FULL CONTAINMENT - >12" DIA)	LF	$3.65
AR-005	GLOVE BAG REMOVAL OF PIPE OR FITTING INSULATION (MINI-CONTAINMENT - FIRST 25)	EA	$26.05
AR-006	GLOVE BAG REMOVAL OF PIPE OR FITTING INSULATION (MINI-CONTAINMENT - QUANTITY BETWEEN 25-50)	EA	$20.56
AR-007	GLOVE BAG REMOVAL OF PIPE OR FITTING INSULATION (MINI-CONTAINMENT - QUANTITY IN EXCESS OF 50)	EA	$18.30
AR-008	REMOVAL OF EQUIPMENT INSULATION	SF	$3.81
AR-009	REMOVAL OF HVAC DUCT INSULATION	SF	$3.81
AR-010	REMOVAL OF HVAC DUCT SYSTEM FLEXIBLE CONNECTOR	SF	$2.77
AR-011	REMOVAL OF RESILIENT FLOORING INCLUDING MASTIC	SF	$1.05
AR-012	REMOVAL OF RESILIENT FLOORING (NO MASTIC)	SF	$0.67
AR-013	REMOVAL OF SPRAYED ON FIREPROOFING	SF	$2.61
AR-014	REMOVAL OF PLASTER CEILING SYSTEM (INCLUDING BLACK IRON AND METAL LATH)	SF	$2.68
AR-015	REMOVAL OF ACOUSTIC OR METAL PAN CEILING SYSTEM (INCLUDING GRID)	SF	$1.74
AR-016	REMOVAL OF ACOUSTIC CEILING PANELS (CLEAN GRID FOR REUSE)	SF	$1.45
AR-017	REMOVAL OF ACOUSTIC PLASTER FINISH MATERIAL (SCRAPE)	SF	$2.45
AR-018	PATCH AND/OR SEAL DAMAGED INSULATION	SF	$1.05
AR-019	REMOVAL OF CONTAMINATED SOIL (2" DEPTH)	SF	$1.69
AR-020	REMOVAL OF TRANSITE MATERIAL	SF	$0.92
AR-021	REMOVAL OF ROOFING OR ROOF FLASHING MATERIAL	SF	$1.34

AR-022	REMOVAL OF UNDERGROUND PIPE OR PIPE INSULATION (INCLUDING HAND EXCAVATION)	LF	$10.75
AR-023	REMOVAL OF CARPET OVER RESILIENT FLOORING	SF	$0.83
AR-024	REMOVAL OF WALL BASE AND MASTIC	LF	$0.95
AR-025	REMOVAL OF DRYWALL PARTITION (INCLUDING WALL FRAMING)	SF	$0.90
AR-026	REMOVAL OF CMU WALL	SF	$1.82
AR-027	PREP WORK AREA	SF	$1.09
AR-028	SOLID BARRIERS OR ACCESS TUNNELS (2"x4"@16", 1/2" PLYWOOD)	SFSA	$1.26
AR-029	SELECTIVE DEMOLITION TO ACCESS CONCEALED ACM	SF	$1.11
AR-030	REMOVAL OF FLOOR LEVELING MATERIAL	SF	$0.79
AR-031	SMALL CONTAINMENT PREPARATION TO ENCLOSE ASBESTOS ABATEMENT AREAS (>160 SF/260 LF)	CONTAINMENT	$1,500.00
AR-032	LARGE CONTAINMENT PREPARATION TO ENCLOSE ASBESTOS ABATEMENT AREAS (>160 SF/260 LF)	CONTAINMENT	$3,500.00
AR-033	CEMENTITIOUS ROOF SHINGLES REMOVAL AND DISPOSAL AS ACM	SF	$10.00
AR-034	ROOF DRAIN CAULKING REMOVAL AND DISPOSAL AS ACM	LF	$20.00
AR-035	ROOFING DEBRIS REMOVAL AND DISPOSAL AS ACM	EA	$25.00
AR-036	MUDDED PIPE FITTING INSULATION REMOVAL AND DISPOSAL AS ACM	EA	$50.00
AR-037	FLOOR TILE AND ASSOCIATED MASITC REMOVAL AND DISPOSAL AS ACM	SF	$7.00
AR-038	PLASTER REMOVAL AND DISPOSAL AS ACM	SF	$7.00
AR-039	MIRROR GLUE REMOVAL AND DISPOSAL AS ACM	SF	$10.00
AR-040	WINDOW CAULKING REMOVAL AND DISPOSAL AS ACM	LF	$16.00
AR-041	EXPANSION JOINT CAULKING REMOVAL AND DISPOSAL AS ACM	LF	$12.00
AR-042	DOOR CAULKING REMOVAL AND DISPOSAL AS ACM	LF	$15.00
AR-042	CEMENTITIOUS SOFFIT PANELING REMOVAL AND DISPOSAL AS ACM	SF	$15.00
AR-043	CAULKING ASSOCIATED WITH FASCIA REMOVAL AND DISPOSAL AS ACM	LF	$15.00
AR-044	ROOFING MATERIALS (BUILT-UP ROOF LAYERS, FLASHING, TARS) REMOVAL AND DISPOSAL AS ACM	SF	$200.00
AR-045	FIRE DOOR REMOVAL AND DISPOSAL AS ACM	EA	$1.45
AR-046	DAMPPROOFING REMOVAL AND DISPOSAL AS ACM	SF	$25.00
AR-047	VAPOR BARRIER UNDER CONCRETE FLOOR REMOVAL AND DISPOSAL AS ACM	SF	$35.00

1.9.2 LEAD-BASED PAINT ABATEMENT		**UNIT**	**$ ADD/ DEDUCT**
SP-001	REMOVE LOOSE PAINT FROM WALLS OR CEILINGS (WET SCRAPING OR BRUSHING)	SF	$0.89
SP-002	STRIP PAINT FROM FLAT SURFACES	SF	$2.93
SP-003	STRIP PAINT FROM COLUMNS AND STRUCTURAL FRAMING MEMBERS	SF	$3.68
SP-004	STRIP PAINT FROM STAIR TREADS, RISERS AND STRINGERS	SF	$5.08
SP-005	STRIP PAINT FROM TRIM	LF	$2.82
SP-006	STRIP PAINT FROM DOORS (DOOR OPENING SIZE)	SF	$4.54
SP-007	STRIP PAINT FROM WINDOW (WINDOW SIZE)	SF	$7.08
SP-008	STRIP PAINT FROM RADIATOR	SF	$8.75
SP-009	STRIP PAINT FROM HANDRAIL	LF	$7.35
SP-010	STRIP PAINT FROM PIPING	SF	$6.30
SP-011	CLEAN-UP OF MATERIALS CONTAINING LEAD (DIRT, BUILDING DEBRIS, ETC.)	CF	$3.43
SP-012	HEPA VACUUMING AND WASHING SURFACE (SMOOTH SURFACE)	SF	$0.63
SP-013	HEPA VACUUMING AND WASHING SURFACE (POROUS SURFACE)	SF	$1.05
SP-014	REMOVE EXTERIOR SOIL (6" DEPTH)	SF	$4.50

1.9.5 REWORK ITEMS DURING ABATEMENT ACTIVITIES		**UNIT**	**$ ADD/ DEDUCT**
RW-001	REINSULATE PIPE 1" THICK FIBERGLAS ASJ	SF	$2.83
RW-002	REINSULATE PIPE 1 1/2" THICK FIBERGLAS ASJ	SF	$3.62
RW-003	REINSULATE PIPE 2" THICK FIBERGLAS ASJ	SF	$4.30
RW-004	REINSULATE PIPE FITTING 1" THICK FIBERGLAS ASJ	EA	$4.37
RW-005	REINSULATE PIPE FITTING 1 1/2" THICK FIBERGLAS ASJ	EA	$5.34

RW-006	REINSULATE PIPE FITTING 2" THICK FIBERGLAS ASJ	EA	$6.50
RW-007	REINSULATE MECHANICAL EQUIPMENT 3 PCF, 2" THICK	SF	$3.50
RW-008	REINSULATE HVAC DUCT SYSTEM (FLEXIBLE DUCT WRAP) 0.75 PCF, 1 1/2" THICK	SF	$2.25
RW-009	REINSULATE HVAC DUCT SYSTEM (RIGID BOARD) 3 PCF, 1 1/2" THICK	SF	$6.00
RW-010	REPLACE HVAC DUCT SYSTEM FLEXIBLE CONNECTOR	SF	$7.83
RW-011	REPLACE TRIM COMPONENT (WOOD CASING, JAMB, APRON, ETC.)	LF	$1.26
RW-012	REPLACE INTERIOR DOOR (SOLID CORE FLUSH OR 6-PANEL PINE)	EA	$207.50
RW-013	REPLACE WINDOW (SASH ONLY)	EA	$207.50
RW-014	REPLACE WINDOW (COMPLETE UNIT INCLUDING FRAME)	EA	$375.00
RW-015	PAINT FLAT SURFACES (PRIMER + FINISH COAT)	SF	$0.27
RW-016	PAINT COLUMNS AND STRUCTURAL FRAMING MEMBERS (PRIMER + FINISH COAT)	SF	$2.89
RW-017	PAINT STAIR TREADS, RISERS AND STRINGERS (PRIMER + FINISH COAT)	SF	$2.89
RW-018	PAINT HANDRAIL (PRIMER + FINISH COAT)	LF	$0.27
RW-019	PAINT TRIM COMPONENT (CASING, JAMB, APRON, ETC., PRIMER + FINISH COAT)	LF	$0.83
RW-020	PAINT DOORS (DOOR OPENING SIZE - INCLUDES BOTH FACES PRIMER + FINISH COAT)	SF	$1.67
RW-021	PAINT WINDOW (INCLUDES INTERIOR & EXTERIOR PRIMER + FINISH COAT)	SF	$1.97
RW-022	PAINT RADIATOR (PRIMER + FINISH COAT)	SF	$2.97
RW-023	PAINT PIPING (PRIMER + FINISH COAT)	LF	$0.29
RW-024	REPLACE EXTERIOR SOIL (6" LOAM AND SEED)	SF	$7.19
RW-025	ASPHALT PAVING	SF	$3.43

1.9.6 MISCELLANEOUS ABATEMENT ITEMS		UNIT	$ ADD/ DEDUCT
MI-001	MOBILIZATION (1 PER WORK AREA)	EA	$262.50
MI-002	WORKER DECON (1 PER WORK AREA)	EA	$262.50
MI-003	CONTAINMENT BARRIERS TO SEPARATE THE WORK AREA (SOFT BARRIER)	SF	$1.02
MI-004	CONTAINMENT BARRIERS TO SEPARATE THE WORK AREA (HARD BARRIER)	SF	$2.55
MI-005	TEMP ELECTRICAL CONNECTION (LICENSED ELECTRICIAN)	EA	$450.00
MI-006	TEMP ELECTRICAL GENERATOR	DY	$375.00
MI-007	DISPOSAL OF ACM WASTE (INCLUDES TRANSPORTATION)	CY	$60.00
MI-008	DISPOSAL OF HAZARDOUS WASTE MATERIAL (INCLUDES TRANSPORTATION)	TON	$380.00
MI-009	DISPOSAL OF CONSTRUCTION DEBRIS (INCLUDES TRANSPORTATION)	TON	$30.00
MI-010	ABATEMENT SUPERVISOR (LICENSED)	HR	$81.00
MI-011	STAND-BY ABATEMENT PERSONNEL (EACH LICENSED WORKER)	HR	$74.00
MI-012	ENCAPSULATION UTILIZING LIQUID COATING SYSTEM	SF	$0.69
MI-013	ENCAPSULATION UTILIZING HEAVY BODIED REINFORCED COATING SYSTEM	SF	$1.03
MI-014	FIXED SCAFFOLDING	SF	$16.00
MI-015	EXCAVATION TO EXPOSE UNDERGROUND PIPE	CY	$25.00
MI-016	PROJECT NOTIFICATION AND FEES	EA	$0.00
MI-017	PROJECT BOND (3% OF CONTRACT)	EA	$0.00

1.9.7 COMPONENT REPLACEMENT DURING ABATEMENT ACTIVITIES		UNIT	$ ADD/ DEDUCT
CR-001	REMOVE TRIM COMPONENT (CASING, BASE, APRON, ETC.)	LF	$0.49
CR-002	REMOVE DOOR (DOOR ONLY)	SF	$0.27
CR-003	REMOVE DOOR (INCLUDING JAMB, NO TRIM)	SF	$0.61
CR-004	REMOVE WINDOW (SASH ONLY)	SF	$0.40
CR-005	REMOVE WINDOW (COMPLETE UNIT INCLUDING FRAME)	SF	$0.92
CR-006	REMOVE RADIATOR	SF	$0.77
CR-007	REMOVE MISCELLANEOUS ITEM	CF	$7.56

C. The $Add and $Deduct Unit Prices shown in the tables above are a **price per unit measurement** for materials, services, or work added to or deducted from the Contract Sum by appropriate modification **if the Base Bid Quantities** of the Work listed in the Contract Documents are **increased or decreased**.

D. The **Base Bid Quantities** for each type of Work listed in the above Schedule and described in the Contract Documents shall be included in the Contractor's **Lump Sum Base Bid**.

E. Unit Prices shall be negotiated if there is a change in scope of work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 20 00

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for handling requests for equals and substitutions made after award of the Contract.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 33 00 "Submittal Procedures" specifies requirements for submitting the Contractor's Construction Schedule and the Submittal Schedule.
2. Division 01 Section 01 42 20 "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
3. Division 01 Section 01 60 00 "Product Requirements" specifies requirements governing the Contractor's selection of products and product options.

1.3 DEFINITIONS

A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.

B. Equals or Substitutions General: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract.

1.4 SUBMITTALS

A. Equals and Substitution Request Submittals: The Owner will consider requests for equals or substitutions if made prior to the Receipt of the Competitive Bid. The information on all materials shall be consistent with the information herein. After the contract award, substitutions will be considered for materials or systems specified that are no longer available. It will not be considered if the product was not purchased in a reasonable time after award. The Contractor shall submit all equal and substitutions requests on the **"Equal or Substitute Product Request (Form 7001)"**, an example of which is shown at the end of this Section. The Form is available from the Construction Administrator (CA). See Article 15 in the General Conditions for further refinement and information.

B. The Contractor is required to prepare and submit three (3) copies of the required data for the first manufacturer listed or procedure listed in the specifications section with reference to all of the following areas: the substance and function considering quality, workmanship, economy of operation, durability and suitability for purposes intended including the size, rating performance, LEED® compliance, and cost. All submissions must include all the required data for the first listed manufacturer or procedure as specified, as well as the required data for the proposed Equal or Substitution. This will enable the Owner and Architect to determine that the proposed Equal or Substitution is or is not substantially equal to the first listed manufacturer or procedure.

1. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.

2. Provide complete documentation showing compliance with the requirements for equals or substitutions, and the following information, as appropriate:

a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors that will be necessary to accommodate the proposed Equal or Substitution.

b. A detailed comparison chart of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.

c. Product Data, including Shop Drawings and descriptions of products and fabrication and installation procedures.

d. Samples, where applicable or requested.

e. A statement indicating the effect on the Contractor's Construction Schedule or CPM Schedule compared to the schedule without approval of the Equal or Substitution. Indicate the effect on overall Contract Time.

f. Cost information, broken down, including a proposal of the net change, if any in the Contract Sum.

g. The Contractor's certification that the proposed Equal or Substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.

h. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the Equal or Substitution to perform adequately.

3. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation within **seven (7) days** of receipt of the original request for equal or substitution request. The Architect will notify the Construction Administrator who will notify the Owner of recommended acceptance or rejection of the proposed equal or substitution, within **fourteen (14) days** of receipt of the request, or **seven (7) days** of receipt of additional information or documentation, whichever is later. The Construction Administrator will give final acceptance or rejection by the Owner not less than **seven (7) days** after notification.

a. Any request deemed an "Equal" and accepted by the Construction Administrator, Architect, Owner, and Agency will result in written notification to the Contractor and will not be in the form of a change order for an "Equal".

b. Any request deemed a "Substitution" and rejected or approved by Construction Administrator, Architect, and Owner may result in written notification to the Contractor and may be in the form of a change order if the "Substitution" is approved.

PART 2 - PRODUCTS

2.1 EQUAL OR SUBSTITUTIONS

A. Conditions: The Architect will consider the Contractor's request for Equal or Substitution of a product or method of construction when one or more of the following conditions are satisfied, as determined by the Architect. If the following conditions are not satisfied, the Architect will return the requests to the Construction Administrator without action except to record noncompliance with these requirements.

1. The proposed request does not require extensive revisions to the Contract Documents.

2. The proposed request is in accordance with the general intent of the Contract Documents.

3. The proposed request is timely, fully documented, and/or properly submitted.

4. The proposed request can be provided within the Contract Time. However, the Architect will not consider the proposed request if it is a result of the Contractor's failure to pursue the Work promptly or coordinate activities properly.

5. The proposed request will offer the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume. However, if the proposed request requires the Owner to incur additional responsibilities, including but not limited to, additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or similar considerations, then the Owner will have just cause to reject the request for Equal or Substitution.

6. The proposed request can receive the necessary approvals, in a timely manner, required by governing authorities having jurisdiction.

7. The proposed request can be provided in a manner that is compatible with the Work as certified by the Contractor.

8. The proposed request can be coordinated with the Work as certified by the Contractor.

9. The proposed request can uphold the warranties required by the Contract Documents as certified by the Contractor.

B. The Contractor's submission and the Architect's review of Submittals, including but not limited to, Samples, Manufacturer's Data, Shop Drawings, or other such items, which are not clearly identified as a request for an Equal or Substitution, will not be considered or accepted as a valid request for an Equal or Substitution, nor does it constitute an approval.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 25 00

7001
Equal or Substitute Product Request

Page 2 of 2

Will proposed substitution impact other parts of the Work?	No ☐	Yes ☐	*If Yes Attach An Explanation.*	
Will proposed substitution increase Contract Time?	No ☐	Yes ☐	*By Number Of Calendar Days*	
Actual Dollar Savings to the State of Connecticut if substitution is accepted:	$			

The Undersigned Certifies:
That The Proposed Request For An Equal Or Substitute Product Conforms To All Of The Requirements Of Division 01 General Requirements, Section 01 25 00 Substitution Procedures.

Request Submitted By General Contractor / CMR: _____
(Firm's Typed Name)

By: _____ _____ _____ _____
(Typed Name) *(Title)* *(Signature)* *(Date)*

Contractor / CMR Send copies to : DAS PM: ☐ CA: ☐

Consultant's Request Received on (Date): _____

Consultant's Review – This Substitution Request is:

☐	Approved:	*(Submittal(s) in accordance with Div. 01 General Requirements, Section 01 33 00 Submittal Procedures.)*
☐	Approved as Noted:	*(Submittals in accordance with Div. 01 General Requirements, Section 01 33 00 Submittal Procedures.)*
☐	Rejected:	Use Specified Materials.
☐	Rejected:	Request Not Received Within Specified Time Period - Use Specified Materials.

Reviewed Issued By:

Name: _____
(Typed Name)

Title: _____

Signature: _____ _____
(Signature) *(Date)*

CONSULTANT Send copies to: DAS PM ☐ CA ☐ Chief Architect ☐ Chief Engineer ☐

If Approved: As noted by Consultant,
DAS Chief Architect: _____ _____
(Signature) *(Date)*

Copies: Project File Red R2

END

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing contract modifications.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 20 00 "Contract Considerations" for administrative requirements governing use of Unit Prices.

2. Division 01 Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after award of the Contract.

3. Division 01 Section 01 29 76 "Progress Payment Procedures" for administrative procedures governing Applications for Payment.

4. Division 01 Section 01 32 16 "Construction Progress Schedules" for requirements for construction scheduling and reporting progress of work.

5. Division 01 Section 01 33 00 "Submittal Procedures" for requirements for submittal of the Construction Progress Schedule or CPM Schedule.

6. General Conditions “Article 13 - Compensation for Changes in the Work”.

C. All Forms referenced in this Section are available for download from the DAS website (www.ct.gov/DAS)> Doing Business With The State > State Building Construction > Publications and Forms > DAS Construction Services Library > 7000 Series - Construction Phase Forms.

1.3 REQUESTS FOR INFORMATION

A. In the event that the Contractor or subcontractor, at any tier, determines that some portion of the drawings, specifications, or other contract documents requires clarification or interpretation by the Architect, the Contractor shall submit a "Request for Information" in writing to the Architect via the Construction Administrator. "Requests for Information" may only be submitted by the Contractor and shall only be submitted on the "Request for Information" forms as required by the Owner.

1. In the "Request for Information", the Contractor shall clearly and concisely set forth the issue for which clarification or interpretation is sought and why a response is needed from the Architect.

2. In the "Request for Information", the Contractor shall set forth an interpretation or understanding of the requirement along with reasons why such an understanding was reached.

3. The Owner acknowledges that this is a complex project. Based upon the owner’s past experience with projects of similar complexity, the Owner anticipates that there will probably be some "Requests for Information" on this project.

4. The Architect will review all "Requests for Information" to determine whether they are valid "Requests for Information". If it is determined that the document is not a valid "Request for Information", it will be returned to the Contractor, unreviewed as to content, for resubmittal on the proper form and in the proper manner.

5. A "Request for Information Response" shall be issued within seven (7) days of receipt of the request from the Contractor unless the Owner determines that a longer time is necessary to provide an adequate response. If a longer time is determined necessary by the Owner, the Owner will, within seven (7) days of receipt of the request, notify the Contractor of the anticipated response time. If the Contractor submits a "Request for Information" on an activity with seven (7) days or less of float on the current project schedule, the Contractor shall not be entitled to any time extension due to the time it takes the Architect to respond to the request provided that the Architect responds within the seven (7) days set forth above.

6. A "Request for Information Response" from Architect will not change any requirement of the Contract Documents. In the event the Contractor believes that the "Request for Information Response" will cause

a change to the requirements of the Contract Documents, the Contractor shall within five (5) days give written notice to the Construction Administrator stating that the Contractor believes the "Request for Information Response" will result in a "Change Order" and the Contractor intends to submit a "Change Order Proposal" request. Failure to give such written notice within five (5) days shall waive the Contractor's right to seek additional time or cost under the requirement these Requirements.

1.4 MINOR CHANGES IN THE WORK

A. The Architect, through the Construction Administrator, will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract Time, on the "Supplemental Instructions" form as required by the Owner.

1.5 PROPOSAL REQUEST

A. Architect/Owner-Initiated Requests for Proposals: The Architect or Owner will issue a detailed description of proposed changes in the Work via the Construction Administrator that will require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications. Such requests shall be on a "Proposal Request" form as required by the Owner.

1. "Proposal Request" is issued for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.
2. Within **(14) days** of receipt of a "Proposal Request", submit a "Change Order Proposal" with the required information necessary to execute the change to the Construction Administrator for the Architect's/Owner's review.
    a. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
    b. Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
    c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
    d. The Agency is tax exempt. All Contractor and Subcontractor services provided under your Contract with the State of Connecticut may not be exempt from taxes. The Department of Revenue Services can guide you as to which services are exempt and which are not. Please contact the State of Connecticut, Department of Revenue Services at 1-800-382-9463 or 860-541-3280.
    e. Dollar values shown on the Schedule of Values shall not be the governing (or deciding) final amounts for change orders involving either additional charges or deletions.

1.6 CHANGE ORDER PROPOSAL

A. When either a "Request for Information" from the Contractor or a "Proposal Request" from the Architect or Owner results in conditions that may require modifications to the Contract, the Contractor may propose changes by submitting a request for a "Change Order Proposal" to the Architect via the Construction Administrator on forms as required by the Owner. These forms shall also include "Change Order Proposal Workbook(s)" as required by the Owner.

1. Include statements outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
2. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities as directed by Article 13 of the General Conditions of the Contract for Construction.
3. Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
4. Comply with requirements in Division 01 Section 01 25 00 "Substitution Procedures" if the proposed change requires an equal or substitution of one product or system for a product or system specified.
5. The State of Connecticut construction contract has the following tax exemptions:
    a. Purchasing of materials which will be physically incorporated and become a permanent part of the project.
    b. Tools, supplies and equipment used in fulfilling the construction contract are not exempt.

c. Services that are resold by the Contractor are exempt, i.e. if a Contractor hires a plumber, carpenter or electrician, a resale certificate may be issued to the subcontractor because these services are considered to be integral and inseparable component parts of the building contract

C. "Change Order Request" Forms: Use "Change Order Proposal" and "Change Order Proposal Worksheets" forms as required by Owner.

D. A "Change Order Proposal" cannot be submitted without either prior submission of a "Request for Information" from the Contractor or as a response to a "Proposal Request" submitted by the Architect or Owner.

E. Any "Change Order Request" submitted without a prior submittal of a "Request for Information" or as a response to a "Proposal Request" will be immediately rejected and returned to the Contractor.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. "Construction Change Directive":

When the Owner and the Contractor disagree on the terms of a "Change Order Proposal" resulting from either a "Request for Information" or "Proposal Request", then the Architect through the Construction Administrator may issue a "Construction Change Directive" on a "Construction Change Directive" form as authorized by the Owner. The "Construction Change Directive" instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a "Change Order".

1. The "Construction Change Directive" contains a complete description of the change in the Work. It also designates the method to be followed to determine change in the Contract Sum or Contract Time.
2. Contractor must proceed with the Work once a "Construction Change Directive" is issued.
3. The change in the Contract Sum and Contract Time resulting from the issuance of a "Construction Change Directive" will be based on "Time & Material" or "Unit Prices".
4. Issuance of "Construction Change Directive" does not guarantee payment for the Work described in the "Construction Change Directive".

B. Documentation: The Contractor shall maintain detailed records on a time and material basis of work required by the "Construction Change Directive".

1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.
2. The final value shall be negotiated based on the supporting data to determine the value of the work.

1.8 CHANGE ORDER PROCEDURES

A. Upon the Owner's approval of a Contractor’s "Change Order Proposal", the Construction Administrator will issue a "Change Order" for signatures of the Architect, Owner and the Contractor on a "Change Order" form as required by the Owner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 26 00

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies procedures for preparation and submittal of the Contractor's Applications for Payment.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Instruction to Bidders 00 21 13:

2. General Conditions: Articles: 27 "Schedule of Values, Application for Payment"; 28 "Partial Payments"; 31 "Final Payment"; and 32 "Owner's Right to Withhold Payments".

3. Division 01 Section 01 32 16 "Construction Progress Schedules" for requirements for construction scheduling and reporting progress of work.

4. Division 01 Section 01 33 00 "Submittal Procedures".

5. Division 01 Section 01 77 00 "Closeout Procedures" for requirements for Final Payment.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the "Schedule of Values" with preparation of the CPM Schedule or Construction Schedule. Use "Schedule of Values" form as required by the Owner

1. Submit the "Schedule of Values" to the Construction Administrator at the earliest possible date but no later than **twenty-one (21)** days after Contract Start Date.

2. Sub-schedules: Where Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the "Schedule of Values". Provide at least one line item for each Specification Section on electronic media printout.

1. Identification: Project identification on the Schedule of Values shall include, but not be limited to, the following:

a. Owner

b. Project Number

c. Project Name

d. Project Location

e. Contractor's name and address.

2. Arrange the "Schedule of Values" in tabular format as required by the Owner, containing separate columns including, but not limited to, the following Items:

a. Item Number.

b. Description of Work with Related Specification Section or Division Number.

c. Scheduled Values broken down by description number, type material, units of each material.

1) Include break down of General Condition requirements, i.e. bonds, insurance premiums, taxes, job mobilization, temporary facilities, field supervision and layout, operation and maintenance manuals, punch list activities, project record documents, demonstration and training, overhead, and profit as separate line items.

d. Name of subcontractor.

e. Name of manufacturer or fabricator.

f. Name of supplier.

g. Retainage.

h. Contract sum in sufficient detail.

3. Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

4. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual Table of Contents. Break principal subcontract amounts down into several line items. In addition, the following items listed below must be included.

a. Site Logistics Plan (01 31 00): a lump sum at 1/20 of one percent of the base bid total project cost at the time of submission of this plan.

b. Coordination Drawings (01 31 00): a lump sum of this cost for payment at the submittal of this product a minimum cost of 1/10th of one percent of the base bid total project cost or $5,000 whichever is greater.

c. Photographic Documentation (01 32 33): a monthly cost of $1,000 per month to be paid each month upon receipt of the photographs or forfeit of that month's payment.

d. Submittal Schedule (01 33 00): a lump sum payment calculated at 1/20th of 1% of the base bid total project cost upon receipt of the schedule

e. Waste Collection & Cleaning (01 50 00): a monthly cost. A minimum payment of $1,000 to $3,000 (based on size & complexity of the project) with forfeit of that monthly payment if not done.

f. As-Built Updates (01 31 00): a monthly cost, a minimum payment of $1,000 with forfeit of that monthly payment if not done.

g. Start-up and Adjusting (01 75 00): a lump sum cost upon completion. (to be determined by the DAS/CS Project Manager (PM) with Architect/Engineer and Construction Administrator (CA) advice)

h. Schedule (01 32 16): For the Base Schedule a lump sum payment or 40% of the total schedule budget, with the remainder paid on an even payment over the duration of the project.

5. Round amounts to nearest whole dollar; the total shall equal the Contract Sum.

6. Unit-Cost Allowances: Show the line-item value of unit-cost allowances, as a product of the unit cost, multiplied by the measured quantity. Estimate quantities from the best indication in the Contract Documents.

7. General Conditions: Show line items for indirect costs and margins on actual costs only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at the Contractor's option.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and Construction Administrator and paid for by the Owner.

1. The initial "Application for Payment", the "Application for Payment" at time of "Substantial Completion", and the final "Application for Payment", involve additional requirements.

B. **Payment-Application Terms:** The Owner will process monthly progress payments. The Contractor may submit applications for payment on a monthly basis.

C. **Payment-Application Forms:** Use the "Application for Payment" form as required by the Owner. Present the required information on electronic media printout or Owner approved form; multiple pages should be used if required.

1. For each item, provide a column including but not limited to the following items:

a. Item Number.

b. Description of Work and Related Specification Section or Division.

c. Scheduled Value, break down by units of material and units of labor.

d. Work Completed from previous application.

e. Work Completed this period.

f. Materials presently stored.

g. Total Completed and stored to date of application.

h. Percentage of Completion.

i. Balance to Finish.

j. Retainage.

D. Application Preparation: Complete every entry on the Application form. At the time of Final Payment only, include an executed Application form by a person authorized to sign legal documents on behalf of the Contractor. The Construction Administrator will return incomplete Applications without action.

1. Entries shall match data on the "Schedule of Values".

2. Include amounts of Change Orders issued prior to the last day of the construction period covered by the application.

E. Transmittal: Except for final payment, submit to the Construction Administrator by a method ensuring receipt within ***forty-eight (48)*** hours. ***One (1)*** complete, signed and notarized original of each Application for Payment, including lien waivers and similar attachments when required, along with ***six (6)*** copies. For Final Payment, ***nine (9)*** complete, signed and notarized copies shall be submitted.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to the Architect.

F. Applications for Payment: Administrative actions and submittals, that must precede or coincide with submittal of the first Application for Payment and all subsequent Application for Payments including, but not limited to, the following items:

1. List of subcontractors and suppliers' name, FEIN/Social Security numbers, and Connecticut Tax Registration Numbers.

2. List of principal suppliers and fabricators.

3. Schedule of Values.

4. Contractor's Construction Schedule (preliminary if not final).

5. Schedule of principal products.

6. Submittal Schedule (preliminary if not final).

7. List of Contractor's staff assignments.

8. List of Contractor's principal consultants.

9. Copies of all applicable permits.

10. Copies of authorizations and licenses from governing authorities for performance of the Work.

11. Proof that subcontractors have been paid amounts included on the Contractor's Application for Payment within thirty (30) days after the Owner has paid the Contractor for the particular Application for Payment in accordance with Connecticut General Statute § 49-41a (a)(1).

12. Releases of Lien from subcontractors with amounts included on the Contractor's Application for Payment when Contractor has been paid by the Owner for the particular Application for Payment but the subcontractors have not been paid.

13. Proof that as-built documents are updated as required by Section 01 77 00 "Closeout Procedures.

14. Initial as-built survey and damage report, if required.

15. Update the "Contractor's Master Subcontract Agreement List" and submit copies all recently executed Subcontract Agreements in accordance with CGS § 4b-96.

15.1. The "Contractor's Master Subcontract Agreement List" shall list all Subcontract Agreements in order of Contract Sum magnitude (from high to low) in the following format:

Contractor's Master Subcontract Agreement List				
Subcontractor Name	**Minority Or Small Business Designation**	**Trade**	**Address**	**Contract Sum**

16. In accordance with CGS § 42-158j (b):
Each payment requisition submitted shall include a statement showing the status of all pending construction change orders, other pending change directives and approved changes to the original contract or subcontract. Such statement shall identify the pending construction change orders and other pending change directives, and shall include the date such change orders and directives were initiated, the costs associated with their performance and a description of any work completed. As used in this section, "pending construction change order" or "other pending change directive" **means an authorized directive for extra work that has been issued to a contractor or a subcontractor and identified by an official Change Order Number or Construction Change Directive Number assigned by the State of Connecticut.**

G. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion submit an Application for Payment form; use the form as required by the Owner. Present the required information on electronic media printout as applicable that include, but are not limited, to the following:

1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

2. Administrative actions and submittals that shall precede or coincide with this application include, but are not limited to, the following:

2.1 Occupancy permits and similar approvals.

2.2 Warranties (guarantees) and maintenance agreements.

2.3 Test/adjust/balance records.

2.4 Maintenance instructions.

2.5 Meter readings.

2.6 Startup performance reports.

2.7 Changeover information related to Owner's occupancy, use, operation, and maintenance.

2.8 Final cleaning.

2.9 Application for reduction of retainage and consent of surety.

2.10 Advice on shifting insurance coverage.
2.11 Final progress photographs.
2.12 List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.

H. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include, but are not limited, to the following:

1. Completion of Project Closeout requirements.

2. Completion of list of items remaining to be completed as indicated on the attachment to the Certificate of Substantial Completion.

3. Ensure that unsettled claims will be settled.

4. Ensure that incomplete Work is not accepted and will be completed in accordance with a schedule prepared by the Contractor which is acceptable to the Owner.

5. Transmittal of required Project construction records to the Owner (including as-built documents specified in Section 01 77 00 "Closeout Procedures").

6. Certified property survey.

7. Proof that taxes, fees, and similar obligations were paid.

8. Removal of temporary facilities and services.

9. Removal of surplus materials, rubbish, and similar elements (Reference Section 01 74 19 "Construction Waste Management & Disposal").

10. Change of door locks to Owner's access.

11. The requirements of the General Conditions and Supplementary Conditions for Final Acceptance, Final Completion, Final Inspection, and Final Payment.

12. Asbestos, lead or other hazardous material manifests.

13. Completion of "Building Contractor Reporting Form" as supplied by Department of Construction Services, for all Contractors, Subcontractors, Vendors, Suppliers, etc. who work on the Contract. The form includes the following information:

- **a.** Contractor/Subcontractor name.
- **b.** FEIN/Social Security Numbers
- **c.** Connecticut Tax Registration Numbers
- **d.** Type of work
- **e.** Name of business and address
- **f.** Remittance address.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 29 76

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:

1. General project coordination procedures.

2. Conservation.

3. Coordination Drawings, including Site Logistics Plans.

4. Administrative and supervisory personnel.

5. Cleaning and protection.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 29 76 “Progress Payment Procedures” for Schedule of Values items

2. Division 01 Section 01 31 19 "Project Meetings" for progress meetings, coordination meetings, and pre-installation conferences.

3. Division 01 Section 01 32 16 "Construction Progress Schedules" for requirements for construction scheduling and reporting progress of work.

4. Division 01 Section 01 50 00 "Temporary Facilities and Controls".

5. Division 01 Section 01 60 00 "Product Requirements" for coordinating general installation.

6. Division 01 Section 01 71 23 "Field Engineering" specifies procedures for field engineering services, including establishment of benchmarks and control points.

7. Division 01 Section 01 77 00 "Closeout Procedures" for coordinating contract closeout.

8. Division 01 Section 01 91 00 "Commissioning" defines the commissioning process.

1.3 CONSTRUCTION ADMINISTRATOR

A. Construction Administrator:

1. The Construction Administrator is identified in Division 01 Section 01 11 00 "Summary of Work".

2. Construction Mobilization:

a. Cooperate with the Construction Administrator in the allocation of mobilization areas of the site, for field offices and sheds, for agency facility access, traffic, and parking facilities.

b. During Construction, coordinate use of site and facilities through the Construction Administrator.

c. Comply with Construction Administrator’s procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

d. Comply with instructions of the Construction Administrator for use of temporary utilities and construction facilities.

e. Coordinate field engineering layout as specified in Division 01 Section 01 71 23 "Field Engineering" for work under the instructions of the Construction Administrator.

1.4 COORDINATION

A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
3. Make provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Construction Administrator, Owner and separate contractors where coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project closeout activities.
6. As-Builts - coordinate monthly meetings to assure up-dates being performed.

1.5 SUBMITTALS

A. Coordination Drawings: Prepare coordination drawings to complete detailed coordination of systems and components and to integrate information about fabrication and installation.

1. Thoroughly prepare coordination drawings, as further stipulated in Part 3 "Execution", reviewing all contract documents and consulting with all entities contributing to or involved with each portion of the work under consideration.
   a. Show the relationship of all components shown on any separate Shop Drawings.
   b. Indicate required desired installation sequences.
   c. Comply with requirements contained in Division 01 Section 01 33 00 "Submittal Procedures".
2. Prepare coordination drawings for installation of all products and materials fabricated by separate entities.
3. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components: mechanical room.
4. **Prepare a Site Logistics Plan(s) showing:** The entire project area and limits; all routes into and out of site; all staging and stockpiling and lay-down areas; all aspects of phasing/staging; all parking, paving and fencing; and all specific provisions to satisfy requirements of Division 01 Sections, including but not limited to Field Engineering and Temporary Facilities and Controls. The Site Logistics Plan shall coincide with and complement the general staging plans and site plan outlined in the contract bidding documents. It is intended that the Contractor shall present this refined plan for approval by the Construction Administrator. The fencing shown on this plan is required for all phases. Exact placement and timing of installations and removals will be reviewed and approved by the Construction Administrator prior to implementation. The Site Logistics Plan(s) shall be drawn at a scale no smaller than 1"=40' and shall be submitted as stipulated in Division 01 Section 01 29 76 "Progress Payment Procedures", but in no case later than (30) days after Notice to Proceed.
5. Prepare coordination drawings showing locations of surface recesses and voids, as well as offsets and breaks, requiring filling and/or feathering, both those initially visible and those discovered during the course of work. Review with Owner and Architect to obtain direction for filling and feathering. Revise drawing(s) to record directions for same for field and record purposes.

B. Staff Names: Prior to the contract start date, submit a list of the Contractor's principal staff assignments, including the superintendent, project safety officer, and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.

1. Post copies of the list in the Project meeting room, the temporary field office, and at each temporary telephone.

2. Provide resumes of each staff member proposed for the Project. This shall include the Project Manager, Project Superintendent and Safety Officer.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

A. **Inspection of Conditions:** The Contractor shall require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed and coordinate such inspections with the Construction Administrator and authorities having jurisdictions. If unsatisfactory conditions exist notify the Construction Administrator immediately. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. The Contractor shall coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

C. **Coordination Drawings:** Before construction work can begin, the Contractor shall submit to the Architect coordination drawings in the form of (a) reproducible (vellum) transparencies at not less than 1/4-inch scale and (b) CAD files of the coordination drawings on CDROM. Such drawings will be required throughout all areas for trades as described below. These drawings shall show resolutions of trade conflicts in congested areas. The Architect will supply base drawings (with the title blocks removed), including floor plans, reflected ceiling plans, and structural framing plans, in the form of electronic CAD files on CDROM, using the AutoCAD release edition specified with the files, to the Contractor for distribution to the trades for use in developing the coordination drawings. Each trade contractor shall create separate layers within the CAD files to show the work of their trade. Prepare coordination drawings as follows:

1. The HVAC subcontractor shall initiate 1/4-inch scale drawings done on AutoCAD (latest version) showing ducts and piping in plan and section. Sheet metal shop drawings must be approved prior to starting coordination drawings.
2. The Sprinkler subcontractor shall then add layers to superimpose his piping layout on the coordination drawings.
3. The Electrical subcontractor shall then add layers to superimpose all the electrical information on the coordination drawings. Said information is to include but not necessarily be limited to cable trays, equipment, lighting, conduits, bus duct, etc. Show space allowances reserved for work under other contracts, such as audio-visual wiring and equipment.
4. The Plumbing subcontractor shall then add layers to complete the coordination drawing by drawing his piping (including pitch) on the coordination drawings.
5. Subcontractors for specialties, furnishings, equipment and special construction shall add layers to show their work to assure full coordination of all systems.
6. The Construction Administrator shall review the completed coordination drawings for general compliance and then submit them to the Architect for his review. All subcontractors shall rework the drawings until all systems are properly coordinated.
7. The Ceiling subcontractor shall utilize the drawings to prepare acoustic panel ceiling drawings and any other suspended ceiling drawings, and shall indicate areas of conflict with the work of other trades by drafting the location of grids, panels and tiles.
8. The Contractor shall indicate Architectural/Structural conflicts or obstacles and coordinate to suit the overall construction schedule. The Contractor shall locate all precut and prefabricated holes and openings in structural steel on the CAD coordination drawing files as required for HVAC, plumbing, fire protection and electrical work. The Contractor shall coordinate these holes and openings with the structural steel fabricator during the structural steel shop drawing development phase. Coordination to take place on schedule so as to permit shop fabrication of all structural steel holes and openings. The Owner will not be held responsible for the costs associated with field fabrication of structural openings resulting from the lack of timely and thorough coordination.
9. The Contractor shall expedite all drawing work and coordinate to suit the construction schedule. The Contractor shall then review these drawings and compare them with the Architectural, Structural, Equipment, and other drawings and determine that all of the work can be installed without undue interference. Prior to the submittal to the Architect, areas of potential conflict shall be brought to the

attention of the Contractor who shall convene a coordination meeting of all parties involved, for the purpose of resolving all utility conflicts. The Contractor shall supervise and direct corrective measures and have all trades sign acceptance of the drawings. Submit four (4) hard copies of each drawing to the Architect and two (2) copies to the Construction Administrator for the record, and only after all conflicts have been accommodated.

10. If the coordination meeting fails to resolve coordination conflicts, the Contractor shall indicate the nature of such conflicts in a detailed RFI, proposing the most economical solution.

11. The Contractor shall not permit work by trades to proceed in a given bay or area until all trade foremen agree on the exact arrangements for each room or area. If a given trade proceeds prior to trades approval, then if necessary, that trade shall revise their work, if necessary, at no extra cost, in order to permit other trades to proceed.

12. Submit all coordination drawings on CD-ROM, in addition to hard copy.

D. The Construction Administrator will meet with the Contractor on all major items of coordination.

3.2 CLEANING AND PROTECTION

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering, where required, to assure protection from damage or deterioration.

B. Clean and provide maintenance on completed construction as construction per manufacturers requirements through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.

2. Excessive internal or external pressures.

3. Excessively high or low temperatures.

4. Thermal shock.

5. Excessively high or low humidity.

6. Air contamination or pollution.

7. Water or ice.

8. Solvents.

9. Chemicals.

10. Light.

11. Radiation.

12. Puncture.

13. Abrasion.

14. Heavy traffic.

15. Soiling, staining, and corrosion.

16. Bacteria.

17. Rodent and insect infestation.

18. Combustion.

19. Electrical current.

20. High-speed operation.

21. Improper lubrication.

22. Unusual wear or other misuse.

23. Contact between incompatible materials.

24. Destructive testing.

25. Misalignment.

26. Excessive weathering.

27. Unprotected storage.

28. Improper shipping or handling.

29. Theft.

30. Vandalism.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 31 00

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. **Start Date meeting (establishes start date)**
2. **Pre-construction conferences.**
3. **Pre-installation conferences.**
4. **Progress meetings.**
5. **Safety**
6. **Coordination**
7. **As-built drawings review**
8. **And as required**

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 31 00 "Project Management and Coordination" for procedures for coordinating project meetings with other construction activities.
2. Division 01 Section 01 32 16 "Construction Progress Schedules" for requirements for construction scheduling and reporting progress of work.
3. Division 01 Section 01 33 00 "Submittal Procedures" for submitting the Construction Schedule or CPM Schedule.
4. Division 01 Section 01 35 26 “Government Safety Requirements specifies the requirements for safety plans, reports, and investigation submittals.
5. Division 05 Section of 12 00 “Structural Steel” for pre-construction conferences
6. Division 07 Section 07 31 29 "Wood Shingles" for pre-construction conferences.

1.3 PRE-CONSTRUCTION CONFERENCE

A. The Contractor will attend a pre-construction conference before starting construction, as scheduled by the Construction Administrator convenient to the Owner, the Construction Administrator, Architect, and Contractor. This meeting will take place at least **fourteen (14)** days prior to official Start Date. Hold the conference at the Project Site or another convenient location as directed by the Construction Administrator. The Construction Administrator shall conduct the Pre-construction Conference to review the Contractor and Subcontractor responsibilities and personnel assignments.

B. Attendees: Authorized representatives of the Construction Administrator, Owner, Architect, and their consultants; the Contractor and its superintendent; major subcontractors; agency; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress, including the following:

1. **Tentative construction schedule.**
2. **Critical work sequencing.**
3. **Progress meeting schedule.**
4. **Designation of responsible personnel.**
5. **Procedures for processing field decisions and Change Orders.**

6. **Procedures for processing Applications for Payment.**
7. **Distribution of Contract Documents.**
8. **Submittal of Shop Drawings, Product Data, and Samples.**
9. **Preparation of record documents.**
10. **Use of the premises.**
11. **Parking availability.**
12. **Office, work, and storage areas.**
13. **Equipment deliveries and priorities.**
14. **Safety procedures.**
15. **First aid.**
16. **Security.**
17. **Housekeeping.**
18. **Working hours.**
19. **Coordination with security alarm installation.**

1.4 PRE-INSTALLATION/CONSTRUCTION CONFERENCES

A. The Contractor will schedule a pre-installation conference(s) at the Project Site before each construction activity that requires coordination with other construction. The Contractor shall be responsible to notify in writing the Construction Administrator and the appropriate Subcontractor(s), etc., of the date and time of all Pre-installation/Construction Conferences. Notification shall be at least seven (7) days, prior to the Conference. The Contractor shall be responsible for coordination and attendance of all Subcontractors, etc., involved in or affected by the installation for all Pre-installation/Construction Conferences.

B. **Attendees:** The Construction Administrator, Contractor, Subcontractors, Owner and Architect, the installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. The Contractor shall advise all attendees of the scheduled Pre-installation/Construction Conferences dates.

C. **Agenda:** Review the progress of other construction activities and preparations for the particular activity under consideration at each Pre-installation/Construction Conference, including but not limited to the following requirements:

1. **Contract Documents.**
2. **Related Change Orders.**
3. **Purchases.**
4. **Deliveries.**
5. **Shop Drawings, Product Data, and quality-control samples.**
6. **Review of mockups.**
7. **Possible conflicts.**
8. **Compatibility problems.**
9. **Time schedules.**
10. **Weather limitations.**
11. **Manufacturer's recommendations.**
12. **Warranty requirements.**
13. **Compatibility of materials.**
14. **Acceptability of substrates.**
15. **Temporary facilities.**
16. **Space and access limitations.**

17. **Governing regulations.**
18. **Safety.**
19. **Inspecting and testing requirements.**
20. **Required performance results.**
21. **Recording requirements.**
22. **Protection.**

D. The Construction Administrator will record significant discussions and agreements and disagreements of each Pre-installation/Construction Conference, and the approved schedule. The Construction Administrator will promptly distribute the record of the Pre-installation/Construction Conference to all attendees.

E. The Contractor shall not proceed with the installation/construction if the conference cannot be successfully concluded. The Contractor shall be responsible to initiate whatever actions are necessary to resolve impediments to performance of Work and schedule and reconvene another Pre-installation/Construction Conference at the earliest feasible date. Failure of the contractor to resolve impediments to the performance of the work will not result in an extension of days.

1.5 PROGRESS MEETINGS

A. The Construction Administrator will conduct progress meetings, bi-weekly, at the Project Site or at regular intervals as agreed upon at the Pre-construction Conference. The Construction Administrator will notify the Owner, the Architect, and the Contractor of the scheduled Progress Meeting dates. Coordinate dates of Progress Meetings with preparation of Application for Payment requests.

B. **Attendees:** In addition to representatives of the Contractor, Construction Administrator, Owner and the Architect, subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities may be requested to attend these meetings on an as needed basis. All participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work. The Contractor shall include the site superintendent as a minimum.

C. **Agenda:** Progress Meetings shall review and correct or approve minutes of the previous Progress Meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

1. **Construction Schedule or CPM Schedule:** Review progress since the last Progress Meeting. Determine where each activity is in relation to the required Contractor's "Construction Schedule" or "CPM Schedule" and whether each activity is on time or ahead or behind Schedule. Determine how Work that is behind Schedule will be expedited; secure commitments from parties involved to do so. Discuss whether Schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.
2. Review the present and future needs of each entity present, including the following:
    a. **Interface requirements.**
    b. **Time.**
    c. **Sequences.**
    d. **Status of submittals.**
    e. **Deliveries.**
    f. **Off-site fabrication problems.**
    g. **Access.**
    h. **Site utilization.**
    i. **Temporary facilities and services.**
    j. **Hours of work.**
    k. **Hazards and risks.**
    l. **Housekeeping.**
    m. **Quality and work standards.**
    n. **Change Orders.**

o. Documentation of information for payment requests.

D. Reporting: The Construction Administrator will distribute minutes of the meeting to each party present, promptly and before the next scheduled meeting, and to parties who should have been present.

1.6 SUBCONTRACTOR/COORDINATION/SAFETY MEETINGS

A. The Contractor shall conduct Subcontractor/coordination meetings.

B. The Contractor shall conduct a separate safety meeting after the safety plan is submitted. The Contractor shall take meeting minutes. These minutes shall be made available upon request. The Contractor shall notify the Construction Administrator of the times and dates of these meetings, who may elect to attend these meetings as an observer when necessary. A minimum of one safety meeting will be held per month.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 31 19

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the preparation, submittal, and updating of the Contractor's construction schedules and reporting progress of the Work.

1. Refer to the General Conditions and the Agreement for definitions and specific dates of Contract Time.

B. This Section includes the following:

1. Format.

2. Content.

3. Revisions to schedules.

4. Submittals.

5. Distribution.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 29 76 "Progress Payment Procedures" specifies requirements for submitting Schedule of Values and Application for Payments.

2. Division 01 Section 01 31 19 "Project Meetings" specifies requirements for submitting and distributing meeting and conference minutes.

3. Division 01 Section 01 33 00 "Submittal Procedures" specifies requirements for submitting the Submittal Schedule.

4. Division 01 Section 01 45 00 "Quality Control" specifies requirements for submitting inspection and test reports.

5. Division 01 Section 01 60 00 "Product Requirements" specifies requirements for submitting the list of products.

1.3 DEFINITIONS

A. **Construction Schedule:** A method of planning and scheduling a construction project utilizing a horizontal bar chart with a separate bar for each major portion of the Work or operation to make the schedule an effective tool for planning and monitoring the progress of the work.

1.4 QUALITY ASSURANCE

A. The Contractor's Consultant: Retain a consultant to provide planning, evaluating, and reporting by CPM scheduling.

1. In-House Option: The Owner may waive the requirement to retain a consultant if the Contractor can demonstrate that:

a. The Contractor has the computer equipment required to produce construction schedules.

b. The Contractor employs skilled personnel with experience in construction scheduling and reporting techniques.

2. Program: Use **Microsoft Project** latest version.

3. Standards: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

1.5 PRELIMINARY SCHEDULE

A. Preliminary Gantt schedule is to be prepared by the Contractor and submitted to the Construction Administrator within **seven (7)** days of award of contract. This schedule is to cover all items of Work from the start of the project up to the completion of the project. This schedule must be revised when the actual schedule of significant items varies more than one week from the proposed schedule.

1.6 CONSTRUCTION SCHEDULE FORMAT

1. **Format:** Utilize a horizontal bar chart (Gantt) with a separate bar for each major portion of the Work or operation, identifying first work day of each week.
2. **Program:** Use **Microsoft Project**, latest version.
3. **Sequence of Listings:** Utilize the Table of Contents of this Project Manual and the chronological order **of the start of each item of work.**
4. **Scale and Spacing:** Provide space for notations and revisions.
5. **Sheet Size:** To be coordinated with Construction Administrator.
6. **Weather Days Allowance:** The Contractor shall include as a separate identifiable activity on the Critical Path of the Construction Schedule, and activity labeled "Weather Days Allowance." Insert this activity immediately prior to the substantial completion milestone.

6.1 The Contractor shall be fully responsible for determining the number of weather delay days to be included in the Construction Schedule. This determination shall be based on the normal anticipated weather for the project location and the nature of the project work. The Construction Schedule shall be based on the contractor's determined weather delay allowance. The weather delay activity shall be included in the construction schedule immediately prior to the Substantial Completion milestone.

6.2 The minimal allowed duration of the Weather Days Allowance shall be calculated as follows (decimals rounded to nearest whole number):

$$\frac{\textbf{Contract Time } \textit{(Calendar Days)}}{\textbf{365}} \textbf{ multiplied by } 7 \textbf{ equals Weather Days Allowance } \textit{(Calendar Days)}$$

6.3 The Contractor shall insert an activity in the Critical Path of the Construction Schedule to reflect weather day occurrences when weather days are experienced and accepted by the Owner. Identify this activity as a weather delay.

6.4 The Contractor shall reduce duration of Weather Days Allowance activity as weather delays are experienced and inserted into the schedule. Remaining weather days in Weather Day Allowance at completion of project is considered float. Weather delay, when justified, are considered allowable, non compensable.

1.7 CONTENT

A. Show complete sequence of construction by activity, with dates beginning and completion of each element of construction.

B. Identify each item by specification section numbers.

C. Identify work of separate phases and other logically grouped activities.

D. Show accumulated percentages of completion of each item, and total percentage of Work completed, as of the **first** day of each month.

E. Provide separate schedule of submittal dates for shop drawings, product data, and samples, Owner/Agency furnished products and any products identified as under Allowances, and dates reviewed submittals will be required from Architect/Engineer. Indicate decision dates for selection of finishes.

F. Indicate delivery dates for Owner/Agency furnished products and any products identified as under Allowances.

G. Indicate critical path with original baseline indicated.

H. Coordinate content with Schedule of Values specified in Section 01 29 76 "Progress Payment Procedures."

1.8 SUBMITTALS AND REVISIONS TO SCHEDULES

A. An initial bar graph schedule is to be prepared by the Contractor and submitted to the Construction Administrator. Refer to Article 1.5.

B. Indicate progress of each activity to date of submittal, and projected completion date of each activity.

C. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.

D. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect.

E. Schedules must be revised monthly and when the actual schedule of significant items varies more than **seven (7) days** from the proposed schedule.

F. Submit revised Construction Schedules for each Application for Payment.

G. Submit **four (4)** copies of the Construction Schedule to the Construction Administrator.

1.9 DISTRIBUTION

A. Distribute copies of the Construction Schedules to Construction Administrator, Architect, Owner, Subcontractors, suppliers, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problem anticipated by projections indicated in schedules.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 32 16

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for construction photographs.

B. **Related Sections:** The following Section contains requirements that relate to construction photographs:

1. Division 01 Section 01 33 00 "Submittal Procedures" specifies general requirements for submitting digital construction photographs.

1.3 SUBMITTALS

A. **Photographs:** Provide a digital camera to take **twenty-four (24)** or more photos each time. Deliver two (2) sets of photo files on one (1) CD-ROM and one (1) set of prints (8x10) to the Construction Administrator for the Department.

B. **Extra Sets**: When requested by the Owner, the photographer shall prepare extra sets of prints or CD-ROM. The photographer shall distribute these directly to the designated parties who will pay the costs for the extra sets directly to the photographer.

1.4 QUALITY ASSURANCE

A. Engage a qualified commercial photographer to take photographs during construction.

B. **Photographer's Qualifications:** Photographer shall be an individual of established reputation who has been regularly engaged as a professional photographer for not less than **three (3) years**.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC COPIES

A. On the date the work is begun and every **thirty (30) days** thereafter (until the work is at least 95 percent complete), the Contractor shall have digital photographs of the construction taken by a professional photographer.

B. **Identification:** Label each CD-ROM with project name and date the photographs were taken. With each submittal provide an applied label, rubber-stamped or index sheet with the following information:

1. **Name of the Project.**
2. **Name and address of the photographer.**
3. **Name of the Architect.**
4. **Name of the Contractor.**
5. **Date the photographs were taken.**
6. **Vantage Point: Description of vantage point, in terms of location, direction (by compass point), and elevation or story of construction.**

PART 3 – EXECUTION

3.1 PRECONSTRUCTION PHOTOGRAPHS

A. Before starting construction, take digital photos of the site and surrounding properties from different points of view, as selected by the Construction Administrator.

1. Take digital photos in sufficient number to show existing site conditions before starting Work.

2. Take digital photos of adjacent existing buildings either on or adjoining the property in sufficient detail to record accurately the physical conditions at the start of construction.

3.2 PHOTOGRAPHIC REQUIREMENTS

A. Take **twenty-four (24)** or more digital photographs monthly, coinciding with the cutoff date associated with each Application for Payment. The Construction Administrator shall select the vantage points for each shot to best show the status of construction and progress since the last photos were taken.

B. As the digital photographs are a record of the work progress, they shall be taken each month, whether or not they show work done during the preceding month. Deliver the CD-ROMs and prints within **ten (10) days** of their taking.

C. Provide and coordinate the use of photographic software to assure that the photos are viewable by all interested parties.

D. PART 2 - PRODUCTS (Not Applicable)

E. PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 32 33

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including but not limited to the following:

1. **Submittal schedule.**
2. **Shop Drawings.**
3. **Product Data.**
4. **Samples.**
5. **Quality assurance submittals.**
6. **Proposed "Substitutions/Equals".**
7. **Warrantee samples.**
8. **Coordination Drawings.**
9. **O & M Manuals**

B. Administrative Submittals: Refer to other Division 01 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. **Permits.**
2. **Applications for Payment.**
3. **Performance and payment bonds.**
4. **Contractor's construction schedule.**
5. **Daily construction reports.**
6. **Construction Photographs.**
7. **Insurance certificates.**
8. **List of subcontractors.**
9. **Subcontractors/Suppliers FEIN number's and Connecticut tax registration number.**

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 25 00 "Substitution Procedures" specifies requirements for submittal of requests for equals and substitutions.
2. Division 01 Section 01 29 76 "Progress Payment Procedures" specifies requirements for submittal of the Schedule of Values.
3. Division 01 Section 01 31 00 "Project Management and Coordination" specifies requirements governing preparation and submittal of required Coordination Drawings.
4. Division 01 Section 01 31 19 "Project Meetings" specifies requirements for submittal and distribution of meeting and conference minutes.
5. Division 01 Section 01 32 16 "Construction Progress Schedules" for requirements for construction scheduling and reporting progress of work.
6. Division 01 Section 01 32 33 "Photographic Documentation" specifies requirements for submittal of periodic construction photographs.
7. Division 01 Section 01 35 26 "Government Safety Requirements specifies the requirements for safety plans, reports, and investigation submittals.
8. Division 01 Section 01 45 00 "Quality Control" specifies requirements for submittal of inspection and test reports and mockups.

9. Division 01 Section 01 77 00 "Closeout Procedures" specifies requirements for submittal of Project Record Documents and warranties at project closeout.

10. Division 01 Section 01 78 30 "Warranties and Bonds".

11. Division 01 Section 01 91 00 "Commissioning" specifies requirements for submittal of quality assurance documentation related to commissioning.

1.3 DEFINITIONS

A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended and as identified in the Specification Divisions 02 through 49.

1. Preparation of Coordination Drawings is specified in Division 01 Section 01 31 00 "Project Management and Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.

B. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.

C. Mockups are full-size assemblies for review of construction, coordination, testing, or operation; they are not Samples.

1.4 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

b. The Architect reserves the right to reject incomplete submitted packages.

3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for re-submittals.

a. Allow **fourteen (14) days** for initial review. Allow additional time if the Architect must delay processing to permit coordination with subsequent submittals.

b. If an intermediate submittal is necessary, process the same as the initial submittal.

c. Allow **fourteen (14) days** for reprocessing each submittal.

d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

B. Submittal Preparation: Place a permanent label, title block or **8-1/2 inches x 11 inches** cover page approved by the Architect, on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. The minimum number of copies required for each submittal shall be **seven (7)** or as determined otherwise at the pre-construction conference or by the Construction Administrator.

2. Provide a space approximately **4 inches by 5 inches** on the label, beside the title block or on the cover page on Shop Drawings to record the Contractor's review and approval markings and the action taken.

3. Include the following information on the label for processing and recording action taken.

a. Project Name and State of Connecticut Project Number.

b. Date.

c. Name and address of the Architect, Construction Administrator, and Owner Representative.

d. Name and address of the Contractor.

e. Name and address of the subcontractor.

f. Name and address of the supplier.

g. Name of the manufacturer.

h. Number and title of appropriate Specification Section.

i. Drawing number and detail references, as appropriate.

j. Indicate either initial or resubmittal.

k. Indicate deviations from Contract Documents.

l. Indicate if "equal" or "substitution".

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect using a transmittal form. Copy the Construction Administrator on the transmittal. The Architect will return all submittals to the Contractor after action is taken with a complete copy of the submittal package and one complete copy of the submittal package. The Architect will not accept submittals received from sources other than the Contractor.

1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

1.6 SUBMITTAL SCHEDULE

A. After development and review by the Owner and Architect acceptance of the Contractor's Construction or CPM schedule prepare a complete schedule of submittals. Submit the schedule to the Construction Administrator within **thirty (30)** days of Contract Award.

1. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products as well as the Contractor's Construction or CPM Schedule.

2. Prepare the schedule in chronological order. Provide the following information:

a. Schedule date for the initial submittal.

b. Related section number.

c. Submittal category (Shop Drawings, Product Data, or Samples).

d. Name of Subcontractor.

e. Description of the part of Work covered.

f. Scheduled date for resubmittal.

g. Scheduled date for the Architect's final release of approval.

B. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's Construction Schedule.

2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Submit all submittal items required for each specification section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.

3. Submit action submittals and informational submittals required by the same specification section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
   a. **Architect reserves** the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on **Architect's** receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. **Initial Review:** Allow **fifteen [15]** days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. **Architect** will advise Contractor when a submittal being processed must be delayed for coordination with related submittals not yet received. Additional time will be required if processing must be delayed to permit review of related subsequent submittals.
2 **Intermediate Review:** If intermediate submittal is necessary, process it in same manner as initial submittal.
3. **Resubmittal Review:** Allow **fifteen [15]** days for review of each resubmittal.
4. **Mass Submittals: Six (6)** or more submittals in **one (1) day** or **twenty (20)** or more submittals in **one (1) week**. If "Mass Submittals" are received, Architect's review time stated above may be extended as necessary to perform proper review. Architect will review "Mass Submittals based upon priority determined by Architect after consultation with Owner and Contractor.

E. Distribution: Following response to the initial submittal, print and distribute copies to the Construction Administrator, Architect, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

A. Schedule Updating: Revise the schedule after each meeting or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.7 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report recording the following information concerning events at the site, and submit duplicate copies to the Construction Administrator at weekly intervals:

1. **List of subcontractors at the site.**
2. **Approximate count of personnel at the site.**
3. **High and low temperatures, general weather conditions.**
4. **Accidents and unusual events.**
5. **Meetings and significant decisions.**
6. **Stoppages, delays, shortages, and losses.**
7. **Meter readings and similar recordings.**
8. **List of equipment on site and identify if idle or in use.**
9. **Orders and requests of governing authorities.**
10. **Change Orders received, start and end dates.**
11. **Services connected, disconnected.**
12. **Equipment or system tests and startups.**
13. **Partial Completion's, occupancies.**
14. **Substantial Completion's authorized.**
15. **Equals or Substitutions approved or rejected.**

1.8 SHOP DRAWINGS

A. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information

as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:

1. Dimensions.

2. Identification of products and materials included by sheet and detail number.

3. Compliance with specified standards.

4. Notation of coordination requirements.

5. Notation of dimensions established by field measurement.

6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least **8-1/2 by 11 inches** but no larger than **36 by 48 inches**.

7. Submit **one (1)** reproducible media and **seven (7)** prints as directed by the Construction Administrator. The Contractor's submittal shall identify the specification section and/or drawing number applicable to the submittal.

8. Details shall be large scale and/or full size.

C. The Contractor shall review the Shop Drawings, stamp with this approval, and submit them with reasonable promptness and in orderly sequence so as to cause no delay in his Work or in the Work of any subcontractor. Shop Drawings shall be properly identified as specified for item, material, workmanship, and project number. At the submission, the Contractor shall inform the Architect, in writing of any deviation in the shop drawings from the requirements of the Contract Documents.

D. The Architect will review and comment on shop drawings with reasonable promptness so as to cause no delay, but only for conformance with the design concept of the project and with the information given in the Contract Documents. Refer to Article 5 of the General Conditions. Shop Drawings received by the Architect that indicate insufficient study of drawings and specifications, illegible portions or gross errors, will be rejected outright. Such rejections shall not constitute an acceptable reason for granting the Contractor additional time to perform the work.

E. The Contractor shall make any corrections required by the Architect and shall resubmit the required number of corrected copies of Shop Drawings until fully reviewed.

F. Upon final review submit **four (4)** additional prints, same as submitted, for use by the Construction Administrator.

G. The Architect's review and comments on Shop Drawings shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents.

H. Only final reviewed Shop Drawings are to be used on the Project site.

I. The Work installed shall be reviewed in accordance with the Shop Drawings and the drawings and specifications. Final Review of the Shop Drawings by the Architect shall constitute acceptance by the State and the Architect of a variation or departure that is **clearly identified**. If the contractor believes notations made by the A/E increases the value or scope of the CD's, the contractor must provide written notice to the CA within **seven (7)** days of this issue. Final reviewed Shop Drawings shall not replace or be used as a vehicle to issue or incorporate change orders or substitutions. Substitutions shall be submitted in accordance with Division 01 Section 01 25 00 "Substitution Procedures".

1.9 SHOP DRAWINGS FOR FIRE PROTECTION SYSTEMS:

A. Shop drawings for fire protection systems shall comply with all of the requirements in the section above "Shop Drawings". In addition Sprinkler system shop drawings and hydraulic calculations must be stamped by a professional engineer licensed in the state of Connecticut and must include the DAS/CS project number. **Two (2)** sets of information [as noted in this Section 01 33 00 "Submittal Procedures"] shall be submitted to the State's Insurance Carrier (SIC), and **one (1)** set shall be submitted to the Office of the State Fire Marshal (OSFM):

1. Office of State Fire Marshal:
CT Department of Administrative Services
Construction Services
Office of State Fire Marshal
450 Columbus Boulevard, Suite 1304
Hartford, Connecticut 06103
Phone: (860) 713-5750

2. **State Insurance Carrier (SIC):**
   FM Global Boston Operations
   Plan Review
   1175 Boston-Providence Turnpike
   PO Box 9102
   Norwood, MA 02062
   Tel: (781) 440-8241 or FAX (781) 440-8742
   bostonleadengineer@fmglobal.com

B. Before the shop drawings are submitted to SIC or OSFM, the A/E's fire protection consultant must review the sprinkler design for compliance with the code, OSFM, and FM Global requirements.

C. The State Insurance Carrier requires **two (2)** weeks prior notice of a sprinkler system acceptance test.

1.10 SHOP DRAWINGS FOR ROOFING SYSTEMS:

A. Construction Phase Requirements: During product submittals and shop drawing review for Roofing Systems the Consultant shall verify FM Global requirements are satisfied for all relevant components. The DAS/CS PM and Construction Administer for the Project shall submit the Contractor's roofing systems product information and shop drawings to the Consultant and FM Global. Shop drawings for roofing systems shall comply with all of the requirements in the section above "Shop Drawings". **Two (2)** sets of information [as noted in this Section 01 33 00 "Submittal Procedures"] shall be submitted to the State's Insurance Carrier (SIC):

1. **State Insurance Carrier (SIC):**
   FM Global Boston Operations
   Plan Review
   1175 Boston-Providence Turnpike
   PO Box 9102
   Norwood, MA 02062
   Tel: (781) 440-8241 or FAX (781) 440-8742
   bostonleadengineer@fmglobal.com

B. The State Insurance Carrier requires **two (2)** weeks prior notice of roofing system shop drawing reviews.

C. See Section **00 30 60 General Statement For FM Global Checklist For Roofing Systems** and **Section 50 60 00 FM Global Checklist for Roofing Systems.**

1.11 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, schedules, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:
   a. **Manufacturer's printed recommendations.**
   b. **Compliance with trade association standards.**
   c. **Compliance with recognized testing agency standards.**
   d. **Application of testing agency labels and seals.**
   e. **Notation of dimensions verified by field measurement.**
   f. **Notation of coordination requirements.**
2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
3. **Preliminary Submittal:** Submit a preliminary single copy of Product Data where selection of options is required.
4. **Submittals:** Submit **seven (7)** copies of each required submittal; submit **five (5)** copies where required for maintenance manuals. The Architect will retain **one (1)** and will return the other marked with action taken and corrections or modifications required.
   a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

5. **Distribution:** Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
   a. Do not proceed with installation until a copy of Product Data is in the Installer's possession.
   b. Do not permit use of unmarked copies of Product Data in connection with construction.

1.12 SAMPLES

A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

1. Store, mount or display Samples on site in the manner to facilitate review of qualities indicated. Prepare Samples to match the Architect's sample. Include the following:
   a. **Specification Section number and reference.**
   b. **Generic description of the Sample.**
   c. **Sample source.**
   d. **Product name or name of the manufacturer.**
   e. **Compliance with recognized standards.**
   f. **Availability and delivery time.**
2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
   a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least **three (3)** multiple units that show approximate limits of the variations.
   b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
   c. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.
   d. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.
3. **Preliminary Submittals:** Submit a full set of choices where Samples are submitted for selection of color, pattern, texture, or similar characteristics from a range of standard choices, unless otherwise noted in specification section.
   a. The Architect will review and return preliminary submittals with the Architects notation, indicating selection and other action.
4. **Submittals:** Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit **three (3)** sets. The Architect will return **one (1)** set marked with the action taken.
5. Maintain sets of Samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.
   a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
   b. Sample sets may be used to obtain final acceptance of the construction associated with each set.

B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.

1. Field samples are full-size examples erected on-site to illustrate finishes, coatings, or finish materials and to establish the Project standard.
   a. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.13 QUALITY ASSURANCE SUBMITTALS

A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.

B. **Certifications:** Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.

1. **Signature:** Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.

C. **Inspection and Test Reports:** Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 01 Section 01 45 00 "Quality Control."

1.14 ARCHITECT'S ACTION

A. Except for submittals for the record or information, where action and return is required, the Architect will review each submittal, mark to indicate action taken, and return promptly.

1. Compliance with specified characteristics is the Contractor's responsibility.

B. **Action Stamp:** The Architect will stamp each submittal with a uniform, action stamp. The Architect will mark the stamp appropriately to indicate the action taken, as follows:

1. **Final Unrestricted Release:** When the Architect marks a submittal "Approved for fabrication," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.

2. **Final-But-Restricted Release:** When the Architect marks a submittal "Incorporate Notations," the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Submit corrected copies for record. Final payment depends on that compliance.

3. **Returned for Resubmittal:** When the Architect marks a submittal "Rejected, or Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.

a. Do not use, or allow others to use, submittals marked "Rejected, or Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.

4. **Other Action**: Where a submittal is for information or record purposes or special processing or other activity, the Architect will return the submittal marked "Action Not Required."

C. **Unsolicited Submittals:** The Architect will discard unsolicited submittals without action.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 33 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 00 General Conditions of the Contract for Construction for Design-Bid-Build and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for performing alteration and renovation Work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 00 Section 00 30 00 “General Statements for Available Information" for information that is available in addition to the Bidding Documents for review by bidders. Such information may include an existing conditions survey, contaminated soil reports, contaminated groundwater reports, hazardous building material reports, geotechnical data, etc.

2. Division 01 Section 01 31 00 "Project Management and Coordination" for procedures for coordinating cutting and patching with other construction activities.

3. Division 01 Section 01 73 29 "Cutting and Patching" for procedures for cutting and patching.

4. Division 01 Section 01 74 19 "Construction Waste Management & Disposal" for the requirements for waste management goals, waste management plan and waste management plan implementation.

5. Division 02 Section 02 42 96 "Historic Removal and Dismantling" for demolition of selected portions of the building for alterations.

6. Division 02 Section 02 82 13 "Asbestos Abatement" for the removal of window glazing for alterations.

7. Division 02 Section 02 83 13 "Lead Paint Activity" for the removal of exterior paint for alterations.

8. Division 50 00 00 “Project-Specific Available Information” for information that is referenced in Section 00 30 00 “General Statements for Available Information".

9. Refer to other Sections for specific requirements and limitations applicable to performing alteration Work with individual parts of the Work.

10. Requirements of this Section apply to mechanical and electrical installations. Refer to Division 22, 23, 26, and 28. Sections for other requirements and limitations applicable to renovation Work by mechanical and electrical installations.

C. Definitions:

1. Clean Fill: Either (1) natural soil or (2) rock, brick, ceramics, concrete, and asphalt paving fragments which are virtually inert and pose neither a pollution threat to ground or surface waters nor a fire hazard.

2. Contaminated Soil: Treated or untreated soil and/or sediment affected by a known or suspected release and determined, or reasonably expected to contain substances exceeding Residential Direct Exposure Criteria or GA Pollutant Mobility Criteria, as these terms are defined in the Remediation Standard Regulations (RCSA Section 22a-133k-1).

3. Hazardous Soil: Soil that is classified as a hazardous waste. Soil is classified as hazardous waste if it exhibits a hazardous waste characteristic or if it contains RCRA-listed hazardous constituents above Connecticut’s RCRA "Contained-In" Policy dated May 2002.

4. Natural Soil: Soil in which all substances naturally occurring therein are present in concentrations not exceeding the concentrations of such substance occurring naturally in the environment and in which soil no other substance is analytically detectable.

5. Polluted Soil: Soil affected by a release of a substance at a concentration above the analytical detection limit for such substance in accordance with RCSA 22a-133k-1(a)(45) or for naturally occurring substance at a concentration that exceeds concentrations that naturally occur in the environment.

6. Regulated Soil: Includes Polluted Soil, Contaminated Soil, and Hazardous Soil.

7. Groundwater Remediation Wastewater: Wastewater generated in connection with investigating pollution or remediating polluted groundwater or soil. Groundwater remediation wastewater includes without limitation groundwater withdrawn from a groundwater recovery well; groundwater which collects in an excavation or foundation drain or other subsurface facility or structure; groundwater contaminated runoff and stormwater impacted by on-site pollutants from any construction activity; condensate resulting from construction or maintenance of a soil vapor extraction system; and wastewater generated by developing, testing, sampling, or purging a well.

PART 2 - PRODUCTS

2.1 PRODUCTS FOR PATCHING AND EXTENDING WORK

A. New materials: As specified in product sections; match existing Products and Work for patching and extending Work.

B. Type and Quality of Existing Products: Determine by inspecting and testing Products where necessary, referring to existing Work as a standard.

2.2 SALVAGEABLE MATERIALS

A. The Owner shall be responsible for removing the following salvageable items from premises and transporting said items to an area away from the construction activity.

1. Exhibits
2. Gift Shop Stock
3. Furniture and Office Equipment
4. Art

PART 3 - EXECUTION

3.1 INSPECTION

A. General:

1. Observe all existing conditions prior to submitting a bid. Include in the bid, existing conditions and their impact, particularly to cost and health and safety of workers and occupants, and proper function and operation of the facility. Be aware of other work being performed. Failure to visit the site shall in no way provide relief from the necessity of furnishing materials or performing any work that may be required to complete the work in accordance with the Contract Documents without additional cost to the Owner. All site visits shall be scheduled with the Owner.

2. The quantities, locations and the extent of work indicated are best estimates, which are limited by the physical constraints imposed by occupancy of the facility. Consider all aspects of the substrates within the identified plan area. Material information and quantities were obtained from site surveys. Accordingly, variations (plus or minus 10 percent) in quantities within the limits of the work area are considered as having no impact on contract sum and contract performance period. Where additional abatement work is required beyond the above variations, the contract sum and contract performance period shall be adjusted under provisions of Division 01 of the Specifications.

3. Verify that demolition is complete and areas are ready for installation of new Work.

4. Beginning of restoration Work means acceptance of existing conditions.

B. Project Procedures for Work Involving Asbestos Containing Material (ACM):

1. The Contractor is responsible for abating all Asbestos Containing Material (ACM) that is visible and accessible.

2. In demolition projects, every attempt should be made by the Contractor to remove all ACM.

3. If testing for asbestos has been conducted at the facility scheduled for renovation, demolition, reconstruction, alteration, remodeling, or repair, then the results of the asbestos testing are summarized in Division 50 00 00 Project-Specific Available Information, Section 50 30 00 Hazardous Building Materials Inspection and Inventory at the end of the Technical Specification Sections. Under no circumstance shall

this information be the sole means used by the Contractor for determining the extent of asbestos. The Contractor shall be responsible for verification of all field conditions affecting performance of the Work.

4. If the Contractor should encounter any material suspected or known to contain asbestos not previously identified and assigned as the Contractor's responsibility, then the Contractor should immediately notify the Construction Administrator in writing of same. It is the Owner's responsibility to have the material tested and abated (if necessary). The Owner will respond within twenty-four (24) hours after receiving the Contractor's written request to the Construction Administrator for testing the suspect material. If necessary, the Contractor will abate ACM within a reasonable time period after the Owner's issuance of a Change Order for the additional abatement work.

4.1 When the Owner requests the Contractor undertake the responsibilities for the abatement and disposal of the ACM, then the compensation to the Contractor by Owner for the Work shall be determined by the "Unit Prices" stated in Section 01 20 00 Contract Considerations.

5. No attempt has been made to locate hazardous material associated with existing site utilities, though it is presumed that at least some asbestos may be discovered associated with underground piping during the course of site and site utilities work. If and when such materials appear, the Contractor shall notify the Owner, who shall direct additional work outside of this Agreement to assist in cutting up and disposing of same. The Contractor shall assist the hazardous materials contractor(s) with excavating, heavy lifting, and the like at no additional cost to the Owner.

C. Project Procedures for Work Involving Lead-Based Paint (LBP):

1. The Contractor is responsible for abating all Lead-Based Paint (LBP) prior to the start of any Work involving renovation, demolition, reconstruction, alteration, remodeling, or repair (if necessary), unless noted differently below or specified differently elsewhere.

2. The Contractor shall conduct all demolition and removal Work, specified in the Technical Specifications Sections of this Project Manual, in conformance with the regulations as specified in this Section 01 35 16 Alteration Project Procedures and as specified in Section 02 83 13 Lead Remediation.

3. If testing for LBP has been conducted at the facility scheduled for renovation, demolition, reconstruction, alteration, remodeling, or repair, then the results of the LBP testing are summarized in Division 50 00 00 Project-Specific Available Information, Section 50 30 00 Hazardous Building Materials Inspection and Inventory at the end of the Technical Specification Sections. Under no circumstance shall this information be the sole means used by the Contractor for determining the extent of LBP. The Contractor shall be responsible for verification of all field conditions affecting performance of the Work.

4. If the Contractor should encounter any material suspected or known to contain LBP that was not previously identified and assigned as the Contractor's responsibility, then the Contractor should immediately notify the Construction Administrator in writing of same. It is the State's responsibility to have the material tested and abated (if necessary). The Owner will respond within four (4) Calendar Days after receiving the Contractor's written request to the Construction Administrator for testing the suspect material.

4.1 When the **Owner** requests the **Contractor** undertake the responsibilities for the abatement and disposal of the LBP, then the compensation to the Contractor by Owner for the Work shall be determined by the "Unit Prices" stated in Section 01 20 00 Contract Considerations.

5. Exposure levels for lead in the construction industry are regulated by 29 CFR 1926.62. Construction activities disturbing surfaces containing lead-based paint (LBP) which are likely to be employed, such as sanding, grinding, welding, cutting and burning, have been known to expose workers to levels of lead in excess of the Permissible Exposure Limit (PEL). Conduct demolition and removal Work specified in the technical sections of this specification in conformance with these regulations. In addition, construction debris/waste may be classified as hazardous waste. Disposal of hazardous waste material shall be in accordance with 40 CFR Parts 260 through 271 and Connecticut Hazardous Waste Management Regulations Section 22a-209-1; 22a-209-8(c); 22a-449(c)-11; and 22a-449(c)-100 through 110.

6. The Contractor's Work shall be based on a child under the age of six (6) years in residence; the Work shall also be in accordance with Connecticut Regulations Section 19a-111-1 through 11.

7. If this facility was constructed **prior to 1978** it is likely to have painted surfaces containing lead-based paint.

8. In accordance with the United States Environmental Protection Agency's (EPA) Lead-Based Paint Renovation, Repair, and Painting Program (RRP) issued by the EPA on April 22, 2008, as amended, and regulated by 40 CFR 745, contractors performing renovation, repair and painting projects that disturb lead-based paint in homes, child care facilities, and schools built before 1978 must be certified and must

follow specific work practices to prevent lead contamination. EPA requires that firms performing renovation, repair, and painting projects that disturb lead-based paint in pre-1978 homes, child care facilities and schools be certified by EPA and that they use certified renovators who are trained by EPA-approved training providers to follow lead-safe work practices. The Contractor must be a Renovation Firm that has completed an EPA Lead-Safe Certification Program and be certified to conduct lead-based paint activities and renovations under the RRP rule. The Contractor shall have at least one "Certified Renovator" assigned to jobs where LBP is disturbed.

D. See also **General Conditions Article 23 "Cutting, Fitting, Patching and Digging".**

3.2 PREPARATION

A. Cut, move, or remove items as are necessary for access to alteration and renovation Work. Replace and restore at completion.

B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.

C. Remove debris and abandoned items from area and from concealed spaces.

D. Prepare surface and remove surface finishes to provide for proper installation of new Work and finishes.

E. Close openings in exterior surfaces to protect existing Work and salvageable items from weather and extremes of temperature and humidity. Insulate ductwork and piping to prevent condensation in exposed areas.

3.3 INSTALLATION

A. Coordinate alteration and renovation Work to expedite completion, and if required sequence Work to accommodate Owner occupancy.

B. Remove, cut and patch Work in a manner to minimize damage and to provide restoring products and finishes to original and or specified condition in accordance with **Section 01 73 29 "Cutting and Patching".**

C. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with neat transition to adjacent finishes in accordance with **Section 01 73 29 "Cutting and Patching".**

D. In addition to specified replacement of equipment and fixtures, restore existing plumbing, heating, ventilation, air conditioning, and electrical systems to full operational condition.

E. Recover and refinish Work that exposes mechanical and electrical Work exposed accidentally during the Work.

F. Install products as specified in individual specification sections.

3.4 TRANSITIONS

A. Where new Work abuts or aligns with existing, perform a smooth and even transition. Patch work to match existing adjacent Work in texture and appearance.

B. When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect/Engineer.

3.5 ADJUSTMENTS

A. Where removal of partitions or walls result in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.

B. Where a change of plane of 1/4-inch in (12) inches or more occurs, request recommendation from Architect/Engineer for providing a smooth transition.

C. Trim existing doors as necessary to clear new floor finish. Refinish trim as required.

D. Fit Work at penetrations of surfaces as specified in **Section 01 73 29 "Cutting and Patching".**

3.6 REPAIR OF DAMAGED SURFACES

A. Patch or replace portions of existing surfaces that are damaged, lifted, discolored, or showing imperfections.

B. Repair substrate prior to patching finishes.

3.7 FINISHES

A. Finish surfaces as specified in individual product specification sections.

B. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.8 CLEANING

A. In addition to cleaning specified in **Section 01 50 00 "Temporary Facilities and Controls",** clean Agency occupied areas of Work.

END OF SECTION 01 35 16

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PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section

1.2 SUMMARY

A. This guide specification covers construction safety requirements and requirements for the protection of people, property, and resources. It is intended for use in construction, renovation, and demolition projects for the State of Connecticut Department of Administrative Services (DAS) / Construction Services (CS).

B. **Related Sections:** The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 33 00 Submittal Procedures specifies the requirements for submittal requirements;
2. Division 01 Section 01 31 19 "Project Meetings" specifies requirements for submittal and distribution of meeting and conference minutes.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE) www.asse.org/publications/	
ASSE/SAFE A10.32	(2004) Fall Protection
ASSE/SAFE A10.34	(2001; R 2005) Protection of the Public on or Adjacent to Construction Sites
ASSE/SAFE Z359.1	(2007) Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) www.asme.org/Codes/	
ASME B30.22	(2005) Articulating Boom Cranes
ASME B30.3	(2004) Construction Tower Cranes
ASME B30.5	(2004) Mobile and Locomotive Cranes
ASME B30.8	(2004) Floating Cranes and Floating Derricks
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) www.nfpa.org/	
NFPA 10	(2007) Portable Fire Extinguishers
NFPA 51B	(2009) Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 241	(2004) Safeguarding Construction, Alteration, and Demolition Operations
NFPA 70	(2008) National Electrical Code
NFPA 70E	Standard for Electrical Safety in the Workplace
CODE OF FEDERAL REGULATIONS (CFR) www.archives.gov/federal-register/cfr/	
10 CFR	Standards for Protection Against Radiation
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1910.28	Safety Requirements For Scaffolding.
29 CFR 1910.146	Permit-required Confined Spaces
29 CFR 1910.147	Control Of Hazardous Energy (Lockout/Tagout)
29 CFR 1910.178	Powered industrial trucks.
29 CFR 1915	Confined and Enclosed Spaces and Other
29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.500	Fall Protection
29 CFR 1926.550	Cranes and Derricks

US Army Core of Engineers (USACE) **www.iwr.usace.army.mil**	
EM 385-1-1	Safety, and Health Requirements Manual (2008),

1.3 SUBMITTALS

A. An "O" followed by "A" indicates that the Owner acceptance; submittals not having an "O" designation are for Contractor Quality Control approval.

B. Submittal Procedures:

1. Preconstruction Submittals:

a. Accident Prevention Plan (APP): “O, A”;
b. Activity Hazard Analysis (AHA); “O, A”;
c. Crane Critical Lift Plan; “O, A”;
d. Proof of qualification for Crane Operators; O, A.

2. Test Reports: Submit reports as their incidence occurs, in accordance with the requirements of the paragraph entitled, "Reports."

a. Accident Reports;
b. Monthly Exposure Reports;
c. Crane Reports;
d. Regulatory Citations and Violations;
e. Gas Protection.

3. Certificates:

a. Confined Space Entry Permit;
b. Hot work permit;
c. License Certificates.
d. Certificate of Compliance – Crane

1.4 DEFINITIONS

A. Competent Person. A competent person is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

B. Competent Person for Fall Protection. A person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as their application and use with related equipment, and has the authority to take prompt corrective measures to eliminate the hazards of falling.

C. Confined Space: A space which by design has limited openings for entry and exit, unfavorable natural ventilation which could contain or produce dangerous air contaminants, and which is not intended for continuous employee occupancy. Confined spaces include, but are not limited to storage tanks, process vessels, pits, silos, vats, degreasers, reaction vessels, boilers, ventilation and exhaust ducts, sewers, tunnels, underground utility vaults, and pipelines.

D. High Visibility Accident: Any mishap which may generate publicity and/or high visibility.

E. Medical Treatment; Medical treatment includes treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even through provided by a physician or registered personnel.

F. Operating Envelope: The area surrounding any crane. Inside this "envelope" is the crane, the operator, riggers and crane walkers, rigging gear between the hook and the load, the load and the crane's supporting structure (ground, rail, etc.).

G. Qualified Person for Fall Protection: A person with a recognized degree or professional certificate and with extensive knowledge, training and experience in the field of fall protection; who is capable of performing design, analysis, and evaluation of fall protection systems and equipment.

H. Recordable Injuries or Illnesses: Any work-related injury or illness that results in:

1. Death, regardless of the time between the injury and death, or the length of the illness;

2. Days away from work (any time lost after day of injury/illness onset);
3. Restricted work;
4. Transfer to another job;
5. Medical treatment beyond first aid;
6. Loss of consciousness; or
7. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.

I. Weight Handling Equipment (WHE) Accident: A WHE accident occurs when any one or more of the six elements in the operating envelope fails to perform correctly during operation, including operation during maintenance or testing resulting in personnel injury or death; material or equipment damage; dropped load; derailment; two-blocking; overload; and/or collision, including unplanned contact between the load, crane, and/or other objects. A dropped load, derailment, two-blocking, overload and collision are considered an accident even though no material damage or injury occurs. A component failure (e.g., motor burnout, gear tooth failure, bearing failure) is not considered an accident solely due to material or equipment damage unless the component failure results in damage to other components (e.g., dropped boom, dropped load, roll over, etc.).]

1.5 REGULATORY REQUIREMENTS

A. In addition to the detailed requirements included in the provisions of this Section see, **Division 01, Section 01 42 20 "Reference Standards and Definitions"** for other state laws, criteria, rules and regulations. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, regulations, and referenced documents vary, the most stringent requirements govern.

1.6 SITE QUALIFICATIONS, DUTIES, AND MEETINGS

A. Personnel Qualifications:

B. Site Safety and Health Officer (SSHO):

1. Provide a Site Safety and Health Officer (SSHO) at the work site at all times to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The Contractor Quality Control (QC) person **can be the SSHO on this project**. Meet the following requirements within the SSHO:

Level 1: Worked on similar projects. 10-hour OSHA construction safety class or equivalent within last **three** (**3**) **years**. Competent person training as needed.

F. Personnel Duties:

1. Site Safety and Health Officer (SSHO):

a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections. Attach safety inspection logs to the Contractors' daily **quality control** report.
b. Conduct mishap investigations and complete required reports. Maintain the **OSHA Form 300 and Daily Production** reports for prime and sub-contractors. For more information visit the OSHA website at **www.osha.gov** > Employers > Recordkeeping Requirements and Forms.
c. Maintain applicable safety reference material on the job site.
d. Attend the pre-construction conference, pre-work meetings including preparatory inspection meeting, and periodic in-progress meetings.
e. Implement and enforce accepted APPS and AHAs.
f. Maintain a safety and health deficiency tracking system that monitors outstanding deficiencies until resolution. Post a list of unresolved safety and health deficiencies on the safety bulletin board.
g. Ensure sub-contractor compliance with safety and health requirements.

Failure to perform the above duties will result in dismissal of the superintendent and/or SSHO, and a project work stoppage. The project work stoppage will remain in effect pending approval of a suitable replacement.

G. Meetings:

1. Preconstruction Conference:

a. Contractor representatives who have a responsibility or significant role in accident prevention on the project shall attend the preconstruction conference. This includes the project superintendent, site safety and health officer, quality control supervisor, or any other assigned safety and health professionals who participated in the development of the **Accident Prevention Plan** (APP); (including the **Activity Hazard Analyses** (AHAs), and special plans, program and procedures associated with it).

b. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Owner's Representative(s) as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, review, and acceptance of AHAs to preclude project delays.

c. Deficiencies in the submitted APP will be brought to the attention of the Contractor at the preconstruction conference, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Do not begin work until there is an accepted APP.

2. Safety Meetings:

Safety meetings shall be conducted to review past activities, plan for new or changed operations, review pertinent aspects of appropriate AHA (by trade), establish safe working procedures for anticipated hazards, and provide pertinent safety and health training and motivation.

a. Meetings shall be conducted at least once a month for all supervisors on the project location and at least once a week for all workers by supervisors or foremen.

b. Meetings shall be documented, including the date, persons in attendance, subjects discussed, and names of individual(s) who conducted the meeting. Documentation shall be maintained and copies furnished to the Construction Administrator (CA) on request.

c. The Construction Administrator (CA) shall be informed of all scheduled meetings in advance and be invited to attend.

1.7 ACCIDENT PREVENTION PLAN (APP):

A. Use a qualified person to prepare the written site-specific APP.

1. Prepare the APP in accordance with the format and requirements of **US Army Core of Engineers (USACE), Safety, and Health Requirements Manual, EM 385-1-1,** or as approved by the CA and as supplemented herein. Cover all paragraphs and subparagraph elements in **USACE EM 385-1-1, Appendix A, "Minimum Basic Outline for Accident Prevention Plan"** or as approved by the CA. The USACE Safety, and Health Requirements Manual, EM 385-1-1 is available at the USACE Website **www.iwr.usace.army.mil.**

2. Specific requirements for some of the APP elements are described in **"B"** below. The APP shall be job-specific and address any unusual or unique aspects of the project or activity for which it is written.

B. The APP shall interface with the Contractor's overall safety and health program. Include any portions of the Contractor's overall safety and health program referenced in the APP in the applicable APP element and made site-specific. The Owner considers the Prime General Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer and any designated Certified Safety Professional (CSP) and/or Certified Industrial Hygienist (CIH).

C. Submit the APP to the DAS/CS Project Manager and Construction Administrator **Fourteen (14) Calendar Days** prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP. Once accepted by the DAS/CS Project Manager and Construction Administrator, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the DAS/CS Project Manager and Construction Administrator, until the matter has been rectified. Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the DAS/CS Project Manager and Construction Administrator, project superintendent, Site Safety and Health Officer **(**SSHO) and quality control manager. Should any hazard become evident, stop work in the area, secure the area, and develop a plan to remove the hazard. Notify the DAS/CS Project Manager and Construction Administrator within **Twenty (24)** hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to

restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by **American Society of Safety Engineers**, **ASSE/SAFE A10.34 - Protection of the Public on or Adjacent to Construction Sites, see www.asse.org**) and the environment.

Copies of the accepted plan will be maintained at the Construction Administrator's office at the job site. Continuously reviewed and amended the APP, as necessary, throughout the life of the contract. Incorporate unusual or high-hazard activities not identified in the original APP as they are discovered.

D. APP Contents:

The contents of the Accident Prevention Plan (APP) shall be in accordance with **Appendix A** of the US Army Corps of Engineers, **EM 385-1-1 Safety and Health Requirements Manual**, Appendix A, Minimum Basic Outline for Accident Prevention Plans or as approved by the CA. For more information visit the USACE Website at **www.usace.army.mil/Library.**

1.8 ACTIVITY HAZARD ANALYSIS (AHA): Activity Hazard Analyses (AHAs) define the activities being performed and identify the sequences of work, the specific hazards anticipated, site conditions, equipment, materials, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk. The Activity Hazard Analysis (AHA) format shall be in accordance with US Army Corps of Engineers, **EM 385-1-1 Safety and Health Requirements Manual** or as approved by the CA.

A. Submittals:

1. Submit initial AHA to CA for review at least fifteen **(15) Calendar Days** prior to the start of each phase. Format subsequent AHAs as amendments to the APP. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.
2. The AHA list will be reviewed monthly at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change. Develop the activity hazard analyses using the project schedule as the basis for the activities performed. Any activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier or subcontractor and provided to the prime contractor for submittal to the CA.

1.9 DISPLAY OF SAFETY INFORMATION

Within **one (1) Calendar Days** after commencement of work, erect a safety bulletin board at the job site. Include and maintain information on safety bulletin board as required by US Army Corps of Engineers, **EM 385-1-1 Safety and Health Requirements Manual**, Section 01.A.06 or as approved by the CA. Additional items required to be posted include:

A. Confined space entry permit.
B. Hot work permit.
C. Crane permit
D. Street permit(s)
E. Others (as required)

1.10 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in the article "References." Maintain applicable equipment manufacturer's manuals.

1.11 EMERGENCY MEDICAL TREATMENT

Contractors will arrange for their own emergency medical treatment. The Owner has no responsibility to provide emergency medical treatment.

1.12 REPORTS

A. Accident Reports

1. Conduct an accident investigation for recordable injuries and illnesses, and property damage accidents resulting in at least **Two Thousand Dollars ($2,000)** in damages, to establish the root cause(s) of the accident, complete "Accident Report Form" approved by the CA. Provide the report to the CA within **five (5) Calendar Days** of the accident.

B. Accident Notification

Notify the CA as soon as practical, but not later than **four hours (4),** after any accident meeting the definition of Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than $2,000, or any weight handling equipment accident.

1. Within notification include the following:
   a. contractor name;
   b. contract title;
   c. type of contract;
   d. name of activity,
   e. installation or location where accident occurred;
   f. date and time of accident;
   g. names of personnel injured**;**
   h. extent of property damage, if any; extent of injury, if known, and brief description of accident. Preserve the conditions and evidence on the accident site until the U.S. Department of Labor, Occupational Safety and Health Administration (USDOL-OSHA) investigation team arrives on-site and USDOL-OSHA investigation is conducted.

C. Monthly Exposure Reports

Monthly exposure reporting to the CA is required to be attached to the monthly Application for Payment request. This report is a compilation of employee-hours worked each month for all site workers, both prime and subcontractor. Provide on a form approved by the CA.

D. Crane Reports

Submit crane inspection reports on a form approved by the CA and as specified herein with Daily Reports of Inspections.

E. HOT WORK

Hot Work shall only be performed in accordance with the requirements of **NFPA 51B "Fire Prevention During Welding, Cutting and Other Hot Work Standard.**

1. Definitions:

a. Hot Work: Work involving burning, welding, or a similar operation that is capable of initiating fires or explosions. Examples listed by NFPA include arc welding, oxygen- fuel gas welding, open-flame soldering, brazing, thermal spraying, oxygen cutting, and arc cutting.

b. Permit Authorizing Individual (PAI). Means the individual designated by the General Contractor to authorize hot work. The PAI is permitted to be, among others, the General Contractor's project executive, supervisor, foreperson, or designated safety administrator. The PAI CANNOT be the hot work operator, except as permitted in **NFPA 51B**. The PAI is aware of the fire hazards involved and is familiar with the provisions of this standard.

2. Permit: Submit and obtain a written permit from the PAI prior to performing "Hot Work" (welding, cutting, etc.) or operating other flame-producing/spark producing devices, from the PAI. CONTRACTORS ARE REQUIRED TO MEET ALL CRITERIA BEFORE A PERMIT IS ISSUED. The General Contractor will provide at least **two (2)** twenty (20) pound 4A:20 BC rated extinguishers for normal "Hot Work". All extinguishers shall be current inspection tagged, approved safety pin and tamper resistant seal.

3. Fire Watch: It is also mandatory to have a designated FIRE WATCH for any "Hot Work" done at this activity. The Fire Watch shall be trained in accordance with **NFPA 51B Standard for Fire Prevention During Welding, Cutting, and Other Hot Work** and remain on-site for a minimum of 30 minutes after completion of the task or as specified on the hot work permit. When starting work in the facility, require personnel to familiarize themselves with the location of the nearest fire alarm boxes and place in memory the local fire department emergency phone number(s). ANY FIRE, NO MATTER HOW SMALL, SHAL BE REPORTED TO THE LOCAL FIRE DEPARTMENT, GENERAL CONTRACTOR'S AUTHORIZED REPRESENTATIVE, AND OWNER'S CA IMMEDIATELY.

1.13 FACILITY OCCUPANCY CLOSURE

Streets, walks, and other facilities occupied and used by the state User Agency shall not be closed or obstructed without written permission from the CA.

1.14 SEVERE STORM PLAN

In the event of a severe storm warning, the Contractor must:

A. Secure outside equipment and materials and place materials that could be damaged in protected areas.

B. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.

C. Ensure that temporary erosion controls are adequate.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

3.1 CONSTRUCTION AND/OR OTHER WORK

Comply with the Connecticut State Building and Fire Safety Codes, OSHA regulations, and other references regulations. The most stringent standard prevails.

3.1.2 HAZARDOUS MATERIAL EXCLUSIONS

Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with **USACE EM 385-1-1** such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocynates, lead-based paint are prohibited. The CA, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials.

3.1.3 UNFORESEEN HAZARDOUS MATERIAL

A. Related Section: Division 01, Section 01 35 16, Alteration Project Procedures.

3.2 PRE-OUTAGE COORDINATION MEETING

Contractors are required to apply for utility outages at least **fifteen (15) Calendar Days** in advance. As a minimum, the request should include the location of the outage, utilities being affected, duration of outage and any necessary sketches. Special requirements for electrical outage requests are contained elsewhere in this specification section. Once approved, and prior to beginning work on the utility system requiring shut down, attend a pre-outage coordination meeting with the CA, User Agency Representative, and Public Utilities representative to review the scope of work and the lock-out/tag-out procedures for worker protection. No work will be performed on energized electrical circuits unless proof is provided that no other means exist.

3.3 SAFETY LOCKOUT/TAGOUT PROCEDURES

A. The General Contractor shall ensure that each employee is familiar with and complies with these procedures and **OSHA 29 CFR 1910.147 Control Of Hazardous Energy (Lockout/Tagout).**

1. The General Contractor's "Authorized Employee" shall apply lockout/tagout tags and take other actions that, because of experience and knowledge, are known to be necessary to make the particular equipment safe to work on.
2. No person, regardless of position or authority, shall operate any switch, valve, or equipment that has an official lockout/tagout tag attached to it, nor shall such tag be removed except as provided in this section.
3. No person shall work on any equipment that requires a lockout/tagout tag unless he, his immediate supervisor, project leader, or a subordinate has in his possession the stubs of the required lockout/tagout tags. Only qualified personnel shall perform work on electrical circuits.
4. A supervisor who is required to enter an area protected by a lockout/tagout tag will be considered a member of the protected group provided he notifies the holder of the tag stub each time he enters and departs from the protected area.
5. Identification markings on building light and power distribution circuits shall not be relied on for established safe work conditions.
6. Before clearance will be given on any equipment other than electrical (generally referred to as mechanical apparatus), the apparatus, valves, or systems shall be secured in a passive condition with the appropriate vents, pins, and locks. Pressurized or vacuum systems shall be vented to relieve differential pressure completely. Vent valves shall be tagged open during the course of the work. Where dangerous gas or fluid systems are involved, or in areas where the environment may be oxygen deficient, system or areas shall be purged, ventilated, or otherwise made safe prior to entry.

B. Tag Placement

Lockout/tagout tags shall be completed in accordance with the regulations printed on the back thereof and attached to any device which, if operated, could cause an unsafe condition to exist. If more than one group is to work on any circuit or equipment, the employee in charge of each group shall have a separate set of lockout/tagout tags completed and properly attached. When it is required that certain equipment be

tagged, the State of Connecticut Authority Having Jurisdiction will review the characteristics of the various systems involved that affect the safety of the operations and the work to be done; take the necessary actions, including voltage and pressure checks, grounding, and venting, to make the system and equipment safe to work on; and apply such lockout/tagout tags to those switches, valves, vents, or other mechanical devices needed to preserve the safety provided. This operation is referred to as "Providing Safety Clearance."

C. Tag Removal

When any individual or group has completed its part of the work and is clear of the circuits or equipment, the supervisor, project leader, or individual for whom the equipment was tagged shall turn in his signed lockout/tagout tag stub to the Contractor. That group's or individual's lockout/tagout tags on equipment may then be removed on authorization by the Contractor.

3.4 FALL HAZARD PROTECTION AND PREVENTION PROGRAM

Establish a fall protection and prevention program, for the protection of all employees exposed to fall hazards. Within the program include company policy, identify responsibilities, education and training requirements, fall hazard identification, prevention and control measures, inspection, storage, care and maintenance of fall protection equipment and rescue and evacuation procedures.

A. Training

Institute a fall protection training program. As part of the Fall Hazard Protection and Prevention Program, provide training for each employee who might be exposed to fall hazards. Provide training by a competent person for fall protection in accordance with **USACE EM 385-1-1**, Section 21.A.16.

B. Fall Protection Equipment and Systems

Enforce use of the fall protection equipment and systems designated for each specific work activity in the Fall Protection and Prevention Plan and/or AHA at all times when an employee is exposed to a fall hazard. Protect employees from fall hazards as specified in **USACE EM 385-1-1, section 21.** In addition to the required fall protection systems, safety skiff, personal floatation devices, life rings etc., are required when working above or next to water in accordance with **USACE EM 385-1-1, paragraphs 05.H. and 05.I**. Personal fall arrest systems are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall arrest systems are required when operating other equipment such as scissor lifts if the work platform is capable of being positioned outside the wheelbase. The need for tying-off in such equipment is to prevent ejection of the employee from the equipment during raising, lowering, or travel. Fall protection must comply with **OSHA 29 CFR 1926.500, Fall Protection, Subpart M, and ASSE/SAFE A10.32, Fall Protection.**

1. Personal Fall Arrest Equipment

Personal fall arrest equipment, systems, subsystems, and components shall meet **ASSE/SAFE Z359.1, Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components.** Only a full-body harness with a shock-absorbing lanyard or self-retracting lanyard is an acceptable personal fall arrest body support device. Body belts may only be used as a positioning device system (for uses such as steel reinforcing assembly and in addition to an approved fall arrest system). Harnesses shall have a fall arrest attachment affixed to the body support (usually a Dorsal D-ring) and specifically designated for attachment to the rest of the system. Only locking snap
hooks and carabiners shall be used. Webbing, straps, and ropes shall be made of synthetic fiber. The maximum free fall distance when using fall arrest equipment shall not exceed 1.8 m 6 feet. The total fall distance and any swinging of the worker (pendulum-like motion) that can occur during a fall shall always be taken

2. Fall Protection for Roofing Work

Implement fall protection controls based on the type of roof being constructed and work being performed. Evaluate the roof area to be accessed for its structural integrity including weight-bearing capabilities for the projected loading.

a. Low Sloped Roofs:

(i) For work within 6 feet (6 feet (1.8 m) of an edge, on low-slope roofs, Protect personnel from falling by use of personal fall arrest systems, guardrails, or safety nets.

(ii) For work greater than (6 feet (1.8 m) from an edge, erect and install warning lines in accordance with **OSHA 29 CFR 1926.500, Fall Protection**.

b. Steep-Sloped Roofs: Work on steep-sloped roofs requires a personal fall arrest system, guardrails with toe-boards, or safety nets. This requirement also includes residential or housing type construction.

3. Existing Anchorage
Certified (or re-certified) by a qualified person for fall protection existing anchorages, to be used for attachment of personal fall arrest equipment in accordance with **ASSE/SAFE Z359.1, Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components.** Exiting horizontal lifeline anchorages must be certified (or re-certified) by a registered professional engineer with experience in designing horizontal lifeline systems.

4. Horizontal Lifelines
Design, install, certify and use under the supervision of a qualified person horizontal lifelines for fall protection as part of a complete fall arrest system which maintains a safety factor of 2 **(OSHA 29 CFR 1926.500 Fall Protection).**

5. Guardrails and Safety Nets
Design, install and use guardrails and safety nets in accordance with **29 CFR 1926, Safety and Health Regulations for Construction Subpart M.**

6. Rescue and Evacuation Procedures
When personal fall arrest systems are used, the contractor must ensure that the mishap victim can self-rescue or can be rescued promptly should a fall occur. Prepare a Rescue and Evacuation Plan and include a detailed discussion of the following: methods of rescue; methods of self-rescue; equipment used; training requirement; specialized training for the rescuers; procedures for requesting rescue and medical assistance; and transportation routes to a medical facility. Include the Rescue and Evacuation Plan within the Activity Hazard Analysis (AHA) for the phase of work, in the Fall Protection and Prevention (FP&P) Plan, and the Accident Prevention Plan (APP).

3.5 SCAFFOLDING

A. The Contractor shall provide all employees with a safe means of access to the work area on the scaffold in accordance with **OSHA 29 CFR 1910.28 Safety Requirements For Scaffolding** and as contained in this section.

1. Climbing of any scaffold braces or supports not specifically designed for access is prohibited.

2. Access scaffold platforms greater than 20 feet (6 m) maximum in height by use of a scaffold stair system.

3. Do not use vertical ladders commonly provided by scaffold system manufacturers for accessing scaffold platforms greater than 20 feet (6 m) maximum in height.

4. The use of an adequate gate is required.

5. Ensure that employees are qualified to perform scaffold erection and dismantling.

6. Do not use scaffold without the capability of supporting at least four times the maximum intended load or without appropriate fall protection as delineated in the accepted fall protection and prevention plan.

7. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward.

8. Give special care to ensure scaffold systems are not overloaded. Side brackets used to extend scaffold platforms on self-supported scaffold systems for the storage of material are prohibited.

9. The first tie-in shall be at the height equal to 4 times the width of the smallest dimension of the scaffold base. Place work platforms on mud sills. Scaffold or work platform erectors shall have fall protection during the erection and dismantling of scaffolding or work platforms that are more than six feet. Delineate fall protection requirements when working above six feet or above dangerous operations in the Fall Protection and Prevention (FP&P) Plan and Activity Hazard Analysis (AHA) for the phase of work.

B. Stilts

The use of stilts for gaining additional height in construction, renovation, repair or maintenance work is **PROHIBITED**.

3.6 EQUIPMENT

A. Material Handling Equipment

Material Handling Equipment shall be in accordance with **OSHA 29 CFR 1910.178 Powered Industrial Trucks** and as contained in this section.

1. Material handling equipment such as forklifts shall not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions.

2. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions.

3. Operators of forklifts or power industrial trucks shall be licensed in accordance with OSHA.

B. Weight Handling Equipment

1. Equip cranes and derricks as specified in **ASME B30.5** or **ASME B30.22** or **ASME B30.8** as applicable.

2. Comply with the crane manufacturer's specifications and limitations for erection and operation of cranes and hoists used in support of the work. Perform erection under the supervision of a designated person (as defined in **ASME B30.5**). Perform all testing in accordance with the manufacturer's recommended procedures.

3. Comply with **ASME B30.5** for mobile and locomotive cranes, **ASME B30.22** for articulating boom cranes, ASME B30.3 for construction tower cranes, and **ASME B30.8** for floating cranes and floating derricks.

4. Under no circumstance shall a Contractor make a lift at or above 90% of the cranes rated capacity in any configuration.

5. When operating in the vicinity of overhead transmission lines, operators and riggers shall be alert to this special hazard and follow the requirements of **ASME B30.5** or **ASME B30.22** as applicable.

6. Do not crane suspended personnel work platforms (baskets) unless the Contractor proves that using any other access to the work location would provide a greater hazard to the workers or is impossible. Do not lift personnel with a line hoist or friction crane.

7. Inspect, maintain, and recharge portable fire extinguishers as specified in **NFPA 10, Standard for Portable Fire Extinguishers.**

8. All employees must keep clear of loads about to be lifted and of suspended loads.

9. Use cribbing when performing lifts on outriggers.

10. The crane hook/block must be positioned directly over the load. Side loading of the crane is prohibited.

11. A physical barricade must be positioned to prevent personnel from entering the counterweight swing (tail swing) area of the crane.

12. Certification records which include the date of inspection, signature of the person performing the inspection, and the serial number or other identifier of the crane that was inspected shall always be available for review by CA.

13. Written reports listing the load test procedures used along with any repairs or alterations performed on the crane shall be available for review by CA.

14. Certify that all crane operators have been trained in proper use of all safety devices (e.g. anti-two block devices).

C. USE OF EXPLOSIVES

Explosives shall not be used or brought to the project site without prior written approval from the CA. Such approval shall not relieve the Contractor of responsibility for injury to persons or for damage to property due to blasting operations. Storage of explosives, when permitted on State property, shall be only where directed and in approved storage facilities. These facilities shall be kept locked at all times except for inspection, delivery, and withdrawal of explosives. Explosive work shall be performed in accordance with the requirements of C.G.S. § 29-343 through 29-355 and as required by the Office of State Fire Marshal, CT Department of Construction Services.

3.7 EXCAVATIONS

A. Perform soil classification by a competent person in accordance with **29 CFR 1926 Safety and Health Regulations for Construction.**

1. Utility Locations

All underground utilities in the work area must be positively identified by and coordinated in accordance with **Division 00, General Conditions, Article 18 Surveys, Permits, And Regulations.** All underground utilities in the work area must be positively identified by a private utility locating service and coordinated with the public utility company. Any markings made during the utility investigation must be maintained by the General Contractor throughout the contract.

2. Utility Location Verification

The Contractor must physically verify underground utility locations by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within three feet of the underground system. Digging within **Two (2) feet** of a known utility must not be performed by means of mechanical equipment; hand digging shall be used. If construction is parallel to an existing utility expose the utility by hand digging every **100 feet** if parallel within **Five (5) feet** of the excavation.

3. Shoring Systems

Trench and shoring systems must be identified in the accepted safety plan and AHA. Manufacture tabulated data and specifications or registered engineer tabulated data for shoring or benching systems shall be readily available on-site for review. Job-made shoring or shielding must have the registered professional engineer stamp, specifications, and tabulated data. Extreme care must be used when excavating near direct burial electric underground cables.

4. Trenching Machinery

Operate trenching machines with digging chain drives only when the spotters/laborers are in plain view of the operator. Provide operator and spotters/laborers training on the hazards of the digging chain drives with emphasis on the distance that needs to be maintained when the digging chain is operating. Keep documentation of the training on file at the project site.

3.8 UTILITIES WITHIN CONCRETE SLABS

A. Utilities located within concrete slabs or pier structures, bridges, and the like, are extremely difficult to identify due to the reinforcing steel used in the construction of these structures. Whenever contract work involves concrete chipping, saw cutting, or core drilling, the existing utility location must be coordinated with utility company in addition to a private locating service. Outages to isolate utility systems must be used in circumstances where utilities are unable to be positively identified. The use of historical drawings does not alleviate the contractor from meeting this requirement.

3.9 ELECTRICAL

A. Conduct of Electrical Work

Underground electrical spaces must be certified safe for entry before entering to conduct work. Cables that will be cut must be positively identified and de-energized prior to performing each cut. Positive cable identification must be made prior to submitting any outage request for electrical systems. Arrangements are to be coordinated with the CA and utility company for identification. The CA will not accept an outage request until the Contractor satisfactorily documents that the circuits have been clearly identified. Perform all high voltage cable cutting remotely using hydraulic cutting tool. When racking in or live switching of circuit breakers, no additional person other than the switch operator will be allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method. When working in energized substations, only qualified electrical workers will be permitted to enter. When work requires Contractor to work near energized circuits as defined by the **NFPA 70**, high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves with leather protective sleeves, fire retarding shirts, coveralls, face shields, and safety glasses. In

addition, provide electrical arc flash protection for personnel as required by **NFPA 70E**. Insulating blankets, hearing protection, and switching suits may also be required, depending on the specific job and as delineated in the Contractor's AHA.

B. Portable Extension Cords

Size portable extension cords in accordance with manufacturer ratings for the tool to be powered and protected from damage. Immediately remove from service all damaged extension cords. Portable extension cords shall meet the requirements of **NFPA 70.**

3.10 WORK IN CONFINED SPACES

A. Comply with the requirements in **OSHA 29 CFR 1910.146** and **OSHA 29 CFR 1926.21(b) (6).** Any potential for a hazard in the confined space requires a permit system to be used.

1. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. All hazards pertaining to the space shall be reviewed with each employee during review of the AHA.

2. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained to ensure exposure to any hazardous atmosphere is kept below its' action level.

3. Sewer wet wells require continuous atmosphere monitoring with audible alarm for toxic gas detection.

END OF SECTION 01 35 26

SECTION 01 35 91 - HISTORIC TREATMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general protection and treatment procedures for designated historic spaces, areas, rooms, and surfaces in Project.

The Prudence Crandall House is listed on the National Register of Historic Places and is a National Historic Landmark. All work for this renovation project shall be in compliance with the Secretary of the Interiors Standards for the Treatment of Historic Structures.

All work activities must be undertaken with sufficient care to protect this historic resource and must be supervised by personnel who are familiar with the Secretary of Interior's Standards for Restoration.

1.3 DEFINITIONS

A. Consolidate: To strengthen loose or deteriorated materials in place.

B. Design Reference Sample: A sample that represents Architect's prebid selection of work to be matched; it may be existing work or work specially produced for Project.

C. Dismantle: To disassemble or detach a historic item from a surface, or a nonhistoric item from a historic surface, using gentle methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

D. Historic: Spaces, areas, rooms, surfaces, materials, finishes, and overall appearance that are important to the successful preservation, rehabilitation, restoration and reconstruction as determined by Architect. Designated historic spaces, areas, rooms and surfaces are indicated on Drawings.

1. Grade 1 Areas: Areas of greatest architectural importance, integrity, and visibility; to be preserved and restored to the original, circa 1805, design and finish as indicated on Drawings.
2. Grade 2 Areas: Areas of significant architectural importance, integrity, and visibility; to be preserved and restored consistent with the remaining historic fabric and to the extent indicated on Drawings.
3. Grade 3 Areas: Areas of slight architectural importance, integrity, and visibility; to leave any remaining original fabric untouched insofar as is consistent with accommodating modern uses for the building as indicated on Drawings.

E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.

F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.

G. Reinstall: To protect removed or dismantled item, repair and clean it as indicated for reuse, and reinstall it in original position, or where indicated.

H. Remove: To take down or detach a nonhistoric item located within a historic space, area, or room, using methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

I. Repair: To correct damage and defects, retaining existing materials, features, and finishes while employing as little new material as possible. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.

J. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.

K. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.

L. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.

M. Restore: To consolidate, replicate, reproduce, repair, and refinish as required to achieve the indicated results.

N. Retain: To keep existing items that are not to be removed or dismantled.

O. Reversible: New construction work, treatments, or processes that can be removed or undone in the future without damaging historic materials unless otherwise indicated.

P. Salvage: To protect removed or dismantled items and deliver them to Owner ready for reuse.

Q. Stabilize: To provide structural reinforcement of unsafe or deteriorated items while maintaining the essential form as it exists at present; also, to reestablish a weather-resistant enclosure.

R. Strip: To remove existing finish down to base material unless otherwise indicated.

1.4 COORDINATION

A. Historic Treatment Subschedule: A construction schedule coordinating the sequencing and scheduling of historic treatment work for entire Project, including each activity to be performed in historic spaces, areas, and rooms, and on historic surfaces; and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for historic treatment work.

1. Schedule construction operations in sequence required to obtain best historic treatment results.
2. Coordinate sequence of historic treatment work activities to accommodate the following:
   a. Other known work in progress.
   b. Tests and inspections.
3. Detail sequence of historic treatment work, with start and end dates.
4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
5. Use of elevator and stairs.
6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.

1.5 PROJECT MEETINGS FOR HISTORIC TREATMENT

A. Preliminary Historic Treatment Conference: Before starting historic treatment work, Architect will conduct conference at Project site.

1. Attendees: In addition to representatives of Owner, Architect, and Contractor, testing service representative, historic treatment specialists, chemical-cleaner manufacturer(s), and installers whose work interfaces with or affects historic treatment shall be represented at the meeting.
2. Agenda: Discuss items of significance that could affect progress of historic treatment work, including review of the following:

a. Historic Treatment Subschedule: Discuss and finalize; verify availability of materials, historic treatment specialists' personnel, equipment, and facilities needed to make progress and avoid delays.
b. Fire-prevention plan.
c. Governing regulations.
d. Areas where existing construction is to remain and the required protection.
e. Hauling routes.
f. Sequence of historic treatment work operations.
g. Storage, protection, and accounting for salvaged and specially fabricated items.
h. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
i. Qualifications of personnel assigned to historic treatment work and assigned duties.
j. Requirements for extent and quality of work, tolerances, and required clearances.
k. Methods and procedures related to historic treatments, including product manufacturers' written instructions and precautions regarding historic treatment procedures and their effects on materials, components, and vegetation.
l. Embedded work such as flashings and lintels, special details, collection of wastes, protection of occupants and the public, and condition of other construction that affect the Work or will affect the work.

3. Reporting: Architect will record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.

B. Coordination Meetings: Conduct specifically for historic treatment work at regular intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner, Architect, and Contractor, each historic treatment specialist, supplier, installer, and other entity concerned with progress or involved in planning, coordination, or performance of historic treatment work activities shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to historic treatment work.
2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of historic treatment work. Include topics for discussion as appropriate to status of Project.

a. Historic Treatment Subschedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed within the Contract Time.
b. Schedule Updating: Revise Contractor's Historic Treatment Subschedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
c. Review present and future needs of each entity present, including review items listed in the "Preliminary Historic Treatment Conference" Paragraph in this article and the following:

1) Interface requirements of historic treatment work with other Project Work.

2) Status of submittals for historic treatment work.
3) Access to historic treatment work.
4) Effectiveness of fire-prevention plan.
5) Quality and work standards of historic treatment work.
6) Change Orders for historic treatment work.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.

1. Dismantle and salvage each item or object and protect it from damage, then promptly deliver it to Owner where directed at Project site.
2. Coordinate with Owner's conservationist who will establish special procedures for dismantling and salvaging.

1.7 INFORMATIONAL SUBMITTALS

A. Historic Treatment Subschedule:

1. Submit historic treatment subschedule within seven days of date established for commencement of historic treatment work.

B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by Contractor's historic treatment operations.

C. Historic Treatment Program: Submit 10 days before work begins.

D. Fire-Prevention Plan: Submit 10 days before work begins.

1.8 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic treatment specialist, experienced in repairing, refinishing, and replacing historic material in whole and in part. Experience in fabricating and installing new work is not sufficient for this historic treatment work. Subject to compliance with requirements, historic specialty work shall be performed by a firm with a minimum of five (5) years successful experience with comparable restoration work including work on at least three (3) buildings listed on the National or State Registers under direction of SHPO, and employing personnel skilled in the restoration process and operations indicated, with a record of successful in-service performance that demonstrates the firm’s qualifications to perform this work. The qualifying historic treatment specialist shall be required to demonstrate its experience with names, dates, and locations of similar projects. This firm must designate a field supervisor, foreman, and tradesmen with commensurate experience for the duration of the work. Supervisors shall be on site when historic treatment begins and during its progress. Supervisors shall not be changed during Project except for causes beyond control of specialty firm. Should a supervisor be replaced, the new supervisor must demonstrate the requirements of the work by constructing new mock-ups. Resumes and experience must be approved by Owner prior to acceptance of bid. In the event of discrepancy, the more stringent requirements will govern.

1. Field Supervisor Qualifications: Full-time supervisors experienced in historic treatment work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on site when historic treatment work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond control of the specialist firm.

    a. Construct new mockups of required work whenever a supervisor is replaced.

B. Title X Requirement: Each firm conducting activities that disturb painted surfaces shall be a "Lead-Safe Certified Firm" according to 40 CFR 745, Subpart E, and use only workers that are trained in lead-safe work practices.

C. Historic Treatment Program: Prepare a written plan for historic treatment for whole Project, including each phase or process and protection of surrounding materials during operations. Describe in detail the materials, methods, and equipment to be used for each phase of work. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project historic treatment program with specific requirements of programs required in other historic treatment Sections.

1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.

D. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.

E. Safety and Health Standard: ANSI/ASSE A10.6.

1.9 STORAGE AND HANDLING OF HISTORIC MATERIALS

A. Salvaged Historic Materials:

1. Clean loose dirt and debris from salvaged historic items unless more extensive cleaning is indicated.
2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site, designated by Owner.
5. Protect items from damage during transport and storage.

B. Historic Materials for Reinstallation:

1. Repair and clean historic items for reuse as indicated.
2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.

C. Existing Historic Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after historic treatment and construction work in the vicinity is complete.

D. Storage: Catalog and store historic items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.

1. Identify each item with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
2. Secure stored materials to protect from theft.
3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F or more above the dew point.

E. Storage Space:

1. Owner will arrange for limited on-site location(s) for free storage of historic material. This storage space includes security and climate control to the extent available in the building, for stored material.
2. Arrange for off-site locations for storage and protection of historic material that cannot be stored and protected on-site.

1.10 FIELD CONDITIONS

A. Size Limitations in Historic Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from historic treatment procedures.

1. Use only proven protection methods, appropriate to each area and surface being protected.
2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where historic treatment work is being performed.
3. Erect temporary barriers to form and maintain fire-egress routes.
4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during historic treatment work.
5. Contain dust and debris generated by historic treatment work, and prevent it from reaching the public or adjacent surfaces.
6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
8. Provide supplemental sound-control treatment to isolate removal and dismantling work from other areas of the building.

B. Temporary Protection of Historic Materials:

1. Protect existing historic materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
2. Do not attach temporary protection to historic surfaces except as indicated as part of the historic treatment program and approved by Architect.

C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

D. Utility and Communications Services:

1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by historic treatment work before commencing operations.
2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for historic treatment work.
3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.

1. Prevent solids such as stone or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from historic treatment work.
2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

F. Existing Roofing: Prior to the start of work in an area, install roofing protection to protect building and its contents at all times.

3.2 PROTECTION FROM FIRE

A. Follow fire-prevention plan and the following:

1. Comply with NFPA 241 requirements unless otherwise indicated. Perform duties titled "Owner's Responsibility for Fire Protection."

2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work. If combustible material cannot be removed, provide fire blankets to cover such materials.

3. Prohibit smoking by all persons on State property.

B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:

1. Obtain Owner's approval for operations involving use of welding or other high-heat equipment. Use of open-flame equipment is not permitted. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that area is safe.
4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:

a. Train each fire watch in proper operation of fire-control equipment and alarms.

b. Prohibit fire-watch personnel from other work that would distract from fire-watch duties.
c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
e. Maintain fire-watch personnel at each area of Project site until 60 minutes after conclusion of daily work or longer if the day's activities warrant.

C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for type of fire risk in each work area. Ensure that nearby personnel and fire-watch personnel are trained in fire-extinguisher and blanket use.

D. Sprinklers: Once sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

A. Protect motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.

B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in historic treatment program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.

C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.

D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.

E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 GENERAL HISTORIC TREATMENT

A. Have historic treatment work performed only by qualified historic treatment specialists.

B. Ensure that supervisory personnel are present when historic treatment work begins and during its progress.

C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs or video recordings. Comply with requirements in Section 013233 "Photographic Documentation."

D. Perform daily inspections of Project site as the Work progresses to detect hazards resulting from historic treatment procedures.

E. Follow the procedures in subparagraphs below and procedures approved in historic treatment program unless otherwise indicated:

1. Retain as much existing material as possible; repair and consolidate rather than replace.
2. Use additional material or structure to reinforce, strengthen, prop, tie, and support existing material or structure.

3. Use reversible processes wherever possible.
4. Use historically accurate repair and replacement materials and techniques unless otherwise indicated.
5. Record existing work before each procedure (preconstruction) and progress during the work with digital preconstruction documentation photographs or video recordings. Comply with requirements in Section 013233 "Photographic Documentation."

F. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion. Do not proceed with the work in question until directed by Architect.

G. Where missing features are indicated to be repaired or replaced, provide work with appearance based on accurate duplications rather than on conjecture, subject to approval of Architect.

H. Where work requires existing features to be removed or dismantled and reinstalled, perform these operations without damage to the material itself, to adjacent materials, or to the substrate.

I. Identify new and replacement materials and features with permanent marks hidden in the completed Work to distinguish them from original materials. Record a legend of identification marks and the locations of the items on record Drawings.

END OF SECTION 013591

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic contract definitions are included in the General Conditions of the Contract for Construction.

B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited to this term.

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases.

D. "Approved": The term "approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": The term "furnish" means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": The term "install" describes operations at the Project Site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term **"experienced,"** when used with the term **"installer,"** means having a minimum of five (5) previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of authorities having jurisdiction.
2. **Trades:** Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
3. **Assigning Specialists:** Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.
   a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.

J. "Project Site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction, with others performing other Work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on CSI's "MasterFormat" 49-Division format and numbering system.

B. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated, as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Streamlined Language: The Specifications generally use the imperative mood and streamlined language. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.

a. The words **"shall be"** are implied where a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents unless a specific date is indicated in the Contract Documents or the governing regulations cited herein.

C. Conflicting Requirements: Where compliance with two (2) or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent and highest quality requirement. Request a decision from the Architect before proceeding on requirements that are different but apparently equal, and where it is uncertain which requirement is the most stringent.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum acceptable. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Request a clarification from the Architect regarding uncertainties before proceeding.

D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Thompson Gale's "Encyclopedia of Associations," available in most libraries.

1.5 GOVERNING REGULATIONS AND AUTHORITIES

A. Copies of Regulations: Obtain copies of the **"latest applicable State Codes"** and the following regulations and retain at the Project Site to be available for reference by parties who have a reasonable need during submittals, planning, and progress of the Work, until Substantial Completion.

1. Connecticut State Building Code - 2018.

1.1 Connecticut State Building Code

1. 2018 Connecticut State Building Code
2. 2015 International Building Code
3. 2015 International Existing Building Code
4. 2018 Connecticut State Fire Code
5. 2015 International Fire Code

6. 2015 International Energy Conservation Code
7. 2015 International Plumbing Code
8. 2015 International Mechanical Code
9. 2017 National Electric Code
10. NFPA 13 – Installation of Sprinkler Systems
11. NFPA 72 – National Fire Alarm and Signaling Code
12. FM Global Property Loss Prevention Data Sheets
13. UL Listings

B. The **"latest applicable State Codes"** are available for download from the DAS website (www.ct.gov/das) > Doing Business With The State > State Building Construction > Publications and Forms > Office of State Building Inspector *and* Office of State Fire Marshal. Also visit the www.ctdol.state.ct.us Connecticut Department of Labor website.

1.6 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01 42 20

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality-control services.

B. Quality-Control services include fire alarm acceptance testing, inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by the Owner.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

E. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 33 00 "Submittal Procedures" specifies requirements for development of a schedule of required tests and inspections.
2. Division 01 Section 01 73 29 "Cutting and Patching" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.
3. Division 01 Section 01 77 00 "Closeout Procedures", specific requirements for contract closeout procedures.
4. Division 28 Section 28 46 21.11 "Addressable Fire Alarm Systems" specifies field quality control for the Alarm System.

1.3 RESPONSIBILITIES

A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, the Owner, through the Construction Administrator, shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. All tests required by the individual specification sections are required to be scheduled and notification given to the Construction Administrator 24/48 hours in advance of the test/inspection as applicable. Costs for these services are not included in the Contract Sum.

1. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Contract Sum.
2. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.
    a) Such services include Special Inspections as required by the latest edition of the "Connecticut State Building Code".
    b) Where the Owner has engaged a testing agency for testing and inspecting part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner. The Owner will engage the services of a qualified

Special Inspector for this project. The Special Inspector, as a representative of the Owner, shall document and confirm compliance with the provisions of the Connecticut State Building Code for Special Inspections.

c) Materials and assemblies for this project will be tested and construction operations inspected as the work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered nor shall it obligate the State for final acceptance.

d) The Owner's use of testing and inspection services shall in no way relieve the Contractor of the responsibility to furnish materials and finished construction in full compliance with the Contract Documents and the Connecticut State Building Code.

B. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.

1. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated non-compliance with Contract Document requirements.

2. The Owner will issue a credit change order to cover all costs incurred related to all re-tests/re-inspections due to non-compliance to the Contract Documents, including but not limited to the Owner's costs and the Consultant's costs.

C. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the Agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:

1. Provide access to the Work.

2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.

3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.

4. Provide facilities for storage and curing of test samples.

5. Deliver samples to testing laboratories.

6. Provide an approved design mix proposed for use for material mixes that require control by the testing agency.

7. Provide security and protection of samples and test equipment at the Project Site.

D. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Construction Administrator, Architect and the Contractor in performance of the testing agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.

1. The testing agency shall notify the Construction Administrator and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. The testing agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.

3. The testing agency shall not perform any duties of the Contractor.

E. Owner will pay for the services of an independent testing agency laboratory to perform inspections, tests and other services required by the Specifications except as noted below, listed for which the Owner will issue a deduct change order to cover the cost associated with these tests:

1. When the Contractor notifies the Construction Administrator and/or Testing Agency less than 24 hours before the expected time of testing.

2. When the Contractor requires testing for his own convenience.

3. When the Contractor schedules a test and is not ready for the required test.

F. Submit reports of tests that are part of the submittal requirements which indicate compliance or non-compliance with the specified standard.

G. See also General Conditions Article 16 "Inspections & Tests".

H. Fire Alarm/Acceptance Testing Procedures:

1. For ***all*** buildings (exceeding the threshold limit and not exceeding the threshold limit), the fire alarm testing shall be as the authority having jurisdiction shall dictate. This will be as determined by the Office of the State Fire Marshal (OSFM), and shall include, but not be limited to, the requirements as set below:

   a. Protective Signaling Systems: All protective signaling systems shall meet with acceptance testing requirements of the applicable standards listed in Section 28 46 21, NFPA 101/2015, and NFPA 13/Latest Edition.

   b. Prior Test Notification: At least five (5) working days prior to testing, the Fire Alarm Contractor shall notify (in writing) the following people of the proposed date the acceptance tests are to be performed (Also, see Part 2 of Certificate of Compliance).

      - Department of Administrative Services – OSFM Representative
      - General Contractor
      - Engineer of Record
      - Equipment Supplier Representative
      - Sprinkler Contractor

   c. Certificates of Compliance:

      1) A Fire Alarm System Inspection and Testing Certification and Description form shall be prepared for each system (See NFPA 72/2016, Chapter 7.)

      2) Parts 1 and 3 through 9, shall be completed after the system is installed and the installation of the wiring has been checked. Every alarm device must also be pre-tested to ensure proper operation and correct annunciation at each remote annunciator and control panel. Part 1 of the form (Certification of System Installation) shall be signed by the fire alarm contractor. The signed and completed preliminary copies of the Certification form shall be forwarded to all parties along with the Prior Test Notification.

      3) Part 2, of each applicable form, shall be completed after the operational tests have been completed.

      4) After the completion of the operational acceptance tests and sign-off of test witness (with stipulations noted), final copies of the Certificates shall be forwarded to the Department of Construction Services Representatives.

   d. Tests:

      1) All tests shall be conducted in accordance with the Manufacturer's Testing Recommendations.

      2) All testing equipment, apparatus (i.e. sound level decibel meter, 2-way radio communication, test devices, ladders, tools, lighting, etc.) and personnel shall be supplied by the Fire Alarm Contractor and Sprinkler Contractor.

   e. **System Documentation:** Every system shall include the following documentation, which shall be delivered to the Department of Construction Services Representatives upon final acceptance of the system. An owner's manual or manufacturer's installation instructions covering all system equipment, including the following:

      1) A detailed narrative description of the system inputs, evacuation signaling, ancillary functions, annunciation, intended sequence of operations, expansion capability, application considerations, and limitations.

      2) Operator's instructions for basic systems operations including alarm acknowledgment, system reset, interpreting system output (LED's CRT display, and printout), operation of manual evacuation signaling and ancillary function controls, changing printer paper, etc.

      3) A detailed description of routine maintenance and testing as required and recommended and as would be provided under a maintenance contract, including testing and maintenance instructions for each type of device installed. This information should include:

         (a) A listing of individual system components that require periodic testing and maintenance.

         (b) Step by step instructions detailing the requisite testing and maintenance procedures and the intervals at which those procedures should be performed.

(c) A schedule that correlates the testing and maintenance procedures required by paragraph (2) above and with the listing required by paragraph (1) above.

4) Detailed troubleshooting instructions for each type of trouble condition recognized by the system, including opens, grounds, parity errors, "loop failures," etc. These instructions should include a list of all trouble signals, and step by step instructions describing how to isolate those problems and correct them (or call for service as appropriate).

5) A service directory, including a list of names and telephone numbers for those who should be called to service the system.

f. As-Built Drawings:

1) The Contractor will produce two (2) sets of as-built drawings and specifications for the fire alarm system, indicating the location (and programmed address, if applicable) of all devices and appliances, the wiring sequences, wiring methods, connection of the components, and sequence of operation of the protective signaling system as installed, shall be given to the Department of Construction Services representatives. This shall be in Accordance with NFPA 72/2016. Refer also to Section 01 77 00 "Closeout Procedures".

1.4 SUBMITTALS

A. Unless the Contractor is responsible for this service, the independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Construction Administrator. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
   a. Date of issue.
   b. Project title and number.
   c. Name, address, and telephone number of testing agency.
   d. Dates and locations of samples and tests or inspections.
   e. Names of individuals making the inspection or test.
   f. Designation of the Work and test method.
   g. Identification of product and Specification Section.
   h. Complete inspection or test data.
   i. Test results and an interpretation of test results.
   j. Ambient conditions at the time of sample taking and testing.
   k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
   l. Name and signature of laboratory inspector.
   m. Recommendations on re-testing.

1.5 QUALITY ASSURANCE

A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are pre-qualified as complying with the National Voluntary Laboratory Accreditation Program and that specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

B. Mockups: Provide full-size, physical assemblies that are constructed on-site. Mockups will be used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not samples. Approved mockups establish the standard by which the Work will be judged.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 MOCKUPS

A. Build site-assembled mockups using installers who will perform same tasks for project.

B. Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size as directed by Architect.

2. Notify Architect seven (7) days in advance of dates and times when mockups will be constructed.

3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Obtain Architect’s approval of mockups before starting work, fabrication, or construction.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Demolish and remove mockups when directed, unless otherwise indicated.

3.2 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 01 Section 01 73 29 "Cutting and Patching."

B. Protect constructions exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 01 45 00

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 00 General Conditions of the Contract for Construction for Design-Bid-Build and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection.

B. Temporary utilities include, but are not limited to, the following:

1. Temporary electric power and lighting services.

2. Temporary water service and distribution, sanitary services, including drinking water.

3. Temporary heating, cooling and ventilation

4. Temporary data service.

C. Support facilities may include, but are not limited to, the following:

1. Field offices – Space in the museum will be provided for use by contractors.
2. Storage and fabrication sheds.
3. Temporary roads and paving.
4. Dewatering facilities and drains.
5. Temporary enclosures.
6. Temporary project identification signs.
7. Temporary exterior lighting.
8. Collection and disposal of waste and cleaning.
9. Temporary Environmental Controls.

D. Security and protection facilities include, but are not limited to, the following:

1. Temporary fire protection.
2. Security for site and Agency.
3. Barricades, warning signs, and lights.
4. Enclosure fence.
5. Security enclosure and lockup.
6. Environmental protection.
7. Traffic ways.
8. Protection.

1.3 RELATED SECTIONS

A. Division 01 Section 01 57 30 "Indoor Environmental Control" for additional provisions governing temporary heating, ventilating and air conditioning.

1.4 SUBMITTALS

A. **Temporary Utilities:** Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

B. **Implementation and Termination Schedule:** Within twenty-one (21) days of the date established for commencement of the Work, submit a schedule indicating implementation and termination of each temporary utility.

1.5 QUALITY ASSURANCE

A. **Regulations:** Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building and fire code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department, and rescue squad rules.
5. Environmental protection regulations.
6. Americans with Disabilities Act.

B. **Standards:** OSHA. Comply with NFPA 241 "Standard for Safeguarding Construction, Alteration, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA 200 "Recommended Practice for Installing and Maintaining Temporary Electric Power at Construction Sites."

1. **Electrical Service:** Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."

C. **Inspections:** Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. **Temporary Utilities:** Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, the Construction Administrator will direct the change over from use of temporary service to use of permanent service.

B. **Conditions of Use:** Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. **General:** Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

B. **Lumber and Plywood:** Comply with requirements in Division 06 Section 06 10 00 "Rough Carpentry."

1. For signs and directory boards, provide 3/4-inch exterior grade, Grade A-B Fir plywood. Mount sign on preservative treated Fir posts.

a. Project sign shall be 4' x 8' painted and supported on 4-inch x 4-inch posts, of a design to be provided by the Owner via the Construction Administrator.

2. **Vision Barriers:** Provide minimum 1/2-inch thick exterior plywood.

3. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch thick exterior plywood.

C. **Paint:** Comply with requirements below.

1. For sign and directory boards applying graphics, provide exterior-grade alkyd gloss enamel over exterior primer unless otherwise indicated.

D. **Tarpaulins:** Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.

E. **Water:** Provide potable water approved by local health authorities.

F. **Enclosure Fencing:** Provide 0.120-inch thick, galvanized 2-inch chain link fabric fencing six (6) feet high galvanized steel pipe posts, 1-1/2 inches knuckle both bottom and top I.D. for line posts and 2-1/2 inches I.D. for corner posts.

2.2 EQUIPMENT

A. **General:** Provide new equipment. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

1. The Contractor shall furnish tools, apparatus and appliances, hoists and/or cranes and power for same, scaffolding, runways, ladders, temporary supports and bracing and similar work or material necessary to insure convenience and safety in the execution of the Contract except where this is otherwise specified in any Specification Section. All such items shall meet the approval of the Owner but responsibility for design, strength and safety shall remain with the Contractor. All such items shall comply with Federal OSHA regulations and applicable codes, statutes, rules and regulations, including compliance with the requirements of the current edition of the "Manual of Accident Prevention in Construction" published by the Associated General Contractors (AGC) and the standards of the State Labor Department.

2. Staging, exterior and interior, required for the execution of this Contract, shall be furnished, erected, relocated if necessary and removed by the Contractor. Staging shall be maintained in a safe condition without charge to and for the use of all trades as needed.

B. **Water Hoses:** Provide 3/4-inch, heavy-duty, abrasion-resistant, flexible rubber hoses with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge and backflow preventers.

C. **Electrical Outlets:** Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

D. **Electrical Power Cords:** Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

E. **Lamps and Light Fixtures:** Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.

F. **Heating Units:** Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

G. **Temporary Field Offices:** Contractor can occupy building as needed. If necessary, Provide prefabricated or mobile units with lockable entrances, operable windows, and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.

H. **Temporary Toilet Units:** Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

I. **Fire Extinguishers:** Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

C. Storm Water Pollution Control:

1. The **Architect/Engineer** shall electronically register the Connecticut Department of Energy and Environmental Protection's (DEEP) "General Permit for the Discharge of Stormwater and Dewatering Wastewater from Construction Activities" (DEEP-WPED-GP-015) and Stormwater Pollution Control Plan (SPCP) through the **DEEP ezFile Portal**. **2.** Once under contract, and prior to construction activities, the Contractor shall assume responsibility for storm water pollution control and conform to the General Permit obligations and requirements. The Contractor shall sign, and cause to be signed by each appropriate Subcontractor, the "Contractor Certification Statement" section of the SPCP and the DEEP "License Transfer Form" (DEEP-APP-006), as directed by the Architect/Engineer. The signed Certification Statement and License Transfer Form shall be attached to the "on-site" SPCP and submitted to the DEEP by the Architect/Engineer.

3. The Owner shall be responsible for the General Permit registration fee and License Transfer notification fee.

4. The Contractor shall retain an updated copy of the SPCP at the construction site from the date construction is initiated at the site until the date construction at the site is completed.

5. The Contractor shall conform to the SPCP or use another plan, prepared at the Contractor's expense, which has been approved by the Owner and the DEEP *prior to construction activities*. The Contractor shall be responsible for implementing, maintaining, and updating the SPCP, including, but not limited to, performing regular inspections, conducting and reporting all stormwater monitoring activities, retaining records for the required period of time, and performing ***all*** post-construction measures and inspections.

6. The Contractor shall ensure all post-construction measures are installed, cleaned, and functioning and the site has been stabilized for at least **three (3) months** following the cessation of construction activities in order for the project to be considered complete. A site is considered stabilized when there is no active erosion or sedimentation present and no disturbed areas remain exposed for **all phases**. Once the site has been stabilized for at least three (3) months, the Contractor shall have the site inspected by a Qualified Inspector to confirm final stabilization. If stabilized, the Contractor shall submit a Notice of Termination (DEP-PED-NOT-015) to the DEEP in order to terminate the Construction Stormwater General Permit.

7. The Contractor shall submit a final copy of the SPCP, the Notice of Termination, and all inspection records to the Architect/Engineer and DAS/CS Project Manager at completion of all post-construction measures.

8. The Contractor shall retain copies of the SPCP and all reports required by the General Permit, and records of all data used to complete the registration for the General Permit, for a period of at least five (5) years from the date that the project is complete. Inspection records must be retained as part of the SPCP for a period of five (5) years after the date of inspection.

9. For sites involving total soil disturbance of less than one (1) acre, the Contractor shall be responsible for sediment and erosion control and utilize best management practices as identified in the "2002 Connecticut Guidelines for Soil Erosion and Sediment Control" (DEEP Bulletin 34), as amended, and any sediment and erosion control plans prepared for the project.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.

2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.

3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.

4. **Use Charges:** If cost or use charges for temporary facilities are specified by this section to be borne by the Owner the cost or use charges for temporary facilities will be borne not longer than thirty (30) days after final acceptance of the project.

B. Temporary Water Service and Distribution:

1. Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.

   a. **Sterilization:** Sterilize temporary water piping prior to use.

2. Connect to existing facilities, through an approved backflow prevention device; extend branch piping with outlets so that water is available by use of hoses. Owner will pay for water used. The Contractor shall not waste water or use faulty equipment. The Contractor shall provide, at his own expense, all connections, extensions and other apparatus required for use of such services. Upon completion of the Contract, the Contractor shall disconnect temporary extensions and return utility to its original condition.

C. Temporary Electric Power and Lighting Services:

1. Power and lighting may be taken from the power company's nearest pole with temporary poles, if needed, to extend the line to project. If permanent power lines have been installed before beginning project, then temporary lines can be brought in from the last pole.

2. **Power Distribution System:** Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, ac 20 Ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

3. **Temporary Lighting:** When overhead floor or roof deck has been installed, provide temporary lighting with local switching. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.

D. Temporary Heating, Cooling and Ventilating:

1. Provide temporary heat required by construction activities for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

   a. **Heating Facilities:** Except where the Owner authorizes use of the permanent system, provide vented, self-contained, LP-gas or fuel oil heaters with individual space thermostatic control.

   b. Use of gasoline-burning space heaters, open flame, or salamander heating units is prohibited.

2. Provide temporary heat during construction for interior areas included in the Contract to counteract low temperatures or excessive dampness. Maintain during said period or periods until final completion of the Contract, unless otherwise approved by the Owner in writing. Windows, doors, ventilators and similar openings shall be temporarily closed. Provide heat and ventilation to maintain specified conditions for construction operations and to protect materials and finishes from damage by temperature or humidity. The permanent heating system is not to be used for temporary heating unless approved, in writing, by the Owner. If approved, use of the permanent heating system by the Contractor does not constitute beneficial use by the Owner. The warrantee for said system will not commence until Substantial Completion is granted. Costs shall be paid by the Contractor. See individual Sections for temperature/humidity limits. Temporary heating methods shall comply with OSHA regulations and other applicable codes, statutes, rules and regulations and shall be approved by the Architect/Engineer and Owner.

3. Permanent air handling equipment, when used for temporary heating, shall be equipped with disposable "construction" filters. The construction filters shall have an average efficiency at least equal to the filters specified under Division 23, but not less than 30 percent when tested in accordance with ASHRAE 52.2 "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size." The filters shall have an average arrestance of not less than 90 percent efficiency on one (1) micron size particles. Before turning over the system for final acceptance, the contractor shall remove and dispose of the construction filters; clean the ductwork; spray clean the heating and cooling coils, and drain pans to "like new" condition; and install the specified filters.

4. The Contractor may use the existing heating system with temporary extensions, radiators or unit heaters, but such use is subject to the Owner's approval. Coordinate use of existing facilities with Owner. Provide additional, temporary extensions and units to satisfy the criteria given in the preceding paragraph. Owner will pay cost of energy used. Take measures to conserve energy. At the termination of construction, return the facilities to their original condition. Before operation of permanent facilities, verify that installation is approved for operation and that filters are in place.

5. Refer to Section 01 57 30 “Indoor Environmental Control” for additional requirements regarding means and methods of providing temporary heating, cooling and ventilating. Meet manufacturer’s standards for minimum and maximum temperatures and humidity governing installation of materials and systems.

E. **Temporary Telephone Service and Data:** Provide temporary telephone, data/internet service and/or portable hotspots throughout the construction period for all personnel engaged in construction activities. Install telephone on a separate line for each temporary office and first aid station. Contractor shall provide telephone service in his office and separate telephone service in the DAS/CS Office and Construction Administrator’s Office, if provided. It is preferred that the Contractor use a cellular phone. Basic service and local calls will be paid for by the Contractor. Toll calls will be paid for by the respective users.

1. **Separate Telephone Lines:** Provide additional telephone lines for the following:

   a. Where an office has more than **two (2)** occupants, install a telephone for each additional occupant or pair of occupants.

   b. Provide dedicated telephone lines for a separate fax machine in both the Contractor’s office and the DAS/CS / CA office.

2. At each telephone, post a list of important telephone numbers.

F. **Temporary Sanitary Facilities, Including Drinking Water:** Temporary sanitary facilities include temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.

1. Provide toilet tissue, wash basins with water, soap and paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material. The Contractor shall maintain the facilities in a sanitary condition.

2. **Toilets:** The Contractor shall install self-contained chemical toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted. Provide separate facilities for male and female personnel.

3. **Water Coolers:** Where power is accessible, provide electric hot/cold water coolers to maintain dispensed cold water temperature at 45 to 55 degrees F. Provide bottled water service and cup supplies and maintain in a clean sanitary condition.

G. **Storm and Sanitary Sewer:** If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully.

1. Filter out excessive amounts of soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.

2. Connect temporary sewers to the municipal system, as directed by sewer department officials.

3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.

H. **Storm Water Pollution Control:** Provide earthen embankments and similar barriers in and around excavations and sub-grade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

3.3 SUPPORT FACILITIES INSTALLATION

A. **General:** Locate storage sheds, and other temporary construction and support facilities in designated area as approved by the Construction Administrator.

1. Maintain support facilities until Final Completion. Remove prior to Final Completion with permission from the Owner.

B. **Field Offices:** Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project Site. Keep all offices clean and orderly, sweep weekly and remove rubbish on a daily basis. Furnish and equip offices as follows:

1. **State User Agency Provided Field Offices:** The State User Agency will furnish, without charge, rooms for the Contractor's use as an office in the first floor Ell of the existing building. The Owner and Construction Administrator will share space with the Contractor. If additional office space is required, contractor will provide a suitable trailer. The Contractor shall provide and install a 5-lb ABC fire extinguisher and an approved first aid kit. The Contractor shall be responsible for furniture and shall keep this area clean and return it to its original condition after use. The Contractor shall provide any needed furniture and Equipment, which will remain his property. The furniture may be used but shall be in good condition as judged by the Owner and Construction Administrator.

C. **Storage and Fabrication Sheds:** Install storage and fabrication sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on-site.

1. Storage sheds for tools, materials and equipment shall be weathertight with heat, lighting and ventilation for products requiring controlled conditions.

2. Remove temporary materials, equipment services and construction before Substantial Completion.

3. Clean and repair damage caused by installation or use of temporary facilities. Restore existing facilities used during construction to specified or original condition.

4. Contractor to provide adequate storage facilities for all existing dismantled items from the Museum building that are to be reused or reinstalled.

D. **Temporary Roads and Paving:** Construct and maintain temporary roads and paving to support the indicated loading adequately and to withstand exposure to traffic during the construction period. Locate temporary paving for roads, storage areas, and parking where the same permanent facilities will be located. Review proposed modifications to permanent paving with the Construction Administrator and Architect.

1. Provide paving for pedestrian access and parking for field offices.

2. Paving: Comply with Division 32 Section 32 12 16 "Asphalt Paving" for construction and maintenance of temporary paving.

3. Coordinate temporary paving development with sub-grade grading, compaction, installation and stabilization of sub-base and installation of base and finish courses of permanent paving.

4. Install temporary paving to minimize the need to rework the installations and to result in permanent roads and paved areas without damage or deterioration when occupied by the Owner.

5. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration, and supervision.

E. **Dewatering Facilities and Drains:** For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 31 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations, and construction free of water.

F. **Temporary Enclosures**: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25-sq ft or less with plywood or similar materials.

3. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.

4. Where temporary enclosure exceeds 100-sq ft in area, use UL-labeled, fire-retardant-treated material for framing and main sheathing.

G. Temporary Lifts, Hoists and Elevator Use:

1. Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

H. Temporary Project Identification Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.

1. **Project Sign:** Engage an experienced sign painter to apply graphics. Comply with details to be furnished by the Construction Administrator.

   a. **Temporary Tripod Frame**: For groundbreaking ceremonies only, provide a temporary tripod for the sign illustrated and described below. Make the tripod of 12 ft long 2" x 4"s (Stud Grade), beveled and bolted at the top. Provide approximately 5-ft between legs at grade. Provide a 6-ft long, 2" x 4" seat for the sign; locate 5-ft above grade and nail in place. Nail sign at four (4) places where edges intersect tripod legs. Drive a 24" long, pointed 2" x 4" stake into the earth next to each leg and nail to legs.

   b. **Project Sign:** The Contractor shall contact the Construction Administrator for the proper wording for the project sign. Fabricate sign of 3/4" Exterior Grade A-B Fir plywood. Mount sign on preservative treated Fir posts. The Owner shall provide design, color selection and illustration of the Project Sign. Paint both sides and all edges of sign and the posts with two (2) coats of exterior, white, alkyd primer. Paint the border and letters with "bulletin" (sign) paint. Letter sizes, colors and related information are given on the illustration below. A self-adhesive decal of the State seal will be furnished at the Contract signing. Erect the sign within two (2) weeks after execution of the Contract and remove the sign within one (1) week after completion of the project.

   c. **Project Sign Detail:** Sign letter sizes, fonts, colors and related information are shown in the illustration available for download from the DAS website (www.ct.gov/das) > Doing Business With The State > State Building Construction > Publications and Forms > DAS Construction Services Library > 3000 Series - Design Phase Forms.

I. Temporary Exterior Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.

J. Collection and Disposal of Waste and Cleaning:

1. Collect waste within the contract limit line from construction areas daily. Provide separate containers for proper waste recycling. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than seven (7) days during normal weather or three (3) days when the temperature is expected to rise above 80 degrees F. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

2. Maintain areas under Contractor's control free of waste materials, debris and rubbish. Maintain in a clean and orderly condition.

3. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces and other closed or remote spaces before closing the space.

4. Periodically clean interior areas before start of surface finishing and continue cleaning on an as-needed basis.

5. Control cleaning operations so that dust and other particulates will not adhere to wet or newly coated surfaces.

K. Temporary Environmental Controls: Contractor is to provide the following controls.

1. Rodent and Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be free of pests and their residues at materials.
2. Dust Control (construction and demolition).
3. Noise Control.
4. Erosion and Sediment Control.
5. Pollution Control.
6. Traffic Control.

L. Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION (listed in Paragraph 1.2 D)

A. Temporary Fire Protection: Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."

1. Provide and locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
5. The Contractor, during construction, shall be responsible for loss or damage by fire to the work of the Contract until completion. Any fire used within the structure for working purposes shall be extinguished when not in use. Bitumen or tar shall be melted on the ground only. No flammable material shall be stored in the structure in excess of amounts allowed by the authorities. No gasoline shall be stored in or close to the building at any time. The Contractor shall assign a responsible employee to be in charge of fire protection measures.
6. If an EPDM or other single-ply roof is included in the work that requires cleaning of mating surfaces of laps with gasoline, limit amount of gasoline on roof to two (2) gallons which shall be in UL listed containers. Also provide one 30 B:C fire extinguisher within 75 feet of any point on the roof.

B. Security for Site and Agency:

1. Provide security program and facilities to protect work, existing facilities and the Owner and Agency's operations from unauthorized entry, vandalism and theft. Coordinate with the Owner's and Agency's security program.
2. The Contractor shall be solely responsible for damage, loss or liability due to theft or vandalism.

C. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.

1. Provide temporary, insulated, weathertight closures at openings to the exterior to provide acceptable working conditions and protection for materials, to allow for temporary heating and to prevent entry of unauthorized persons. Provide doors with self-closing hardware and locks.
2. Barriers and enclosures shall be in conformance with code requirements. Do not block egress from occupied buildings unless necessary to further the work of the Contract. In this case, secure the Owners approval of an alternate egress plan.
3. See also General Conditions Article 19, "Protection of the Work, Persons and Property".

D. **Enclosure Fences:** Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated on the Construction Documents, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.

1. Provide chain link construction fencing with posts set in a compacted mixture of gravel and earth. Use existing fence to the extent possible.

E. **Security Enclosure and Lockup:** Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Provide keys to the Construction Administrator.

1. **Storage:** Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

F. **Protection:**

1. Protect buildings, equipment, furnishings, grounds and plantings from damage. Any damage shall be repaired or otherwise made good at no expense to the Owner.

2. Provide protective coverings and barricades to prevent damage. The Contractor shall be held responsible for, and must make good at his own expense, any water or other type of damage due to improper coverings. Protect the public and building personnel from injury.

3. Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.

4. Provide protective coverings for walls, projections, jambs, sills and soffits of openings. Protect finished floors and stairs from traffic, movement of heavy objects and storage. Prohibit traffic and storage on waterproofed and roofed surfaces and on lawn and landscaped areas.

5. Provide temporary partitions and ceilings to separate work areas from Agency-occupied areas to prevent penetration of dust and moisture into Agency-occupied areas and equipment. Erect framing and sheet materials with closed joints and sealed edges at intersections with existing surfaces.

6. See also General Conditions Article 19, “Protection of the Work, Persons and Property”.

G. **Environmental Protection:** Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result.

H. **Traffic Ways:**

1. The Contractor may use on-site paved roads and parking areas but shall not encumber same or their access. Public highways shall not be blocked by standing trucks, parked cars, material storage, construction operations or in any other manner.

2. Public roads and existing paved roads, drives and parking areas on Owner's property shall be kept free from scrap or debris due to construction operations and any damage to their surface caused by the Contractor shall be repaired by him at his own expense.

3. If the work of the Contract affects public use of any street, road, highway or thoroughfare, the Contractor shall confer with the police authority having jurisdiction to determine if and how many police are needed for public safety in addition to any barriers and signals that may be needed. The Contractor will be responsible for payment of any needed police services.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. **Supervision:** Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. **Maintenance:** Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. **Termination and Removal:** Unless the Architect/CA requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.

2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances, as required by the governing authority.

3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:

a. Replace air filters and clean inside of ductwork and housings.

b. Replace significantly worn parts and parts subject to unusual operating conditions.

c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 01 50 00

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the Contract, including General Conditions of the Contract for Construction and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Microbial and fungal contamination control.

2. Indoor air quality and pollution control.

3. Heating, ventilating, and air conditioning.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 57 40 "Construction IAQ Management Plan" for a description of the IAQ management plan.

1.3 REFERENCES

1. ASTM International (ASTM):

a. ASTM D5116-2006, Standard Guide for Small-Scale Environmental Chamber Determination of Organic Emissions From Indoor Materials/Products.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 MICROBIAL AND FUNGAL CONTAMINATION CONTROL

A. Perform, schedule, and sequence Work as required to limit conditions supporting formations of microbes, molds, and fungi.

1. Control water penetration, dampness, and humidity to prevent products not treated for exterior use from becoming soaked or damp.

2. Enclose building prior to installing interior materials and finishes.

3. Do not install interior products subject to moisture absorption until building is enclosed and wet work generating moisture and humidity is complete.

B. When visible formations are observed and when formations cannot be completely removed by non-abrasive surface cleaning:

1. Remove and replace materials identified as food sources for microbes, molds, and fungi.

2. Correct conditions supporting microbial, mold, and fungal growth.

C. Remove interior products and finishes, identified as food sources that have absorbed sufficient moisture to become damp whether or not microbial, mold, or fungal growth is observed. Include:

1. Gypsum board cores.

2. Organic materials composed of cellulose fiber or paper.

3. Materials containing sucrose or other binders identified as supporting microbial growth.

D. Remove fibrous insulation materials subject to retaining moisture such as duct liner, insulation, and other materials that are made wet or damp and cannot immediately be made dry.

E. Repair or replace ductwork, pans, and other conditions subject to moisture condensation, water penetration, or other water source not drained and made dry.

1. Remove conditions that have become an environment for microbes, molds, or fungi.

2. Do not permit conditions leading to standing water.

F. Install wet work and allow time needed to dry and cure prior to installing materials such as carpet, acoustical material, textiles, and other material of type that may attract and retain moisture.

3.2 INDOOR AIR QUALITY AND POLLUTION CONTROL

A. Product Emission Rate Standards: Test to ASTM D5116 for maximum indoor air concentration levels.

1. **Formaldehyde:**
   - **a.** 0.03 parts per million where no other requirements are specified.
   - **b.** 0.005 parts per million where products are specified as formaldehyde free.
2. **Total VOC Emissions for Carpet Tile, Adhesives, and Sealers:** 0.05 mg/m^2 per hour.
3. **4 Phenyl Cyclohexene (4-PC) Particulate Emissions for Carpet:** One (1) part per billion.
4. **Total Particulate Emission Rate Levels:** 50 ug/m^3.
5. **Primary and Secondary Regulated Pollutants:** Conform to USEPA, Code of Federal Regulations, Title 40, Part 50 National Air Ambient Air Quality Standard. Refer to EPA Web Site http://www.epa.gov/epahome/rules.html#codified.
6. **Other Pollutants Not Listed:** Not greater than 1/10 of Threshold Limit Value - Time Weighted Average (TLV-TWA) industrial workplace standard.

B. Architectural Coatings - Volatile Organic Compound (VOC) Content Limits: Conform to US Environmental Protection Agency (EPA) Federal Register 48886/Vol. 63, No.176 Friday, September 11, 1998/ Rules and Regulations. Refer to EPA Web Site: http://www.epa.gov/ttn/atw/eparules.html.

C. Do not use products in combination with or in contact with other products that can be identified as combining to form toxic fumes or sustained odors.

D. Do not use solvents within interior areas that may penetrate and be retained in absorptive materials such as concrete, gypsum board, wood, cellulose products, fibrous material, and textiles.

E. Protect construction materials from contamination and pollution from contact with construction dust, debris, fumes, solvents, and other environmentally polluting materials.

F. Allow furnishings and materials such as carpet, floor tile, acoustical tile, textiles, office furniture, and casework, to air out in clean environment prior to installation.

3.3 HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

A. Do not run permanent HVAC system during course of construction. Seal ductwork intake and exhaust vents.

B. Heat, dehumidify, and ventilate building during course of Work as necessary to maintain environmental conditions suitable for drying and curing materials and for prevention of conditions suitable for mold and mildew growth.

1. Ventilate building to remove moisture, dust, fumes, and odors.
2. Temper and dehumidify air as needed to remove excess moisture.
3. Do not use propane heaters and other moisture generating heating systems.

C. Flush out building prior to commissioning.

D. Inspect ductwork for refuse, contaminants, moisture and other foreign contamination prior to commissioning. Notify Commissioning Agent (CxA) of satisfactory inspection prior to beginning of Commissioning.

E. Clean underfloor plenum at access flooring acting as supply air duct, prior to occupancy.

3.4 REMEDIAL ACTION

A. Promptly take action as necessary to inspect and remediate conditions suspected of supporting microbial, fungal or mold conditions and where contaminated by indoor air pollution.

B. Notify and consult with Architect prior to beginning remedial action where contamination by hazardous chemicals, microbes, and fungi is suspected.

END OF SECTION 01 57 30

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

1.2 SUMMARY

A. This Section includes:

1. Description of a Construction Indoor Air Quality (IAQ) Management Plan.
2. IAQ construction requirements.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Divisions 01 through 49 sections for green building rating system requirements specific to the Work of each of those sections. These requirements may or may not include reference to LEED or Green Globes.
2. Division 01 Section 01 57 30 "Indoor Environmental Control."
3. Division 01 Section 23 05 93 "Testing, Adjusting and Balancing for HVAC" for additional requirements for baseline testing for IAQ.
4. Division 01 Section 23 05 93 "Testing, Adjusting and Balancing for HVAC" for cleaning of HVAC system including ductwork, air intakes and returns, and changing of filters.

1.3 REFERENCES

A. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):

1. ASHRAE Standard 52.1-1992, Gravimetric and Dust Spot Procedures for Testing Air Cleaning Devices in General Ventilation for Removing Particulate Matter.

B. ASTM International, Inc. (ASTM):

1. ASTM D5116-2006, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.

C. Sheet Metal and Air Conditioning National Contractors' National Association (SMACNA):

1. IAQ Guidelines for Occupied Buildings under Construction, 1995.

1.4 INDOOR AIR QUALITY

A. Goals: The Owner has set the following indoor air quality goals for jobsite operations on the project, within the limits of the construction schedule, Contract Sum, and available materials, equipment, products and services. Goals include:

1. Protect workers on the site from undue health risks during construction.
2. Prevent residual problems with indoor air quality in the completed building.

1.5 SUBMITTALS

A. Indoor Air Quality Plan: Within fourteen (14) days after receipt of Notice of Award and prior to any waste removal from the project, develop and submit for review a healthy indoor air quality plan. The plan shall include:

1. List of IAQ protective measures to be instituted on the site.
2. Schedule for inspection and maintenance of IAQ measures.

1.6 QUALITY ASSURANCE

A. Perform material tests and report results in accordance with ASTM D5116.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Should the Contractor desire to use procedures, materials, equipment, or products that are not specified but meet the intent of the specifications to protect indoor air quality on the site, the Contractor shall propose these substitutions in accordance with Section 01 60 00 "Product Requirements."

2.2 MATERIALS

A. Low emitting products have been specified in appropriate sections.

PART 3 - EXECUTION

3.1 CONSTRUCTION IAQ MANAGEMENT PLAN

A. Meet or exceed the minimum requirements of the SMACNA "IAQ Guidelines for Occupied Buildings Under Construction."

1. Protect the ventilation system components from contamination OR provide cleaning of the ventilation components exposed to contamination during construction prior to occupancy.

B. During installation of carpet, paints, furnishings, and other VOC-emitting products, provide supplemental (spot) ventilation for at least 72 hours after work is completed. Preferred HVAC system operation uses supply air fans and ducts only; exhaust provided through windows. Use exhaust fans to pull exhaust air from deep interior locations. Stair towers and other paths to exterior can be useful during this process.

C. Conduct regular inspection and maintenance of indoor air quality measures including ventilation system protection, and ventilation rate.

D. Require VOC-safe masks for workers installing VOC-emitting products (interior and exterior) defined as products that emit 150 gpl or more UNLESS local jurisdiction’s requirements are stricter, in which case the strictest requirements shall be followed for use of VOC-safe masks.

E. Use low-toxic cleaning supplies for surfaces, equipment, and worker’s personal use. Options include several soybean-based solvents and cleaning options (SoySolv) and citrus-based cleaners.

F. Use wet sanding for gypsum board assemblies. Exception: Dry sanding allowed subject to Architect’s approval of the following measures:

1. Full isolation of space undergoing finishing.
2. Plastic protection sheeting is installed to provide air sealing during sanding.
3. Closure of all air system devices and ductwork.
4. Sequencing of construction precludes the possibility of contamination of other spaces with gypsum dust.
5. Worker protection is provided.

G. Use safety meetings, signage, and Contractor agreements to communicate the goals of the construction indoor air quality plan.

END OF SECTION 01 57 40

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 25 00 "Substitution Procedures" specifies administrative procedures for handling requests for substitutions made after award of the Contract.
2. Division 01 Section 01 33 00 "Submittal Procedures" specifies requirements for submittal of the Contractor's Construction Schedule and the Submittal Schedule.
3. Division 01 Section 01 42 20 "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, which is current as of the date of the Contract Documents.
2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

B. Compatibility of Options: When the Contractor is given the option of selecting between two (2) or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
   a. Name of product and manufacturer.
   b. Model and serial number.
   c. Capacity.
   d. Speed.

e. Ratings.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Store products in accordance with manufacturers' instructions and maintain within temperature and humidity range required by manufacturer.
4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation.
8. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.
9. Store loose granular material on solid surfaces in a well-drained area; prevent mixing with foreign matter.
10. Arrange storage to provide access for inspection. Periodically inspect to insure products are undamaged and are maintained under required conditions. Keep log showing date, time and problems, if any.
11. Stone, masonry units and similar materials shall be stored on platforms or dry skids and shall be adequately covered and protected against damage.
12. Materials and equipment shall be delivered, stored and handled to prevent intrusion of foreign matter and damage by weather or breakage. Packaged materials shall be delivered and stored in original, unbroken packages.
13. Promptly inspect shipments to assure that products comply with requirements, that quantities are correct and products are undamaged.
14. Packages, materials and equipment showing evidence of damage will be rejected and replaced at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:

1. Semi-proprietary Specification Requirements: Where Specifications name two (2) or more products or manufacturers, provide one (1) of the products indicated. Comply with the requirements of Division 01 Section 01 25 00 "Substitution Procedures."
2. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.

3. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
4. Visual Selection: Where specified product requirements include the phrase *"...as selected from manufacturer's standard colors, patterns, textures..."* or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selected.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01 60 00

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. General: This Section specifies administrative and procedural requirements for field engineering services including, but not limited to, the following:

1. Land survey work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 31 00 "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 01 Section 01 33 00 "Submittal Procedures" for submitting Project record surveys.
3. Division 01 Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents and recording of Owner-accepted deviations from indicated lines and levels.

1.3 SUBMITTALS

A. Certificates: Submit a certificate from the Land Surveyor stating that the control information furnished by the Owner is accurate or identify inaccuracies, if they exist. The Contractor shall not take advantage of errors, which may be included in the control information. Stakes and markings shall be preserved.

B. Final Property Survey: Prepare and submit 10 copies of the final property survey.

C. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of "Submittals" and "Project Closeout" Sections.

1.4 QUALITY ASSURANCE

A. Provide field engineering services to establish and record grades, lines and elevations.

B. The Contractor shall retain a Land Surveyor registered by the State of Connecticut to confirm State furnished base lines and benchmarks, lay out the building, underground utility lines and other site work from the information furnished by the Owner and to establish and record the necessary elevations, at no additional cost to the State.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Identification: The Owner will identify two (2) base lines on the Contract Drawings.

B. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks. Notify the Construction Administrator of any discrepancies immediately in writing before proceeding to lay out the Work. Locate and protect existing benchmarks and base line. Preserve permanent reference points during construction.

1. Do not change or relocate benchmarks or base line without prior written approval. Promptly report lost or destroyed reference points or requirements to relocate reference points because of necessary changes in grades or locations.

2. Promptly replace lost or destroyed Project baseline benchmarks. Base replacements on the original survey control points.

C. Establish and maintain a sufficient quantity of (minimum of 2) permanent benchmarks on the site, referenced to data established by Owner supplied information.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

D. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction.

1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping. Notify the Construction Administrator of any discrepancies prior to proceeding.

3.2 PERFORMANCE

A. Work from lines and levels established by the property survey. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities of benchmarks and control points for their use.
2. As construction proceeds, check every major element for line, level, and plumb.

B. Surveyor's Log: Maintain a surveyor's log of control and other survey work. Make this log available for reference.

1. Record deviations from required lines and levels and advise the Construction Administrator when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.
2. On completion of foundation walls, major site improvements, underground utilities, and other Work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, elevations of construction, as-built locations and site work.

C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels, and control lines and levels required for mechanical and electrical work.

E. Existing Utilities: Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines, services, or other appurtenances located in or affected by construction. Coordinate with local authorities having jurisdiction.

F. Final Property Survey: Prepare a final property survey showing significant features (real property) for the Project. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, and levels of the Project are accurately positioned as shown on the survey.

END OF SECTION 01 71 23

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for cutting and patching.

B. **Related Sections:** The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 31 00 "Project Management and Coordination" for procedures for coordinating cutting and patching with other construction activities.

2. Division 01 Section 01 35 16 "Alteration Project Procedures" for procedures for coordinating cutting and patching with other construction activities.

3. Division 02 Section 02 42 96 "Historic Removal and Dismantling" for demolition of selected portions of the building for alterations.

4. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

a. Requirements of this Section apply to mechanical and electrical installations. Refer to Division 22, 23, and 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 SUBMITTALS

A. **Cutting and Patching Proposal:** Submit a proposal to the Construction Administrator describing procedures well in advance of the time cutting and patching will be performed and if the Owner's Representative and/or Architect/Engineer requires approval of these procedures before proceeding. Request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.

2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.

3. Describe affects to integrity of weather exposed or moisture resistant element.

4. Describe affects to efficiency, maintenance, or safety of any operational element.

5. Describe affects to Work of Owner or separate contractor.

6. List products to be used and firms or entities that will perform Work.

7. Indicate dates when cutting and patching will be performed.

8. **Utilities:** List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.

9. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations sealed by an Engineer registered in the State of Connecticut showing integration of reinforcement with the original structure.

10. Approval by the Construction Administrator to proceed with cutting and patching does not waive the Architect/Engineer of Record's rights to later require complete removal and replacement of unsatisfactory Work.

1.4 QUALITY ASSURANCE

A. **Requirements for Structural Work:** Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.

1. Obtain approval from the Architect/Engineer of the cutting and patching proposal before cutting and patching the following structural elements:
    a. Foundation construction.
    b. Bearing and retaining walls.
    c. Miscellaneous structural metals.
    d. Equipment supports.
    e. Piping, ductwork, vessels, and equipment.

B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.

1. Obtain Architect/Engineer's approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
    a. Membranes and flashings.
    b. Control systems.
    c. Electrical wiring systems.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.

1.5 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. Use materials whose installed performance will equal or surpass that of existing materials.

B. The Contractor shall install sleeves, inserts and hangers furnished by the trades needing same.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, notify the Construction Administrator and Architect, before proceeding with corrective action.

B. Openings and chases may not be shown on the Drawings. It is the responsibility of the Contractor to examine the Architectural, Electrical, Heating, Cooling, Ventilating and Plumbing Drawings and to provide chases, channels or openings where needed.

1. After installing Work into openings, channels and/or chases, the Contractor shall close same. If finishes are to be restored, the new Work shall match the original and shall be done by the trade customarily responsible for the particular kind of Work.

C. The Contractor shall verify dimensions for built-in Work and/or Work adjoining that of other trades before ordering any material or doing any Work. Discrepancies shall be submitted to the Construction Administrator before proceeding with the Work.

D. See also General Conditions Article 23 "Cutting, Fitting, Patching & Digging".

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Work that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

2. DO perform cutting and patching to integrate elements of Work. Provide penetrations of existing surfaces. Provide samples for testing. Seal penetrations through floors, walls, ceilings and roofs, as applicable; restore or preserve fire-rated and smoke-barrier construction. Construction and finishes shall match original Work.

B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.

1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.

4. Comply with requirements of applicable Division 32 Sections where cutting and patching requires excavating and backfilling.

5. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat.

4. Patch, repair, or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.4 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 01 73 29

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for waste management goals, waste management plan and waste management plan implementation.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 11 00 "Summary of Work".

2. Division 01 Section 01 20 00 "Price and Payment Procedures".

3. Division 01 Section 01 25 00 "Substitution Procedures".

4. Division 01 Section 01 31 19 "Project Meetings".

5. Division 01 Section 01 33 00 "Submittal Procedures".

6. Division 01 Section 01 45 00 "Quality Control".

7. Division 01 Section 01 50 00 "Temporary Facilities and Controls".

8. Division 01 Section 01 60 00 "Product Requirements".

9. Division 01 Section 01 77 00 "Closeout Procedures".

1.3 DEFINITIONS

A. Construction Waste: Solid wastes such as building materials, packaging and rubble resulting from construction, paving and infrastructure.

B. Demolition Waste: Solid wastes such as concrete, wood, brick, plaster, roofing materials, wallboard, metals, carpeting, insulation, and clean fill resulting from demolition or selective demolition of structures.

C. Recyclable Materials: Products and materials that can be recovered and remanufactured into a new product. Recyclable materials include, but are not limited to, the following:

1. Metals (ferrous and non-ferrous), including banding, metal studs, ductwork, and piping.

2. Asphaltic concrete paving.

3. Portland cement concrete.

4. Gypsum products.

5. Paper and cardboard.

6. Wood products, including structural, finish, crates, and pallets.

7. Brick and masonry.

8. Carpet and padding.

9. Plastics.

10. Copper wiring.

D. Recycling Facility: A business that specializes in collecting, handling, processing, distributing, or remanufacturing waste materials generated by new construction projects, into products or materials that can be used for this project or by others.

E. Salvage and Reuse: Existing usable product or material that can be saved and reused in some manner on the project site. Materials for reuse must be approved by the Architect. Materials that can be salvaged and reused must comply with applicable technical specifications and include, but are not limited to, the following:

1. Dimensional lumber and other wood products.

2. Structural steel.

3. Soil.

4. Masonry products.

5. Plants.

F. Salvage for Resale: Existing usable product that can be saved and removed intact (as is) from the project site to another site for resale to others without remanufacturing.

1.4 WASTE MANAGEMENT GOALS

A. The Owner has established that this Project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.

B. The Contractor shall use all means available to divert the greatest extent practical and economically feasible, construction waste from landfills and incinerators.

C. Of the inevitable waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized.

C. Take a pro-active, responsible role in management of construction waste and require all subcontractors, vendors, and suppliers to participate in the effort. Establish a construction waste management program that includes the following categories:

1. Minimizing packaging waste.

2. Salvage and reuse.

3. Salvage for resale or donation.

4. Recycling.

5. Disposal.

1.5 SUBMITTALS

(Not Applicable)

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with regulations of State of Connecticut Department of Environment Protection, Waste Management Bureau Recycling Program.

B. Waste Management Conference: Review and discuss waste management, disposition of waste, procedures for materials separation, procedures for periodic collection and transportation to recycling and disposal facilities. Review waste management requirements for each trade. Verify availability of containers and bins needed to avoid delays.

1.7 WASTE MANAGEMENT PLAN

(Not Applicable)

PART 2 – PRODUCTS

(Not Applicable)

PART 3 – EXECUTION

3.1 PLAN IMPLEMENTATION

(Not Applicable)

3.2 SEPARATION OF RECYCLABLE WASTE MATERIALS

A. Provide the necessary containers and bins, to facilitate the waste management program, that are clearly and appropriately marked. Prevent contamination of recyclable materials from incompatible products and materials. Separate construction waste at the project site by one of the following methods:

1. **Source Separated Method:** Waste products and materials, that are recyclable, are separated from trash and sorted into appropriately marked separate containers and then transported to the respective recycling facility for further processing. Trash is transported to a landfill or incinerator.
2. **Co-Mingled Method:** All construction waste is placed into a single container and then transported to a recycling facility where the recyclable materials are sorted and processed and the remaining trash is transported to a landfill or incinerator.

END OF SECTION 01 74 19

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for handling requests for building system start up and system demonstration and includes the following:

1. Starting Systems.
2. Demonstration and instructions.
3. Testing, adjusting, and balancing.

B. **Related Sections:** The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 45 00 "Quality Control" specifies quality assurance and inspecting services.
2. Division 01 Section 01 77 00 "Closeout Procedures" specifies requirements for contract close out requirements for system operation and maintenance data and extra materials.
3. Division 01, Section 01 91 00 "Commissioning" specifies process requirements for system commissioning.

1.3 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Provide written notification to the Construction Administrator 30 days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, and control sequence for other conditions that may cause damage.

D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components are complete and tested.

F. Execute the start-up under supervision of manufacturer's representative, in accordance with manufacturer's instructions.

G. When referenced in individual specification sections, require manufacturer to provide an authorized representative to be present at the site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report in accordance with Division 01 Section 01 45 00 "Quality Control" that the equipment or system has been properly installed and is functioning properly.

1.4 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner and Agency Personnel fourteen (14) days prior to substantial completion.

B. Demonstrate Project equipment and instruct in a classroom environment at location designated by the Construction Administrator and instructed by a qualified manufacturer's representative who is knowledgeable about the Project.

C. For equipment or systems requiring seasonal operation perform demonstration for season within six (6) months.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner and Agency Personnel in detail to explain all aspects of operation and maintenance.

E. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, and maintenance, and shutdown of each item at agreed upon scheduled time and at equipment or designated location.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during demonstration.

G. Starting and adjusting equipment does not constitute acceptance by the owner since commissioning is a requirement of this contract. Additionally, the warrantee does not begin until substantial completion has been granted for that specific item.

1.5 TESTING, ADJUSTING, AND BALANCING

A. The Contractor will employ and pay for the testing services of an independent consultant to verify the testing, adjusting, and balancing.

1. Comply with the requirements of Division 01 Section 01 91 00 "Commissioning" as they relate to the Work of this Section.

B. Reports will be submitted by the independent testing consultant to the Construction Administrator indicating observations and results of tests and indicating compliance or non-compliance with the requirements of the Contract Documents.

C. The Owner may employ and pay for the services of an independent consultant to verify testing, adjusting, and balancing which was performed by the Contractor.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 75 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:

1. Inspection procedures.
2. Project record document submittal.
3. Operation and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 11 00 "Summary of Work".
2. Division 01 Section 01 29 76 "Progress Payment Procedures".

C. Closeout requirements for specific construction activities may be included in the appropriate Sections in Divisions 02 through 49.

1.3 SUBSTANTIAL COMPLETION

A. General: Basic contract definitions are included in Article 1 of the General Conditions of the Contract for Construction.

B. Preliminary Procedures: Before requesting inspection for Certification of Substantial Completion, complete the following. List exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.
   a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
   b. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
2. Advise the Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, certificates of compliance, operating certificates, and similar releases.
5. Submit record drawings, maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra stock, and similar items.
7. Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.
8. Demonstrate, thru operation and testing, the functions of all systems and/or equipment to the satisfaction of the Owner for compliance to the Contract. Complete testing of systems and instruction of the Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
9. Complete final cleanup requirements.
10. Certify that required training of personnel is complete.

C. Inspection Procedures: The Contractor shall be ready and prepared when they request a Substantial Completion inspection. If the inspection reveals that the work is not complete, that there are extensive punchlist items that will take more than **ninety (90)** days to complete and as the items listed in Article 1.3 above are not complete, the Construction Administrator, Architect, and Owner will determine the inspection has failed.

D. The Contractor is responsible for all costs to re-inspect due to a failed inspection. The Owner will issue a deduct change order to cover all costs for re-inspection.

1. The Architect will repeat inspection when requested and assured that the Work is substantially complete.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for "Certificate of Acceptance" and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, endorsed and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Architect.
4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the Owner took possession of and assumed responsibility for corresponding elements of the Work.
5. Submit consent of surety to Final Payment.
6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
7. Touch up and otherwise repair and restore marred, exposed finishes, including touchup painting.

B. Re-inspection Procedure: The Inspection Group will re-inspect the Work upon receipt of notice from the Construction Administrator that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Owner.

1. Upon completion of re-inspection, the Construction Administrator will prepare a Certificate of Acceptance. If the Work is incomplete, the Construction Administrator will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

1.5 AS-BUILT DOCUMENT SUBMITTALS

A. General: The Contractor shall not use As-built Drawings for construction purposes. Protect contractor As-built Drawings from deterioration and loss in a secure, fire-resistant location. Provide access to As-built Drawings for the Architect's reference during normal working hours. Keep documents current; do not permanently conceal any work until required information has been recorded. **IMPORTANT NOTE: Failure to keep As-built Documents current is sufficient cause to withhold progress payments.**

1. The Contractor shall also hire the services of a Surveyor registered in the State of Connecticut to conduct a final survey to determine the location of exterior underground utility lines and to record the results, and update existing electronic media.
2. The record of exterior underground utilities shall be made at the time of installation on Mylar film drawing and AutoCAD (latest version) compatible disks. The drawing shall bear the seal of the Land Surveyor and a statement of accuracy.

B. As-built Drawings: The Contractor shall maintain **one (1)** clean, complete undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date. Update As-built Drawings on a monthly basis coincident with the submittal of the Application for Payment.

1. Mark record sets with erasable pencil to distinguish between variations in separate categories of the Work.
2. Mark all new information that is not shown on Contract Drawings.

3. Note related change-order numbers where applicable.
4. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
5. Upon completion of the work, the Contractor shall submit Record Drawings to the Construction Administrator for the Owner's Records who will pass them on to the Architect or Engineer for transferring the changes to the Record Drawing Mylar Tracings.
6. Submit electronic format data of all Coordination Drawings as required by the Owner, at no additional cost.
7. Refer to Section 01 45 00 "Quality Control" Article 1.3 for required as-built drawings and specifications for fire alarm systems.

C. Record Specifications: The Contractor shall maintain one (1) complete copy of the Project Manual, including Addenda. Include with the Project Manual one (1) copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.

1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
2. Give particular attention to equals and substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
3. Note related record drawing information and Product Data.
4. Upon completion of the Work, submit Record Specifications to the Construction Administrator for the Owner's records.

D. Record Product Data: The Contractor shall maintain one (1) copy of each Product Data submittal. Note related Change Orders and markup of record drawings and Specifications.

1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
3. Upon completion of markup, submit complete set of Record Product Data to the Construction Administrator for the Owner's records.

E. Record Sample Submitted: Immediately prior to Substantial Completion, the Contractor shall meet with the Construction Administrator, Architect and the Owner's personnel at the Project Site to determine which Samples are to be transmitted to the Owner for record purposes. Comply with the Owner's instructions regarding delivery to the Owner's Sample storage area.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the Construction Administrator for the Owner's records.

G. Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch, 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder according to Division 01 Section 01 78 23 "Operation & Maintenance Data". Included but not limited to the following types of information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.
5. Recommended "turn-around" cycles.
6. Inspection procedures.
7. Shop Drawings and Product Data.
8. Fixture lamping schedule.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties and bonds.
12. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Startup.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

3.2 FINAL CLEANING

A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in Division 01 Section 01 50 00 "Temporary Facilities and Controls."

B. Cleaning: Employ professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion and Certification of Occupancy.
2. Interior:
    a. Remove labels that are not permanent labels.
    b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Remove paint spots; wash and polish glass.
    c. Clean exposed interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

d. Wash washable surfaces of mechanical, electrical equipment and fixtures and replace filters, clean strainers on mechanical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

e. Clean and polish finish hardware.

f. Clean and polish tile and other glazed surfaces.

g. Clean floors; wax and buff resilient tile. Clean vinyl or rubber base.

h. Vacuum and/or dust walls, ceilings, lighting fixtures, ceiling diffusers and other wall and ceiling items.

i. Remove defacements, streaks, fingerprints and erection marks.

3. Exterior:

a. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth, even-textured surface.

b. Clean exposed exterior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances.

c. Clean roofs, gutters and downspouts.

d. Remove waste and surplus materials, rubbish and construction equipment and facilities from the site, and deposit it legally elsewhere.

e. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Remove paint spots; wash and polish glass.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the work of rodents, insects, and other pests. Provide results of final inspection in writing.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

1. Where extra materials of value remain after completion of associated Work, they become the Owner's property. Dispose of these materials as directed by the Construction Administrator.

2. Leave building clean and ready for occupancy. If the Contractor fails to clean up, the Owner may do so, with the cost charged to the Contractor. The Owner will issue a credit change order to cover the costs.

END OF SECTION 01 77 00

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 00 General Conditions and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for operation and maintenance manuals, including the following:

1. Preparing and submitting operation and maintenance manuals for building operating systems and equipment.

2. Preparing and submitting instruction manuals covering the care, preservation, and maintenance of architectural products and finishes.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 33 00 "Submittal Procedures" specifies preparation of Shop Drawings and Product Data.

2. Division 01 Section 01 75 00 "Starting and Adjusting" specifies instruction of the Owner and Agency operating personnel in the operation and maintenance of building systems and equipment and the general requirements for starting-up equipment and systems.

3. Division 01 Section 01 77 00 "Closeout Procedures" specifies general closeout requirements.

4. Division 01 Section 01 78 30 "Warranties and Bonds" specifies requirements for submittal of warranties and bonds.

5. Division 01 Section 01 91 00 “Commissioning” specifies requirements for submittals related Commissioning.

6. Appropriate Sections of Divisions 02 through 49 specify special operation and maintenance data requirements for specific pieces of equipment or building operating systems.

1.3 QUALITY ASSURANCE

A. Maintenance Manual Preparation: In preparation of maintenance manuals, use personnel thoroughly trained and experienced in operation and maintenance of equipment or system involved.

1. Where maintenance manuals require written instructions, use personnel skilled in technical writing where necessary for communication of essential data.

2. Where maintenance manuals require drawings or diagrams, use draftsmen capable of preparing drawings clearly in an understandable format.

B. Instructions for the Owner and Agency Personnel: The Construction Manager must use experienced instructors thoroughly trained and experienced in operation and maintenance of equipment or system involved, to instruct the Owner's operation and maintenance personnel.

C. Commissioning (Cx) Coordination: The Commissioning process requires detailed O&M documentation. The Contractor must submit O&M manuals to the Construction Administrator for review and approval by Commissioning Agent (CxA).

1.4 SUBMITTALS

A. Submittal Schedule: Comply with the following schedule for submitting operation and maintenance manuals:

1. Before Substantial Completion, when each installation that requires operation and maintenance manuals is nominally complete, submit four (4) draft copies of each manual to the Owner’s Representative, Commissioning Agent (CxA), Agency Representative, and Architect for review. Include a complete index or table of contents of each manual.

a. The Owner’s Representative will return one (1) copy of the draft with comments within twenty - one (21) calendar days of receipt.

b. Submit four (4) copies of data in final form at least twenty-one (21) calendar days before final inspection. The Owner's Representative will return one (1) copy within twenty-one (21) calendar after final inspection, with comments.

2. After final inspection, make corrections or modifications to comply with the Commissioning Agent's (CxA), Architect's, and Agency Representative's comments. Submit final copies to the Owner's Representative within twenty-one (21) calendar days of receipt of the Commissioning Agent's (CxA), Architect's, and Agency Representative's comments.

B. Form of Submittal: Prepare operation and maintenance manuals in the form of an instructional manual for use by the Owner's operating personnel. Organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder.

1. Binders: For each manual, provide heavy-duty, commercial-quality, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8-1/2-by-11- inch paper. Provide a clear plastic sleeve on the spine to hold labels describing contents. Provide pockets in the covers to receive folded sheets.

a. Where two (2) or more binders are necessary to accommodate data, correlate data in each binder into related groupings according to the Project Manual table of contents. Cross-reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.

b. Identify each binder on front and spine, with the printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter covered. Indicate volume number for multiple volume sets of manuals.

2. Dividers: Provide heavy paper dividers with celluloid-covered tabs for each separate section. Mark each tab to indicate contents. Provide a typed description of the product and major parts of equipment included in the section on each divider.

3. Protective Plastic Jackets: Provide protective, transparent, plastic jackets designed to enclose diagnostic software for computerized electronic equipment.

4. Text Material: Where maintenance manuals require written material, use the manufacturer's standard printed material. If manufacturer's standard printed material is not available, provide specially prepared data, neatly typewritten, on 8-1/2-by-11-inch, 20-lb/sq ft white bond paper.

5. Drawings: Where maintenance manuals require drawings or diagrams, provide reinforced, punched binder tabs on drawings and bind in with text.

a. Where oversize drawings are necessary, fold drawings to the same size as text pages and use as a foldout.

b. If drawings are too large to be used practically as a foldout, place the drawing, neatly folded, in front or rear pocket of binder. Insert a typewritten page indicating drawing title, description of contents, and drawing location at the appropriate location in the manual.

1.5 MANUAL CONTENT

A. In each manual include information specified in the individual Specification Section and the following information for each major component of building equipment and its controls:

1. General system or equipment description.
2. Design factors and assumptions.
3. Copies of applicable shop drawings and product data.
4. System or equipment identification, including:
   a. Name of manufacturer.
   b. Model number.
   c. Serial number of each component.
5. Operating instructions.
6. Emergency instructions.
7. Wiring diagrams.

8. Inspection and test procedures.
9. Maintenance procedures and schedules.
10. Precautions against improper use and maintenance.
11. Copies of warranties.
12. Repair instructions including spare parts listing.
13. Sources of required maintenance materials and related services.
14. Manual index.

B. Organize each manual into separate sections for each piece of related equipment. As a minimum, each manual shall contain a title page; a table of contents; copies of product data, supplemented by drawings and written text; and copies of each warranty, bond, and service contract issued.

1. Title Page: Provide a title page in a transparent, plastic envelope as the first sheet of each manual. Provide the following information:

a. Subject matter covered by the manual.
b. Name and address of the Project.
c. Date of submittal.
d. Name, address, and telephone number of the Construction Manager.
e. Name and address of the Architect and Owner's Representative.
f. Cross-reference to related systems in other operation and maintenance manuals.

2. Table of Contents: After title page, include a typewritten table of contents for each volume, arranged systematically according to the Project Manual format. Include a list of each product included, identified by product name or other appropriate identifying symbol and indexed to the content of the volume.

a. Where a system requires more than one volume to accommodate data, provide a comprehensive table of contents for all volumes in each volume of the set.

3. Provide a general information section immediately following table of contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the subcontractor or Installer and the maintenance subcontractor. Clearly delineate the extent of responsibility of each of these entities. Include a local source for replacement parts and equipment.

4. Product Data: Where the manuals include manufacturer's standard printed data, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where the Project includes more than one (1) item in a tabular format, identify each item, using appropriate references from the Contract Documents. Identify data that is applicable to the installation, and delete references to information that is not applicable.

5. Written Text: Prepare written text to provide necessary information where manufacturer's standard printed data is not available, and the information is necessary for proper operation and maintenance of equipment or systems. Prepare written text where it is necessary to provide additional information or to supplement data included in the manual. Organize text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operation or maintenance procedure.

6. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems or to provide control or flow diagrams. Coordinate these drawings with information contained in project record drawings to assure correct illustration of the completed installation.

a. Do not use original Record Documents as part of operation and maintenance manuals.

7. Warranties and/or Bonds: Provide a copy of each warranty and/or bond in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to follow in the event of product failure. List circumstances and conditions that would affect validity of warranty or bond.

1.6 MATERIAL AND FINISHES MAINTENANCE MANUAL

A. Submit four (4) copies of each manual, in final form, on material and finishes to the Owner's Representative for distribution. Provide one (1) section for architectural products, including applied materials and finishes. Provide a second section for products designed for moisture protection and products exposed to the weather.

1. Refer to individual Specification Sections for additional requirements on care and maintenance of materials and finishes.

B. Architectural Products: Provide manufacturer's data and instructions on care and maintenance of architectural products, including applied materials and finishes.

1. **Manufacturer's Data:** Provide complete information on architectural products, including the following, as applicable:
   - **a.** Manufacturer's catalog number.
   - **b.** Size.
   - **c.** Material composition.
   - **d.** Color.
   - **e.** Texture.
   - **f.** Reordering information for specially manufactured products.
2. **Care and Maintenance Instructions:** Provide information on care and maintenance, including manufacturer's recommendations for types of cleaning agents to be used and methods of cleaning. Provide information on cleaning agents and methods that could prove detrimental to the product. Include manufacturer's recommended schedule for cleaning and maintenance.

C. Moisture Protection and Products Exposed to the Weather: Provide complete manufacturer's data with instructions on inspection, maintenance, and repair of products exposed to the weather or designed for moisture-protection purposes.

1. **Manufacturer's Data:** Provide manufacturer's data giving detailed information, including the following, as applicable:
   a. Applicable standards.
   b. Chemical composition.
   c. Installation details.
   d. Inspection procedures.
   e. Maintenance information.
   f. Repair procedures.

1.7 EQUIPMENT AND SYSTEMS MAINTENANCE MANUAL

A. Submit four (4) copies of each manual, in final form, on equipment and systems to the Owner's Representative for distribution. Provide separate manuals for each unit of equipment, each operating system, and each electric and electronic system.

1. Refer to individual Specification Sections for additional requirements on operation and maintenance of the various pieces of equipment and operating systems.

B. Equipment and Systems: Provide the following information for each piece of equipment, each building operating system, and each electric or electronic system.

1. Description: Provide a complete description of each unit and related component parts, including the following:
   a. Equipment or system function.
   b. Operating characteristics.
   c. Limiting conditions.
   d. Performance curves.
   e. Engineering data and tests.
   f. Complete nomenclature and number of replacement parts.
2. **Manufacturer's Information:** For each manufacturer of a component part or piece of equipment, provide the following:
   a. Printed operation and maintenance instructions.
   b. Assembly drawings and diagrams required for maintenance.
   c. List of items recommended to be stocked as spare parts.

3. **Maintenance Procedures:** Provide information detailing essential maintenance procedures, including the following:
4. **Operating Procedures:** Provide information on equipment and system operating procedures, including the following:
   a. Startup procedures.
   b. Equipment or system break-in.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Instructions on stopping.
   f. Shutdown and emergency instructions.
   g. Summer and winter operating instructions.
   h. Required sequences for electric or electronic systems.
   i. Special operating instructions.
5. **Servicing Schedule:** Provide a schedule of routine servicing and lubrication requirements, including a list of required lubricants for equipment with moving parts.
6. **Controls:** Provide a description of the sequence of operation and as-installed control diagrams by the control manufacturer for systems requiring controls.
7. **Identification Drawings:** Provide each Subcontractor's Identification Drawings.
   a. Provide as-installed, color-coded, piping diagrams, where required for identification.
8. **Valve Tags**: Provide charts of valve-tag numbers, with the location and function of each valve.
9. **Circuit Directories:** For electric and electronic systems, provide complete circuit directories of panel boards, including the following:
   a. Controls.
   b. Communication.

C. Electronic Media:

1. For equipment which requires maintenance by operational personnel, provide a professionally developed DVD for the use of maintenance training for the facility. Each DVD will be accompanied by a written index which can be utilized to find any specific item of information by time or place on the DVD.
2. The Construction Manager is responsible for this production. This DVD will be provided to the Owner's Representative at the same time as the delivery of the other maintenance material.
3. The DVD must be able to be edited for future changes to the equipment and modifications as they occur.

1.8 COMMISSIONING RECORD AND TESTING DATA MANUAL

The Contractor shall cooperate with Commissioning Agent (CxA) in the preparation of a separate Manual dedicated to documenting the Commissioning process which will include all certifications and testing data and some repeating of O&M data. Description of this Manual is found in Section 01 91 00 Commissioning and shall be prepared by the Commissioning Agent (CxA).

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 78 23

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PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 33 00 "Submittal Procedures" specifies procedures for submitting warranties.
2. Division 01 Section 01 77 00 "Closeout Procedures" specifies contract closeout procedures.
3. Division 01 Section 01 78 23 "Operation and Maintenance Data" specifies required operation and maintenance data.
4. Divisions 02 through 49 Sections for specific requirements for warranties on products and installations specified to be warranted.
5. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

F. The Contractor shall guarantee all materials and workmanship for a period of **eighteen (18)** months from the date of Substantial Completion of the Work. In addition, the Contractor shall furnish the warranties listed below. Submit four (4) copies of each to the Construction Administrator in the supplier's standard form or in the form given below if there is no standard form available.

G. Specification/Warranty Table: The General Contractor shall provide for all warranties as shown in the Specification/Warranty table:

Specification / Warranty Table			
Item No.	**Section No.**		**Specification Product/Warranty**
1.	**07**	**31 29**	**Wood Shingle Roofing:**
			5-Year weathertightness warranty by General Contractor's Installer
			Limited lifetime from date of substantial completion.
2.	**07**	**62 00**	**Sheet metal flashings / trim:** 10 years
3.	**07**	**71 00**	**Roof Specialties:** Included with Wood Shingle Roofing.
4.	**07**	**92 00**	**Joint Sealants:** 5-Year
5.	**23**	**81 26**	**Split-System Air-Conditioners:** 10 years
6.	**23**	**84 16**	**Dehumidification Units:** Compressors-Standard, not less than 2 yrs
			Coils: Standard, not less than 5 years.
7.	**26**	**24 16**	**Panelboards:** 18 months
8.	**26**	**28 16**	**Enclosed Switches and Circuit Breakers:** 1 year.
9.	**26**	**51 19**	**Lighting Fixtures:** 5 years.
10.	**28**	**46 21 11**	**Addressable Fire-Alarm Systems:** 5 years
11.	**28**	**46 21 15**	**Aspirating Smoke Detection:** 2 years.

H. Submit certification that finish materials are fire rated as specified.

I. Form of Warranty: Warranties shall be submitted in following format:

Warranty

Commissioner: *(Insert Commissioner's Name)*
Department of Administrative Services
DAS Commissioner's Office
450 Columbus Boulevard, Suite 1501
Hartford, CT 06103

Project Number: BI-RR-28
Project Title: Prudence Crandall Museum Renovation

I (We) hereby warranty

the _____ ***work on the referenced project for a period of*** _____ ***years***

from _____ ***, 20*** _____ ***against failures of workmanship and materials in accordance***

with the requirements of Section _____ ***, Page*** _____ ***, Paragraph*** _____ ***, of the Specifications.***

Installer ☐ | ***Subcontractor*** ☐ | ***Vendor/Suppliers*** ☐ | ***Manufacturer*** ☐

Installer or Subcontractor or Vendor/Suppliers or Manufacturer Name: _____

Installer or Subcontractor or Vendor/Suppliers or Manufacturer Signature: _____

General Contractor's Name _____

General Contractor's Signature: _____

or

General Contractor's Authorized Agent Signature: _____

J. Bonds shall be by approved Surety Companies, made out to the Commissioner, Department of Administrative Services on companies' standard form.

K. Warranties, Guarantees, or bonds supplied by the General Contractor's Subcontractors or Vendors/Suppliers or Manufacturers shall reference the project name, number, and location and be certified by the General Contractor to be for the product and installation on the project and must be countersigned by the General Contractor.

L. Bonds shall be by approved Surety Companies, made out to the Commissioner, Department of Administrative Services, on company's standard form.

M. Guarantees, warranties or bonds supplied by Subcontractors, Suppliers or Manufacturers shall reference the project name, number, and location and be certified by the Contractor to be for the product and installation on the project and must be countersigned by the Contractor.

1.4 SUBMITTALS

A. Submit written warranties prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

B. Forms for special warranties are included in this Section. Prepare a written document utilizing the appropriate form, ready for execution by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Submit a draft to the Owner, through the Construction Administrator, for approval prior to final execution.

1. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

C. **Form of Submittal:** At Final Completion compile two (2) copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not applicable)

END OF SECTION 01 78 30

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

1.2 SUMMARY

A. This Section includes equipment and system commissioning, which MAY be undertaken by owner, including the following:

1. Completion of commissioning procedures on specific equipment and systems as indicated under "Related Sections" below.

2. Verification of operational and functional performance of specific equipment and systems for compliance with the “Design Intent” as described in the "Related Sections" indicated below.

B. **Related Sections**: The following Sections contain requirements that relate to this Section:

1. Section 01 31 00 “Project Management And Coordination” specifies procedures for coordinating the Commissioning Process.

2. Division 01 Section 01 33 00 "Submittal Procedures" specifies procedures for submittal of Product Data and Quality Assurance Submittals.

3. Division 01 Section 01 77 00 "Closeout Procedures" specifies general closeout requirements..

1.3 DEFINITIONS

A. **Basis of Design (BOD):** A document that records the concepts, calculations, decisions, and product selections used to meet the Owner’s Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

B. **Commissioning Agent (CxA):** An entity identified by the Owner who leads, plans, schedules, and coordinates the commissioning team to implement the Commissioning Process.

C. **Commissioning (Cx) Plan:** A plan that includes a list of all equipment to be commissioned, delineation of roles for each of the primary commissioning participants, and details on the scope, timeline, and deliverables throughout the commissioning process.”

C. **Deficiencies and Resolutions List:** List of noted deficiencies discovered as result of commissioning process.

E. **Final Commissioning Report:** Overall final commissioning document (see 1.6, I(2) below), prepared by the Commissioning Agent, which details the actual commissioning procedures performed, inspection and testing results, and the final version of the deficiencies and resolutions list indicating that all issues discovered through the commissioning process have been verified as resolved.

F. **Functional Completion:** Functional Completion is when all remaining TAB (Testing, Adjusting, Balancing) and commissioning responsibilities of the Contractor and their subcontractor’s (except for Seasonal Testing or Approved Deferred Functional Testing and controls training), have been functionally certified as complete by the Owner’s Commissioning Agent (CxA) and the Certificate of Functional Completion has been issued.

G. **Functional Testing Process:** Documented testing of system parameters, under actual or simulated operating conditions. Functional Testing is the dynamic testing of systems (rather than just components).

H. **Pre-Commissioning Checklists:** Installation and start-up items to be completed by the appropriate party prior to operational verification through Functional Testing.

I. **Physical Inspection Process:** On-site inspection and review of related system components for conformance to the specifications.

J. **Seasonal Tests:** Functional Tests that are deferred until the system(s) will experience conditions closer to their intended design conditions.

K. **Trending:** Monitoring using the building control system.

1.4 COORDINATION

A. **Commissioning Team:** The members of the commissioning team consist of the Commissioning Agent (CxA), the DAS/CS Project Manager (PM), the Construction Administrator (CA), the Contractor, the Architect and Design engineers (particularly the mechanical engineer), the Mechanical Subcontractor, the Electrical Subcontractor, the TAB representative, the Controls Subcontractor, any other installing subcontractors or suppliers of equipment. If known, the Agency's building or plant operator/engineer is also a member of the Commissioning team.

B. **Management:** The CxA is hired by the Owner. The CxA directs and coordinates the commissioning activities and the reports to the CA. All members of the Commissioning Team work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents. Refer to Section 01 91 00 Part 1.6 and 1.7 for additional management details.

C. **Scheduling.** The CxA will work with the CA and Contractor according to established protocols to schedule the commissioning activities. The CxA will provide sufficient notice to the CA and Contractor for scheduling commissioning activities. The Contractor will integrate all commissioning activities into their master CPM schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

1. The CxA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. The Commissioning Plan—Construction Phase provides a format for this schedule. As construction progresses more detailed schedules are developed by the CxA. The Commissioning Plan also provides a format for detailed schedules.

1.5 DESCRIPTION OF CONSTRUCTION PHASE COMMISSIONING PROCESS

A. As soon as practicable after the "Contract Start Date", the Commissioning Agent (CxA) will conduct a pre-installation commissioning "kick-off" meeting with the Subcontractors. Parties directly affected by the commissioning work will be required to attend. The CxA will explain the commissioning process in detail, and identify specific commissioning related responsibilities of the various parties.

B. Commissioning status meetings will be scheduled to occur during construction to monitor progress and to help facilitate the commissioning process. Contractor representatives will be required to attend these meetings.

C. Once Subcontractors have provided the CxA with written verification indicating completion of installation and startup procedures, the CxA will conduct an on-site physical inspection of the specific systems and equipment.

D. Upon confirmation of system readiness, the CxA will schedule the Subcontractors to perform Functional Testing in accordance with the project specifications and drawings. The CxA will oversee the process and will provide the format and documentation for these tests.

E. Deficiencies noted during these tests will be documented on the Deficiencies and Resolutions list. When corrected, issues will be resolved at the time of discovery. The responsible Contractor will resolve all other issues at a later date. All deficiencies will be noted by the CxA as either resolved or pending resolution.

F. The construction commissioning process will be complete when all noted deficiencies have been corrected, proved to be in compliance with the project specifications and drawings, or otherwise resolved to the satisfaction of the Owner and when the CxA has issued the Certificate of Functional Completion.

1.6 COMMISSIONING AGENT'S (CxA's) DUTIES AND RESPONSIBILITIES

A. Meet and communicate with the Owner's representatives, Construction Administrator, Subcontractors, equipment manufacturers' representatives, Architect, Engineer as needed, to facilitate the commissioning process.

B. Review commissioning related specifications, submittals and construction documents. Communicate noted deficiencies and concerns to the Owner, Architect and Engineer.

C. Develop detailed and specific Functional Testing procedures for equipment and systems to be commissioned.

D. Develop testing, adjusting and balancing (TAB) specifications. Oversee the TAB process.

E. Perform site inspections and verify Contractor's Subcontractor readiness for the Functional Testing process. Document deficiencies for future resolution.

F. Witness Contractor-performed Functional Testing process as appropriate to verify Contractor compliance with the functional testing procedures. Document deficiencies for future resolution.

G. Provide the Owner, Construction Administrator, Architect, and Engineer with a Final Commissioning Report to document the commissioning process and to verify that the commissioning process is complete.

H. Verify that the Contractor O&M documentation is complete.

I. Commissioning Record in O&M Manuals.

1. The CxA is responsible to compile, organize and index the following commissioning data by equipment into labeled, indexed and tabbed, three-ring binders and deliver it to the Contractor, to be included with the O&M manuals. Three copies of the manuals will be provided. The format of the manuals shall be:

1.1 **Tab I-1:** Commissioning Plan;

1.2 **Tab I-2:** Final Commissioning Report (see (2) below)

1.3 **Tab 01***:* System Type 1 (chiller system, packaged unit, boiler system, etc.);

1.3.1 **Sub-Tab A:** Design narrative and criteria, sequences, approvals for equipment in System Type 1;

1.3.2 **Sub-Tab B:** Startup plan and report, approvals, corrections, blank Precommissioning Checklists;

.1 **Colored Separator Sheets**—for each equipment type (fans, pumps, chiller, etc.);

1.3.3 **Sub-Tab C:** Functional tests (completed), trending and analysis, approvals and corrections, training plan, record and approvals, blank functional test forms and a recommended recommissioning schedule.

1.4 **Tab 02:** System Type 2.....repeat as per above requirements for System 1.

2. **Final Commissioning Report Details.** The final commissioning report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope, and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the commissioning authority regarding the adequacy of the equipment, documentation and training meeting the contract documents in the following areas:

2.1 Equipment meeting the equipment specifications;

2.2 Equipment installation,

2.3 Functional performance and efficiency;

2.4 Equipment documentation and design intent; and

2.5 Operator training. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. The functional performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

2.6 **Pre-Occupancy Commissioning (Cx) Report:**
A Pre-occupancy Commissioning (Cx) Report shall be prepared by the Commissioning Agent (CxA**)** that demonstrates that the project has met all of the requirements spelled out in the following Table:

Twelve (12) Mandatory Requirements [16a-38k-3] Summary Table:		
	Regulation	**Summary Description**
1.	16a-38k-3(a)	Building Commissioning:
2.	16a-38 -3(b)	Integrated Design Process:
3.	16a-38k-3(d)	ENERGY STAR Products:
4.	16a-38k-3(c)	Energy Performance:
5.	16a-38k-3(e)	Indoor Air Quality Management Plan:
6.	16a-38k-3(f)	Water Usage:
7.	16a-38k-3(g)	Recycling of Materials:
8.	16a-38k-3(h)	Erosion and Sedimentation Control:
9.	16a-38k-3(i)	No Smoking Policy:
10.	16a-38k-3(j)	Integrated Pest Management Plan:
11.	16a-38k-3(k)	Chlorofluorocarbon (CFC)-Based Refrigerants:
12.	16a-38k-3(l)	Minimum Ventilation Requirement:

2.7 **Post-Occupancy Commissioning (Cx) Report:**

A Post-Occupancy Commissioning (Cx) Report shall be prepared by the Commissioning Agent (CxA) and submitted to the DAS/CS PM for review and approval. The approved Report shall be submitted by the State Agency that is responsible for the ongoing care, operation, and maintenance of the building to the CT OPM Secretary and the DAS Commissioner within one hundred eighty (180) days after one year of Occupancy Date of DAS/CS Acceptance of the Work. The Report shall include results of any post-occupancy survey of building occupants, a description of any adjustments made to equipment or building operation and the reasons for which the changes were made, and one year of all energy usage by source and water usage.

3. Other documentation will be retained by the CxA.

1.7 DUTIES AND RESPONSIBILITIES OF OTHERS FOR COMMISSIONING

A. The commissioning process will require the active participation of persons qualified to represent the Owner, Mechanical Engineer, Electrical Engineer, Construction Manager, Equipment Manufacturers' Representatives, Mechanical Subcontractor, HVAC Subcontractor, Controls Subcontractor, TAB Subcontractor, Electrical Subcontractor, and other specific subcontractors, as deemed appropriate. The CxA will witness the final functional performance commissioning process. Participants shall include in their contracts all costs necessary to participate in and complete the commissioning process.

B. The Contractor will assure the participation and co-operation of the Subcontractors, as required to complete the commissioning process.

C. The Owner will assure the participation of their chosen representatives as required to complete the commissioning process.

D. The Architect will assure the participation of necessary representatives from the Design Team as required to complete the commissioning process. Design team members will provide prompt replies to requests for information issued during the commissioning process.

E. It is the Contractor's specific responsibility to complete their respective start-up and checkout procedures, and to insure the complete readiness of equipment and systems, prior to the start of the functional performance testing phase. The CxA shall request written confirmation of system readiness for performance testing, from the appropriate Contractor or Subcontractor. Once the CxA is provided with confirmation of all related systems completion, the actual date and times for the functional performance testing process will be confirmed. Contractor and Subcontractors shall provide sufficient time, and qualified representatives, to complete this process at no additional cost to the State.

F. After a second failure of a system to successfully meet the criteria as set forth in the functional performance testing process, the Contractor shall reimburse the Owner for all costs associated with any additional re-testing efforts made necessary due to remaining Contractor related system deficiencies previously reported by the Contractor as corrected. These costs shall also include the costs (where applicable) for the CxA.

G. Training on related systems and equipment operation and maintenance shall only be scheduled to commence after final performance commissioning is satisfactorily completed, and systems are verified to be 100 percent complete and functional.

1.8 SUBMITTALS

A. Refer to Section 01 33 00 Submittal Procedures.

B. **Pre-Commissioning Checklist Forms:** Submit two (2) signed copies of the checklist forms to the CxA upon completion of all listed items.

C. **Equipment Manufacturer's Startup Forms:** Submit two (2) completed copies of the installation and startup checklists provided by the equipment manufacturers to the CxA.

D. Test Reports: Submit two (2) copies of test reports for equipment and systems to the CxA.

E. Control Schematics: Submit two (2) copies of the control schematics for equipment, systems, and subsystems to the CxA.

F. Inspection Records: Submit two (2) copies of the records of inspections for code compliance, and approved permits and licenses to operate the equipment and systems to the CxA.

G. Operating Data: Submit two (2) copies of equipment and system operating data including all necessary instructions to facilitate operation to specified performance standards to the Owner.

H. Maintenance Data: Submit two (2) copies of equipment and system maintenance data including all necessary information required to maintain the equipment and systems in continuous operation, such as the testing, balancing and adjusting report and the as-built drawings.

1.9 TRAINING OF OWNER PERSONNEL

A. The Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.

B. The CxA shall be responsible for overseeing and approving the content and adequacy of the training of Agency's personnel for commissioned equipment.

1. The CxA shall interview the Agency's facility manager and lead engineer to determine the special needs and areas where training will be most valuable. The Construction Administrator, Agency's facility manager, and CxA shall decide how rigorous the training should be for each piece of commissioned equipment. The CxA shall communicate the results to the Contractor of Subcontractors and vendors who have training responsibilities.

2. In addition to these general requirements, the specific training requirements of Owner personnel by Subcontractor and vendors are specified in Divisions 21, 22, 23, 25, 26, and 27.

3. The Contractor shall require each Subcontractor and vendor responsible for training to submit a written training plan to the CxA for review and approval prior to training. The plan will cover the following elements:
- **3.1** Equipment (included in training);
- **3.2** Intended audience;
- **3.3** Location of training;
- **3.4** Objectives;
- **3.5** Subjects covered (description, duration of discussion, special methods, etc.);
- **3.6** Duration of training on each subject;
- **3.7** Instructor for each subject;
- **3.8** Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.);
- **3.9** Instructor and qualifications.

4. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.

5. The CxA shall develop an overall training plan and coordinate and schedule, with the CA, Agency Representative, and Contractor, the overall training for the commissioned systems. The CxA shall develop criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CxA shall recommend approval of the training to the CA using a standard form for submittal to the Contractor. The CA also shall sign the approval form.

6. At one of the training sessions, the CxA shall present a **one (1)** hour presentation discussing the use of the blank functional test forms for re-commissioning equipment.

7. Video recording of the training sessions shall be provided by Contractor. The Contractor shall provide the CA, with video disks cataloged by Contractor, and added to the O&M manuals.

8. The HVAC design engineer shall at the first training session present the overall system design concept and the design concept of each equipment section. This presentation shall be two (2) hours in length and include a review of all systems using the simplified system schematics (one-line drawings) including chilled water systems, condenser water or heat rejection systems, heating systems, fuel oil and gas supply systems, supply air systems, exhaust system and outside air strategies.

1.10 DEFERRED TESTING

A. Unforeseen Deferred Functional Testing. If the Contractor determines that any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and Functional Testing may be delayed upon approval of the DAS/CS PM. These tests will be conducted in the same manner as the Seasonal Tests as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing. During the warranty period, Seasonal Testing (tests delayed until weather conditions are closer to the system's design intent) as specified in Division 23 shall be completed as part of this contract. The CxA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subcontractors, with the Agency facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and as-built drawings due to the testing will be made.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 91 00

SECTION 02 41 20 - SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section Includes:
1. Demolition and removal of selected site elements.
2. Salvage of existing items to be reused or recycled. See Demolition Plans.

B. Related Requirements:

1. Section 01 11 00 "Summary of Work" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 31 10 00 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

C. If there any discrepancies found between these specifications and related drawings and details, the most restrictive requirement and/or material/part shall be applied by the Contractor without compensation.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse or store.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of the Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property**,** for environmental protection, for dust control, and, for noise control. Indicate proposed locations and construction of barriers.

C. Schedule of Selective Site Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of stairs.

D. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

E. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 FIELD CONDITIONS

A. Owner will occupy the building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Construction Manager and Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective site demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Engage a professional engineer to perform an engineering survey of the site condition to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective site demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Verify that hazardous materials have been remediated before proceeding with the site demolition operations.

E. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs or video.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
2. Before selective demolition or removal of existing site elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off utilities with utility companies.

3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of the area.

3.3 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
4. Maintain fire watch during and for at least 12 hours after flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly, as required by the Federal, State of Connecticut or local laws.
10. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.

3. Store items in a secure area until delivery to Owner.
4. Transport items as indicated on Drawings.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Construction Manager and/or Engineer, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

E. Bituminous Concrete Pavement and curbing: Cut bituminous concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove bituminous concrete between saw cuts.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA and CT DEEP approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

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SECTION 02 42 96 - HISTORIC REMOVAL AND DISMANTLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes historic treatment procedures in the form of special types of selective demolition work for designated historic spaces, areas, rooms, and surfaces and the following specific work:

1. Removal and dismantling of exterior siding, trim, moldings, panels, or other exterior elements for reuse or reproduction.
2. Removal and dismantling of interior plaster wall and ceiling finishes.
3. Removal and dismantling of interior baseboard, door casing, and cornice trim for reuse or reproduction.
4. Removal and dismantling of miscellaneous interior items as needed to complete the scope of work.

B. The Prudence Crandall House is listed on the National Register of Historic Places and is a National Historic Landmark. All work for this renovation project shall be in compliance with the Secretary of the Interiors Standards for the Treatment of Historic Structures.
All work activities must be undertaken with sufficient care to protect this historic resource and must be supervised by personnel who are familiar with the Secretary of Interior's Standards for Restoration.

1.3 DEFINITIONS

A. Dismantle: To disassemble or detach a historic item from a surface, or a nonhistoric item from a historic surface, using gentle methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

B. Existing to Remain: Existing items that are not to be removed or dismantled, except to the degree indicated for performing required Work.

C. Remove: To take down or detach a nonhistoric item located within a historic space, area, or room, using methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

D. Retain: To keep existing items that are not to be removed or dismantled.

E. Salvage: To protect removed or dismantled items and deliver them to Owner ready for reuse.

1.4 PRECONSTRUCTION MEETINGS

A. Preconstruction Conference(s): Conduct conference(s) at Project site.
1. Review list of items indicated to be salvaged.
2. Verify qualifications of personnel assigned to perform removal and dismantling.
3. Inspect and discuss condition of each construction type to be removed or dismantled.

4. Review requirements of other work that depends on condition of substrates exposed by removal and dismantling work.
5. Review methods and procedures related to removal and dismantling work, including, but not limited to, the following:

    a. Historic removal and dismantling specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
    b. Materials, material application, sequencing, tolerances, and required clearances.
    c. Fire prevention.
    d. Coordination with building occupants.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For historic removal and dismantling specialist.

B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by Contractor's removal and dismantling operations.

C. Removal and Dismantling Historic Treatment Program: Submit 30 days before work begins.

D. List of Items Indicated to Be Salvaged: Prepare a list of items indicated on Drawings to be salvaged for Owner's use or for reinstallation. Submit 15 days before preconstruction conference.

E. Inventory of Salvaged Items: After removal or dismantling work is complete, submit a list of items that have been salvaged.

1. Include item description, item condition, number of items if more than one of a type, and tag number. Include photo of item in original location.
2. As work proceeds, include on the inventory items that were indicated to be salvaged and items of historic importance discovered during the work. Document reasons, if any, why an item indicated to be salvaged was not salvaged.

1.6 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic treatment specialist, experienced in repairing, refinishing, and replacing historic material in whole and in part. Experience in fabricating and installing new work is not sufficient for this historic treatment work. Subject to compliance with requirements, historic specialty work shall be performed by a firm with a minimum of five (5) years successful experience with comparable restoration work including work on at least three (3) buildings listed on the National or State Registers under direction of SHPO, and employing personnel skilled in the restoration process and operations indicated, with a record of successful in-service performance that demonstrates the firm’s qualifications to perform this work. The qualifying historic treatment specialist shall be required to demonstrate its experience with names, dates, and locations of similar projects. This firm must designate a field supervisor, foreman, and tradesmen with commensurate experience for the duration of the work. Supervisors shall be on site when historic treatment begins and during its progress. Supervisors shall not be changed during Project except for causes beyond control of specialty firm. Should a supervisor be replaced, the new supervisor must demonstrate the requirements of the work by constructing new mock-ups. Resumes and experience must be approved by Owner prior to acceptance of bid. In the event of discrepancy, the more stringent requirements will govern.

B. Removal and Dismantling Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of removal and dismantling work, including protection of surrounding and substrate materials and Project site.

1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.

C. Mockups: Prepare mockups of specific historic removal and dismantling procedures specified in this Section to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Typical Removal Work: Remove typical wall area as shown on Drawings.
2. Typical Dismantling Work: Dismantle typical fixture from plaster surface as shown on Drawings.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

D. Regulatory Requirements: Comply with notification regulations of authorities having jurisdiction before beginning removal and dismantling work. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.7 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before removal and dismantling, Owner will remove the following items:

a. Historic exhibits and artifacts.
b. Gift Shop stock and stored materials
c. Movable fixtures, furniture and equipment determined to conflict with planned Work.

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.

C. Hazardous Materials: Hazardous materials are present in construction affected by removal and dismantling work. A report on the presence of hazardous materials is included int eh Contract Documents for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents. The TRC Hazmat report is located in Section 50 30 00. Asbestos abatement is specified in section 02 82 13. Lead activity is specified in section 02 83 13.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials, except under procedures specified elsewhere in the Contract Documents.
3. If unanticipated asbestos is suspected, stop work in the area of potential hazard, shut off fans and other air handlers ventilating the area, and rope off area until the questionable material is identified. Reassign workers to continue work in unaffected areas. Resume work in the area of concern after safe working conditions are verified.

D. Storage or sale of removed or dismantled items on-site is not permitted unless otherwise indicated.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT SPECIALISTS

A. Historic Removal and Dismantling Specialist Firms: Subject to compliance with requirements, historic removal and dismantling shall be performed by a firm with a minimum of five years successful experience with historic properties.

3.2 HISTORIC REMOVAL AND DISMANTLING EQUIPMENT

A. Removal Equipment: Use only hand-held tools, except as follows or unless otherwise approved by Architect on a case-by-case basis:

1. Light jackhammers are allowed subject to Architect's approval and only outside of building.
2. Large air hammers are not permitted.

B. Dismantling Equipment: Use manual, hand-held tools, except as follows or otherwise approved by Architect on a case-by-case basis:

1. Hand-held power tools and cutting torches are permitted only as submitted in the historic treatment program. They must be adjustable so as to penetrate or cut only the thickness of material being removed.
2. Pry bars more than 18 inches long and hammers weighing more than 2 lb are not permitted for dismantling work.

3.3 EXAMINATION

A. Preparation for Removal and Dismantling: Examine construction to be removed or dismantled to determine best methods to safely and effectively perform removal and dismantling work. Examine adjacent work to determine what protective measures are necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed or dismantled and location of utilities and services to remain that may be hidden by construction that is to be removed or dismantled.

1. Verify that affected utilities are disconnected and capped.
2. Inventory and record the condition of items to be removed and dismantled for reinstallation or salvage. Enter this information on the submittal of inventory of salvaged items.
3. Before removal or dismantling of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
4. Engineering Survey: Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures as a result of removal and dismantling work.

B. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and preconstruction video recordings.

1. Comply with requirements specified in Section 013233 "Photographic Documentation."

C. Perform surveys as the Work progresses to detect hazards resulting from historic removal and dismantling procedures.

3.4 HISTORIC REMOVAL AND DISMANTLING

A. General: Have removal and dismantling work performed by a qualified historic removal and dismantling specialist. Ensure that historic removal and dismantling specialist's field supervisors are present when removal and dismantling work begins and during its progress.

B. Perform work according to the historic treatment program and approved mockup(s).

1. Perform removal and dismantling to the limits indicated.
2. Provide supports or reinforcement for existing construction that becomes temporarily weakened by removal and dismantling work, until the Project Work is completed unless otherwise indicated.
3. Perform cutting by hand or with small power tools wherever possible. Cut holes and slots neatly to size required, with minimum disturbance of adjacent work.
4. Do not operate air compressors inside building unless approved by Architect in each case.
5. Do not drill or cut columns, beams, joints, girders, structural slabs, or other structural supporting elements, without having Contractor's professional engineer's written approval for each location before such work is begun.
6. Dispose of removed and dismantled items off-site unless indicated to be salvaged or reinstalled.

C. Water-Mist Sprinkling: Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment according to the historic treatment program to ensure that such water does not create a hazard or adversely affect other building areas or materials.

D. Unacceptable Equipment: Keep equipment that is not permitted for historic removal or dismantling work away from the vicinity where such work is being performed.

E. Removing and Dismantling Items on or Near Historic Surfaces:

1. Use only dismantling equipment and procedures within 12 inches of historic surface. Do not use pry bars. Protect historic surface from contact with or damage by tools.
2. Unfasten items in the opposite order from which they were installed.
3. Support each item as it becomes loosened to prevent stress and damage to the historic surface.
4. Dismantle anchorages.

F. Masonry Walls:

1. Remove masonry carefully, and erect temporary bracing and supports as needed to prevent collapse of materials being removed.
2. Dismantle top edge and sides before removing wall. Stop removal work and immediately inform Architect if any structural elements above or adjacent to the work show signs of distress or dislocation during any phase of removal work.
3. Remove wall in easily managed pieces.
4. During removal, maintain the stability of the partially remaining wall. Notify Architect of the condition of temporary bracing for wall if work is temporarily stopped during the wall's removal.

G. Loose Plaster: Identify loose, nonhistoric plaster, and separate it from its substrate by tapping with a hammer and prying with a chisel or screwdriver. Do not use pry bars. Leave sound, firmly adhered plaster in place. Do not damage, remove, or dismantle historic plasterwork, except where indicated or where it is an immediate hazard to personnel and as approved by Architect.

H. Concrete Floor Surface Removal: Remove floor surfaces, fill, and topping to the indicated lower elevations or cleavage planes as indicated on Drawings. Use dismantling methods when removing floor surfaces 12 inches or less away from historic walls. Take away material to a uniform surface at the indicated level.

I. Anchorages:

1. Remove anchorages associated with removed items.
2. Dismantle anchorages associated with dismantled items.

3. In nonhistoric surfaces, patch holes created by anchorage removal or dismantling according to the requirements for new work.
4. In historic surfaces, patch or repair holes created by anchorage removal or dismantling according to Section that is specific to the historic surface being patched.

END OF SECTION 024296

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PART 1 GENERAL

1.1 SCOPE

A. Work under this item shall include the abatement of asbestos containing materials (ACM) and associated work by persons who are knowledgeable, qualified, trained and licensed in the removal, treatment, handling, and disposal of ACM and the subsequent cleaning of the affected environment. ACM shall include material composed of any type of asbestos in amounts greater than one percent (1%) by weight. The Contractor performing this work shall possess a valid Asbestos Abatement Contractor license issued by the Connecticut Department of Public Health (CTDPH).

B. These Specifications govern all work activities that disturb asbestos containing materials. All activities shall be performed in accordance with, but not limited to, the current revision of the Occupational Safety and Health Administration (OSHA) General Industry Standard for Asbestos (29 CFR 1926.1001), the OSHA Asbestos in Construction Regulations (29 CFR 1926.1101), the United States Environmental Protection Agency (USEPA) Asbestos National Emission Standards for Hazardous Air Pollutants (NESHAP) Regulations (40 CFR Part 61 Subpart M), the CTDPH Standards for Asbestos Abatement, Licensure and Training (19a-332a-1 through 16, 20-440-1 through 9 & 20-441), and the Connecticut Department of Energy and Environmental Protection (CTDEEP) Special Waste Disposal Regulations (22a-209-8(i)).

C. The asbestos abatement work shall include the removal and disposal of all exterior ACM as identified on the Contract drawings and Specifications prior to the planned renovation/demolition project. A full asbestos NESHAP survey was performed by TRC, Inc. for this site. The survey report is located in Division 50 00 00 Project-Specific Available Information Section at the end of the Technical Specification Sections. The CT Department of Administrative Services/Construction Services (CTDAS/CS) will retain the services of a State of Connecticut licensed Project Monitor for protection of its interests and those using the building. **ALL WORK MENTIONED IN THIS SPEC IS EXTERIOR.**

D. Deviations from these Specifications require the written approval of the Engineer and Owner.

E. The Contractor may elect to utilize an Alternative Work Practice (AWP), if approved by the CTDPH and the Engineer/Owner prior to the initiation of the abatement activities. An AWP is a variance from certain CTDPH asbestos regulatory requirements, which must provide the equivalent or a greater measure of asbestos emission control than the standard work practices prescribed by the CTDPH.

F. The Engineer/Project Monitor for this project will be TRC, Inc. for the asbestos/lead-paint removal portion of this project ONLY.

1.2 DESCRIPTION OF WORK

A. The following details the extent of each phase of operation designated for this project. Phase areas may be combined or divided at the direction of the Engineer/Construction Manager. Proceed through the sequencing of the work phases under the direction of the Engineer/Construction Manager.

B. The asbestos abatement work shall include the removal of asbestos-containing materials as specified herein. This abatement project was designed by Mr. Donald LePage, a State of Connecticut licensed Asbestos Project Designer (#000233).

PRUDENCE CRANDALL MUSEUM

Exterior – Windows

Includes the removal of:

- **Exterior Grey Window Glazing**

Notes:
- **ACM window glazing will be impacted and removed, as part of the paint stabilization described in Section 028313. Removal of all ACM window glazing is part of this scope.**
- **Exterior grey window glazing also contains lead paint, therefore any impact to abatement of this material will also coincide with lead paint activity as outlined in Section 028313.**
- **All windows with ACM window glazing are to remain, unless otherwise noted on the contract drawings. The glazing is to be removed, keeping glass panes and windows wholly intact to be re-glazed and re-used.**

A regulated area(s) shall be established at the perimeter of the work area(s), and access shall be controlled by the Contractor. A remote personnel decontamination unit shall be utilized. Removal shall be undertaken in accordance with OSHA Class II and USEPA Asbestos NESHAP requirements. Visual inspection shall be performed by project monitor prior to work area being deregulated. No containment required for exterior abatements. See drawings ASB-01 – ASB-03 located in Division 50 00 00 Project-Specific Available Information Section at the end of the Technical Specification Sections for ACM locations.

1.3 DEFINITIONS

Accessible - A space easily accessed and which can be entered or seen without demolition.

Adequately Wet - Sufficiently mix or penetrate with liquid to prevent the release of particulates. If visible emissions are observed coming from asbestos-containing material, then that material has not been adequately wetted. However, the absence of visible emissions is not sufficient evidence of being adequately wet.

AHERA - Asbestos Hazard Emergency Response Act - U. S. EPA regulation 40 CFR Part 763 under Section 203 of Title II of the Toxic Substances Control Act (TSCA), 15 U.S.C. 2643. This rule mandates inspections, accreditations of persons involved with asbestos, and -final air clearances following abatement in public and private schools, and public and commercial buildings.

Alternative Work Practice (AWP) - State of Connecticut Department of Public Health - approved deviation from Asbestos Standards (Sections 19a-332a-1 to 19a-332a-16 inclusive). Alternative Work Practice methods may be used if pre-approved by DPH or with the approval of DPH, the Design Consultant and the CTDAS/CS Project Monitor when not pre-approved. Approval of alternative work practice procedures shall not relieve the Contractor from any codes, regulations or standards required by this specification.

Asbestos - The term asbestos includes chrysotile, amosite, crocidolite, asbestiform tremolite, asbestos, anthophyllite asbestos, actinolite asbestos and any of these minerals that has been chemically treated and/or altered.

Asbestos Abatement - The removal, encapsulation, enclosure, renovation, repair, demolition or other disturbance of asbestos-containing materials except activities which are related to the removal or repair of asbestos cement pipe and are performed as defined in Section 25-32a of the Connecticut General Statutes.

Asbestos-Containing Waste Materials - Mill tailings or any waste that contains commercial asbestos and is generated by a source subject to the provisions of this subpart. This term includes filters from control devices, friable asbestos waste material, and bags or other similar packaging contaminated with commercial asbestos. As applied to demolition and renovations operations, this term also includes regulated asbestos-containing material waste and materials contaminated with asbestos including disposable equipment and clothing.

Asbestos Control Area - An area where asbestos abatement operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris. Two examples of an Asbestos Control Area are a "full containment" and a "glovebag".

Asbestos Fiber - A particulate form of asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals having a length of five micrometers or longer, with a length-to-diameter ratio of at least 3 to 1.

Authorized Asbestos Disposal Facility - A location approved by the Connecticut Department of Environmental Protection for handling and disposing of asbestos waste or by an equivalent regulatory agency if the material is disposed of outside the State of Connecticut.

Category I Non-Friable Asbestos-Containing Material (ACM) - Asbestos-containing packings, gaskets, resilient Floor coverings and asphalt roofing products containing more than 1 percent asbestos as determined using the method specified in Appendix A, subpart F, 40 CFR part 763, section 1, Polarized Light Microscopy.

Category II Non-Friable ACM - Any material, excluding Category I non-friable ACM, containing more than 1 percent asbestos as determined using the method specified in Appendix A, subpart F, 40 CFR part 763, section 1, Polarized Light Microscopy that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Class I Asbestos Work - Activities involving the removal of TSI and surfacing ACM and PACM.

Class II Asbestos Work - Activities involving the removal of ACM which is not TSI or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics.

Class III Asbestos Work - Repair and maintenance operations, where ACM, including TSI and surfacing material, is likely to be disturbed.

Class IV Asbestos Work - Maintenance and custodial activities during which employees contact ACM and PACM and activities to clean up waste and debris containing ACM and PACM.

Competent Person - In addition to the definition in 29 CFR 1926.32(f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f): in addition, for Class I and Class II work who is specifically trained in a training course which meet the criteria of EPA's Model Accreditation Plan (40 CFR 763).

Concealed Space - Space which is out of sight. Examples of a concealed space include area above ceilings; below floors; between double walls; furred-in areas; pipe and duct shafts; and similar spaces.

Critical Barrier - A minimum of two layers of six (6) mil polyethylene sheeting taped securely over windows, doorways, diffusers, grilles and any other openings between the Work Area and uncontaminated areas outside of the Work Area, including the outside of the building.

Decontamination Enclosure System - A series of rooms separated from the Work Area and from each other by air locks, for the decontamination of workers and equipment.

Demolition - The wrecking or taking out of any load-supporting structural member of a facility together with any related handling operations or the intentional burning of any facility.

DEEP - The Connecticut Department of Energy and Environmental Protection, 79 Elm Street, Hartford, CT 06106.

DPH - The Connecticut Department of Public Health, 410 Capitol Avenue, Hartford, CT 06134.

Differential Pressure - A difference in the static air pressure between the Work Area and occupied areas, and is developed by the use of HEPA filtered exhaust fans. This differential is generally in the range of 0.02 to 0.04 inches of water column.

Encapsulant - Specific materials in various forms used to chemically entrap asbestos fibers in various configurations to prevent these fibers from becoming airborne. There are four types of encapsulant as follows:

1. Removal Encapsulant (can be used as a wetting agent).

2. Bridging Encapsulant (used to provide a tough durable surface coating to asbestos-containing material).

3. Penetrating Encapsulant (used to penetrate the asbestos containing material down to substrate, encapsulating all asbestos fibers).

4. Lock-down Encapsulant (used to seal off "lock-down" minute asbestos fibers left on surfaces from which asbestos containing materials have been removed).

Encapsulation - The application of an encapsulant to asbestos-containing building materials to control the possible release of asbestos fibers into the air.

Engineering Controls - Controls to include, but not be limited to, pressure differential equipment, decontamination enclosures, critical barriers and related procedures.

Equipment Decontamination Enclosure System - The portion of a Decontamination Enclosure System designed for controlled transfer of materials and equipment into or out of the Work Area, typically consisting of a Washroom and a Holding Area.

Exposed - Open to view.

Finished Space - Space used for habitation or occupancy where rough surfaces are plastered, paneled or otherwise treated to provide a pleasing appearance.

Fixed Critical Barrier - Barrier constructed of 2" x 4" wood or metal framing 16" O.C., with plywood on the occupied side and two layers of six (6) mil polyethylene sheeting on the Work Area side to prevent unauthorized access or air flow.

Fixed Object - A piece of equipment or furniture in the Work Area which cannot be removed from the Work Area, as determined by the Design Consultant.

Friable Asbestos Material - Material containing more than 1 percent asbestos as determined using the method specified in Appendix A, subpart F, 40 CFR part 763, Section 1, Polarized Light Microscopy, that when dry can be crumbled, pulverized or reduced to powder by hand pressure. If the asbestos content is less than 10 percent as determined by a method other than point counting by polarized light microscopy (PLM), verify the asbestos content by point counting using PLM.

Glovebag - A sealed compartment with attached inner gloves used for the handling of asbestos-containing materials. Properly installed and used glovebags provide a small Work Area enclosure typically used for small scale asbestos stripping operations. Information on glovebag installation, equipment and supplies, and work practices is contained in 29 CFR 1926.1101).

Glovebag Technique - A method with limited applications for removing small amounts of friable asbestos-containing material from HVAC ducts, short piping runs, valves, joints, elbows, and other non-planar surfaces in a non-contaminated work area. The glovebag assembly is a manufactured or fabricated device consisting of a glovebag (typically constructed of six (6) mil polyethylene or polyvinyl chloride plastic), two inward projecting long sleeves, an internal tool pouch, and an attached, labeled receptacle for asbestos waste. The glovebag is constructed and installed in such a manner that it surrounds the object or material to be removed and contains all asbestos fibers released during the process. This technique requires AWP application and may only be used if pre-approved by DPH or with the approval of the Design Consultant and DPH when not pre-approved.

HEPA Filter Equipment - High-efficiency particulate air (HEPA) filtered vacuum and/or exhaust ventilation equipment with a filter system capable of trapping and retaining asbestos fibers. Filters shall be of 99.97 percent efficiency for retaining fibers of 0.3 microns in diameter or larger.

Inaccessible - A space not accessible and which cannot be entered or seen without demolition.

Lock-Down - The procedure of spraying polyethylene sheeting and building materials with an encapsulant type sealant to seal in non-visible asbestos-containing residue.

Mini-Containment - A procedure using a single layer of polyethylene sheeting to contain the Work Area. Access to the mini-containment is controlled by an air lock which also serves as a Holding Area. This procedure requires AWP application and may only be used if pre-approved by DPH or with the approval of the Design Consultant and DPH when not pre-approved.

Movable Object - A piece of equipment or furniture in the Work Area which can be removed from the Work Area, as determined by the Design Consultant.

Negative Exposure Assessment - For any one specific asbestos job which will be performed by employees who have been trained in compliance with the standard, the employer may demonstrate that employee exposures will be below the PELs by data which conform to the following criteria:

1. Objective data demonstrating that the product or material containing asbestos minerals or the activity involving such product or material cannot release airborne fibers in concentrations exceeding the TWA and excursion limit under those work conditions having the greatest potential for releasing asbestos; or

2. Where the employer has monitored prior asbestos jobs for the PEL and the excursion limit within 12 months of the current or projected job, the monitoring and analysis were performed in compliance with the asbestos standard in effect; and the data were obtained during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the employer's current operations, the operations were conducted by employees whose training and experience are not more extensive than that of employees performing the current job, and these data show that under the conditions prevailing and which will prevail in the current workplace there is a high degree of certainty that employee exposures will not exceed the TWA and excursion limit; or

3. The results of initial exposure monitoring of the current job made from breathing zone air samples that are representative of the 8-hour TWA and 30-minute short-term exposures of each employee covering operations which are most likely during the performance of the entire asbestos job to result in exposures over the PELs.

Non-Friable Asbestos-Containing Material - Material containing more than 1 percent asbestos as determined using the method specified in Appendix A, subpart F, 40 CFR part 763, section 1, Polarized Light Microscopy, which when dry cannot be crumbled, pulverized or reduced to powder by hand pressure.

NPE - Negative pressure enclosure.

Owner or Operator of a Demolition or Renovation Activity - Any person who owns, leases, operates, controls and supervises the facility being demolished or renovated or any person who owns, leases, operates, controls or supervises the demolition or renovation, or both.

Permissible Exposure Limit (PEL) - (1) time-weighted average unit (TWA). The employer shall ensure that no employee is exposed to an airborne concentration of asbestos in excess of 0.1 fiber per cubic centimeter (f/cc) or air as an eight (8) hour time-weighted average time (TWA). (2) excursion limit. The employer shall ensure that no employee is exposed to an airborne concentration of asbestos in excess of 1.0 fibers per cubic centimeter of air (f/cc) as averaged over a sampling period of thirty (30) minutes.

Personal Monitoring - Air sampling within the breathing zone of an employee.

Pre-Clean - The process of cleaning an area before asbestos abatement activities begin to ensure all dust and debris in the area considered to be asbestos-containing are properly contained and disposed of. This increases the likelihood the area will pass aggressive air sampling clearance requirements after asbestos-containing materials have been removed.

Presumed Asbestos-Containing Material (PACM) - TSI and surfacing material found in buildings constructed no later than 1980.

Project Monitor - The certified and licensed individual contracted or employed by the building owner of contractor to supervise and/or conduct air monitoring and analysis schemes. This individual is responsible for recognition of technical deficiencies in procedures during both planning and on-site phases of an abatement project. Requirements for Project Monitor are defined in the Connecticut DPH regulations (Sections 20-440-1 through 9). In addition to these requirements, this person shall be listed in the American Industrial Hygiene Association's Asbestos Analysts Registry.

Regulated Area – An area established by the employer to demarcate areas where Class I, II and III work is conducted and any adjoining area where debris and waste from such asbestos work accumulate; a work area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed the Permissible Exposure Limit.

Regulated Asbestos-Containing Material (RACM) - (a) Friable asbestos material, (b) Category I non-friable ACM that has become friable, (c) Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

Renovation - Altering a facility or one or more facility components in any way, including the stripping or removal of RACM from a facility component. Operations in which load-supporting members are wrecked or taken out are demolitions.

Repair - Overhauling, rebuilding, reconstructing or reconditioning of structures or substrates where asbestos, tremolite, anthophyllite or actinolite is present.

Thermal System Insulation (TSI) - Materials applied to pipes, fittings, breeching, tanks, ducts or other structural components to prevent heat loss or gain.

Unfinished Space - Space used for storage, utilities or work area where appearance is not a factor. Examples of an unfinished space include crawlspace; pipe tunnel and similar spaces.

Visible Emissions - Any emissions, which are visually detectable without the aid of instruments, coming from RACM or asbestos-containing waste material or from any asbestos milling, manufacturing, or fabricating operation. This does not include condensed, uncombined water vapor.

Visible Residue - Any debris or dust on surfaces in areas within the Work Area where asbestos abatement has taken place and which is visible to the unaided eye. All visible residue is assumed to contain asbestos.

Waste Generator - Any owner or operator of a source whose act or process produces asbestos-containing waste material.

Waste Shipment Record - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste material.

Wet Cleaning - The process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with water, and afterwards thoroughly decontaminated or disposed of as asbestos-contaminated waste.

Work Area - Specific area or location where the actual work is being performed or such other area of a facility which the Design Consultant determines may be hazardous to public health as a result of such asbestos abatement.

Worker Decontamination Enclosure System - The portion of a Decontamination Enclosure System designed for controlled passage of workers and authorized visitors, typically consisting of a Clean Room, a Shower Room and an Equipment Room.

1.4 SUBMITTALS AND NOTICES

A. The Contractor shall submit, in accordance with CTDPH Standard 19a-332a-3 and EPA 40 CFR 61.145 (b), proper notification using the prescribed form, to the Commissioner, State of Connecticut, Department of Public Health and EPA Region 1 not fewer than ten (10) days (10 business days) prior to the commencement of work as follows:

1. Asbestos abatement projects involving greater than ten (10) linear feet (LF) or twenty-five (25) square feet (SF) of ACM (friable or non-friable) within a facility (i.e. interior abatement) and/or greater than 10 LF or 25 SF of friable ACM outside a facility, require an CTDPH Asbestos Abatement Notification. Also, abatement projects greater than one hundred sixty (160) SF, two hundred sixty (260) LF of interior/exterior or 35 cubic feet (CF) of interior/exterior Regulated Asbestos containing materials (RACM) require Notification of Demolition & Renovation to EPA Region 1.

2. At sites scheduled for demolition, asbestos abatement of exterior non-friable ACM or interior abatement involving less than 10 LF or 25 SF of ACM (friable or non-friable), and/or exterior abatement involving less than 10 LF or 25 SF of friable ACM require a Demolition Notification. In most cases, the Demolition Contractor is responsible for filing the Demolition Notification not fewer than ten (10) days prior to the commencement of demolition. However, if a portion of the demolition activities are scheduled to be conducted in conjunction with and/or under the supervision of an Asbestos Abatement Contractor (i.e. in the event of a structure which has been condemned, structurally damaged, and/or deemed unsafe for asbestos abatement activities); then it is the responsibility of the Asbestos Abatement Contractor to submit the Demolition Notification.

3. In the event that an Asbestos Abatement Notification has been submitted and the subject facility is scheduled for demolition, a separate Demolition Notification form does not need to be submitted. In such cases, the submission of the Asbestos Abatement Notification form shall be deemed as satisfying the requirement for the notification of the demolition of the facility.

4. The Contractor filing the proper notification is responsible for all associated fees.

5. If the Contractor intends to dispose of ACM waste within the State of Connecticut, a copy of the Asbestos Abatement/Demolition Notification must also be submitted to the Department of Environmental Protection, Solid Waste Management Unit, and the Contractor must obtain a CTDEEP Special Waste Disposal authorization.

B. Any Alternative Work Practice (AWP) methods must be pre-approved by CTDPH and the Engineer/Owner. Should the Contractor desire to use AWP procedures that have not been pre-approved, the Contractor shall submit in writing a description of the proposed methods to the Engineer/Owner and CTDPH for review and approval. Alternative procedures shall provide equivalent or greater protection

than procedures which they replace. The Contractor is responsible for all fees associated with filing AWP applications which have not been pre-approved. Submission of AWP applications requires a CTDPH Project Designer License. The Contractor shall not proceed with any AWP other than those listed in this Specification without approval from both the CTDPH and the Engineer/Owner.

C. Seven (7) working days prior to the commencement of asbestos abatement work (Pre-abatement Meeting), the Contractor shall submit to the Engineer/Owner for review and acceptance and/or acknowledgment of the following:

1. Copies of all required notifications.

2. AWP applications/approvals.

3. Permits and licenses for the removal, transport, and disposal of asbestos-containing or contaminated materials, including a CTDPH valid asbestos removal contractor's license.

4. Documentation dated within the previous twelve (12) months, certifying that all employees have received USEPA Model Accreditation Plan approved asbestos worker/supervisor training in the proper handling of materials that contain asbestos; understand the health implications and risks involved, including the illnesses possible from exposure to airborne asbestos fibers; understands the use and limits of respiratory equipment to be used; and understands the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment as indicated in 29 CFR 1926.1101 on an initial and annual basis, and copies of all employees CTDPH asbestos worker and/or supervisor licenses.

5. Documentation from the Contractor, typed on company letterhead and signed by the Contractor, certifying that all employees listed herein have received the following:

    a. Medical monitoring within the previous twelve (12) months, as required in 29 CFR 1926.1101
    b. Respirator fit testing within the previous twelve (12) months, as detailed in 29 CFR 1910.134 (for all employees who must also don a tight-fitting face piece respirator)

6. Copies of the EPA/State-approved certificates for the proposed asbestos landfill.

7. Name and qualifications of the Asbestos Abatement Site Supervisor. This individual shall be the OSHA Competent Person for the abatement activities, shall have a minimum of three years working experience as an Asbestos Abatement Site Supervisor, shall be capable of identifying existing asbestos hazards and shall have the authority to implement corrective measures to eliminate such hazards. The Asbestos Abatement Site Supervisor shall be on-site at all times asbestos abatement is occurring, shall comply with applicable Federal, State and Local regulations which mandate work practices, and shall be capable of performing the work

of this contract. The Competent Person/Site Supervisor shall also have prior experience with the abatement of ACM from historic wooden windows and structures in accordance with, and be knowledgeable of, the U.S. Department of the Interior, National Park Service Cultural Resources, Historic Preservation Briefs 9, 10 & 37.

D. No abatement shall commence until a copy of all required submittals have been received and found acceptable to the Engineer. Those employees added to the Contractor's original list will be allowed to perform work only upon submittal to, and receipt of, all required paperwork by the Engineer.

E. Provide the Engineer/Owner, within 30 days of completion of asbestos abatement, a compliance package; which shall include, but not be limited to, the following:

1. Asbestos Abatement Site Supervisor job log;
2. OSHA personnel air sampling data and exposure assessments;
3. Completed waste shipment records.

1.5 SEQUENCE OF WORK

A. The Contractor shall proceed in accordance with the sequence of work as directed by the Engineer/Construction Manager. Work shall be divided into convenient Work Areas, each of which is to be completed as a separate unit.

B. The Contractor shall use the following sequence for the asbestos abatement work:

1. Release of work area to Contractor.

2. A visual inspection of the work area to determine pre-existing damage to facility components.

3. Removal of all moveable objects from the Work Areas undergoing abatement by the Contractor.

4. All temporary utilities required for the project shall be on site and operational prior to the initiation of asbestos work.

5. Abatement of all asbestos-containing materials by the Contractor.

6. Final visual inspections by the Project Monitor.

7. Interior NPE work area air sampling by the Project Monitor for re-occupancy (if applicable).

8. Cleanup by the Contractor. Work Areas must be returned to their original condition or as directed by the Engineer/Project Monitor.

9. Removal of waste from the site.

PART 2 PRODUCTS

2.1 MATERIALS

A. All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description.

B. No damaged or deteriorating materials shall be used. If material becomes contaminated with asbestos, the material shall be decontaminated or disposed of as asbestos-containing waste material. The cost to decontaminate and dispose of this material shall be at the expense of the Contractor.

C. Fire retardant polyethylene sheet shall be in roll size to minimize the frequency of joints, with factory label indicating four (4) or six (6) mil thickness.

D. Six (6) mil polyethylene disposable bags shall have pre-printed OSHA/EPA/DOT labels and shall be transparent.

E. Tape (or equivalent) capable of sealing joints in adjacent polyethylene sheets and for the attachment of polyethylene sheets to finished or unfinished surfaces must be capable of adhering under both dry and wet conditions.

F. Surfactant is a chemical wetting agent added to water to improve penetration and shall consist of fifty (50) percent polyoxyethylene ether and fifty (50) percent polyoxyethylene ester, or equivalent. The surfactant shall be mixed with water to provide a concentration one (1) ounce surfactant to five (5) gallons of water, or as directed by the manufacturer.

G. Spray equipment must be capable of mixing necessary chemical agents with water, generating sufficient pressure and volume; and equipped with adequate hose length to access all necessary work areas.

H. Mechanical mastic removal equipment shall be suitable for the application and shall be operated in a manner which prevents damage to the underlying floor. Sanders, grinders, wire brushes and needle-gun type removal equipment shall be equipped with a High Efficiency Particulate Air (HEPA) filtered vacuum dust collection system.

I. Containers for storage, transportation and disposal of asbestos containing waste material shall be impermeable and both air and watertight.

J. Labels and warning signs shall conform to OSHA 29 CFR 1926.1101, USEPA 40 CFR Part 61.152, and USDOT 49 CFR Part 172 as appropriate.

K. Encapsulant, a material used to chemically entrap asbestos fibers to prevent these fibers from becoming airborne, shall be of the type which has been approved by the Engineer. Use shall be in accordance with manufacturer's printed technical data. The encapsulant shall be clear and must be compatible with new materials being installed, if any.

L. Glovebag assembly shall be manufactured of six (6) mil transparent polyethylene or PVC with two (2) inward projecting long sleeve gloves, an internal pouch for tools, and an attached labeled receptacle for waste.

M. Any planking, bracing, shoring, barricades and/or temporary sheet piling, necessary to appropriately perform work activities shall conform to all applicable federal, state and local regulations.

N. Air filtration devices and vacuum units shall be equipped with HEPA filters.

2.2 TOOLS AND EQUIPMENT

A. Air monitoring equipment of the type and quantity required to monitor operations and conduct personnel exposure surveillance shall conform to OSHA requirements.

B. Protective clothing, respirators, filter cartridges, air filters and sample filter cassettes shall be provided in sufficient quantities for the project.

C. Electrical equipment, protective devices and power cables shall conform to all applicable codes.

D. Shower stalls and plumbing shall include sufficient hose length and drain system or an acceptable alternate. Showers shall be equipped with hot and cold or warm running water. One shower stall shall be provided for each eight workers. Water is filtered through a 5 micron and a 10 micron filter prior to being discharged into the city sewer/sanitary system. The contractor may need to supply their own water as the closest operating water supply is at the Visitors Center.

E. The Contractor may need to supply electrical power to the site by either fuel operated generator(s) or temporary restoration of electrical service. Electrical power supply will be sufficient for maintaining in operation all equipment required for this project throughout the duration of the project.

F. Exhaust air filtration units shall be equipped with HEPA filters capable of providing sufficient air exhaust to create a minimum pressure differential of 0.02 inches of water column, and to allow a sufficient flow of air through the area providing 4 air changes per hour. An automatic warning system shall be incorporated into the equipment to indicate pressure drop or unit failure. No air movement system or air filtering equipment shall discharge unfiltered air outside the Regulated Area. The Contractor shall provide actual airflow measurement of filtration units while the unit is in place and calculate actual air exchange rates.

G. Pressure differential monitoring equipment shall be provided to ensure exhaust air filtration devices provide the minimum pressure differential required between the Work Area and occupied areas of the facility.

H. Vacuum units, of suitable size and capabilities for the project, shall have HEPA filters capable of trapping and retaining at least 99.97 percent of all monodispersed particles of three micrometers in diameter or larger.

I. Ladders and/or scaffolds shall be of adequate length, strength and sufficient quantity to support the work schedule.

J. Other materials such as lumber, nails and hardware necessary to construct and dismantle the decontamination enclosures and the barriers that isolate the Work Area shall be provided as appropriate for the work.

K. Spray equipment shall be capable of mixing wetting agent with water and capable of generating sufficient pressure and volume. Hose length shall be sufficient to reach all of the Regulated area.

L. Mechanical mastic removal equipment shall be suitable for the application and shall be operated in a manner which prevents excessive damage to the underlying floor.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. The Abatement Contractor/Subcontractor shall possess a valid State of Connecticut Asbestos Contractor License. Should any portion of the work be subcontracted, the subcontractor must also possess a valid State of Connecticut Asbestos Contractor License. The Asbestos Abatement Site Supervisor employed by the Contractor shall be in control on the job site at all times during asbestos abatement work. All employees of the Contractor who shall perform work (i.e. Asbestos Abatement Site Supervisor, Asbestos Abatement Worker) shall be properly certified/licensed by the State of Connecticut to perform such duties.

B. All labor, materials, tools, equipment, services, testing, insurance (with specific coverage for work on asbestos), and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations, industry standards and codes, and these Specifications shall be provided by the Contractor. The Contractor shall be prepared to work all shifts and weekends throughout the course of this project.

C. Prior to beginning work, the Engineer and Contractor shall perform a visual survey of each work area and review conditions at the site for safety reasons. In addition, the Contractor shall instruct all workers in all aspects of personnel protection, work procedures, emergency evacuation procedures and use of equipment including procedures unique to this project.

D. The Contractor shall:

1. Shutdown and isolate heating, cooling, and ventilating air systems to prevent contamination and fiber dispersal to the other areas of the building.

2. Shut down and lock out electrical power, including all receptacles and light fixtures, when feasible. The use or isolation of electrical power will be coordinated with all other ongoing uses of electrical power at the site.

3. Coordinate all power and fire alarm isolation with the appropriate representatives.

4. When necessary, provide temporary power and adequate lighting and ensure safe installation of electrical equipment, including ground fault protection and power cables, in compliance with applicable electrical codes and OSHA requirements. The Contractor is responsible for proper connection and installation of electrical wiring.

E. If sufficient electrical service is unavailable, the Contractor may need to supply electrical power to the site by fuel operated generator(s). Electrical power supply shall be sufficient for all equipment required for this project in operation throughout the duration of the project. If the Contractor elects to supply electrical power to the work site through the use of generators, the Contractor shall ensure that each work area is a manageable size such that removal, final cleaning and re-occupancy testing can be accomplished within one work shift while negative air machines are operating.

F. Negative pressure must be continuously maintained in each work area, until the area achieves satisfactory re-occupancy criteria and is approved by the Project Monitor to be deregulated. Negative air pressure must be maintained twenty-four (24) hours per day and the Contractor shall establish temporary electrical service to the site, rather than utilize generators.

G. Water service may not be available at the site. Contractor shall supply sufficient water for each shift to operate the decontamination shower units as well as to maintain the work areas adequately wet.

H. Ladders and/or scaffolds shall be in compliance with OSHA requirements, and of adequate length, strength and sufficient quantity to support the scope of work. Use of ladders/scaffolds shall be in conformance with OSHA 29 CFR 1926 Subpart L and X requirements.

I. Work performed at heights exceeding six feet (6') shall be performed in accordance with the OSHA Fall Protection Standard 29 CFR 1926 Subpart M including the use of fall arrest systems as applicable.

J. Data provided regarding asbestos sampling conducted throughout the structure(s) is for informational purposes only. Under no circumstances shall this information be the sole means used by the Contractor for determining the presence and location of all asbestos containing materials. The Contractor shall verify all field conditions affecting performance of the work as described in these Specifications in accordance with OSHA, USEPA, USDOT, CTDPH and CTDEEP standards. Compliance with the applicable requirements is solely the responsibility of the Contractor.

K. The Owner will provide a Project Monitor to oversee the activities of the Contractor. No asbestos work shall be performed until the Project Monitor is on-site. Pre-abatement, during abatement and post-abatement air sampling will be conducted as deemed necessary by the Project Monitor. Waste stream testing will be performed, as necessary, by the Project Monitor prior to waste disposal.

3.2 PREPARATION OF WORK AREA ENCLOSURE SYSTEM

A. Pre-clean the work areas using HEPA filtered equipment (vacuum) and/or wet methods as appropriate, collecting and properly containing all dust and debris as asbestos-containing/asbestos contaminated waste. Vacuum units, of suitable size and capabilities for the project, shall have HEPA filters capable of trapping and retaining at least 99.97 percent of all monodispersed particles of three micrometers in diameter or larger. Do not use methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters.

B. After pre-cleaning, movable objects shall be removed from the work areas with the utmost care to prevent damage of any kind and relocated to a temporary storage location coordinated with the Engineer. The Contractor is responsible for protecting all fixed objects that are permanent fixtures or are too large to remove and remain inside the Regulated Area. Fixed objects shall be enclosed with one layer of six (6) mil polyethylene sheeting sealed with tape.

C. Where non-ACM insulation exists within a Regulated Area, the Contractor has the option of removing the non-ACM insulation material and disposing of as ACM debris, or decontaminating and protecting non-ACM insulation material with two (2) layers of six (6) mil polyethylene sheeting. Any non-ACM insulation removed shall be replaced with new material of equal or better quality at the Contractor's expense.

3.3 WORKER DECONTAMINATION ENCLOSURE SYSTEM

A. The Contractor shall establish contiguous to the Regulated Area, a Worker Decontamination Enclosure System consisting of Equipment Room, Shower Room and Clean Room in series, as detailed below. Access to the Regulated Area shall only be through this enclosure.

B. Access between rooms in the Worker Decontamination Enclosure System shall be through airlocks. Other effective designs are permissible. The Clean Room, Shower Room and Equipment Room located within the Worker Decontamination Enclosure, shall be contiguously connected with taped airtight edges, thus ensuring the sole source of airflow originates from outside the regulated areas, once the negative pressure differential within the Regulated Area is established.

C. The Clean Room shall be adequately sized to accommodate workers and shall be equipped with a suitable number of hooks, lockers, shelves, etc., for workers to store personal articles and clothing. Changing areas of the Clean Room shall be suitably screened from areas occupied by the public.

D. The Shower Room shall be of sufficient capacity to accommodate the number of workers. One shower stall shall be provided for each eight (8) workers. Showers shall be equipped with hot and cold or warm running water through the use of electric hot water heaters supplied by the Contractor. No worker or other person shall leave a Regulated Area without showering. Shower water shall be collected and filtered using best available technology and dumped down an approved sanitary drain. Shower stalls and plumbing shall include sufficient hose length and drain system or an acceptable alternate.

3.4 EQUIPMENT DECONTAMINATION ENCLOSURE SYSTEM

A. The Contractor shall establish contiguous to the Regulated Area an Equipment/Waste Removal Decontamination Enclosure System consisting of two (2) totally enclosed chambers divided by a double flap curtained opening. Other effective designs are permissible. This enclosure must be constructed so as to ensure that no personnel enter or exit through this unit.

B. The Contractor shall ensure that no personnel or equipment be permitted to leave the Regulated Area until proper decontamination procedures (including HEPA vacuuming, wet wiping and showering) to remove all asbestos debris have occurred. No asbestos-contaminated materials or persons shall enter the Clean Room.

3.5 SEPARATION OF WORK AREAS FROM OCCUPIED AREAS

A. Seal off all windows, doorways, skylights, ducts, grilles, diffusers, vents, light fixtures, electrical receptacles, suspended ceiling tile systems and any other openings between the Regulated Area and the uncontaminated areas outside of the Regulated Area, including the outside of the building, with critical barriers consisting of a minimum of one (1) layer of six (6) mil polyethylene sheeting securing the edges with tape. Doorways and corridors which will not be used for passage during work and separate the regulated areas from occupied areas must be sealed with fixed critical barriers constructed of 2" x 4" wood or metal framing 16" O.C., with ½" plywood on the occupied side and two layers of six (6) mil polyethylene sheeting on the Regulated Area side to prevent unauthorized access or air flow.

B. The Contractor shall create a negative pressure differential in the range of 0.02 to 0.04 inches of water column between the Regulated Area and surrounding areas by the use of acceptable negative air pressure equipment. Exhaust air filtration units shall be equipped with HEPA filters capable of providing sufficient air exhaust to create a minimum pressure differential of 0.02 inches of water column, and to allow a sufficient flow of air through the area providing 4 air changes per hour. The Contractor shall provide a sufficient quantity of HEPA air filters to maintain the pressure differential throughout the duration of the project. An automatic warning system shall be incorporated into the equipment to indicate pressure drop or unit failure. Continuously monitor the pressure differential between the Regulated Area and surrounding area to ensure exhaust air filtration equipment maintains a minimum pressure differential of 0.02 inches of water column. The Contractor shall provide actual air flow measurement of filtration units while the unit is in place and

calculate actual air exchange rates. No air movement system or air filtering equipment shall discharge unfiltered air outside the Regulated Area.

C. A Negative Pressure Enclosure (NPE) shall be constructed via covering of floor and wall surfaces with polyethylene sheeting sealed with tape. Polyethylene shall be applied alternately to floors and walls. Cover floors first, with a layer of six (6) mil polyethylene sheeting, so that polyethylene extends at least twelve (12) inches up on wall. Cover wall with a layer of four (4) mil polyethylene sheeting to twelve (12) inches beyond the wall/floor intersection, thus overlapping the floor material by a minimum of twenty-four (24) inches. Repeat the process for the second layer of polyethylene. There shall be no seams at wall-to-floor joints. Protect carpet and floor tile with two additional layers of six (6) mil reinforced polyethylene in addition to the prior two layers required.

D. Conspicuously label and maintain emergency and fire exits from the Regulated Area satisfactory to fire officials.

E. Post warning signs meeting the specifications of OSHA 29 CFR 1910.1001 and 29 CFR 1926.1101 at each Regulated Area. In addition, signs shall be posted at all approaches to Regulated Areas so that an employee or building occupant may read the sign and take the necessary protective steps before entering the area. Additional signs may require posting following construction of workplace enclosure barriers.

3.6 ALTERNATE EXTERIOR NON-FRIABLE ASBESTOS SET-UP PROCEDURES

A. In lieu of the establishment of a negative pressure enclosure (NPE) system as described by CTDPH Sections 19a-332a-5(c), 5(d), 5(e), and 5(h), non-friable ACM will be removed from exterior work areas within an outdoor Regulated Area(s). The regulated work area will be established by the use of appropriately labeled barrier tape and postings in compliance with CTDPH 19a-332a-5(a) as well as OSHA 29 CFR 1926.1101. A remote personnel decontamination unit as specified in Section 19a-332a-6 will be required. This method shall only be utilized provided exposure assessment air sampling data collected during the removal of the exterior non-friable materials indicates that the exposure levels during removal of such materials do not exceed 0.1 asbestos f/cc. Should exposure assessment air sampling data exceed this level, and engineering efforts to reduce the airborne fiber levels not be successful in reducing the levels to less than 0.1 f/cc, removal shall occur within these areas under full containment conditions.

3.7 ALTERNATE “SPOT REPAIR” ASBESTOS PROCEDURES

A. In lieu of the establishment of a negative pressure enclosure (NPE) system as described by CTDPH Sections 19a-332a-5(c), 5(d), 5(e), and 5(h), less than 3 LF or 3 SF of ACM will be removed as a “spot repair” in accordance with CTDPH Section 19a-332a-10. A regulated area will be established by the use of appropriately labeled barrier tape and postings in compliance with CTDPH 19a-332a-5(a) as well as OSHA 29 CFR 1926.1101. A remote personnel decontamination unit as specified in Section 19a-332a-6 will be required. Air-tight barriers will be constructed to assure that asbestos fibers released during abatement activities are contained within the work area. (Glovebags are permitted,

as specified below.) ACM will be adequately wet prior to disturbance and remain wet until placed in leak-tight container. Following abatement, clean-up methods within the work area will include HEPA-filtered vacuuming or wet cleaning techniques until no visible residue remains.

B. Glovebags utilized to perform “spot repair” activities on asbestos containing pipe insulation/mudded fitting insulation, in conformance with OSHA 29 CFR 1926.1101(g)(5)(ii), shall be:

1. constructed of 6 mil poly, seamless at bottom, unmodified
2. installed so that it completely covers the circumference of pipe or other structure where work is to be done, with impermeable dropcloths placed on all surfaces beneath the work area
3. smoke-tested for leaks and sealed, as needed
4. used only once, may not be moved
5. used only on surfaces with temperatures <150ºF
6. collapsed by removing air via HEPA-vacuum, prior to disposal
7. adhered to surfaces which are intact, surfaces with loose and friable material shall be sealed in two layers of 6 mil poly or otherwise rendered intact
8. capable of sustaining integrity at connection site to attached waste bag, which must have equivalent of sliding valve for disconnection (as applicable)
9. performed by a minimum of two (2) persons

C. Glovebags may also be used for “spot repair” abatement procedures involving additional materials (e.g. floor tile/linoleum, transite, etc.) provided that the glovebag is capable of fully enclosing the material to be removed.

3.8 PERSONNEL PROTECTION

A. The Contractor shall utilize all appropriate engineering controls and safety and protective equipment while performing the work in accordance with OSHA, USEPA, USDOT, CTDEEP and CTDPH regulations.

B. The Contractor shall provide and require all workers to wear protective clothing in the Regulated Areas where asbestos fiber concentrations may reasonably be expected to exceed the OSHA established Permissible Exposure Limits (PEL) or where asbestos contamination exists. Protective clothing shall include impervious coveralls with elastic wrists and ankles, head covering, gloves and foot coverings.

C. Respiratory protection shall be provided and selection shall conform to the requirements of OSHA 29 CFR 1910.134 and 29 CFR 1926.1101 as well as the requirements of the CTDPH regulations and 42 CFR Part 84. A formal respiratory protection program must be implemented in accordance with 29 CFR 1926.1101 and 29 CFR 1910.134.

D. All other necessary personnel protective equipment (i.e. hardhat, work boots, safety glasses, hearing protection, etc.) required to perform the asbestos abatement work activities shall conform to all applicable federal, state and local regulations.

E. All other qualified and authorized persons entering into a Regulated Area (i.e. Project Monitor, Regulatory Agency Representative) shall adhere to the requirements of personnel protection as stated in this section.

3.9 ASBESTOS ABATEMENT PROCEDURES

A. The Asbestos Abatement Site Supervisor, as the OSHA Competent Person shall be at the site at all times.

B. The Contractor shall not begin abatement work until authorized by the Project Monitor, following a pre-abatement visual inspection.

C. All workers and authorized persons shall enter and leave the Regulated Area through the Worker Decontamination Enclosure System, leaving contaminated protective clothing in the Equipment Room for reuse or disposal of as asbestos contaminated waste. No one shall eat, drink, smoke, chew gum or tobacco, or apply cosmetics while in a Regulated Area.

D. During removal, the Contractor shall spray asbestos materials with amended water using airless spray equipment capable of providing a "mist" application to reduce the release of airborne fibers. Spray equipment shall be capable of mixing wetting agent with water and capable of generating sufficient pressure and volume. Hose length shall be sufficient to reach all of the Regulated Area. Do not “flood” the area with hose type water supply equipment with the potential to create water releases from the regulated area.

E. The Contractor shall continue to spray the asbestos materials with amended water, as necessary, throughout removal activities to ensure the asbestos materials remain adequately wet. The asbestos materials shall not be allowed to dry out.

F. In order to minimize airborne asbestos concentrations inside the Regulated Area, the Contractor shall remove the adequately wetted asbestos in manageable sections. In addition, asbestos materials removed from any elevated level shall be carefully lowered to the floor.

G. The Contractor shall promptly place the adequately wet asbestos material in disposal containers (six (6) mil polyethylene bags/fiber drum/poly-lined dumpsters, etc.) as it is removed. Large components removed intact may be wrapped in two (2) layers of six (6) mil polyethylene sheeting secured with tape. As the disposal containers are filled, the Contractor shall promptly seal the containers, apply caution labels and clean the containers before transportation to the equipment decontamination area. Bags shall be securely sealed to prevent accidental opening and leakage by taping in gooseneck fashion. Small components and asbestos-containing waste with sharp-edged components (e.g. nails, screws, metal lath, tin sheeting) which could tear polyethylene bags and sheeting shall be placed in clean drums and sealed with locking ring tops. All waste containers shall be leak-tight, (typically consisting of two layers of 6 mil poly (or bags)), and shall be properly labeled and placarded with OSHA Danger labels, DOT shipping labels, markings and placards and USEPA NESHAP generators labels. Containers shall be decontaminated by wet cleaning and HEPA vacuuming within the equipment

decontamination area prior to exiting the regulated area. Wet clean each container thoroughly before moving to Holding Area.

H. If at any time during asbestos removal, the Project Monitor should suspect contamination of areas outside the Regulated Area, the Contractor shall immediately stop all abatement work and take steps to decontaminate these areas and eliminate causes of such contamination. Unprotected individuals shall be prohibited from entering contaminated areas until air sampling and/or visual inspections determine decontamination.

I. After completion of abatement work, all surfaces from which asbestos has been removed shall be wet brushed, using a nylon brush, wet wiped and sponged or cleaned by an equivalent method to remove all visible material (wire brushes are not permitted). During this work the surfaces being cleaned shall be kept wet. Cleaning shall also include the use of HEPA filtered vacuum equipment.

3.10 CLEAN-UP PROCEDURES

A. The Contractor shall also remove and containerize all visible accumulations of asbestos-containing and/or asbestos-contaminated debris which may have splattered or collected on the polyethylene engineering controls/barriers.

B. The Contractor shall clean surfaces of contaminated containers and equipment thoroughly by vacuuming with HEPA filtered equipment and wet sponging or wiping before moving such items into the Equipment Decontamination Enclosure System for final cleaning and removal to uncontaminated areas.

C. The Contractor shall remove contamination from the exteriors of the air filtration devices, scaffolding, ladders, extension cords, hoses and other equipment inside the Regulated Area. Cleaning may be accomplished by brushing, HEPA vacuuming and/or wet cleaning. The Contractor shall wet wipe the Regulated Area beginning at the point farthest away from the negative air filtration units using cotton rags or lint free paper towels. Rags and towels shall be disposed of after each use. Workers should avoid the use of dirty rags to insure proper cleaning of surfaces. Mop the entire floor with a clean mop head and amended water. Water shall be changed frequently. For those Regulated Areas where lead is also disturbed, the cleaning shall also include a wet washing with a high phosphate detergent solution and HEPA vacuuming. Waste water shall be filtered using best available technology into leak-proof containers prior to being transported to a sanitary sewer for discharge.

D. Once the Regulated Area surfaces have dried, the Project Monitor shall perform a thorough post abatement visual inspection utilizing protocols from the ASTM Standard E1368-90 *Standard Practice for Visual Inspection of Asbestos Abatement Projects*. All surfaces within the Regulated Area, including but not limited to ledges, beams, and hidden locations shall be inspected for visible residue. Evidence of asbestos contamination identified during this inspection will necessitate further cleaning as heretofore specified. The area shall be re-cleaned at the Contractor's expense, until the standard of cleaning is achieved.

E. Once the area has received a satisfactory post-abatement visual inspection, any equipment, tools or materials not required for completion of the work, shall be removed by the Contractor from the Regulated Area. Negative air filtration devices shall remain in place and operating for the remainder of the clean-up operation.

F. Following the post-abatement visual, the Contractor shall apply a lock-down encapsulant to all surfaces within the Regulated Area from which asbestos has been removed and the cleaned inner layer of polyethylene.

3.11 AIR MONITORING REQUIREMENTS

A. The Contractor shall:

1. Provide air monitoring equipment including sample filter cassettes of the type and quantity required to properly monitor operations and personnel exposure surveillance throughout the duration of the project.

2. Conduct personnel exposure assessment air sampling, as necessary, to assure that workers are using appropriate respiratory protection in accordance with OSHA Standard 1926.1101. Documentation of air sampling results must be recorded at the work site within twenty-four (24) hours and shall be available for review until the job is complete.

B. The Project Monitor, acting as the representative of the Engineer during abatement activities, will:

1. Collect air samples in accordance with the current revision of the NIOSH 7400 Method of Air Sampling for Airborne Asbestos Fibers while overseeing the activities of the Abatement Contractor. Frequency and duration of the air sampling during abatement will be representative of the actual conditions at the abatement site. The size and configuration of the asbestos project will be a factor in the number of samples required to monitor the abatement activities and shall be determined by the Project Monitor. The following schedule of samples may be collected by the Project Monitor:

a. Pre-Abatement (Optional)
   i. Background areas
   ii. Area(s) adjacent to Work Area(s)
   iii. Work Area(s)

b. During Abatement (Optional)
   i. At the exhaust of air filtering device
   ii. Within Regulated Area(s)
   iii. Area(s) adjacent to Regulated Areas(s) (exterior to critical barriers)
   iv. At the Decontamination Enclosure System

c. Post-Abatement (re-occupancy air clearance testing) (**REQUIRED)**
   i. Interior Regulated NPE Area - At least five (5) per homogenous area

Abatement Activity	Pre-Abatement	During Abatement	Post-Abatement
Greater than 160 SF/260 LF – Interior	PCM	PCM	TEM
Greater than 3 LF/3 SF and Less than 160 SF/260 LF – Interior	PCM	PCM	PCM
Spot Removal and Glovebag Procedures (<3 LF/3 SF)	---	PCM	---
Exterior Friable/Non-Friable	---	PCM	---

C. If air samples collected outside of the Regulated Area during abatement activities indicate airborne fiber concentrations greater than original background levels, or greater than 0.1 f/cc, as determined by Phase Contrast Microscopy, whichever is larger, an examination of the Regulated Area perimeter shall be conducted and the integrity of barriers shall be restored. Cleanup of surfaces outside the Regulated Area using HEPA vacuum equipment or wet cleaning techniques shall be done prior to resuming abatement activities.

3.12 POST-ABATEMENT RE-OCCUPANCY PROCEDURES

A. For interior NPE Regulated Areas, clearance air sampling will be performed by the Project Monitor as specified in the Air Sampling Schedule. Clearance sampling will be undertaken using aggressive sampling techniques. Sampling and analysis of clearance samples will follow State of Connecticut Regulations, Section 19a-332a-12. Areas which do not comply shall continue to be cleaned by and at the Contractors expense, until the specified Standard of Cleaning is achieved as evidenced by results of air testing. When the Regulated Area passes the re-occupancy clearance, controls established by these Specifications may be removed.

1. Air sampling will not begin until after the area has received an acceptable post abatement visual inspection, encapsulation has been completed, and no visible water, liquid encapsulant or condensation remain in the Regulated Area.

2. Sampling equipment will be placed at random throughout the Regulated Area.

3. The following aggressive air sampling procedures will be used within the Regulated Area during all air clearance monitoring:

   a. Before starting the sampling pumps, direct the exhaust from forced air equipment (such as a 1 horsepower leaf blower) against all walls, ceilings, floors, ledges and other surfaces in the Regulated Area.
   b. Pre-calibrate the sampling pump flow rates through the use of a rotameter calibrated to a primary standard.
   c. Start the sampling pumps and sample for the required time.
   d. Post-calibrate the sampling pump flow rates.

4. Air volumes taken for clearance sampling shall be sufficient to accurately determine (to a 95 percent probability) fiber concentrations to 0.010 f/cc of air (1,200 liters).

5. Analysis shall follow the requirements of CTDPH 19a-332a-12.

6. Each homogeneous Regulated Area which does not meet the clearance criteria shall be thoroughly re-cleaned using HEPA vacuuming and/or wet cleaning, with the negative pressure ventilation system in operation. New samples shall be collected in the Regulated Area as described above. The process shall be repeated until the Regulated Area passes the test, with the cost of repeat sampling being borne entirely by the Contractor.

7. For an asbestos abatement project with more than one homogeneous Regulated Area, the release criterion shall be applied independently to each Regulated Area.

8. These clearance sampling procedures may also be implemented for exterior NPE work areas at the discretion of the Engineer.

3.13 POST ABATEMENT WORK AREA DEREGULATION

A. The Contractor shall remove all remaining polyethylene, including critical barriers, and Decontamination Enclosure Systems leaving negative air filtration devices in operation. HEPA vacuum and/or wet wipe any visible residue which is uncovered during this process. All waste generated during this disassembly process shall be discarded as ACM waste.

B. A final visual inspection of the work area shall be conducted by the Competent Person and the Project Monitor to ensure that all visible accumulations of suspect materials have been removed and that no equipment or materials associated with the abatement project remain.

C. The Contractor shall restore all work areas and auxiliary areas utilized during work to conditions equal to or better than original. Any damage caused during the performance of the work activity shall be repaired by the Contractor at no additional expense to the Engineer.

3.14 WASTE DISPOSAL

A. Unless otherwise specified, all removed materials and debris resulting from execution of this project shall become the responsibility of the Contractor and removed from the premises. Materials not scheduled for reuse shall be removed from the site and disposed of in accordance with all applicable Federal, State and Local requirements.

B. Waste removal dumpsters and cargo areas of transport vehicles shall be lined with a layer of six (6) mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting shall be installed first, and shall be extended up sidewalls 12-inches. Wall sheeting shall overlap floor sheeting 24-inches and shall be taped into place.

C. OSHA “Danger” signs must be attached to vehicles used to transport asbestos-containing waste prior to loading ACM waste. The signs must be posted so that they are plainly visible.

D. Waste haulers and disposal facilities utilized shall match those indicated on the submitted CTDPH notification.

E. Ensure all waste containers (bags, drums, etc.) are properly packed, sealed and labeled with USEPA NESHAP generator labels, OSHA danger labels and DOT shipping labels. For each shipment of ACM waste, the Contractor shall complete an EPA-approved asbestos waste shipment record.

F. Authorized representatives signing waste shipment records on behalf of the generator must have USDOT Shipper Certification training in accordance with HMR 49 CFR Parts 171-180.

G. Transport vehicles hauling ACM waste shall have appropriate USDOT placards visible on all four (4) sides of the vehicle.

H. The Contractor shall dispose of asbestos-containing and/or asbestos contaminated material at an EPA authorized site and must be in compliance with the requirements of the Special Waste Provisions of the Office of Solid Waste Management, Department of Environmental Protection, State of Connecticut, or other designated agency having jurisdiction over solid waste disposal.

I. Any asbestos-containing and/or asbestos-contaminated waste materials which also contain other hazardous contaminants shall be disposed of in accordance with the EPA’s Resource Conservation and Recovery Act (RCRA), CTDEEP and ConnDOT requirements. Materials may be required to be stored on-site and tested by the Project Monitor to determine proper waste disposal requirements.

END OF SECTION 02 82 13

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PART 1 GENERAL

1.1 SCOPE

A. Work under this item shall include the special handling measures and work practices required for renovation (construction) activities impacting various materials containing or covered by lead paint, including the loading, transportation and final off-site disposal of non-hazardous and/or hazardous lead construction waste, and the subsequent cleaning of the affected environment. Lead paint includes paint found to contain **any** detectable amount of lead by Atomic Absorption Spectrophotometry (AAS) or X-Ray Fluorescence (XRF). **ALL WORK MENTIONED IN THIS SPEC IS EXTERIOR.**

B. All activities shall be performed in accordance with, but not limited to, the current revision of the Occupational Safety and Health Administration (OSHA) Lead in Construction Regulations (29 CFR 1926.62), the United States Environmental Protection Agency (USEPA) Resource Conservation and Recovery Act (RCRA) Hazardous Waste Regulations (40 CFR Parts 260 through 274), the Connecticut Department of Energy and Environmental Protection (CTDEEP) Hazardous Waste Regulations (22a-209-1 and 22a-449(c)) and the United States Department of Transportation (USDOT) Hazardous Materials Regulations (49 CFR Parts 171 through 180).

C. All activities shall be performed by individuals with appropriate levels of OSHA lead awareness and hazard communication training and shall be supervised by the Contractor's Competent Person on the job site at all times. The Contractor's Competent Person is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

D. Hazardous lead debris shall be transported from the Project by a licensed hazardous waste transporter and disposed of at an EPA permitted hazardous waste facility within 90 days from the date of generation.

E. Deviations from these Specifications require the written approval of the Engineer/Construction Manager.

F. The Engineer/Project Monitor for this project will be TRC, Inc. for the asbestos/lead paint removal portion of this project ONLY.

1.2 DESCRIPTION OF WORK

A. All work impacting the lead painted materials identified below shall be conducted within an established Regulated Area with a remote wash facility/decontamination system and the OSHA Lead in Construction Standard. In accordance with 29 CFR 1926.62, engineering controls and work practices shall be utilized to prevent the spread of lead dust and debris beyond the Regulated Area and limit the generation of airborne lead. All wastes containing lead paint shall be properly contained and secured for storage, transportation and disposal.

B. Data for random lead testing conducted on surfaces throughout the buildings as well as any waste characterization results are available from the Engineer for informational purposes only. Under no circumstances shall this information be the sole means used by the Contractor for determining the extent of lead painted materials. The Contractor shall be responsible for verification of all field conditions affecting performance of the work as described in these Specifications in accordance with OSHA, USEPA, USDOT and CTDEEP standards. Compliance with the applicable requirements is solely the responsibility of the Contractor. The Lead Based Paint Measurement Summary Table is located in Division 50 00 00 Project-Specific Available Information Section at the end of the Technical Specification Sections.

C. The Contractor shall conduct exposure assessments for all tasks which impact lead paint in accordance with OSHA 29 CFR 1926.62(d) and shall implement appropriate personal protective equipment until negative exposure assessments are developed.

D. The following details the extent of each phase of operation designated for this project. Phase areas may be combined or divided at the direction of the Engineer/Construction Manager. Proceed through the sequencing of the work phases under the direction of the Engineer/Construction Manager.

a. The scope of work for this project includes the complete removal of paint (down to wood) on exterior window components (sashes, sills, trim, etc.) and wood siding in preparation for them to be repainted. Scraping or sanding (using wet methods) is the surface preparation technique which shall be utilized to perform this work. Any other surface preparation techniques (such as dry sanding, sandblasting, etc.) are not permitted without prior authorization from the Engineer or Owner. Stabilization of defective/delaminating paint will be considered complete following a final visual inspection from the Engineer.

Surface preparation techniques (such as wet scraping and wet sanding) which are utilized on surfaces coated with lead paint must be conducted in accordance with the OSHA worker protection and USEPA RCRA/CTDEEP waste disposal standards. All work impacting those materials shall be conducted within an established lead control (regulated) area with a remote handwash facility/decontamination system in accordance with OSHA Lead in Construction Standards. In accordance with OSHA 29 CFR 1926.62, engineering controls and work practices shall be utilized to prevent the spread of lead dust and debris beyond the Regulated Area and limit the generation of airborne lead. All wastes containing lead paint shall be properly contained and secured for storage, transportation and disposal.

Prior to disposal, the waste stream generated from this work shall require proper TCLP characterization. The Engineer will be responsible for performing the TCLP waste stream characterization.

b. Lead paint has been identified on various wood components throughout the building:

- **Wood wall paneling, wood trim, wood doors, wood window components, and wood siding**
  - **The windows contain exterior ACM window glaze. See drawing ASB-1 located in Division 50 00 00 Project-Specific Available Information Section at the end of the Technical Specification Sections for ACM locations. Lead paint activity on these windows will coincide with asbestos abatement as outlined in Section 028213.**

All exterior painted components to be impacted as part of this work shall be presumed to contain lead paint.

1.3 DEFINITIONS

Abatement: Any set of measures designed to eliminate lead hazards in accordance with the established CTDPH and OSHA standards, including, but not limited to, the encapsulation, replacement, removal, enclosure or covering of paint, plaster, soil, dust or other material containing toxic levels of lead and all preparation, clean-up, disposal and re-occupancy clearance testing.

Abatement Area: A room or area isolated with containment in accordance with CTDPH Section 19a-111-4(c)(2) where lead abatement is occurring.

Abrasive Removal: A method of abatement that entails the removal of lead-based paint using mechanical removal equipment logically fitted with a high efficiency particulate accumulator (HEPA) dust collection system.

Action Level: Employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter ($\mu g/m^3$) calculated as an eight-hour time weighted average (TWA).

Agency: The authoritative force, usually at a state level, or their representative.

Atomic Absorption Spectrophotometer (AAS): An instrument which measures the lead content in parts per million (ppm) using a lead source lamp, a flame capable of measuring the absorbed energy and converting it to concentration.

Biological Monitoring: The analysis of a person's blood and/or urine to determine the level of lead contamination in the body.

Certificate: A document issued by the department indicating successful completion of an approved training course.

Certified Historic Property: Any building, structure, or site which has been determined historic by the Connecticut Historical Commission.

Certified Lead Abatement Supervisor: Any person who completes an appropriate approved training course and obtains a certificate as a lead abatement supervisor from the department. A lead abatement supervisor oversees lead abatement activities.

Certified Lead Abatement Worker: Any person who completes an appropriate approved training course and obtains a certificate as a lead abatement worker from the department. A lead abatement worker performs lead abatement activities.

Certified Lead Inspector: Any lead consultant who completes an appropriate approved training course and obtains a certificate as a lead inspector from the department. A certified lead inspector conducts inspections to determine the presence of lead in paint, other surface coverings and various environmental media.

Certified Lead Inspector Risk Assessor: Any lead consultant who completes an appropriate approved training course and obtains a certificate as a lead inspector risk assessor from the department. A certified lead inspector risk assessor conducts inspections and collects and interprets information to assess the level of risk from lead hazards.

Certified Lead Planner-Project Designer: Any lead consultant who completes an appropriate approved training course and obtains a certificate as a lead planner-project designer from the department. A certified lead planner-project designer designs lead abatement and management activities.

Chemical Removal: A method of abatement which entails the removal of lead-based paint using chemical paint strippers.

Chewable Surface: Any projection one-half (0.5) inch or greater from an interior or exterior surface up to five (5) feet in height that can be mouthed by a child as defined in CTDPH 19a-111-1.

Child: A person under the age of six (6).

Common Area: A room or area that is accessible to all occupants in a building (e.g. hallway, stairwell).

Competent Person: An individual with 32 hours of lead abatement training capable of identifying existing and predictable lead hazards, identifying corrective measures to eliminate them, and who has authorization to take prompt measures to eliminate them. The duties of the competent person include at least the following: controlling entry to and exit from the lead control area; ensuring that all employees working within the lead control area wear the appropriate personal protective equipment, are trained in the use of appropriate methods of exposure control, and use the hygiene facilities and decontamination procedures specified; and ensuring that engineering controls in use are in proper operating condition and are functioning properly.

Complete Abatement: Abatement of all lead-based paint, inadequately covered lead-contaminated soil and lead-contaminated dust inside or outside a dwelling or building. All of these strategies require preparation; cleanup; post abatement clearance testing; record keeping; and, if applicable, reevaluation and on-going monitoring.

Containment: A process for protecting workers, residents, and the environment by controlling exposures to lead dust and debris created during abatement.

CTDEEP: The Connecticut Department of Energy and Environmental Protection, 79 Elm Street, Hartford, CT 06106.

CTDPH: The Connecticut Department of Public Health, 410 Capitol Avenue, Hartford, CT 06106.

Department: The State of Connecticut Department of Public Health.

Defective Surface: Peeling, flaking, chalking, scaling, or chipping paint; or paint over crumbling, cracking, or falling plaster; or paint over a defective or deteriorating substrate; or paint that is damaged in any manner such that a child can get paint from the damaged area. Defective may be termed as Deteriorated and may be classified as either fair or poor condition.

Differential Pressure: A difference in the static air pressure between the prepared work area and the occupied area developed by the use of HEPA filtered exhaust fans.

Dwelling: Every building or shelter used or intended for human habitation, including exterior surfaces and all common areas thereof, and the exterior of any other structure located within the same lot, even if not used for human habitation.

Dwelling Unit: A room or group of rooms within a dwelling arranged for use as a single household by one or more individuals living together who share living and sleeping facilities.

Elevated Blood Lead Level: A blood lead concentration equal to or greater than twenty (20) micrograms per deciliter (µg/dl) as defined in CTDPH Regulation 19a-111-1. A blood lead concentration equal to or greater than forty (40) micrograms per deciliter (µg/dl) as defined in OSHA Standard 29 CFR 1926.62.

Encapsulation: The resurfacing or covering of surfaces and sealing or caulking with durable materials so as to prevent or control chalking, flaking, lead-containing substances from being part of building dust or accessible to children. Painting or wallpapering is not considered encapsulation.

Enclosure: The use of rigid, durable construction materials that are mechanically fastened to the substrate to act as a barrier between the lead-based paint and the environment.

Engineer: - The Connecticut Department of Administrative Services, 450 Columbus Boulevard, Hartford, CT or their authorized representative, TRC Environmental Corporation, 5 Waterside Crossing, Windsor, Connecticut 06095.

Engineering Controls: Measures implemented at the work site to contain, control, and/or otherwise reduce worker exposure to, and environmental releases of, lead dust and debris.

EPA: The U.S. Environmental Protection Agency, 401 M Street SW, Washington, DC 20460.

Evaluation: Risk assessment, paint inspection, reevaluation, investigation, clearance examination or risk assessment screen.

Fixed Object: A unit of equipment or furniture in the work area which cannot, as determined by the Engineer, be removed from the work area.

Hazardous Waste: As defined in the Resource Conservation and Recovery Act (RCRA) the term "hazardous waste" means a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

A. cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness, or

B. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

As defined in the regulations, a solid waste is hazardous if it meets one of four conditions:

1. Exhibits a characteristic of a hazardous waste (40 CFR Sections 261.20 through 262.24),

2. Has been listed as hazardous (40 CFR Section 261.31 through 261.33),

3. Is a mixture containing a listed hazardous waste and a non-hazardous solid waste (unless the mixture is specifically excluded or no longer exhibits any of the characteristics of hazardous waste), or

4. Is not excluded from regulation as a hazardous waste.

HEPA Filter: A high-efficiency particulate accumulator (HEPA) filter is capable of trapping and retaining at least 99.97 percent of all monodispersed particles of 0.3 micrometers in diameter or larger.

High Phosphate Detergent: Detergent which contains at least five percent tri-sodium phosphate (TSP).

HUD: The U.S. Department of Housing and Urban Development.

ICP (Inductively Coupled Plasma): An analytical technique capable of identifying metal constituents including lead.

Inspection: A surface-by surface investigation to determine the presence of lead-based paint (in some cases including dust and soil sampling) and a report of the results.

Intact Surface: A defect-free surface with no loose, peeling, chipping, or flaking paint or paint substrate. A surface not damaged in any way such that a child can get paint from the damaged area.

Interim Controls: A set of measures designed to temporarily reduce human exposure or possible exposure to lead-based paint hazards. Such measures include specialized cleaning, repairs, maintenance painting, temporary containment and management and resident education programs. Interim controls also include dust removal; paint film stabilization; treatment of friction and impact surfaces; installation of soil coverings, such as grass or sod; and land-use controls.

Lead: Metallic lead, all inorganic lead compounds and organic lead soaps.

Lead Abatement Plan: A written plan that identifies the location of intact and defective lead-based paint, lead-contaminated soil and lead-contaminated dust and describes how defective lead-based surfaces, lead-contaminated soil and lead-contaminated dust will be abated and how the environment and human health and safety will be protected.

Lead Abatement: A comprehensive process of eliminating exposure to lead paint, lead soil and lead dust which includes removal, encapsulation, enclosure, testing, measures for worker protection, containment of dust and debris, cleanup, and disposal of waste.

Lead Based Paint: Paints or other surface coatings containing a toxic level of lead as defined in State of Connecticut DPH Regulation 19a-111-1.

Lead Based Paint Hazard (Lead Hazards): Any condition that causes exposure to lead from lead-contaminated dust, lead-contaminated soil or lead-based paint that would have an adverse effect on human health. Lead-based paint hazards include, for example, deteriorated lead-based paint, leaded dust levels above applicable standards and bare leaded soil above applicable standards.

Lead Based Paint Hazard Control (Lead Hazard Control): Activities to control and eliminate lead-based paint hazards, including interim controls, abatement and complete abatement.

Lead-Contaminated Dust: Dust containing lead at or above the levels of acceptance as defined in State of Connecticut DPH Regulation 19a-111.

Lead-Contaminated Soil: Soil containing lead at or above the levels of acceptance as defined in State of Connecticut DPH Regulation 19a-111.

Lead Control Area: An area where lead abatement operations are performed where airborne concentrations of lead dust exceed or can reasonably be expected to exceed the permissible exposure limit. The lead control area is isolated by physical boundaries from occupied areas to prevent the spread of lead dust, paint chips, debris, and unauthorized entry of personnel.

Lead-Free Dwelling: A lead-free dwelling contains no lead-based painted surfaces and has interior dust and exterior soil lead levels below the applicable CTDPH, HUD and EPA standards.

Lead Hazard Screen: A means of determining whether residences in good condition should have a full risk assessment. Also called a risk assessment screen.

Lead Management Plan: A written plan that describes how an intact surface with lead-based paint will be monitored to ensure that defective paint surfaces will be identified and abated.

Licensed Lead Abatement Contractor: Any entity that contracts to perform lead hazard abatement and obtains a license from the department to conduct such abatement work. The contractor uses certified lead abatement supervisors to oversee such lead abatement activities and certified lead abatement workers to perform such lead abatement activities.

Licensed Lead Consultant Contractor: Any entity that contracts to perform lead hazard reduction consultation work utilizing an inspector, inspector risk assessor and/or planner-project designer and obtains a license from the department to conduct such consultation work.

Lead-Safe Dwelling: A lead-safe dwelling contains intact, encapsulated or enclosed lead-based paint, adequately covered lead-contaminated soil and has interior dust and inadequately covered exterior soil below the applicable CTDPH, HUD and EPA standards.

Manifest: The shipping document used to track hazardous waste, EPA Form 8700-22, originated and signed by the generator in accordance with the instructions included in the Appendix to 40 CFR Part 262 and Section 102 of CTDEP Regulations.

µ; Microgram: The prefix "micro-" means 1/1,000,000 of a gram or 1/1000 of a milligram.

Movable Object: A unit of equipment or furniture in the work area which can, as determined by the Engineer, be removed from the work area.

Paint Film Stabilization: the process of wet scraping, priming, and repainting surfaces coated with deteriorated lead-based paint; paint film stabilization includes cleanup and clearance.

Paint Removal: An abatement strategy that entails the removal of lead-based paint from surfaces. For lead hazard control work, this can mean using chemicals, heat guns below 700 degrees Fahrenheit, and certain contained abrasive methods. Open flame burning, open abrasive blasting, sand blasting, water blasting and extensive dry scraping are prohibited paint removal methods.

Permissible Exposure Limit (PEL): Fifty (50) micrograms per cubic meter ($\mu g/m^3$) of air averaged over an 8-hour period as determined by 29 CFR 1926.62.

Personal Monitoring: Sampling of lead concentrations within the breathing zone of a worker to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employee's work tasks.

Pre-Clean: The process of cleaning an area before lead abatement activities begin to ensure all dust, paint chips, and debris in the work area are properly contained and disposed of.

Project Monitor: A professional capable of conducting air monitoring and wipe sampling. This individual is responsible for recognition of technical deficiencies in worker protection equipment and procedures during both planning and on-site phases of an abatement project. The Project Monitor shall meet the training requirements in lead abatement or inspection.

Reevaluation: In lead hazard control work the combination of a visual assessment and collection of environmental samples performed by a certified risk assessor to determine if a previously implemented lead-based paint hazard control measure is still effective and if the dwelling remains lead-safe.

Replacement: A strategy of abatement that entails removing components such as windows, doors, and trim that have lead painted surfaces and installing new or de-leaded components free of lead paint.

Risk Assessment: An on-site investigation of a residential dwelling to discover any lead-based paint hazards. Risk assessments include an investigation of the age, history, management and maintenance of the dwelling and the number of children under the age of six (6) and women of childbearing age who are residents; a visual assessment; limited environmental sampling (i.e. collection of dust wipe samples, soil samples and deteriorated paint samples); and preparation of a report identifying acceptable abatement and interim control strategies based on specific conditions.

Risk Assessment Screen: A type of risk assessment performed only in buildings in good condition using fewer samples but more stringent evaluation criteria (standards) to determine lead hazards.

Substrate: The underlying surface beneath a paint or varnish.

Toxic Level of Lead: When present in a dried paint, plaster or other accessible surface in a residential dwelling contains more than 0.50 percent lead by dry weight as measured by atomic absorption spectrophotometry (AAS), graphite furnace atomic absorption spectrophotometry (GFAAS), or inductively coupled plasma atomic emission spectrophotometry (ICP-AES) by a laboratory approved by the department for lead analysis, or more than 1.0 milligrams per square centimeter of surface as measured on site by an X-ray fluorescence analyzer as defined in CTDPH 19a-111-1.

Toxicity Characteristic Leaching Procedure (TCLP): A laboratory analytical method (EPA Test Method SW-846, Method 1311) for analyzing the waste stream to determine toxicity; the results are provided in milligrams per liter of extract (mg/l). For the 8 RCRA metals, measurements above the following values indicate that the waste is hazardous:

Parameter	mg/l	Parameter	mg/l
Arsenic	5.0	Lead	5.0
Barium	100.00	Mercury	0.2
Cadmium	1.0	Selenium	1.0
Chromium	5.0	Silver	5.0

TriSodium Phosphate (TSP): A specific lead-specific detergent known to perform well in the clean-up of lead-dust when used in solution.

Visible Residue: Any debris, dust or chips on surfaces in areas within the work area where lead abatement has taken place, and which is visible to the unaided eye.

Wet Cleaning: The process of eliminating lead dust and chip contamination from surfaces by using cloths, mops, or other cleaning tools which have been dampened with water and afterwards disposing of the cleaning items as lead waste.

Wipe Test: A test used to determine the concentration of lead particles; used to determine whether clearance levels for lead abatement have been achieved. A wipe test assimilates the dust from a measured surface area of about one square foot and is laboratory analyzed to determine the quantity of lead contained in that area.

X-Ray Fluorescence (XRF) Analyzer: An analytical instrument which measures lead concentration of dried paint on surfaces or in a laboratory sample in milligrams per square centimeter (mg/cm^2) using a radioactive source within the instrument.

1.4 SUBMITTALS AND NOTICES

A. Prior to the start of **any** work that will generate hazardous lead waste above conditionally exempt small quantities (greater than 100 kg/month or greater than 1000 kg at any time), the Contractor shall obtain from the Engineer/CTDEEP a temporary EPA Hazardous Waste Generators ID, unless otherwise directed by the Engineer.

B. Prior to the generation of any hazardous waste, provide a copy of the USEPA permit for disposal of hazardous lead bearing waste for each proposed hazardous waste treatment storage disposal facility. Also provide a copy of each proposed hazardous waste transporters current USDOT Certificate of Registration and current Hazardous Waste Transporter permits for the State of Connecticut, the hazardous waste destination state and any other applicable states.

C. Fifteen (15) working days prior to beginning work that impacts lead paint, the Contractor shall submit the following to the Engineer:

1. Work plan for work impacting lead paint including engineering controls, methods of containment of debris and work practices to be employed, as needed, to minimize employee exposure and prevent the spread of lead contamination outside the Regulated Area.

2. For projects when the intent is to mitigate lead hazards and provide lead-safe conditions for building occupants, a valid CTDPH Lead Abatement Contractor License.

3. Copies of all employee certificates, dated within the previous twelve (12) months, relating to OSHA lead awareness and hazard communication training and training in the use of lead-safe work practices. SSPC, HUD

LSWP and USEPA RRP training programs may be deemed acceptable as meeting these requirements if it can be demonstrated that such training addressed all required OSHA topics.

4. Name and qualifications of Contractor's OSHA Competent Person under 29 CFR 1926.62.

5. Documentation from the Contractor, typed on company letterhead and signed by the Contractor, certifying that all employees listed therein have received the following:

   a. medical monitoring within the previous twelve (12) months, as required in 29 CFR 1926.62;
   b. biological monitoring within the previous six (6) months, as required in 29 CFR 1926.62;
   c. respirator fit testing within the previous twelve (12) months, as required in 29 CFR 1910.134 (for those who don a tight-fitting face piece respirator)

6. Name of proposed waste recycling facility for lead-painted asphalt, brick, stone, and concrete that meets CT Remediation Standard Regulations (RSR) GA/Residential Criteria. If these materials do not meet GA/Residential Criteria, they will be disposed of as a non-hazardous construction and demolition (C&D) waste.

7. Names of the proposed non-hazardous construction and demolition (C&D) lead debris bulky waste disposal facility (CTDEEP-permitted Solid Waste landfill)

8. Names of the proposed scrap metal recycling facilities. The Contractor shall submit to the Engineer all documentation necessary to demonstrate the selected facility is able to accept lead-painted scrap metal.

9. Negative exposure assessments conducted within the previous 12 months documenting that employee exposure to lead for each task is below the OSHA Action Level of 30 $\mu g/m^3$. If a negative exposure assessment has not been conducted, the Contractor shall submit its air monitoring program for the work tasks.

D. No activity shall commence until all required submittals have been received and found acceptable to the Engineer/Owner. Those employees added to the Contractor's original list will be allowed to perform work only upon submittal of acceptable documentation to, and review by, the Engineer/Owner.

E. Provide the Engineer/Owner, within thirty (30) days of completion of the project site work, a compliance package; which shall include, but not be limited to, the following:

   1. Competent persons (supervisor) job log;
   2. OSHA-compliant personnel air sampling data and exposure assessments;

3. Completed waste shipment papers for non-hazardous lead construction and demolition (C&D) bulky waste disposal and scrap metal recycling
4. Completed certified hazardous waste manifests for hazardous lead debris.

1.5 MEASUREMENT AND PAYMENT

The Contractor's cost proposal shall be based on the following criteria:

Measurement for payment shall be based on a lump sum price for the lead hazard control construction activities. Measurement of payment shall be based on a per ton price for transport and disposal of hazardous and non-hazardous lead waste.

No extra payment shall be made for the construction and removal of containments, any required barrier installation and removal, decontamination, dust control, site preparation, site restoration or waste disposal areas. The cost for these items shall be included in the base bid.

PART 2 PRODUCTS

2.1 MATERIALS

A. All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description, with MSDS sheets as applicable.

B. No damaged or deteriorating materials shall be used. If material becomes contaminated with lead, the material shall be decontaminated or disposed of as lead-containing waste material. The cost to decontaminate and dispose of this material shall be at the expense of the Contractor.

C. Fire retardant polyethylene sheet shall be in roll size to minimize the frequency of joints, with factory label indicating six (6) mil thickness.

D. Polyethylene disposable bags shall be six (6) mils thick.

E. Tape (or equivalent) capable of sealing joints in adjacent polyethylene sheets and for the attachment of polyethylene sheets to finished or unfinished surfaces must be capable of adhering under both dry and wet conditions.

F. Cleaning agents and detergent shall be lead specific, such as TriSodium Phosphate (TSP).

G. Any chemical strippers and chemical neutralizers to be utilized shall be compatible with the substrate as well as with each other. Such chemical strippers shall contain less than 50% volatile organic compounds (VOCs) in accordance with RCSA 22a-174-40 Table 40-1.

H. Labels and warning signs shall conform to OSHA 29 CFR 1926.62, USEPA 40 CFR 745, USEPA 40 CFR 260 through 274 and USDOT 49 CFR 172 as appropriate.

I. Any planking, bracing, shoring, barricades and/or temporary sheet piling, necessary to appropriately perform work activities shall conform to all applicable federal, state and local regulations.

J. Air filtration devices and vacuum units shall be equipped with HEPA filters.

2.2 TOOLS AND EQUIPMENT

A. The Contractor shall provide tools and equipment that are suitable for lead paint related activity:

1. Air monitoring equipment of the type and quantity required to monitor operations and conduct personnel exposure surveillance in accordance with OSHA requirements.

2. Electrical equipment, protective devices and power cables shall conform to all applicable codes.

3. Where lead exposures are above the OSHA Action Level or PEL, the Contractor shall provide wash facilities/shower stalls and plumbing that include sufficient hose length and drain system or an acceptable alternate. One shower stall shall be provided for each eight workers.

4. Where lead exposures are above the OSHA PEL, the Contractor shall provide exhaust air filtration units that are equipped with HEPA filters to provide local exhaust ventilation at the work area to reduce airborne lead emissions.

5. The Contractor shall provide vacuum units of suitable size and capabilities for the project which have HEPA filters capable of trapping and retaining at least 99.97 percent of all monodispersed particles of three micrometers in diameter or larger. HEPA vacuums shall also be equipped with a beater bar.

6. The Contractor shall provide ladders and/or scaffolds of adequate length, strength and sufficient quantity to support the work schedule. Scaffolds shall be equipped with safety rails and kick boards in compliance with OSHA requirements.

7. Protective clothing, respirators, and HEPA P100 filter cartridges shall be provided in sufficient quantities for the project.

8. Equipment suitable for building renovation/demolition and proper waste/debris collection/packing/removal, (e.g. excavators, grapples, backhoes, roll-offs, etc.) shall be provided by the Contractor as required.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. All employees of the Contractor who perform work impacting lead paint shall be properly trained to perform such duties. In addition, the Contractor shall instruct all workers in all aspects of personnel protection, work procedures, emergency evacuation procedures and use of equipment including procedures unique to this project.

B. Contractor shall provide all labor, materials, tools, equipment, services, testing, insurance (with specific coverage for work on lead), and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations, industry standards and codes, and these Specifications.

C. Prior to beginning work, the Engineer and Contractor shall perform a visual survey of each work area and review conditions at the site.

D. As necessary, the Contractor shall:

1. Shutdown and isolate heating, cooling, and ventilating air systems to prevent contamination and particulate dispersal to the other areas of the building.

2. Shut down and lock out electrical power, including all receptacles and light fixtures, when feasible. The use or isolation of electrical power will be coordinated with all other ongoing uses of electrical power at the site.

3. Coordinate all power and fire alarm isolation with the appropriate representatives.

4. When necessary, provide temporary power and adequate lighting and ensure safe installation of electrical equipment, including ground fault protection and power cables, in compliance with applicable electrical codes and OSHA requirements. The Contractor is responsible for proper connection and installation of electrical wiring.

E. Ladders and/or scaffolds to be utilized throughout this project shall be in compliance with OSHA requirements, and of adequate length, strength and sufficient quantity to support the scope of work. Use of ladders/scaffolds shall be in conformance with OSHA 29 CFR 1926 Subpart L and X requirements.

F. Work performed at heights exceeding six feet (6') shall be performed in accordance with the OSHA Fall Protection Standard 29 CFR 1926 Subpart M including the use of fall arrest systems as applicable.

G. If adequate electrical supply is not available at the site, the Contractor shall supply temporary power. Such temporary power shall be sufficient to provide adequate lighting and power the Contractor's equipment. The Contractor is responsible for proper connection and installation of electrical wiring and shall

ensure safe installation of electrical equipment in compliance with applicable electrical codes and OSHA requirements.

H. If water service is not be available at the site for Contractor's use, the Contractor shall supply sufficient water for each shift to operate the wash facility/decontamination shower units in addition to the water needed at the work area.

I. The Owner will provide a Project Monitor to monitor compliance of the Contractor. In such cases no activity impacting lead paint shall be performed Until the Project Monitor is on-site. Environmental sampling, including ambient air sampling, TCLP waste stream sampling and/or dust wipe sampling, will be conducted by the Engineer/Project Monitor as deemed necessary throughout the project. Air monitoring to comply with the Contractor's obligations under OSHA remains solely the responsibility of the Contractor.

J. If air samples collected outside of the Regulated Area during activities impacting lead paint indicate airborne lead concentrations greater than original background levels or 30 ug/m^3, whichever is larger, or if at any time visible emissions of lead paint extend out from the Regulated Area, an examination of the Regulated Area shall be conducted and the cause of such emissions corrected. Cleanup of surfaces outside the Regulated Area using HEPA vacuum equipment or wet cleaning techniques shall be done prior to resuming work.

K. Work outside the initial designated area(s) will not be paid for by the Engineer. The Contractor will be responsible for all costs incurred from these activities including repair of any damage.

3.2 ESTABLISHMENT OF REGULATED WORK AREAS

A. The Contractor shall establish a Regulated Area, through the use of appropriate barrier tape, or other means to control unauthorized access into the area when activities impacting lead paint are occurring.

B. Warning signs meeting the requirements of OSHA 29 CFR 1926.62 shall be posted at all approaches to Regulated Areas. These signs shall read:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

C. The Contractor shall implement appropriate engineering controls such as critical barriers, poly drop cloths, negative pressure, local exhaust ventilation, wet dust suppression methods, etc. as necessary, and as approved by the Engineer, to prevent the spread of lead contamination beyond the Regulated Area in accordance with the Contractor's approved work plan. Should the previously submitted work plan prove to be insufficient to contain the contamination, the Contractor shall modify its plan and submit it for review by the Engineer.

D. For exterior work areas, the Contractor shall use a High Efficiency Particulate Air (HEPA) filtered vacuum dust collection system to remove any visible existing paint chips from the ground to a distance of 20' out from the base of the exterior surface scheduled for lead paint activity prior to commencement of work and extend a 6 mil polyethylene sheet drop cloth on the ground adjacent to the exterior surface scheduled for lead paint activity to contain debris/contamination.

3.3 WASH FACILITIES

A. The Contractor shall provide handwash facilities in compliance with 29 CFR 1926.51(f) and 29 CFR 1926.62 regardless of airborne lead exposure.

B. If employee exposure to airborne lead exceeds the OSHA Permissible Exposure Limit (PEL) of 50 micrograms per cubic meter of air ($\mu g/m^3$), shower rooms must be provided. The Shower Room shall be of sufficient capacity to accommodate the number of workers. One shower stall shall be provided for each eight (8) workers. Showers shall be equipped with hot and cold or warm running water. Shower water shall be collected and filtered using best available technology and disposed of in accordance with all federal, state and local laws, regulations and ordinances.

3.4 PERSONNEL PROTECTION

A. Exposure Assessments: The Contractor shall initially determine if any employee performing construction tasks impacting lead paint may be exposed to lead at or above the OSHA Action Level of 30 micrograms per cubic meter (30 $\mu g/m^3$). Assessments shall be based on initial air monitoring results as well as other relevant information. The Contractor may rely on historical air monitoring data obtained within the past 12 months under workplace conditions closely resembling the process, type of material, control methods, work practices and environmental conditions used and prevailing in the Contractors current operations to satisfy the exposure assessment requirements. Monitoring shall continue as specified in the OSHA standard until a negative exposure assessment is developed.

B. Until a negative exposure assessment is developed for each task impacting lead paint, the Contractor shall ensure that all workers and authorized person entering the Regulated Area wear protective clothing and respirators in accordance with OSHA 29 CFR 1926.62. Protective clothing shall include impervious coveralls with elastic wrists and ankles, head covering, gloves and foot coverings. Sufficient quantities shall be provided to last throughout the duration of the project.

C. Protective clothing provided by the Contractor and used during chemical removal operations shall be impervious to caustic materials. Gloves provided by the Contractor and used during chemical removal shall be of neoprene composition with glove extenders.

D. Respiratory protective equipment shall be provided, and selection shall conform to 42 CFR Part 84, 29 CFR Part 1910.134, and 29 CFR Part 1926.62. A formal respiratory protection program must be implemented in accordance with 29 CFR Part 1926.62 and 29 CFR Part 1910.134.

3.5 AIR MONITORING REQUIREMENTS

A. The Contractor shall:

1. Provide air monitoring equipment including sample filter cassettes of the type and quantity required to properly monitor operations and personnel exposure surveillance throughout the duration of the project.

2. Conduct initial exposure monitoring to determine if any employee performing construction tasks impacting lead paint may be exposed to lead at or above the OSHA Action Level of 30 micrograms per cubic meter. Monitoring shall continue as specified in the OSHA standard until a negative exposure assessment is developed.

3. Conduct personnel exposure assessment air sampling, as necessary, to assure that workers are using appropriate respiratory protection in accordance with OSHA Standard 1926.62. Documentation of air sampling results must be recorded at the work site within twenty-four (24) hours and shall be available for review until the job is complete.

3.6 LEAD PAINT ACTIVITY PROCEDURES

A. The Contractor's Competent Person shall be at the job at all times during work impacting lead. The Competent Person shall also have prior experience with the removal of lead paint from historic wooden windows and structures in accordance with, and be knowledgeable of, the U.S. Department of the Interior, National Park Service, Cultural Resources, Historic Preservation Briefs 9, 10 & 37.

B. Work impacting lead paint shall not begin until authorized by the Engineer, following a pre-abatement visual inspection by the Project Monitor.

C. Any activity impacting lead painted surfaces shall be performed in a manner which minimizes the spread of lead dust contamination and generation of airborne lead.

D. The Contractor shall ensure proper entry and exit procedures for workers and authorized persons who enter and leave the Regulated Area. All workers and authorized persons shall leave the Regulated Area and proceed directly to the wash or shower facilities where they will HEPA vacuum gross debris from work suit, remove and dispose of work suit, wash and dry face and hands, and vacuum clothes. Do not remove lead chips or dust by blowing or shaking of clothing. Wash water shall be collected, filtered, and disposed of in accordance with federal, state and local water discharge standards. Any permit required for such discharge shall be the responsibility of the Contractor.

E. No one shall eat, drink, smoke, chew gum or tobacco, or apply cosmetics while in the Regulated Area.

F. Utilize appropriate engineering controls and work practices (e.g. wet methods) as directed by 29 CFR 1926.62 (and 40 CFR 745.85 as applicable) to control lead emissions and contamination.

G. Properly contain wastes containing lead paint for appropriate storage, transport and disposal.

H. Stop all work in the regulated area and take steps to decontaminate non-work areas and eliminate causes of such contamination should lead contamination be discovered in areas outside of the regulated area.

I. Special Requirements:

1. Demolition/Renovation:

    a. Demolish/renovate in a manner which minimizes the spread of lead contamination and generation of lead dust.

    b. Implement dust suppression controls, such as misters, local exhausts ventilation, etc. to minimize the generation of airborne lead dust.

    c. Segregate work areas from non-work areas through the use or barrier tape, poly criticals, etc.

    d. Clean up immediately after renovation/demolition has been completed

2. Chemical Removal:

    a. Any chemical stripper must be approved by the Project Engineer prior to use.

    b. Apply chemical stripper in quantities and for durations specified by manufacturer.

    c. Where necessary scrape lead paint from surface down to required level of removal (i.e. stabilized surface, bare substrate with no trace of residual pigment, etc.). Use sanding, hand scraping, and dental picks to supplement chemical methods as necessary.

    d. Apply neutralizer compatible with substrate and chemical agent to substrate following removal in accordance with manufacturer's instructions.

    e. Protect adjacent surfaces from damage from chemical removal.

    f. Maintain a portable eyewash station in the work area.

    g. Wear respirators that will protect workers from chemical vapors.

h. Do not apply caustic agents to aluminum surfaces.

3. Paint Stabilization/Liquid Encapsulation:

   a. Remove surface dust, dirt, mildew, scale, rust or other debris by scrubbing with detergent (lead-specific detergent solution) and rinsing. Remove loose paint using wet scraping methods until a sound surface is achieved. Remove unsound substrate not firmly adhered and repair with an appropriate patching material in accordance with the U.S. Department of the Interior, National Park Service Cultural Resources, Historic Preservation Briefs 9, 10 & 37, and the contract technical specifications.

   b. Remove and reinstall or protect electrical receptacles, hardware, and wall mounted objects from being painted-over by encapsulant. Protect adjacent finishes from paint splatter or other damage.

   c. Apply encapsulant in a continuous coat. Number of coats is as specified in the manufacturer's instructions for application. Encapsulant shall be approved by the CTDPH for use. Use encapsulants only on substrates and locations approved for use in the manufacturer's instructions.

1. Mechanical Paint Removal:

   a. Mechanical paint removal methods are only to be utilized if removal cannot be completed using hand tools, and if approved by the Owner/Architect.

   b. Provide sanders, grinders, rotary wire brushes, or needle gun removers equipped with a HEPA filtered vacuum dust collection system. Cowling on the dust collection system for orbital-type tools must be capable of maintaining a continuous tight seal with the surface being abated. Cowling on the dust collection system for reciprocating-type tools shall promote an effective vacuum flow of loosened dust and debris. Inflexible cowlings may be used on flat surfaces only. Flexible contoured cowlings are required for curved or irregular surfaces.

   c. Provide HEPA vacuums that are high performance designed to provide maximum static lift and maximum vacuum system flow at the actual operating vacuum condition with the shroud in use. The HEPA vacuum shall be equipped with a pivoting vacuum head.

   d. Remove lead paint from surface down to required level of removal (i.e. stabilized surface, bare substrate with no trace of residual pigment, etc.). Use chemical methods, hand scraping, and dental picks to supplement abrasive removal methods as necessary.

   e. Protect adjacent surfaces from damage from abrasive removal techniques.

f. "Sandblasting" type removal techniques should only be performed within full containment negative pressure enclosures, and not without prior approval by the Project Engineer.

5. Component Removal/Replacement:

a. Wet down components which are to be removed to reduce the amount of dust generated during the removal process.

b. Remove components utilizing hand tools and follow appropriate safety procedures during removal. Remove the building components by approved methods which will provide the least disturbance to the substrate material. Do not damage adjacent surfaces.

c. Clean up immediately after component removals have been completed. Remove any dust located behind the component removed.

3.7 PROHIBITED REMOVAL METHODS

A. The use of heat guns in excess of 700 degrees Fahrenheit to remove lead paint is prohibited.

B. The use of sand, steel grit, water, air, CO_2, baking soda, or any other blasting media to remove lead or lead paint without the use of a HEPA ventilated contained negative pressure enclosure is prohibited.

C. Power tool assisted grinding, sanding, cutting, needle gun, power planning or wire brushing of lead paint without the use of cowled HEPA vacuum dust collection systems is prohibited.

D. Lead paint burning, busting of rivets painted with lead paint, welding of materials painted with lead paint, and torch cutting of materials painted with lead paint is prohibited. Where cutting, welding, busting, or torch cutting of materials is required, pre-remove the lead paint in the area affected.

E. Use of chemical strippers containing Methylene Chloride is prohibited.

F. Compressed air shall not be utilized to remove lead paint.

G. Power/Pressure washing shall not be used to remove paint.

3.8 CLEAN-UP AND VISUAL INSPECTION/VERIFICATION

A. The Contractor shall remove and containerize all lead waste material and visible accumulations of debris, paint chips and associated items.

B. During clean up the Contractor shall utilize rags and sponges wetted with lead-specific detergent and water as well as HEPA filtered vacuum equipment.

C. The Engineer/Project Monitor will conduct a visual inspection of the work areas in order to document that all surfaces have been maintained as free as practicable of accumulations of lead in accordance with OSHA 29 CFR 1926.62(h). If visible accumulations of waste, debris, lead paint chips or dust are found in the work area, the Contractor shall repeat the cleaning, at the Contractor's expense, until the area is in compliance. The visual inspection will detect incomplete work, damage caused by the abatement activity, and inadequate clean up of the work site.

D. Dust wipe clearance testing, in accordance with CTDPH/USEPA/HUD protocols, will also be performed by the Engineer if so detailed in Section 1.2 Description of Work. If lead dust wipe levels are above CTDPH/EPA/HUD clearance criteria, the Contractor shall re-clean the work area and retesting shall be conducted at the Contractors expense. The testing and cleaning sequence shall be repeated until the clearance criteria levels have been achieved.

3.9 POST ABATEMENT WORK AREA DEREGULATION

A. Following the visual inspection, (and clearance/verification testing if appropriate/specified), any engineering controls and warning signs implemented may be removed.

B. A final visual inspection of the work area shall be conducted by the Competent Person and the Project Monitor to ensure that all visible accumulations of suspect materials have been removed and that no equipment or materials associated with the abatement project remain. If this final visual is acceptable, the Contractor shall reopen the Regulated Area and remove all signage.

C. The Contractor shall restore all work areas and auxiliary areas utilized during work to conditions equal to or better than original. Any damage caused during the performance of the work activity shall be repaired by the Contractor at no additional expense to the Engineer/Owner.

3.10 NON-HAZARDOUS WASTE DISPOSAL/RECYCLING

A. Non-metallic building debris waste materials tested and found to be non-hazardous Construction and Demolition (C&D) bulky waste shall be disposed of properly at a CTDEEP approved Solid Waste landfill.

B. Metallic debris shall be segregated and recycled as scrap metal at an approved metal recycling facility. The Contractor shall submit to the Engineer all documentation necessary to demonstrate the selected recycling facility is able to accept lead-painted scrap metal.

C. Concrete, brick, stone, cured asphalt, etc. coated with any amount of lead paint cannot be crushed, recycled or buried on-site to minimize waste disposal unless representatively tested and found to meet the CTDEEP RSR GA/Residential Standards. Only CTDEEP defined “clean fill” can be recycled on-site or sent to a recycling facility.

3.11 HAZARDOUS LEAD WASTE DISPOSAL

A. If required to dispose of any hazardous waste, the Contractor shall utilize a certified/permitted transporter for hazardous waste in compliance with DOT 49 CFR Part 172 and USEPA 40 CFR 260-274 and a permitted hazardous waste treatment storage disposal facility (TSDF) in compliance with USEPA 40 CFR 260-274.

B. Hazardous lead bearing material must be offered for transportation and transported in compliance with the Code of Federal Regulations, Title 49, Chapter 1, Part 173, Subparts A, B, C, and D and Paragraph 178.118. Transport vehicles (hopper or dump type) must be free from leaks and discharge openings must be securely closed during transportation. All storage containers (roll offs or drums) shall have a protective liner and removable lid. These containers shall not have any indentations or damage that would allow seepage of the contained material.

C. The disposal of hazardous lead bearing material must be in compliance with the requirements of, and authorized by, the Office of Solid Waste Management, Department of Environmental Protection, State of Connecticut, and the USEPA.

D. The disposal of hazardous lead bearing waste shall comply with the requirements of the Resource Conservation and Recovery Act (RCRA).

E. Unless previous waste characterizations have been completed by the Engineer, all generated waste shall be containerized and stored on-site for hazardous waste determination via TCLP testing. TCLP testing and analysis shall be the responsibility of the Engineer.

F. The dumpsters/containers containing hazardous waste are to be kept closed and covered and locked when not in active use for the loading of materials.

G. All containers of hazardous lead bearing material shall be labeled in accordance with 29 CFR 1926.62 and EPA 40 CFR 260-270.

H. All hazardous lead-bearing waste removed from the site by the Contractor shall be containerized in lined roll-offs or barrels. Store waste materials in U.S. Department of Transportation (49 CFR 178) approved containers. Properly label and placard each container to identify the type of waste (49 CFR 172) and the date the container was filled. The disposal containers shall be labeled with a six-inch square, yellow, weatherproof, hazardous waste sticker in accordance with U.S. DOT regulations, by the Contractor.

I. The Contractor may not store containerized hazardous lead waste on the job site for in excess of 90 calendar days from the accumulation start date.

J. When required to dispose of hazardous waste, the Contractor shall utilize a certified/permitted transporter for hazardous waste in compliance with USDOT 49 CFR Part 172 and USEPA 40 CFR 260-274 and a permitted hazardous waste treatment storage disposal facility (TSDF) in compliance with USEPA 40 CFR 260-274.

K. The Contractor shall complete a Uniform Hazardous Waste Manifest, EPA Form 8700-22, and submit to the Engineer for review and generator sign-off prior to each load of hazardous waste scheduled to leave the site. Completed copies of the manifest shall be delivered by the Contractor to the Engineer within 30 calendar days following the date the load leaves the site.

L. When all necessary procedures have been completed, then the hazardous waste shall be shipped to the hazardous waste disposal facility.

M. Any spillage of debris during disposal operation, i.e., loading, transport and unloading, shall be cleaned up in accordance with the Code of Federal Regulations, Title 40, Chapter 1, Part 265, Subparts C and D, at the Contractor's expense.

N. The Contractor is liable for any fines, costs or remediation costs incurred as a result of the failure to be in compliance with this special provision and all federal, state and local laws.

O. Final payment requisitions for the contract will not be processed until a signed copy of the manifest from the treatment or disposal facility certifying the amount of lead-containing materials delivered is returned and a copy is furnished to the Engineer.

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SECTION 03 30 00 - CAST IN PLACE CONCRETE

PART 1-GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified in this section.

1.2 DESCRIPTION OF WORK

A. The extent of cast-in-place concrete work shown on drawings.

B. Related work specified elsewhere.

1.3 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes, specifications and standards, except where more stringent requirements are shown or specified. For the codes and standards listed in this section and in subsequent sections, follow the latest edition recognized by building authority having jurisdiction at the time of construction.

1. "Specifications for Structural Concrete for Buildings", American Concrete Institute, (ACI 301).

2. "Building Code Requirements for Reinforced Concrete", ACI-318

3. Concrete Reinforcing Steel Institute, CRSI, "Manual of Standard Practice"

4. "Standard Specification for Ready-Mixed Concrete" ASTM C 94

B. Concrete Testing Service: Employ, at Contractor's expense, a testing laboratory acceptable to Engineer to perform material evaluation tests for concrete mix designs and to design concrete mixes.

C. Materials and installed work may require testing and retesting, as directed by Engineer, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests not specifically indicated to be done at Owner's expense, including retesting of rejected materials and installed work, shall be done at Contractor's expense.

D. Inspection: The Owner will engage the services of a qualified "Testing Laboratory" for this project. The testing lab, as a representative of the Owner, will provide testing requirements, as necessary.

E. Sampling and testing for quality assurance during placement of concrete includes the following:

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

2. Slump: ASTM C 143; one test for each concrete load at point of discharge from truck, and one test for each set of compressive strength test specimens.

3. Air Content: ASTM C 231 one for each set of compressive strength test specimens.

4. Concrete Temperature: Test hourly when air temperature is 40 degrees F. (4 degrees C.) and below, and when 80 degrees F (27 degrees C), and above; and each time a set of compressive test specimens are made.

5. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field cure test specimens are required.

6. Compressive Strength Tests: ASTM C 39; one set for each 50 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed; 1 specimen tested at 7 days, 2 specimens tested at 28 days, and one specimen retained in reserve for later

testing if required.

When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

F. Test results will be reported to Engineer and Contractor on same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, name of concrete supplier, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, air content, slump, concrete temperature, compressive breaking strength and type of break for both 7-day tests and 28 day tests.

G. Additional Tests: The testing service will make additional tests of in place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when concrete placed does not conform to the specified limits of the Contract Documents or when unacceptable concrete is verified.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, curing compounds, and others as requested by Engineer.

B. Shop Drawings Reinforcement: Submit shop drawings electronically in PDF format with the ability for reviewers to comment and re-save the file for; fabrication, bending, and placement of concrete reinforcement. Comply with ACI Detailing Manual, Publication SP-66, showing bar schedules, stirrup spacing, diagrams of bent bars, placing plans and wall elevations showing arrangement of concrete reinforcement. Include special reinforcement required and openings through concrete structures. Reproductions of the Engineers Contract Drawings are not acceptable for use as shop drawings.

C. Certificates of Compliance: Provide the Special Inspector with Certificates of Compliance for welded wire fabric, cement, air-entraining agent, water-reducing agent, water stop, and vapor barrier.

In addition, provide mill test reports for reinforcement bars used for this project.

D. Laboratory Test Reports: Submit for review laboratory test reports for concrete materials and mix design test as specified.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces, or prevent bonding for architectural finishes.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars (Rebar): ASTM A 6l5-82 (S1), Grade 60, deformed.

B. Steel Wire: ASTM A 82-79, plain, cold-drawn, steel.

C. Welded Wire Fabric (WWF): ASTM A l85-79, welded steel wire fabric.

D. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use bar type supports complying with CRSI recommendations, unless otherwise acceptable.

1. For slabs on grade, provide chairs with sufficient bearing surface to not sink into bearing material or to puncture vapor barrier. Use of stone, clay brick, or concrete brick is NOT acceptable.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C l50, Type I, unless otherwise acceptable to the Architect. Use one brand of cement throughout project, unless acceptable to Engineer.

B. Normal Weight Aggregates: ASTM C 33 and as herein specified. Provide aggregates from a single source for exposed concrete.

C. Water: Potable.

D. Air-Entraining Admixture: ASTM C 260.

E. Water-Reducing Admixture: ASTM C 494, Type A and not containing more chloride ions than are present in municipal drinking water.

2.4 RELATED MATERIALS

A. Vapor Barrier: Provide tear resistant vapor barrier cover over prepared base material. Vapor barrier shall be 15mil ASTM E 1745 Class A with a permeance below 0.01 perms. All joints to be lapped six inches and sealed with –manufacturer's tape. Continue vapor barrier up all adjacent vertical surfaces and seal around all penetrations per the manufacturer's recommendations. Patch any punctures or tears in material with tape or by taping additional vapor barrier material over the damaged area.

B. Moisture-Retaining Cover: One of the following, complying with ASTM C l7l.

1. Waterproof paper.

2. Polyethylene film.

3. Polyethylene-coated burlap.

4. Membrane-Forming Curing Compound: ASTM C 309, Type I unless other type acceptable to Engineer. Ensure that curing compound is chemically compatible with hardeners, surface treatments and finish coatings that will be used.

2.5 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete in accordance with ACI 301 Section 3.9 "Proportioning on the Basis of Previous Field Experience or Trial Mixtures", as indicated on drawings.

Use an independent testing facility acceptable to Engineer for preparing and reporting proposed mix design. The testing facility shall not be the same as used for field quality assurance testing unless otherwise acceptable to Engineer.

B. Submit written reports to Engineer for each proposed mix for each class of concrete AT LEAST 15 DAYS PRIOR TO START OF WORK. Do not begin concrete production until mixes have been reviewed and approved by Engineer.

C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job condition, weather, test results, or other circumstances warrant; at no

additional cost to Owner and as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before using in work. Submit adjusted concrete mixes to the Engineer for review AT LEAST 5 WORKING DAYS PRIOR TO USE.

D. Use air-entraining admixture in all concrete exposed to freeze – thaw cycles. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having air content within specified limits.

1. Concrete structures and slabs exposed to freezing and thawing or subject to hydraulic pressure:

4% to 4 1/2% for maximum 2" aggregate
5 1/2% to 6 1/2% for maximum 3/4" aggregate
6 1/2% to 7% for maximum 1/2" aggregate

2. Other Concrete: 2% to 4%.

E. Slump Limits: The concrete shall be proportioned and produced to have a slump of 4 inches or less if consolidation is to be by vibration, and 5 inches or less if consolidation is to be by methods other than vibration. A tolerance up to 1 inch above the maximum indicated shall be allowed for one batch in any five consecutive batches tested. Concrete of lower slump may be used provided it is properly placed and consolidated.

F. Do not use admixtures containing calcium chloride

2.6 CONCRETE MIXING

A. Ready-Mix Concrete: Comply with requirements of ASTM C 94 "Standard Specification for Ready-Mixed Concrete", and as herein specified.

Addition of water to the batch will not be permitted.

When air temperature is between 85 degrees F (30 degrees C) and 90 degrees F (32 degrees C), reduce mixing, delivery, and placement time from l-1/2 hours to 75 minutes, and when air temperature is above 90 degrees F (32 degrees C), reduce time to 60 minutes.

When placement of concrete is likely to occur with air temperatures above 85 degrees F, submit a Hot Weather Concreting Plan to the Engineer for review and approval prior to beginning work. Hot Weather Concreting Plan should comply with ACI 305R.

When placement of concrete is likely to occur with air temperatures below 40 degrees F, submit a Cold Weather Concreting plan to the Engineer for review and approval prior to beginning work. Cold Weather Concreting Plan should comply with ACI 306R.

PART 3 - EXECUTION

3.1 FORMS

A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structures. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position. The Contractor is solely responsible for the safe design and installation of formwork and supports.

B. Design Formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms complying with ACI 347, "Recommended Practice for Concrete Formwork", to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide

back-up at joints to prevent leakage of cement paste.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

E. Provide temporary openings where interior area of formwork is inaccessible for clean out, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

F. Chamfer exposed corners and edges unless otherwise specified, using wood, metal PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

G. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

1. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least 1-1/2" inside concrete.

2. Unless otherwise shown, provide form ties which will not leave holes larger than 1" diameter in concrete surface.

H. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Re-tighten forms and bracing after concrete placement if required to eliminate mortar leaks and maintain proper alignment.

3.2 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

B. Clean reinforcement of loose rust and mill scale, old concrete, earth, ice, and other materials, which reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required. Concrete bricks are NOT acceptable.

D. Place reinforcement to obtain at least minimum coverages indicated on the Contract drawings for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces. All reinforcement must be completely supported and secured against possible displacement prior to placing concrete in any portion of the scheduled placement.

E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lap splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

F. Concrete reinforcement shall be erected from shop drawings displaying the Engineer's stamp of acceptance only. In the event a conflict exists between the accepted shop drawing and the Contract Documents the conflict shall be brought to the immediate attention of the Engineer for resolution.

3.3 JOINTS

A. Construction Joints: Locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to Engineer.

B. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs, and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.

C. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.

D. Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated.

E. Control Joints in Slabs-on-Ground: Construct control joints in slabs-on-ground to form panels or patterns as shown. Use inserts or saw-cut 1/4" wide x 1/5 to 1/4 of the slab depth, unless otherwise indicated.

3.4 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instruction and directions provided by suppliers of items to be attached thereto.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.5 PREPARATION OF FORM SURFACES

A. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

B. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.6 CONCRETE PLACEMENT

A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work. Cooperate with other trades in setting such work.

B. Notify testing/inspection agency of intent to place concrete at least 48 hours prior to placement. Perform complete preplacement inspection of formwork, reinforcement and condition of base prior to arrival of inspector. For each placement Contractor will provide the Special Inspector with a written record of the quality control inspection performed by and signed by the Contractor.

C. Coordinate the installation of joint materials and vapor barriers with placement of forms and reinforcing steel.

D. General: Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete", and as herein specified. Deposit concrete continuously or in layers of such thickness that concrete will not be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

E. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

F. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

G. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion; limit duration of vibration to time necessary to consolidate without causing segregation of mix.

H. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

I. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

J. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

K. Maintain reinforcing in proper position during concrete placement operations.

L. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306, "Recommended Practice for Cold Weather Concreting" and as herein specified.

1. When air temperature has fallen to or is expected to fall below 40 degrees F (4 degrees C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C, and not more than 80 degrees F (27 degrees C) at time of placement.

M. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

N. Do not use calcium chloride, salt and other materials containing anti-freeze agents or chemical accelerators, unless otherwise accepted in mix designs.

O. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 "Recommended Practice for Hot Weather Concreting", and as herein stated.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F (32 degrees C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing.

P. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

Q. Wet forms thoroughly before placing concrete.

R. Do not use retarding admixtures unless otherwise accepted in mix designs.

3.7 FINISH OF SURFACES

A. Rough Form Finish (RfFm-Fn): For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

3.8 MONOLITHIC SLAB FINISHES

A. Troweled Finish (Tr-Fn): Apply troweled finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, paint or other thin film finish coating system.

After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling, with a

steel trowel, when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8" in 10', except for concrete on metal deck shall not exceed 1/4" in 10' when testing with a 10' straight edge.

3.9 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.

Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods: Perform curing of concrete by moist curing, by

1. Keep concrete surface continuously wet by covering with water.

2. Continuous water-Fog Spray.

Surfaces shall be kept continuously moist for not less than 72 hours after finishing.

3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

Surfaces shall be kept continuously moist for not less than 72 hours after finishing.

C. Provide moisture-cover curing as follows:

1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

D. Provide membrane curing to slabs as follows:

1. Apply membrane-forming curing compound to concrete surfaces as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Re-coat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

2. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, damp proofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to Engineer.

E. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. IF FORMS ARE REMOVED, CONTINUE CURING BY METHODS SPECIFIED ABOVE AS APPLICABLE.

F. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

3.10 REMOVAL OF FORMS

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength of 28-days. Determine potential compressive strength of in place concrete by testing field-cured specimens representative of concrete location or members.

C. Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

D. Early removal of formwork may be permitted as acceptable to the Engineer provided sufficient data is presented indicating that concrete has attained adequate strength and stiffness to resist anticipated loads without damage. Additional tests to determine early strength and stiffness shall be performed AT THE EXPENSE OF THE CONTRACTOR.

3.11 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surface, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.12 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Engineer.

B. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete, but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Before placing cement mortar or proprietary agent, brush-coat the area to be patched with neat cement grout or proprietary bonding agent.

C. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixtures and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surfaces.

D. Repair of formed Surfaces: Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

E. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

F. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

G. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

H. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

I. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Engineer.

J. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and brush with a neat cement grout, or apply concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

K. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and brush with neat cement grout, or apply concrete bonding agent. Mix dry-pack, consisting of one-part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

L. Use epoxy-based mortar, approved by the Engineer, for structural repairs. Structural repairs include, but are not limited to, areas of unsound (honeycombed or spalled) concrete with a surface area greater than 9 square inches and/or with a depth greater than 1.5 inches, areas where reinforcement is exposed or areas with cracks greater than 1/16 inch in width. All areas requiring a structural patch shall be approved by the Engineer prior to commencing patching operations.

END OF SECTION 03 30 00

SECTION 03 30 53 – MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.1.1 SUMMARY

A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Also, section includes exterior cement concrete pavement for the following:
1. Concrete for Posts and Signs
2. Concrete for Small Utility Pads
3. Concrete for Light Poles Base

C. Related Sections include the following:

1. Division 31, Section 31 20 00 "Earth Moving".
2. Division 32, Section 32 13 13 "Concrete Paving".
3. Division 32, Section 32 13 73 "Concrete Paving Joint Sealants".

D. If there any discrepancies found between these specifications and related drawings and details, the most restrictive requirement and/or material/part shall be applied by the Contractor without compensation.

1.2 REFERENCES

A. State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, including current edition and supplemental.

B. Town of Canterbury Details and Specifications.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.
1. Review methods and procedures related to concrete paving, including but not limited to, the following:
   a. Concrete mixture design.
   b. Quality control of concrete materials and concrete paving construction practices.

2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete paving Subcontractor.

1.1 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.

D. Qualification Data: The Concrete installer to submit current ACI flatwork certification.

E. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.
9. Salt guard.

F. Material Test Reports for:

1. Aggregates: Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

G. D. Field quality-control reports

1.2 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1.3 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. Comply with the following sections of ACI 301 unless modified by requirements in the Contract Documents:

1. "General Requirements."
2. "Formwork and Formwork Accessories."
3. "Reinforcement and Reinforcement Supports."
4. "Concrete Mixtures."
5. "Handling, Placing, and Constructing."
6. "Lightweight Concrete."

B. Comply with ACI 117.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves of a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Epoxy-Coated Welded Wire Fabric: ASTM A 884/A 884M, Class A, plain steel.

B. Epoxy-Coated Reinforcement Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 deformed bars.

C. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 plain steel bars.

D. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

E. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer coated wire bar supports.

G. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.

2.4 CONCRETE MATERIALS

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

B. Concrete for posts, signs posts, light pole bases, and small utility pads shall conform to the requirements of Section 6.01 and M.03 of the State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, including current supplemental and Town of Canterbury standards, including current supplemental and the notes and details included on

the plans. Concrete for light pole bases and small utility pads shall be Class F, 4,400 psi. Concrete for posts and signs posts shall be Class C, 3,300 psi.

2.5 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy-Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:

   a. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch. Concrete retarding materials shall be utilized when weather has an adverse effect on placement, all sidewalk placement shall take place between April 15th and October 15th unless previously requested and approved by the Engineer. Concrete evaporation retarder is not preferred method. Preferred method is the use of wet cure for 7 days.

2.6 SALT GUARD

A. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

   1. VOC Content: 200 g/L or less.

PART 3 - EXECUTION

3.1 PREPARATION

A. Proof-roll prepared sub-base surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

B. Remove loose material from compacted sub-base surface immediately before placing concrete.

3.2 FORMWORK INSTALLATION

A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.3 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.4 VAPOR-RETARDER INSTALLATION

A. Install, protect, and repair vapor retarders according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.

1. Lap joints 6 inches and seal with manufacturer's recommended adhesive or joint tape.

3.5 STEEL REINFORCEMENT INSTALLATION

A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

2. Apply epoxy repair coating to uncoated or damaged surfaces of epoxy-coated reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

3.7 CONCRETE PLACEMENT

A. Comply with ACI 301 for placing concrete.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

C. Do not add water to concrete during delivery, at Project site, or during placement.

D. Consolidate concrete with mechanical vibrating equipment according to ACI 301.

E. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 6 inches high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4,400 psi at 28 days, unless otherwise indicated.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor them into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections exceeding 1/2 inch.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.

C. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301, to smooth-formed-finished as-cast concrete where indicated:

1. Smooth-rubbed finish.
2. Grout-cleaned finish.
3. Cork-floated finish.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 FINISHING UNFORMED SURFACES

A. General: Comply with ACI 302.1R for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or derbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.

1. Do not further disturb surfaces before starting finishing operations.

C. Scratch Finish: Apply scratch finish to surfaces indicated and surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes unless otherwise indicated.

D. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.

E. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

F. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

G. Slip-Resistive Broom Finish: Apply a slip-resistive finish to surfaces indicated and to exterior concrete platforms, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.10 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas

subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests: Perform according to ACI 301.

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

3.12 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/8 inch.
2. Lateral Alignment and Spacing of Tie Bars and Dowels: 1\2 inch.
3. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
5. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
6. Contraction Joint Depth: Plus 1/4 inch, no minus.
7. Joint Width: Plus 1/8 inch, no minus.

3.13 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

B. Protect concrete from damage for at least 14 days after placement.

C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

3.14 AS-BUILT

A. Provide a record drawing of all constructed items prepared by a Licensed Land Surveyor licensed in Connecticut. Provide a statement that the as built record conforms with the design, or as acceptable by the design engineer. As-built to be prepared in paper, Mylar and AutoCad format and provided to the Owner.

END OF SECTION 03 30 53

SECTION 04 03 22 - HISTORIC BRICK UNIT MASONRY REPAIR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes historic treatment work consisting of repairing historic clay brick masonry as follows:

1. Repairing unit masonry.

B. Related Requirements:

1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.
2. Section 024296 "Historic Removal and Dismantling" for historic removal and dismantling work.

C. The Prudence Crandall House is listed on the National Register of Historic Places and is a National Historic Landmark. All work for this renovation project shall be performed in compliance with the Secretary of the Interiors Standards for the Treatment of Historic Structures.
All work activities must be undertaken with sufficient care to protect this historic resource and must be supervised by personnel who are familiar with the Secretary of Interior's Standards for Restoration.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 01 20 00 "Contract Consideration."

1. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

1.4 DEFINITIONS

A. Low-Pressure Spray:

1. Pressure: 100 to 400 psi.
2. Flow Rate: 4 to 6 gpm.

B. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

C. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of bricks to freezing and thawing.

1.5 SEQUENCING AND SCHEDULING

A. Work Sequence: Perform masonry historic treatment work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean masonry.
5. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
6. Repair masonry, including replacing existing masonry with new masonry materials.
7. Rake out mortar from joints to be repointed.
8. Point mortar and sealant joints.
9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
10. Where water repellents are to be used on or near masonry work, delay application of these chemicals until after pointing and cleaning.

B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in bricks according to "Brick Masonry Patching" Article. Patch holes in mortar joints according to Section 040323 "Historic Brick Unit Masonry Repointing."

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include recommendations for product application and use.
3. Include test data substantiating that products comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, sections, and locations of masonry repair work on the structure.
2. Show full-size patterns with complete dimensions for new brick and jointing, showing relationship of existing units to new units.
3. Show provisions for expansion joints or other sealant joints.
4. Show provisions for flashing, lighting fixtures, conduits, and weep holes as required.
5. Show replacement and repair anchors. Include details of anchors within individual bricks, with locations of anchors and dimensions of holes and recesses in units required for anchors.
6. Show locations of scaffolding and points of scaffolding in contact with masonry. Include details of each point of contact or anchorage.

C. Samples for Initial Selection: For the following:

1. Sand Types Used for Mortar: Minimum 8 oz. of each in plastic screw-top jars.

   a. For blended sands, provide Samples of each component and blend. Identify blend ratio.
   b. Identify sources, both supplier and quarry, of each type of sand.

2. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of masonry representative of the range of masonry colors on the building.

a. Have each set contain a close color range of at least three Samples of different mixes of patching compound that match the variations in existing masonry when cured and dry.

3. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For the following:

1. Each type of brick to be used for replacing existing units. Include sets of Samples to show the full range of shape, color, and texture to be expected.

a. For each brick type, provide straps or panels containing at least four bricks. Include multiple straps for brick with a wide range.

2. Each type of patching compound in the form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each Sample with manufacturer and stock number or other information necessary to order additional material.
3. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For historic treatment specialist.

B. Quality-control program.

C. Unit masonry historic treatment program.

1.8 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic treatment specialist, experienced in repairing, refinishing, and replacing historic material in whole and in part. Experience in fabricating and installing new work is not sufficient for this historic treatment work. Subject to compliance with requirements, historic specialty work shall be performed by a firm with a minimum of five (5) years successful experience with comparable restoration work including work on at least three (3) buildings listed on the National or State Registers under direction of SHPO, and employing personnel skilled in the restoration process and operations indicated, with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work. The qualifying historic treatment specialist shall be required to demonstrate its experience with names, dates, and locations of similar projects. This firm must designate a field supervisor, foreman, and tradesmen with commensurate experience for the duration of the work. Supervisors shall be on site when historic treatment begins and during its progress. Supervisors shall not be changed during Project except for causes beyond control of specialty firm. Should a supervisor be replaced, the new supervisor must demonstrate the requirements of the work by constructing new mock-ups. Resumes and experience must be approved by Owner prior to acceptance of bid. In the event of discrepancy, the more stringent requirements will govern.

1. Historic Treatment Worker Qualifications: When bricks are being patched, assign at least one worker per crew who is trained and certified by manufacturer of patching compound to apply its products.

B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising worker performance and preventing damage.

C. Unit Masonry Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of historic treatment work, including protection of surrounding materials and Project site.

1. Include methods for keeping exposed mortar damp during curing period.
2. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add to the quality-control program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver bricks to Project site strapped together in suitable packs or pallets or in heavy-duty cartons and protected against impact and chipping.

B. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

E. Store lime putty covered with water in sealed containers.

F. Store sand where grading and other required characteristics can be maintained and contamination avoided.

G. Handle bricks to prevent overstressing, chipping, defacement, and other damage.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repair work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits: Repair brick masonry only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for masonry repair unless otherwise indicated:

1. When air temperature is below 40 deg F, heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F.
2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after repair.

D. Hot-Weather Requirements: Protect masonry repairs when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Source Limitations: Obtain each type of material for repairing historic masonry (face brick, cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MASONRY MATERIALS

A. Face Brick: Units, including molded, ground, cut, or sawed shapes as required to complete masonry repair work.

1. Brick Matching Existing: Units with colors, color variation within units, surface texture, size, and shape that match existing brickwork and with physical properties within 10 percent of those determined from preconstruction testing of selected existing units.

a. Physical Properties: According to ASTM C67 and as follows:

1) Compressive Strength: 1600 psi.

b. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.

2. Special Shapes:

a. Provide molded, 100 percent solid shapes for applications where core holes or "frogs" could be exposed to view or weather when in final position, and where shapes produced by sawing would result in sawed surfaces being exposed to view.
b. Provide specially ground units, shaped to match patterns, for arches and where indicated.
c. Mechanically chopping or breaking brick, or bonding pieces of brick together by adhesive, are unacceptable procedures for fabricating special shapes.

3. Tolerances as Fabricated: According to tolerance requirements in ASTM C216, Type FBX.

2.3 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II; white or gray or both where required for color matching of mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Factory-Prepared Lime Putty: ASTM C1489.

D. Quicklime: ASTM C5, pulverized lime.

E. Mortar Sand: ASTM C144 unless otherwise indicated.

1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
2. Colored Mortar: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
3. For exposed mortar, provide sand with rounded edges.

F. Water: ASTM C270, potable.

2.4 MANUFACTURED REPAIR MATERIALS

A. Brick Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching brick masonry.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Cathedral Stone Products, Inc
   b. Conproco Corporation
   c. Edison Coatings Inc
2. Use formulation that is vapor and water permeable (equal to or more than the brick), exhibits low shrinkage, has lower modulus of elasticity than the bricks being repaired, and develops high bond strength to all types of masonry.
3. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
4. Formulate patching compound used for patching brick in colors and textures to match each unit being patched. Provide not less than three colors to enable matching the color, texture, and variation of each unit.

2.5 ACCESSORY MATERIALS

A. Masonry Repair Anchors, Expansion Type: Mechanical fasteners designed for masonry veneer stabilization consisting of 1/4-inch- diameter, Type 304 stainless-steel rod with brass expanding shells at each end and water-shedding washer in the middle. Expanding shells shall be designed to provide positive mechanical anchorage to veneer on one end and backup masonry on the other.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
   a. Blok-Lok
   b. Dur-O-Wall
   c. Hohmann & Barnard, Inc.

B. Masonry Repair Anchors, Spiral Type: Driven-in, Type 304 stainless-steel spiral rods designed to be installed in drilled holes and relying on screw effect rather than adhesive to secure them to backup and veneer. Anchors are flexible in plane of veneer but rigid perpendicular to it.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
   a. Blok-Lok
   b. Dur-O-Wall
   c. Hohmann & Barnard, Inc.

C. Setting Buttons and Shims: Resilient plastic, nonstaining to masonry, sized to suit joint thicknesses and bed depths of bricks, less the required depth of pointing materials unless removed before pointing.

D. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

E. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:

    a. Remove, alter, or harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in Contract.
    b. Leave residue on surfaces.

2.6 MORTAR MIXES

A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C5 and manufacturer's written instructions.

B. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mixes: Mix mortar materials in the following proportions:

1. Rebuilding (Setting) Mortar by Volume: ASTM C270, Proportion Specification, 1 part portland cement, 2 parts lime, and 7 parts sand.
2. Rebuilding (Setting) Mortar by Type: ASTM C270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to portland cement and lime.
3. Rebuilding (Setting) Mortar by ASTM C1713 Composition: ASTM C1713, with binder material limited to portland cement and lime, and with a volume ratio of 1 part portland cement, 1 part lime, and 6 parts sand.

PART 3 - EXECUTION

3.1 PROTECTION

A. Prevent mortar from staining face of surrounding masonry and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below rebuilding and repair work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.

B. Remove gutters and downspouts and associated hardware adjacent to immediate work area, and store during masonry repair work. Reinstall when repairs are complete.

1. Provide temporary rain drainage during work to direct water away from building.

3.2 MASONRY REPAIR, GENERAL

A. Have repair work performed only by qualified historic treatment specialist.

B. Repair Appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

3.3 BRICK REMOVAL AND REPLACEMENT

A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated or are to be reused. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

1. When removing single bricks, remove material from center of brick and work toward outside edges.

B. Support and protect remaining masonry that surrounds removal area.

C. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

D. Notify Architect of unforeseen detrimental conditions, including voids, cracks, bulges, loose masonry units in existing backup, rotted wood, rusted metal, and other deteriorated items.

E. Remove in an undamaged condition as many whole bricks as possible.

1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
3. Store brick for reuse. Store off ground, on skids, and protected from weather.
4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.

F. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.

G. Replace removed damaged brick with other removed brick and salvaged brick in good condition, where possible, or with new brick matching existing brick. Do not use broken units unless they can be cut to usable size.

H. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

1. Maintain joint width for replacement units to match existing joints.
2. Use setting buttons or shims to set units accurately spaced with uniform joints.

I. Lay replacement brick with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min.. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.

1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
2. Rake out mortar used for laying brick before mortar sets according to Section 040323 "Historic Brick Unit Masonry Repointing." Point at same time as repointing of surrounding area.
3. When mortar is hard enough to support units, remove shims and other devices interfering with pointing of joints.

J. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.

1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.4 BACKUP MASONRY REMOVAL AND REPLACEMENT

A. Where backup masonry is fractured or unstable and at locations indicated, remove mortar and masonry units that are broken or deteriorated and rebuild with whole, new brick or whole salvaged backup masonry units. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

B. Support and protect remaining masonry that surrounds removal area.

C. Maintain flashing, reinforcement, anchors, lintels, and adjoining construction in an undamaged condition.

D. Notify Architect of unforeseen detrimental conditions, including voids, cracks, bulges, loose masonry units beyond the removal area, rotted wood, rusted metal, and other deteriorated items.

E. Remove in an undamaged condition as many whole bricks as possible.

1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
3. Store brick for reuse. Store off ground, on skids, and protected from weather.
4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.

F. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.

G. Replace removed damaged brick with salvaged backup brick in good condition, where possible, or with new building brick matching existing backup brick. Do not use broken units unless they can be cut to usable size.

H. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

I. Lay replacement brick with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min.. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.

J. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.

1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.5 BRICK MASONRY PATCHING

A. Patch the following bricks unless another type of repair or replacement is indicated:

1. Units indicated to be patched.
2. Units with holes.
3. Units with chipped edges or corners. Patch chipped edges or corners measuring more than 3/4 inch in least dimension.
4. Units with small areas of deep deterioration. Patch deep deteriorations measuring more than 3/4 inch in least dimension and more than 1/4 inch deep.

B. Patching Bricks:

1. Remove loose material from masonry surface. Carefully remove additional material so patch does not have feathered edges but has square or slightly undercut edges on area to be patched and is at least 1/4 inch(es) thick, but not less than recommended in writing by patching compound manufacturer.
2. Mask adjacent mortar joint or rake out for repointing if patch extends to edge of brick.
3. Mix patching compound in individual batches to match each unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
4. Rinse surface to be patched and leave damp, but without standing water.
5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
6. Place patching compound in layers as recommended in writing by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
7. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the brick. Shape and finish surface before or after curing, as determined by testing, to best match existing brick.
8. Keep each layer damp for 72 hours or until patching compound has set.

3.6 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Clean adjacent nonmasonry surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Remove masking materials, leaving no residues that could trap dirt.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage qualified testing agencies to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

C. Notify Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Architect's Project representatives have had reasonable opportunity to make observations of work areas at lift device or scaffold location.

3.8 MASONRY-WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property.

B. Masonry Waste: Remove masonry waste and legally dispose of off Owner's property.

END OF SECTION 040322

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SECTION 04 03 23 - HISTORIC BRICK UNIT MASONRY REPOINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes historic treatment work consisting of repointing brick masonry as follows:

1. Repointing joints with mortar.

B. Related Requirements:

1. Section 01 35 91 "Historic Treatment Procedures" for general historic treatment requirements.

C. The Prudence Crandall House is listed on the National Register of Historic Places and is a National Historic Landmark. All work for this renovation project shall be performed in compliance with the Secretary of the Interiors Standards for the Treatment of Historic Structures.
All work activities must be undertaken with sufficient care to protect this historic resource and must be supervised by personnel who are familiar with the Secretary of Interior's Standards for Restoration.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 01 20 00 "Contract Considerations."

1. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

1.4 DEFINITIONS

A. Low-Pressure Spray:

1. Pressure: 100 to 400 psi.
2. Flow Rate: 4 to 6 gpm.

1.5 SEQUENCING AND SCHEDULING

A. Order sand and gray portland cement for pointing mortar immediately after approval of Samples. Take delivery of and store at Project site a sufficient quantity to complete Project.

B. Work Sequence: Perform masonry historic treatment work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent intrusion of water and other cleaning materials into the wall.
3. Remove paint.

4. Clean masonry.
5. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
6. Repair masonry, including replacing existing masonry with new masonry materials.
7. Rake out mortar from joints to be repointed.
8. Point mortar joints.
9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
10. Where water repellents are to be used on or near masonry work, delay application of these chemicals until after pointing and cleaning.

C. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in bricks according to Section 040322 "Historic Brick Unit Masonry Repair." Patch holes in mortar joints according to "Repointing" Article.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include recommendations for product application and use.
3. Include test data substantiating that products comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, sections, and locations of repointing work on the structure.
2. Show provisions for expansion joints or other sealant joints.
3. Show locations of scaffolding and points of scaffolding in contact with building. Include details of contact or anchorage.

C. Samples for Initial Selection: For the following:

1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.

    a. Have each set contain a close color range of at least three Samples of different mixes of colored sands and cements that produce a mortar matching existing, cleaned mortar when cured and dry.
    b. Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.

2. Sand Type Used for Pointing Mortar: Minimum 8 oz. of each in plastic screw-top jars.

    a. For blended sands, provide Samples of each component and blend. Identify blend ratio.
    b. Identify sources, both supplier and quarry, of each type of sand.

3. Sealant materials.
4. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For the following:

1. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.

a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.

2. Sealant materials.
3. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Historic treatment specialists, including field supervisors and workers.

B. Quality-control program.

C. Unit masonry historic treatment program.

1.8 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic treatment specialist, experienced in repairing, refinishing, and replacing historic material in whole and in part. Experience in fabricating and installing new work is not sufficient for this historic treatment work. Subject to compliance with requirements, historic specialty work shall be performed by a firm with a minimum of five (5) years successful experience with comparable restoration work including work on at least three (3) buildings listed on the National or State Registers under direction of SHPO, and employing personnel skilled in the restoration process and operations indicated, with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work. The qualifying historic treatment specialist shall be required to demonstrate its experience with names, dates, and locations of similar projects. This firm must designate a field supervisor, foreman, and tradesmen with commensurate experience for the duration of the work. Supervisors shall be on site when historic treatment begins and during its progress. Supervisors shall not be changed during Project except for causes beyond control of specialty firm. Should a supervisor be replaced, the new supervisor must demonstrate the requirements of the work by constructing new mock-ups. Resumes and experience must be approved by Owner prior to acceptance of bid. In the event of discrepancy, the more stringent requirements will govern.

B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising worker performance and preventing damage.

C. Unit Masonry Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of historic treatment work, including protection of surrounding materials and Project site.

1. Include methods for keeping pointing mortar damp during curing period.
2. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add to the quality-control program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner may engage a qualified testing agency to perform preconstruction testing on brick masonry as follows:

1. Provide test specimens as indicated and representative of proposed materials and existing construction.

2. Existing Brick: Test each type of existing brick indicated for repointing, according to testing methods in ASTM C67 for compressive strength and initial rate of absorption (suction). Carefully remove three existing units for testing from locations designated by Architect. Take testing samples from these units.
3. Existing Mortar: Test according to ASTM C1324, modified as agreed by testing service and Architect for Project requirements, to determine proportional composition of original ingredients, sizes and colors of aggregates, and approximate strength. Use X-ray diffraction, infrared spectroscopy, and differential thermal analysis to supplement microscopical methods. Carefully remove existing mortar for testing from within joints at three locations designated by Architect.
4. Temporary Patch: As directed by Architect, provide temporary materials at locations from which existing samples were taken.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

D. Store lime putty covered with water in sealed containers.

E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits: Repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for mortar-joint pointing unless otherwise indicated:

1. When air temperature is below 40 deg F, heat mortar ingredients and existing masonry walls to produce temperatures between 40 and 120 deg F.
2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after pointing.

D. Hot-Weather Requirements: Protect mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Source Limitations: Obtain each type of material for repointing historic masonry (cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II; white or gray or both where required for color matching of mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Factory-Prepared Lime Putty: ASTM C1489.

D. Quicklime: ASTM C5, pulverized lime.

E. Mortar Sand: ASTM C144 unless otherwise indicated.

1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
2. Color: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
3. Provide sand with rounded edges.

F. Water: ASTM C270, potable.

2.3 ACCESSORY MATERIALS

A. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

B. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:

a. Remove, alter, or harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in Contract.
b. Leave residue on surfaces.

2.4 MORTAR MIXES

A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C5 and manufacturer's written instructions.

B. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mixes: Mix mortar materials in the following proportions:

1. Pointing Mortar by Volume: ASTM C270, Proportion Specification, 1 part portland cement, 2 parts lime, and 7 parts sand.
2. Pointing Mortar by Type: ASTM C270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to portland cement and lime.

PART 3 - EXECUTION

3.1 PROTECTION

A. Prevent mortar from staining face of surrounding masonry and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.

B. Remove gutters and downspouts and associated hardware adjacent to immediate work area and store during masonry repointing work. Reinstall when repointing is complete.

1. Provide temporary rain drainage during work to direct water away from building.

3.2 MASONRY REPOINTING, GENERAL

A. Have repointing work performed only by qualified historic treatment specialist.

B. Appearance Standard: Repointed surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

3.3 REPOINTING

A. Rake out and repoint joints to the following extent:

1. All joints in areas indicated.
2. Joints indicated as sealant-filled joints.
3. Joints at locations of the following defects:

a. Holes and missing mortar.
b. Cracks that can be penetrated 1/4 inch or more by a knife blade 0.027 inch thick.
c. Cracks 1/16 inch(es) or more in width and of any depth.
d. Hollow-sounding joints when tapped by metal object.
e. Eroded surfaces 1/4 inch or more deep.

f. Deterioration to point that mortar can be easily removed by hand, without tools.
g. Joints filled with substances other than mortar.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows, according to procedures demonstrated in approved mockup:

1. Remove mortar from joints to depth of 2 times joint width. Do not remove unsound mortar more than 2 inches deep; consult Architect for direction.
2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of bricks or widen joints. Replace or patch damaged bricks as directed by Architect.

a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Architect's written approval based on approved quality-control program.
b. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar in bed joints and mortar in head joints by hand with chisel and resilient mallet. Strictly adhere to approved quality-control program.

D. Notify Architect of unforeseen detrimental conditions, including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:

1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch(es) until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
3. After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than 3/8 inch(es). Fully compact each layer and allow it to become thumbprint hard before applying next layer. Where existing brick have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to featheredge the mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.

a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.

6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Remove mortar and repoint.

F. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.4 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Clean adjacent nonmasonry surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Remove masking materials, leaving no residues that could trap dirt.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage qualified testing agencies to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

C. Notify Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Architect's Project representatives have had reasonable opportunity to make observations of work areas at lift device or scaffold location.

END OF SECTION 040323

SECTION 04 03 42 - HISTORIC STONE MASONRY REPAIR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes historic treatment work consisting of repairing historic stone assemblies as follows:

1. Repairing stone masonry.

B. Related Requirements:

1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.
2. Section 024296 "Historic Removal and Dismantling" for historic removal and dismantling work.

C. The Prudence Crandall House is listed on the National Register of Historic Places and is a National Historic Landmark. All work for this renovation project shall be performed in compliance with the Secretary of the Interiors Standards for the Treatment of Historic Structures.
All work activities must be undertaken with sufficient care to protect this historic resource and must be supervised by personnel who are familiar with the Secretary of Interior's Standards for Restoration.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 01 20 00 "Contract Considerations."

1. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

1.4 DEFINITIONS

A. Low-Pressure Spray:

1. Pressure: 100 to 400 psi.
2. Flow Rate: 4 to 6 gpm.

B. Face Bedding: Setting of stone with the rift or natural bedding planes (strata) vertical and parallel to the wall plane rather than horizontal or "naturally bedded," which holds bedding planes together by gravity.

C. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

D. Rift: The most pronounced direction of splitting or cleavage of a stone.

E. Stone Terminology: ASTM C119.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference on historic masonry repair and repointing at Project site.

1. Review minutes of Preliminary Historic Treatment Conference that pertain to stone historic treatment and repair.
2. Review methods and procedures related to repairing historic stone masonry, including, but not limited to, the following:

a. Verify historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Materials, material application, sequencing, tolerances, and required clearances.
c. Quality-control program.
d. Fire-protection plan.
e. Stone historic treatment program.
f. Coordination with building occupants.

1.6 SEQUENCING AND SCHEDULING

A. Order sand and gray portland cement for colored mortar immediately after approval of Samples. Take delivery of and store at Project site a sufficient quantity to complete Project.

B. Work Sequence: Perform stone historic treatment work in the following sequence, which includes work specified in this and other Sections:

1. Prior to disassembling stone foundation wall, number and record location of each stone, indicating interior and exterior orientation.
2. Disassemble area of wall indicated on the drawings and construct to be plumb and in line with the structure.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include recommendations for product application and use.
3. Include test data substantiating that products comply with requirements.

B. Samples for Initial Selection: For the following:

1. Each type of sand used for mortar; minimum 8 oz. of each in plastic screw-top jars.

a. For blended sands, provide Samples of each component and blend. Identify blend ratio.
b. Identify sources, both supplier and quarry, of each type of sand.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For historic treatment specialist.

B. Quality-control program.

C. Stone historic treatment program.

1.9 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic treatment specialist, experienced in repairing, refinishing, and replacing historic material in whole and in part. Experience in fabricating and installing new work is not sufficient for this historic treatment work. Subject to compliance with requirements, historic specialty work shall be performed by a firm with a minimum of five (5) years successful experience with comparable restoration work including work on at least three (3) buildings listed on the National or State Registers under direction of SHPO, and employing personnel skilled in the restoration process and operations indicated, with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work. The qualifying historic treatment specialist shall be required to demonstrate its experience with names, dates, and locations of similar projects. This firm must designate a field supervisor, foreman, and tradesmen with commensurate experience for the duration of the work. Supervisors shall be on site when historic treatment begins and during its progress. Supervisors shall not be changed during Project except for causes beyond control of specialty firm. Should a supervisor be replaced, the new supervisor must demonstrate the requirements of the work by constructing new mock-ups. Resumes and experience must be approved by Owner prior to acceptance of bid. In the event of discrepancy, the more stringent requirements will govern.

B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising worker performance and preventing damage.

C. Stone Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of the historic treatment work, including protection of surrounding materials and Project site.

1. Include methods for keeping exposed mortar damp during curing period.
2. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add to the quality-control program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
3. completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

B. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

C. Store lime putty covered with water in sealed containers.

D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

E. Handle stone to prevent overstressing, chipping, defacement, and other damage.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repair work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits: Repair stonework only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for stone repair unless otherwise indicated:

1. When air temperature is below 40 deg F, heat mortar ingredients, repair materials, and existing stone to produce temperatures between 40 and 120 deg F .
2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after repair.

D. Hot-Weather Requirements: Protect stonework repairs when temperature and humidity conditions produce excessive evaporation of water from mortar and patching materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Source Limitations: Obtain each type of material for repairing historic masonry (stone, cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MASONRY MATERIALS

A. Salvaged Stone: Stone removed from existing ramp may be used, if approved by architect. Clean off residual mortar before resetting in new work..

2.3 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II; white or gray, or both, where required for color matching of mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Factory-Prepared Lime Putty: ASTM C1489.

D. Quicklime: ASTM C5, pulverized lime.

E. Mortar Sand: ASTM C144 unless otherwise indicated.

1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
2. Colored Mortar: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
3. For exposed mortar, provide sand with rounded edges.

F. Water: ASTM C270, potable.

2.4 ACCESSORY MATERIALS

A. Setting Buttons and Shims: Resilient plastic, nonstaining to stone, sized to suit joint thicknesses and bed depths of stone units, less the required depth of pointing materials unless removed before pointing.

B. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

C. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:

a. Remove, alter, or harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
b. Leave residue on surfaces.

2.5 MORTAR MIXES

A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix in ASTM C5 and to manufacturer's written instructions.

B. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mixes: Mix mortar materials in the following proportions:

1. Rebuilding (Setting) Mortar by Volume: ASTM C270, Proportion Specification, 1 part portland cement, 2 parts lime, and 7 parts sand.
2. Rebuilding (Setting) Mortar by Type: ASTM C270, Proportion Specification, Type N type unless otherwise indicated; with cementitious material limited to portland cement and lime.

PART 3 - EXECUTION

3.1 PROTECTION

A. Prevent mortar from staining face of surrounding stone and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below rebuilding and repair work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.

3.2 STONE REMOVAL AND REPLACEMENT

A. At locations indicated, carefully remove entire units from joint to joint, without damaging stone or surrounding masonry, in a manner that permits replacement in same location with plumb and true lines.

B. Support and protect remaining masonry that was supported by removed stone.

C. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition. Coordinate with new waterproofing and existing concrete collar beam.

D. Notify Architect of unforeseen detrimental conditions, including voids, cracks, bulges, loose masonry units in existing stone or unit masonry backup, rotted wood, rusted metal, and other deteriorated items.

E. Remove in an undamaged condition as many whole stone units as possible.

1. Remove mortar, loose particles, and soil from stone by cleaning with hand chisels, brushes, and water.
2. Remove sealants by cutting close to stone with utility knife and cleaning with solvents.
3. Store stone for reuse. Store off ground, on skids, and protected from weather.
4. Deliver cleaned stone not required for reuse to Owner unless otherwise indicated.

F. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for stone replacement.

G. Replace removed damaged stone with same removed stone.

H. Rift: Do not allow face bedding of stone. Before setting, inspect to verify that each stone has been oriented so that, when it is set in final position, the rift or natural bedding planes are predominantly horizontal, except for arches, where bedding planes are predominantly radial or vertical, but perpendicular to the wall. Reject stone with vertical bedding planes, except as required for arches, lintels, and copings.

I. Install replacement stone into bonding and coursing pattern of existing stone. If cutting is required, use a motor-driven saw designed to cut stone with clean, sharp, unchipped edges. Finish edges to blend with appearance of edges of existing stone.

1. Maintain joint width for replacement stone to match existing joints.
2. Use setting buttons or shims to set stone accurately spaced with uniform joints.

J. Set replacement stone with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter vertical joints for full width before setting, and set units in full bed of mortar unless otherwise indicated.

1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing stonework.
2. Rake out mortar used for laying stone before mortar sets according to Section 040343 "Historic Stone Masonry Repointing." Point at same time as repointing of surrounding area.
3. When mortar is hard enough to support units, remove shims and other devices interfering with pointing of joints.

K. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.

1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.3 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water applied by low-pressure spray.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Clean adjacent nonstone surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Remove masking materials, leaving no residues that could trap dirt.

E. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure-wash pavement surfaces to remove mortar, dust, dirt, and stains.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage qualified testing agencies to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

C. Notify Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Architect's Project representatives have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

3.5 STONE-WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess stone materials are Contractor's property.

B. Stone Waste: Remove stone waste and legally dispose of off Owner's property.

END OF SECTION 040342

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SECTION 04 03 43 - HISTORIC STONE MASONRY REPOINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes historic treatment work consisting of repointing stone masonry joints with mortar.

B. Related Requirements:

1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.

C. The Prudence Crandall House is listed on the National Register of Historic Places and is a National Historic Landmark. All work for this renovation project shall be performed in compliance with the Secretary of the Interiors Standards for the Treatment of Historic Structures.
All work activities must be undertaken with sufficient care to protect this historic resource and must be supervised by personnel who are familiar with the Secretary of Interior's Standards for Restoration.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 01 20 00 "Contract Considerations."

1. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

1.4 DEFINITIONS

A. Low-Pressure Spray:

1. Pressure: 100 to 400 psi
2. Flow Rate: 4 to 6 gpm.

B. Rift: The most pronounced direction of splitting or cleavage of a stone. Rift may be obscure in igneous rocks such as granite. Often it is obvious, as with bedding planes in many sedimentary stones.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference on historic masonry repair and repointing at Project site.

1. Review minutes of Preliminary Historic Treatment Conference that pertain to masonry historic treatment and repointing.
2. Review methods and procedures related to repointing historic stone masonry including, but not limited to, the following:

a. Verify historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.

b. Materials, material application, sequencing, tolerances, and required clearances.
c. Quality-control program.
d. Fire-protection plan.
e. Stone historic treatment program.
f. Coordination with building occupants.

1.6 SEQUENCING AND SCHEDULING

A. Order sand and gray portland cement for pointing mortar immediately after approval of Samples. Take delivery of and store at Project site a sufficient quantity to complete Project.

B. Work Sequence: Perform stone historic treatment work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth and soils.
2. Inspect for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Clean stone.
4. Rake out mortar from joints surrounding stone to be replaced and from joints adjacent to stone repairs along joints.
5. Repair stonework, including replacing existing stone with new stone.
6. Rake out mortar from joints to be repointed.
7. Point mortar joints.
8. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
9. Where water repellents are to be used on or near stonework, delay application of these chemicals until after pointing and cleaning.

C. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in stone according to Section 040342 "Historic Stone Masonry Repair." Patch holes in mortar joints according to Part 3 "Repointing" Article.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include recommendations for product application and use.
3. Include test data substantiating that products comply with requirements.

B. Samples for Initial Selection: For the following:

1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For historic treatment specialist.

B. Quality-control program.

C. Stone historic treatment program.

1.9 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic treatment specialist, experienced in repairing, refinishing, and replacing historic material in whole and in part. Experience in fabricating and installing new work is not sufficient for this historic treatment work. Subject to compliance with requirements, historic specialty work shall be performed by a firm with a minimum of five (5) years successful experience with comparable restoration work including work on at least three (3) buildings listed on the National or State Registers under direction of SHPO, and employing personnel skilled in the restoration process and operations indicated, with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work. The qualifying historic treatment specialist shall be required to demonstrate its experience with names, dates, and locations of similar projects. This firm must designate a field supervisor, foreman, and tradesmen with commensurate experience for the duration of the work. Supervisors shall be on site when historic treatment begins and during its progress. Supervisors shall not be changed during Project except for causes beyond control of specialty firm. Should a supervisor be replaced, the new supervisor must demonstrate the requirements of the work by constructing new mock-ups. Resumes and experience must be approved by Owner prior to acceptance of bid. In the event of discrepancy, the more stringent requirements will govern.

B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising worker performance and preventing damage.

C. Stone Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of the historic treatment work, including protection of surrounding materials and Project site.

1. Include methods for keeping pointing mortar damp during curing period.
2. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add to the quality-control program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

D. Store lime putty covered with water in sealed containers.

E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits: Repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for mortar-joint pointing unless otherwise indicated:

1. When air temperature is below 40 deg F, heat mortar ingredients and existing stone to produce temperatures between 40 and 120 deg F.
2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after pointing.

D. Hot-Weather Requirements: Protect mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Source Limitations: Obtain each type of material for repointing historic masonry (cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II; white or gray, or both where required for color matching of mortar, above grade.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Factory-Prepared Lime Putty: ASTM C1489.

D. Quicklime: ASTM C5, pulverized lime.

E. Mortar Sand: ASTM C144 unless otherwise indicated.

1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
2. Color: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
3. Provide sand with rounded edges.

F. Water: ASTM C270, potable.

2.3 ACCESSORY MATERIALS

A. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

B. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing work involved.

2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:

    a. Remove, alter, or harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
    b. Leave residue on surfaces.

2.4 MORTAR MIXES

A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix in ASTM C5 and to manufacturer's written instructions.

B. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mixes: Mix mortar materials in the following proportions:

1. Pointing Mortar by Volume: ASTM C270, Proportion Specification, 1 part portland cement, 2 parts lime, and 7 parts sand.
2. Pointing Mortar by Type: ASTM C270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to portland cement and lime.

PART 3 - EXECUTION

3.1 PROTECTION

A. Prevent mortar from staining face of surrounding stone and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed stone and other surfaces.

3.2 STONE REPOINTING, GENERAL

A. Have repointing work performed only by qualified historic treatment specialist.

B. Appearance Standard: Repointed surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

3.3 REPOINTING

A. Rake out and repoint joints to the following extent:

1. All joints in foundation stone.
2. Joints that are sealant-filled.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows, according to procedures demonstrated in approved mockup:

1. Remove mortar from joints to depth of joint width plus 1/8 inch and deeper as required to expose sound, unweathered mortar. Do not remove unsound mortar more than 2 inches deep; consult Architect for direction.
2. Remove mortar from stone surfaces within raked-out joints to provide reveals with square backs and to expose stone for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of stone units or widen joints. Replace or patch damaged stone units as directed by Architect.

    a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Architect's written approval based on approved quality-control program.
    b. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar in bed joints and mortar in head joints by hand with chisel and resilient mallet. Strictly adhere to approved quality-control program.

D. Notify Architect of unforeseen detrimental conditions, including voids in mortar joints, cracks, loose stone, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:

1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer thoroughly, and allow it to become thumbprint hard before applying next layer.
3. After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer, and allow it to become thumbprint hard before applying next layer. Where existing stone has worn or rounded edges, slightly recess finished mortar surface below face of stone to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed stone surfaces or to featheredge the mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.

    a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
    b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.

6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Remove mortar and repoint.

F. Where repointing work precedes cleaning of existing stone, allow mortar to harden at least 30 days before beginning cleaning work.

3.4 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water applied by low-pressure spray.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Clean adjacent nonstone surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Remove masking materials, leaving no residues that could trap dirt.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage qualified testing agencies to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

C. Notify testing agency and Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors and Architect's Project representatives have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

END OF SECTION 040343

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SECTION 04 43 13 - ANCHORED STONE MASONRY VENEER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Stone masonry anchored to poured concrete.

2. Ties and anchors.

3. Through-wall metal flashing.

B. Products Installed but Not Furnished under This Section Include:

1. NA

C. Related Requirements:

1. NA.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each variety of stone, stone accessory, and manufactured product.

B. Samples for Initial Selection: For colored mortar and other items involving color selection.

C. Samples for Verification:

1. For each stone type indicated. Include at least three Samples in each set and show the full range of color and other visual characteristics in completed Work.
2. For each color of mortar required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. List of Materials Used in Constructing Mockup: List generic product names together with manufacturers, manufacturers' product names, supply sources, and other information as required to identify materials used. Include mix proportions for mortar and source of aggregates.

1. Neither receipt of list nor approval of mockups constitutes approval of deviations from the Contract Documents contained in mockups unless Architect approves such deviations in writing.

C. Material Test Reports:
1. NA.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs experienced stonemasons and stone fitters.

B. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
a. Include through-wall flashing installed for a 48-inch length (omit stone masonry above 12 inches of flashing).

2. Protect accepted mockups from the elements with weather-resistant membrane.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 PRECONSTRUCTION TESTING

A. NA

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, in a dry location, or in covered weatherproof dispensing silos.

D. Store masonry accessories to prevent accumulation of dirt and oil.

1.9 FIELD CONDITIONS

A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed stone masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining stone masonry face.

1. Protect base of walls from rain-splashed mud and mortar splatter using coverings spread on the ground and over the wall surface.

2. Protect sills, ledges, and projections from mortar droppings.
3. Protect steps and ramp surfaces from mortar droppings.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace stone masonry damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than seven days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1.10 COORDINATION

A. Advise installers of adjacent Work about specific requirements for placement of reinforcement, veneer anchors, flashing, and similar items to be built into stone masonry.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Stone: Obtain each variety of stone from single quarry with resources to provide materials of consistent quality in appearance and physical properties.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality for each cementitious component from single manufacturer and each aggregate from single source or producer.

2.2 GRANITE RANDOM ASHLAR VENEER

A. Material Standards: Comply with ASTM C615/C615M

B. Varieties and Sources: Subject to compliance with requirements, available stone varieties that may be incorporated into the Work include, but are not limited to, the following:

1. Full bed random ashlar veneer stone: Eldon Hill, Tower hill, or Old Spruce (4 inches to 6 inches in depth, 6 inches to 16 inches in length, and 3 inches to 8 inches in height).

2. Supplied by O&G Industries; 260 Murphy Road, Hartford, CT 06114 or a comparable product supplied by Connecticut Stone or Sansoucy Quarry. Full range of product line as selected by Owner and Architect.

2.3 MORTAR MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or Type II, except Type III may be used for cold-weather construction; natural color or white cement may be used as required to produce mortar color indicated.

1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Essroc.
b. Holcim (US) Inc.
c. Lafarge North America Inc.
d. Lehigh Hanson; HeidelbergCement Group.

D. Mortar Cement: ASTM C 1329/C 1329M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Cemex
b. Lafarge North America Inc.
c. National Cement

E. Masonry Cement: ASTM C 91/C 91M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Cemex S.A.B. de C.V.
b. Essroc.
c. Holcim (US) Inc.
d. Lafarge North America Inc.
e. Lehigh Hanson; Heidelberg Cement Group.

F. Aggregate: ASTM C 144 and as follows:

1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.

G. Water: Potable.

2.4 VENEER ANCHORS AND TIES

A. General: Provide anchors that allow vertical adjustment but resist a 100 lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch. Ties and anchors shall extend at least 2 inches into veneer but with at least a 1inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Individual adjustable wire ties with pintle and eye connections. Fabricate wire ties from 0.25-inch stainless steel type 304.

2. Sheet metal anchor; parts from stainless steel sheet type 304, .0109 inch thick.

2.5 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Copper Sheet ASTM B101-12, lead-coated copper.

2. Manufacturer: Subject to compliance with specifications:
   a. Hussey Copper Ltd.
   b. Revere Copper Products
   c. Arubis Inc.

3. Fabricate through-wall flashing with drip edge. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.

B. Wicking Material: Absorbent rope, made from UV resistant synthetic fiber.

2.7 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Diedrich Technologies, Inc.; a division of Sandell Construction Solutions.
   b. EaCo Chem, Inc.
   c. PROSOCO, Inc.

2.8 FABRICATION

A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated.

B. Select stone to produce pieces of thickness, size, and shape indicated.

2.9 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride.
2. Use Portland cement-lime, masonry cement or mortar cement mortar unless otherwise indicated.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
4. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Stone Masonry: Comply with ASTM C 270, Proportion Specification.

1. Mortar for Setting Stone: Type N or Type S.
2. Mortar for Pointing Stone: Type N.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces indicated to receive stone masonry, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone masonry.

B. Examine substrate to verify that reinforcement, veneer anchors, flashing, and other items installed in substrates and required for or extending into stone masonry are correctly installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 SETTING STONE MASONRY

A. Perform necessary field cutting and trimming as stone is set.

1. Use hammer and chisel to split stone that is fabricated with split surfaces. Make edges straight and true, matching similar surfaces that were shop or quarry fabricated.
2. Pitch face at field-split edges as needed to match stones that are not field split.

B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.

C. Arrange stones in random ashlar pattern with joint widths within tolerances indicated. Insert small stones into spaces between larger stones as needed to produce joints as uniform in width as practical.

D. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.

E. Install supports, fasteners, and other attachments indicated or necessary to secure stone masonry in place.

F. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

G. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any. Lay walls with joints not less than 3/8 inch at narrowest points or more than 1 inch at widest points.

H. Install embedded flashing and weep holes at shelf.

3.4 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.

B. Variation from Level: For lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.

C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet.

D. Measure variation from level, plumb, and position shown in plan as a variation of the average plane of each stone face from level, plumb, or dimensioned plane.

E. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.

F. Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.

3.5 INSTALLATION OF ANCHORED STONE MASONRY

A. Anchor stone masonry to poured concrete with adjustable veneer anchors and ties.

B. Embed veneer anchors in mortar joints of stone masonry at least halfway, but not less than 2 inches, through stone masonry and with at least a 1-inch cover on exterior face.

C. Set stone in full bed of mortar with full head joints unless otherwise indicated. Build anchors into mortar joints as stone is set.

D. Fill space between back of stone masonry with mortar as stone is set.

E. Rake out joints for pointing with mortar to depth of not less than 3/4 inch before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

3.6 POINTING

A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch deep until a uniform depth is formed.

B. Point stone joints by placing and compacting pointing mortar in layers of not more than 3/8 inch deep. Compact each layer thoroughly and allow to it become thumbprint hard before applying next layer.

C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:

1. Joint Profile: Concave.

3.7 ADJUSTING AND CLEANING

A. Remove and replace stone masonry of the following description:

1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.

2. Defective joints.
3. Stone masonry not matching approved samples and mockups.
4. Stone masonry not complying with other requirements indicated.

B. Replace in a manner that results in stone masonry matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning stone masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
5. Clean stone masonry by bucket and brush hand-cleaning method described in BIA Technical Note No. 20, Revised II, using job-mixed detergent solution.
6. Clean stone masonry with proprietary acidic cleaner applied according to manufacturer's written instructions.

3.8 EXCESS MATERIALS AND WASTE

A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.

END OF SECTION 04 43 13

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work specified in this section.

1.2 SUMMARY

A. Extent of structural steel work is shown on Drawings, including schedules, notes, details and type of steel required.

B. Structural steel is that work defined in American Institute of Steel Construction, AISC 303, "Code of Standard Practice for Steel Buildings and Bridges" and as otherwise shown on Drawings.

1.3 QUALITY ASSURANCE

A. Codes and Standards: Comply with Provisions of following except as otherwise indicated:

1. AISC 303 "Code of Standard Practice for Steel Buildings and Bridges" – Latest Edition.

2. AISC 360 "Specifications for Structural Steel Buildings – Latest Edition.

3. RCSC's "Specifications for Structural Joints using High-Strength Bolts" – Latest Edition.

4. AISC 341 "Seismic Provisions for Structural Steel Buildings" – Latest Edition.

5. American Welding Society, AWS, D1.1 "Structural Welding Code".

6. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

7. ASTM A 123 "Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products."

8. American Hot Dip Galvanizers Association, "Inspection Manual for Hot Dip Galvanized Steel Products".

B. Fabricator Qualifications: Fabricator must have a minimum of 5 years successful experience in the fabrication of structural steel framing components similar, in nature, to those required for this project. In addition, the fabricator shall have a quality control program acceptable to the Engineer.

C. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC–Certified Erector.

D. Qualifications for Welding Work: Qualify procedures and personnel according to AWS D.1/D1.1M "Structural Welding Code-Steel."

Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within previous 12 months.

1. If recertification of welders is required, retesting will be Contractor's responsibility.

E. Special Inspection: The Owner will engage the services of a qualified "Special Inspector" for this project. The Special Inspector, as a representative of the Owner, will confirm that the provisions of Chapter 17 of the International Building Code are complied with and will provide and/or supervise inspection and testing requirements, as necessary.

F. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

G. Steel fabricator shall be subject to Special Inspection requirements of the Building Code for fabrication plants and as defined in Part A and Part B below.

Part A Inspection – Verification of Capability and Quality Control: The Special Inspector will confirm that the structural steel fabricating plant has the personnel, organization, knowledge, experience, procedures, equipment, capability, and commitment to produce fabricated structural steel of the required quality of the category of structural steel work involved in the project. The basis of inspection will be the AISC manual “Quality Criteria and Inspection Standards”.

A structural steel fabricator that is Certified in Category II under the AISC Quality Certification Program may be exempted from Part A.

Part B Inspection – Verification of Implementation: The Special Inspector will confirm the implementation of the design by inspecting the fabrication of structural steel load bearing connections, members or assemblies in the shop to ensure conformance with the design plans, approved shop drawings and project specifications. Inspection shall consist of one or more of the following: Observation, interviews, testing, and/or examination of records.

H. The Special Inspector will inspect high-strength bolted connections and welded connections, perform tests, examine steel for straightness and alignment, fissures, mill scale, and other defects and deformities as described in ASTM A6, examine fabricated pieces for conformity with approved shop drawings including member sizes and prepare test reports as required.

Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

I. The Contractor shall furnish such facilities and provide such assistance as may be required for carrying out the inspection prescribed herein. He shall notify the inspection agency at least two weeks in advance of the start of any qualification testing or welding.

J. The Special Inspector will perform his duties, insofar as possible, in such a way that neither fabrication nor erection is unnecessarily delayed or impeded.

Field inspection will include examination of erected steel for welding, proper fitting, tensioning of bolts, alignment, trueness and plumbness.

K. Contractor shall correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Additional tests will be performed at contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

L. Shop bolted connections will be inspected in accordance with AISC specifications and "Specification for Structural Joints using High Strength Bolts", Latest Edition.

M. Shop Welding will be inspected and tested during fabrication of structural steel assemblies, as follows:

1. Verify welder certification and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

2. The inspection agency will test shop welds as follows:

   All welds: 100% visual according to AWS D1.1/D1.M and the following inspection procedures, at testing agency’s option:

   1. Liquid Penetrant Inspection: ASTM E165.
   2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not accepted.
   3. Ultrasonic Inspection: ASTM E 164.

4. Radiographic Inspection: ASTM E 94.

P. **Field Welding in not permitted.**

1.4 SUBMITTALS

A. Product Data: Submit producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. High-strength bolts (each type), including nuts and washers.

2. Shrinkage-resistant grout.

B. Shop Drawings: Submit shop drawings (in electronic form) including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams.

1. Include details of cuts, connections, splices, camber, holes and other pertinent data.

2. Include embedment drawings.

3. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by others.

4. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

5. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pre-tensioned and slip-critical, high-strength bolted connections.

I. Survey of existing conditions.

J. Source and Field quality-control reports.

K. Special Inspection Reports.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay that work.

B. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

C. For galvanized materials comply with ASTM A 123.

D. Store fasteners in a protected place, in sealed containers with manufactures labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seal containers.

2. Clean and re-lubricate bolts and nuts that become dry and rusty before use.

3. Comply with manufacturer's written recommendations for cleaning and lubricating

ASTM F 1852 Fasteners and for retesting fasteners after re-lubrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.

B. Channels, Angles: ASTM A36

C. Structural Steel, Plates and Bars: ASTM A 36 or ASTM A 572 Grade 50 or ASTM A529, as indicated on the Drawings.

D. Material for galvanizing shall be geometrically suitable for galvanizing as specified in ASTM A 384 and A 385.

E. Anchor Bolts: ASTM F 1554, unheaded type unless otherwise indicated on the Drawings.

F. High-Strength Bolts, Nuts and Washers: ASTM A325 or A490, Type 1, heavy–hex steel structural bolts.

G. Unfinished Threaded Fasteners: ASTM A36, regular low-carbon steel bolts and nuts.

1. Provide hexagonal heads and nuts for all connections.

H. High-Strength Threaded Fasteners: Heavy hexagon structural "tension control" bolts, heavy hexagon nuts, hardened washers as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.

I. Electrodes for Welding: Comply with AWS Code.

J. Non-Metallic Non-Shrink Grout: Premixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with ASTM C1107 and suitable to be placed for 30-minute working time.

K. Zinc for Galvanizing: As specified in ASTM A123.

L. Primer:

1. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services). "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers".

2. Primer Fabricators standard lead and chromate-free, nonasphaltic, rust-inhabiting primer complying with MPI #79 and compatible with topcoat.

3. Galvanizing Repair Paint: Comply with ASTM A780.

2.3 FABRICATION

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as

indicated on final shop drawings.

1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
2. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

2. **Thermal cutting in the field is not permitted.**

C. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

D. Cleaning: Clean and prepare steel surfaces that are to remain unpainted.

E. Connections: Weld or bolt shop connection, as indicated.

2.3 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Galvanized surfaces.
3. Surfaces enclosed in interior construction.

B. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommend by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

C. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Priming Systems", to provide a dry thickness of not less than 1.5 mils.

2.4 GALVANIZING

A. Apply Zinc coating by hot-dip process to structural steel members, fabrications, and assemblies according to ASTM A 123.

B. Safeguard against steel embrittlement in conformance with ASTM A 143.

C. Safeguard against warpage or distortion of steel members to conform with ASTM A 384. Notify Architect/Engineer of potential warpage problems which may require modification in design, before proceeding with steel fabrications.

D. Bolts, nuts, and washers, and iron and steel hardware components to be galvanized in accordance with ASTM A 153. Nuts to be tapped after galvanizing to minimum diametral amounts specified in ASTM A 563. Coat nuts with waterproof lubricant, clean and dry to touch. High strength bolts for structural steel joints to be galvanized in accordance with ASTM A 325.

PART 3 - EXECUTION

3.1 INSPECTION

A. Erector must examine areas and conditions under which structural steel work is to be installed, and notify Contractor in writing of conditions detrimental to proper and timely completion of work.

3.2 ERECTION:

A. Temporary Shoring and Bracing: Provide temporary shoring and bracing members as needed to perform the specified work. Remove temporary members and connections when permanent members are in place and final connections are made. Provide guy lines to achieve proper alignment of structures as erection proceeds. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

B. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

C. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

D. Pack non-shrink grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials and allow to cure.

1. For proprietary grout materials, comply with manufacturer's instructions.

E. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure within specified AISC tolerances. Adjust and weld in final position all structural steel angles which support architectural finish material. Adjustments are to be made to the tolerances of the applied finish materials.

2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

3. Splice members only where indicated and accepted on shop drawings.

F. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

G. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in structural framing.

H. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas with same material as used for shop painting.

I. Touch-Up Galvanized Surfaces: Repair damaged galvanized surfaces in accordance with ASTM A 780. Dry film thickness of applied repair materials to be not less than galvanized coating thickness required by ASTM A 123 or A 153, as applicable. Touch up prime-painted surfaces with same galvanized primer applied in shop. Clean damaged surfaces first to assure proper paint adhesion.

END OF SECTION 05 12 00

SECTION 05 73 00 - DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel and iron decorative railings.

1.3 DEFINITIONS

A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas and for pedestrian guidance and support, visual separation, or wall protection.

1.4 COORDINATION AND SCHEDULING

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not meet structural performance requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of railings assembled from standard components.
2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, and attachment details.

C. Samples for Initial Selection: For products involving selection of color, texture, or design.

D. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.
3. Welded connections.

4. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E894 and ASTM E935.

C. Preconstruction test reports.

D. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.7 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches in length.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Steel and Iron Decorative Railings:

1. Basis of Design is Julius Blum & Co. Catalog numbers are indicated on drawings. Acceptable Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Architectural Iron Designs, Inc.
b. Architectural Metal Works.
c. Olin Wrought Iron.

B. Source Limitations: Obtain each type of railing from single source from single manufacturer.

C. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions,

arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods, including structural analysis, preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of railings and are based on the specific system indicated. See Section 016000 "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

2.2 PERFORMANCE REQUIREMENTS

A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Steel: 72 percent of minimum yield strength.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

1. Provide cast-metal brackets with flange tapped for concealed anchorage to threaded hanger bolt.
2. Provide either formed- or cast-metal brackets with predrilled hole for exposed bolt anchorage.
3. Provide formed-steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.
4. Provide extruded-aluminum brackets with interlocking pieces that conceal anchorage. Locate set screws on bottom of bracket.

2.4 STEEL AND IRON

A. Tubing: ASTM A500 (cold formed) or ASTM A513.

B. Bars: Hot-rolled, carbon steel complying with ASTM A29/A29M, Grade 1010.

C. Plates, Shapes, and Bars: ASTM A36/A36M.

2.5 FASTENERS

A. Fastener Materials: Unless otherwise indicated, provide the following:

1. Galvanized-Steel Components: Plated-steel fasteners complying with ASTM B633, Class Fe/Zn 25 for electrodeposited zinc coating.

B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless exposed fasteners are unavoidable.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

1. Material for Exterior Locations: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Brazing Rods: For copper-alloy railings, provide type and alloy as recommended by producer of metal to be brazed and as required for color match, strength, and compatibility in fabricated items.

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Epoxy Intermediate Coat: Complying with MPI#77 and compatible with primer and topcoat.

E. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.

I. Form changes in direction as follows:

1. By bending to smallest radius that will not result in distortion of railing member.

J. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of hollow railing members with prefabricated end fittings.

L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch or less.

M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.

N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

O. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.9 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
2. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
3. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated railings with universal shop primer.

E. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.

1. Color: Black.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

3.5 CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

3.6 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057300

SECTION 06 03 12 - HISTORIC WOOD REPAIR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes historic treatment of wood in the form of repairing wood features as follows:

1. Repairing wood trim.
2. Replacing wood trim.
3. Repairing or replacing wood clapboards.
4. Repairing, refinishing, and replacing hardware.

B. Related Requirements:

1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.
2. Section 024296 "Historic Removal and Dismantling" for historic removal and dismantling work.
3. Section 028313 “Lead Paint Activity” for removal of exterior paint.
4. Section 080314 "Historic Treatment of Wood Doors" for historic wood door repairs, including related trim.
5. Section 080352 "Historic Treatment of Wood Windows" for historic wood window repairs, including related trim.
6. Section 090391 “Historic Treatment of Plain Painting” for prepping surfaces for paint.

C. The Prudence Crandall House is listed on the National Register of Historic Places and is a National Historic Landmark. All work for this renovation project shall be performed in compliance with the Secretary of the Interiors Standards for the Treatment of Historic Structures.
All work activities must be undertaken with sufficient care to protect this historic resource and must be supervised by personnel who are familiar with the Secretary of Interior’s Standards for Restoration.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 01 20 00 "Contract Considerations."

1. Unit prices apply to authorized additions to and deletions from Work as authorized by Change Orders.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review methods and procedures related to historic wood repair, including, but not limited to, the following:

a. Historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Materials, material application, sequencing, tolerances, and required clearances.

c. Fire-protection plan.
d. Wood historic treatment program.
e. Coordination with building occupants.

1.5 SEQUENCING AND SCHEDULING

A. Perform historic wood repair in the following sequence, which includes work specified in this and other Sections:

1. Before removing wood components for on-site or off-site repair, tag each component with location-identification numbers. Indicate on tags and building plans the locations of each component, such as "Baseboard on North Side of Room 101."
2. Dismantle hardware and tag with location-identification numbers.
3. In the shop, label each repaired component and whole or partial replacement with permanent location-identification number in inconspicuous location and remove site-applied tags.
4. Sort units by condition, separating those that need extensive repair.
5. Clean surfaces.
6. General Wood-Repair Sequence:

a. Remove paint to bare wood.
b. Repair wood by consolidation, replacement, partial replacement, and patching.
c. Sand, prime, fill, sand again, and prime surfaces again for refinishing.

7. Repair, refinish, and replace hardware if required. Reinstall operating hardware.
8. Reinstall components.
9. Apply finish coats.
10. Install remaining hardware.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, and sections showing locations and extent of repair and replacement work, with enlarged details of replacement parts indicating materials, profiles, joinery, reinforcing, method of splicing or attaching wood members to other surfaces, accessory items, and finishes.
2. Include field-verified dimensions and the following:

a. Full-size shapes and profiles with complete dimensions for replacement components and their jointing, showing relationship of existing components to new components.
b. Templates and directions for installing hardware and anchorages.
c. Identification of each new unit and its corresponding location in the building on annotated plans and elevations.
d. Provisions for sealant joints, flashing and as required for location.

C. Samples for Initial Selection: For each type of exposed wood and finish.

1. Identify wood species, cut, and other features.
2. Include Samples of hardware and accessories involving color selection.

D. Samples for Verification: For the following products in manufacturer's standard sizes unless otherwise indicated, finished as required for use in the Work:

1. Replacement Wood: 12-inch-long, full-size molding sections with applied finish.

    a. Additional Samples of replacement members that show fabrication techniques, materials, and finishes as requested by Architect.

2. Repaired Wood: Prepare Samples using existing wood removed from site, repaired, and prepared for refinishing.
3. Refinished Wood: Prepare Samples using existing wood removed from site, repaired, and refinished.
4. Hardware: Full-size units with each factory-applied or restored finish.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For historic treatment specialist, including workers and wood-repair-material manufacturer.

B. Wood Historic Treatment Program: Submit before work begins.

1.8 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic treatment specialist, experienced in repairing, refinishing, and replacing historic material in whole and in part. Experience in fabricating and installing new work is not sufficient for this historic treatment work. Subject to compliance with requirements, historic specialty work shall be performed by a firm with a minimum of five (5) years successful experience with comparable restoration work including work on at least three (3) buildings listed on the National or State Registers under direction of SHPO, and employing personnel skilled in the restoration process and operations indicated, with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work. The qualifying historic treatment specialist shall be required to demonstrate its experience with names, dates, and locations of similar projects. This firm must designate a field supervisor, foreman, and tradesmen with commensurate experience for the duration of the work. Supervisors shall be on site when historic treatment begins and during its progress. Supervisors shall not be changed during Project except for causes beyond control of specialty firm. Should a supervisor be replaced, the new supervisor must demonstrate the requirements of the work by constructing new mock-ups. Resumes and experience must be approved by Owner prior to acceptance of bid. In the event of discrepancy, the more stringent requirements will govern.

B. A qualified historic wood-repair specialist, experienced in repairing, refinishing, and replacing wood in whole and in part.

C. Wood-Repair-Material Manufacturer Qualifications: A firm regularly engaged in producing wood consolidant and wood-patching compound that have been used for similar historic wood-treatment applications with successful results, and with factory-authorized service representatives who are available for consultation, Project-site inspection, and on-site assistance.

D. Wood Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including protection of surrounding materials and Project site.

    1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.

E. Mockups: For elements established at preinstallation meeting, prepare mockups of historic treatment repair processes to demonstrate aesthetic effects and to set quality standards for materials and execution, and for fabrication and installation. Prepare mockups so they are as inconspicuous as practicable.

1. Locate mockups on existing surfaces where directed by Architect, in locations that enable viewing under same conditions as the completed Work.
2. Wood Baseboard Repair: Prepare an approximately 72-inch length of baseboard to serve as mockup to demonstrate samples of each type of wood repair.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified historic treatment specialist to perform preconstruction testing on historic wood materials as follows:

1. Provide test specimens representative of proposed materials and existing construction.
2. Test historic treatment products and methods for effectiveness and compliance with specified requirements.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Pack, deliver, and store products in suitable packs, heavy-duty cartons, or wooden crates; surround with sufficient packing material to ensure that products will not be deformed, broken, or otherwise damaged.

B. Until installed, store products inside a well-ventilated area and protect from weather, moisture, soiling, abrasion, extreme temperatures, and humidity, and where environmental conditions comply with manufacturer's requirements.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with historic wood repair only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.

PART 2 - PRODUCTS

2.1 HISTORIC WOOD REPAIR, GENERAL

A. Quality Standard: Comply with applicable requirements in Section 12, "Historic Restoration Work," and related requirements in AWI/AWMAC/WI's "Architectural Woodwork Standards" for construction, finishes, grade rules, and other requirements unless otherwise indicated.

1. Exception: Industry practices cited in Section 12, Article 1.5, "Industry Practices," of the Architectural Woodwork Standards do not apply to the work of this Section.

2.2 WOOD-REPLACEMENT MATERIALS

A. Wood, General: Clear fine-grained lumber; kiln dried to a moisture content of 6 to 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide.

1. Species: Match species of each existing type of wood component or assembly, assumed to be clear pine, unless otherwise indicated.

B. Exterior Trim: Match existing species, assumed to be All-heart vertical grain redwood.

C. Interior Trim: Match existing species, assumed to be clear pine.

2.3 WOOD-REPAIR MATERIALS

A. Source Limitations: Obtain wood consolidant and wood-patching compound from single source from single manufacturer.

B. Wood Consolidant: Ready-to-use product designed to penetrate, consolidate, and strengthen soft fibers of wood materials that have deteriorated due to weathering and decay and designed specifically to enhance the bond of wood-patching compound to existing wood.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Abatron, Inc.
b. ConServ Epoxy LLC.
c. Gougeon Brothers, Inc.
d. Protective Coating Company.
e. System Three Resins, Inc.

C. Wood-Patching Compound: Two-part, epoxy-resin, wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated due to weathering and decay. Compound shall be capable of filling deep holes and spreading to featheredge.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Abatron, Inc.
b. Advanced Repair Technology, Inc.
c. ConServ Epoxy LLC.
d. Gougeon Brothers, Inc.
e. Polymeric Systems, Inc.
f. Protective Coating Company.
g. System Three Resins, Inc.

2.4 MISCELLANEOUS MATERIALS

A. Borate Preservative Treatment: Inorganic, borate-based solution, with disodium octaborate tetrahydrate as the primary ingredient; manufactured for preserving weathered and decayed wood from further damage caused by fungi and wood-boring insects; complying with AWPA P5; containing no boric acid.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Nisus Corporation.
b. Sashco, Inc.
c. System Three Resins, Inc.

B. Cleaning Materials:

1. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for each 5 gal. of solution required.
2. Mildewcide: Commercial, proprietary mildewcide or a solution prepared by mixing 1/3 cup of household detergent that contains no ammonia, 1 quart of 5 percent sodium hypochlorite bleach, and 3 quarts of warm water.

C. Adhesives: Wood adhesives with minimum 15- to 45-minute cure at 70 deg F, in gunnable and liquid formulations as recommended in writing by adhesive manufacturer for each type of repair and exposure condition.

D. Fasteners: Use fastener metals that are noncorrosive and compatible with each material joined.

1. Match existing fasteners in material and type of fastener unless otherwise indicated.
2. Use concealed fasteners for interconnecting wood components.
3. Use concealed fasteners for attaching items to other work unless exposed fasteners are unavoidable or the existing fastening method.
4. For fastening metals, use fasteners of same basic metal as fastened metal unless otherwise indicated.
5. For exposed fasteners, use Phillips-type machine screws of head profile flush with metal surface unless otherwise indicated.
6. Finish exposed fasteners to match finish of metal fastened unless otherwise indicated.

2.5 WOOD FINISHES

A. Unfinished Replacement Units: Provide exposed exterior and interior wood surfaces of replacement units unfinished; smooth, filled, and suitably prepared for on-site priming and finishing.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect adjacent materials from damage by historic wood repair.

B. Clean wood of mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. After cleaning, rinse thoroughly with fresh water. Allow to dry before repairing or painting.

C. Condition replacement wood members and replacement units to prevailing conditions at installation areas before installing.

3.2 HISTORIC WOOD REPAIR, GENERAL

A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from 5 feet away for interior work and from 20 feet away for exterior work.

B. General: In treating historic items, disturb them as minimally as possible and as follows:

1. Stabilize and repair wood to reestablish structural integrity and weather resistance while maintaining the existing form of each item.
2. Remove coatings and apply borate preservative treatment before repair. Remove coatings according to Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated.
3. Repair items in place where possible.

4. Install temporary protective measures to protect wood-treatment work that is indicated to be completed later.
5. Refinish historic wood according to Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated.

C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and natural-fiber bristle brushing, that will not abrade wood substrate, reducing clarity of detail. Do not use abrasive methods, such as sanding, wire brushing, or power tools, except as indicated as part of the historic treatment program and as approved by Architect.

D. Repair and Refinish Existing Hardware: Dismantle hardware; strip paint, repair, and refinish it to match finish samples; and lubricate moving parts just enough to function smoothly.

E. Repair Wood: Match existing materials and features, retaining as much original material as possible to perform repairs.

1. Unless otherwise indicated, repair wood by consolidating, patching, splicing, or otherwise reinforcing wood with new wood matching existing wood or with salvaged, sound, original wood.
2. Where indicated, repair wood by limited replacement matching existing material.

F. Replace Wood: Where indicated, duplicate and replace units with units made from salvaged, sound, original wood or with new wood matching existing wood. Use surviving prototypes to create patterns for duplicate replacements.

1. Do not use substitute materials unless otherwise indicated.
2. Compatible substitute materials may be used.

G. Identify removed items with numbering system corresponding to item locations, to ensure reinstallation in same location. Key items to Drawings showing location of each removed unit. Permanently label units in a location that will be concealed after reinstallation.

3.3 WOOD PATCH-TYPE REPAIR

A. General: Patch wood that exhibits depressions, holes, or similar voids, and that has limited amounts of rotted or decayed wood.

1. Verify that surfaces are sufficiently clean and free of paint residue prior to patching.
2. Treat wood with wood consolidant prior to application of patching compound. Coat wood surfaces by brushing, applying multiple coats until wood is saturated and refuses to absorb more. Allow treatment to harden before filling void with patching compound.
3. Remove rotted or decayed wood down to sound wood.

B. Apply borate preservative treatment to accessible surfaces either before applying wood consolidant or after removing rotted or decayed wood. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom. Allow treatment to dry.

C. Apply wood-patching compound to fill depressions, nicks, cracks, and other voids created by removed or missing wood.

1. Prime patch area with application of wood consolidant or manufacturer's recommended primer.
2. Mix only as much patching compound as can be applied according to manufacturer's written instructions.
3. Apply patching compound in layers as recommended in writing by manufacturer until the void is completely filled.
4. Sand patch surface smooth and flush with adjacent wood, without voids in patch material, and matching contour of wood member.
5. Clean spilled compound from adjacent materials immediately.

3.4 WOOD-REPLACEMENT REPAIR

A. General: Replace parts of or entire wood items at locations indicated on Drawings and where damage is too extensive to patch, as determined by the Architect.

1. Remove surface-attached items from wood surface before performing wood-replacement repairs unless otherwise indicated.
2. Verify that surfaces are sufficiently clean and free of paint residue prior to repair.
3. Remove broken, rotted, and decayed wood down to sound wood.
4. Custom fabricate new wood to replace missing wood; either replace entire wood member or splice new wood part into existing member.
5. Secure new wood using finger joints, multiple dowels, or splines with adhesive and nailing to ensure maximum structural integrity at each splice. Use only concealed fasteners. Fill nail holes and patch surface to match surrounding sound wood.

B. Apply borate preservative treatment to accessible surfaces after replacements are made. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom.

C. Repair remaining depressions, holes, or similar voids with patch-type repairs.

D. Clean spilled materials from adjacent surfaces immediately.

E. Reinstall items removed for repair into original locations.

3.5 ADJUSTMENT

A. Adjust existing and replacement operating items, hardware, and accessories for a tight fit at contact points and for smooth operation and tight closure. Lubricate hardware and moving parts.

3.6 CLEANING AND PROTECTION

A. Protect wood surfaces from contact with contaminating substances resulting from construction operations. Monitor wood surfaces adjacent to and below exterior concrete and masonry during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances contact wood surfaces, remove contaminants immediately.

B. Clean exposed surfaces immediately after historic wood repair. Avoid damage to coatings and finishes. Remove excess sealants, patching materials, dirt, and other substances.

END OF SECTION 06 03 12

SECTION 06 10 00 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work specified in this section.

1.2 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Rooftop equipment bases and support curbs.

1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other sections and not exposed, unless otherwise indicated.

B. Exposed Framing: Framing not concealed by other construction.

C. Boards: Lumber of 2 inches nominal in thickness and 2 inches nominal or greater in width.

D. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment for chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

2. Include copies of warranties from chemical treatment manufactures for each type of treatment.

B. Material Certificates:

1. For dimension lumber, indicate species and grade of selected materials.

2. For Preservative-Treated Wood Products: Indicate type of preservative used and net amount of preservative retained.

D. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Power-driven fasteners.
3. Powder-actuated fasteners.
4. Expansion anchors.
5. Metal framing anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber form weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, “FSC Principles and Criteria for Forest Stewardship.”

1. Dimension lumber framing.
2. Laminated-veneer lumber.
3. Sheathing.
4. Miscellaneous lumber

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Provide dressed lumber, S4S, unless otherwise indicated as RSL (Rough Sawn Lumber).

C. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

D. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer that meet or exceed those indicated on the Construction Drawings. Manufacturer’s published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE –TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

2. For exposed items indicated to receive a stained or natural finish, use chemical formulation that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates or treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.

3. Wood framing members that are less than 18 inches above the ground in the basement.

4. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. General: Dimension Lumber of grades and species indicated on Drawings according to the American Lumber Standards Committee National Grading Rule Provisions of the Grading Agency indicated.

2.4 ENGINEERED WOOD PRODUCTS

A. Engineered Wood Products, General: Products shall contain no urea formaldehyde.

B. Source Limitations: Obtain each type of engineered wood product form single source from a single manufacturer.

C. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. Sizes, spacing and design properties indicated on drawings unless otherwise indicated.

D. SHEATHING

1. Plywood: DOC PS 1.
2. Oriented Strand Board: DOC PS 2.
3. Thickness: As needed to comply with requirements specified but not less than thickness indicated on Drawings.
4. Comply with “Code Plus” provisions in APA Form No. E30K, “APA Design/Construction Guide: Residential & Commercial.”
5. Factory mark panels according to indicated standard.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Cants.

B. For items of dimension lumber size, provide the following species:

1. Mixed southern pine; SPID for exposed conditions.

2. Douglas Fir-Larch WCLIB or WWPA.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:

1. Mixed southern pine; No. 2 grade; SPIB for exposed conditions.

2. Douglas Fir Larch No. 2 Common grade; WCLIB or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud or No. 3 grade lumber of

any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacturer.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: AMSE B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M), Property Class 4.6); with ASTM A 563 hex nuts and where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F594, Alloy Group 1 or 2.

2.7 METAL CONNECTION HARDWARE

A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated on the Construction Drawings.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

1. Use for interior locations unless otherwise indicated.

C. Joist and Rafter Hangers, Post Base and Caps, Holdown Anchors, Straps, Hurricane Ties and Framing Clips as indicated on Construction Drawings.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF & PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacture's written instructions.

D. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated and per published requirements of metal connection hardware manufacturer.

I. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

J. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

3.4 WALL AND PARTITION FRAMING INSTALLATION

A. General: Arrange studs so wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Provide single bottom plate and double top plates using members of 2 – inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction unless otherwise indicated.

1. For interior partitions and walls, provide 2-by-4-inch nominal size wood studs spaced 16 inches o.c. unless otherwise indicated.

2. Provide continuous horizontal blocking as 4'-0" using members of 2-inch nominal thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width unless otherwise indicated.

3.9 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

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SECTION 07 31 29 - WOOD SHINGLES AND SHAKES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wood roof shingles.
2. Underlayment materials.
3. Metal flashing and trim.

B. Related Requirements:

1. Section 07 71 00 "Roof Specialties" for accessories not specified in this Section.

C. The Prudence Crandall House is listed on the National Register of Historic Places and is a National Historic Landmark. All work for this renovation project shall be in compliance with the Secretary of the Interiors Standards for the Treatment of Historic Structures.
All work activities must be undertaken with sufficient care to protect this historic resource and must be supervised by personnel who are familiar with the Secretary of Interior's Standards for Restoration.

1.3 DEFINITIONS

A. Roofing Terminology: See ASTM D1079 for definitions of terms related to roofing Work in this Section.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Wood roof shingles.
2. Underlayment materials.
3. Asphalt roofing cement.

B. Shop Drawings: For metal flashing and trim.

C. Samples: For each exposed product, in sizes indicated.

1. Wood Roof Shingles: Full size.
2. Ridge Units: Full size.

D. Samples for Initial Selection: For each type of wood product indicated.

1. Include Samples of accessories involving color selection.

E. Samples for Verification: For the following products, in sizes indicated:

1. Wood Roof Shingles: Full size.
2. Ridge Units: Full size.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Research Reports: For wood products, from an agency acceptable to authorities having jurisdiction, indicating that product is suitable for intended use under applicable building codes.

C. Sample Warranty: For manufacturer's materials warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wood products to include in maintenance manuals.

B. Materials warranties.

C. Roofing Installer's warranty.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wood Roof Shingles: 100 sq. ft. of each size and type, in unbroken bundles.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: CSSB member.

B. Grading Agency Qualifications: An independent testing and inspecting agency recognized by authorities having jurisdiction as qualified to label wood products for compliance with referenced grading rules.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups for wood products including accessories.

a. Size: 48 inches long by 48 inches wide.
b. Include gutter and downspout complying with requirements in Section 077100 "Roof Specialties."

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture in accordance with manufacturer's written instructions.

B. Store underlayment rolls on end, on pallets or other raised surfaces. Do not double-stack rolls.

C. Protect unused roofing materials from weather, sunlight, and moisture when left overnight or when roofing Work is not in progress.

D. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Proceed with installation only when existing and forecasted weather conditions permit product installation and related Work to be performed in accordance with manufacturer's written instructions and warranty requirements.

1. Install self-adhering, polymer-modified bitumen sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.12 WARRANTY

A. Materials Warranty: Manufacturer's warranty administered by CSSB and on CSSB's standard form in which manufacturer agrees to repair or replace CSSB-labeled products that fail in materials within specified warranty period. Material failures include manufacturing defects that result in leaks.

1. Materials Warranty Period: Limited lifetime from date of Substantial Completion.

B. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace installed products that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Exterior Fire-Test Exposure: Provide roofing materials identical to those of assemblies tested for fire resistance in accordance with ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Wood Products: Class B.

a. Fire-Retardant Treatment: Exterior-type pressure treatment complying with AWPA U1 and AWPA T1.
b. Accelerated Weathering: Subject test specimens to ASTM D2898 Method A before testing.
c. Identification: Attach a label to each bundle of wood products; include identification mark of testing agency acceptable to authorities having jurisdiction and identify manufacturer, chemical treatment, method of application, purpose of treatment, and warranties available.

B. Grading Rules: Provide wood products that comply with CSSB grading rules for products indicated.

1. Identification: Attach a label to each bundle of wood products that identifies manufacturer, type of product, grade, dimensions, and identification mark of grading agency acceptable to authorities having jurisdiction.

2.2 WOOD ROOF SHINGLES

A. Cedar Shingles: Smooth-sawn western red cedar shingles.

1. Grade: No. 1, with starter courses of No. 1.
2. Size: 16 inches long; 0.40 inch at butt.

B. Cedar Shingle Ridge Units: Manufactured or Site-fabricated, smooth-sawn western red cedar caps for ridges and hips of same thickness as shingles, 7 inches wide; beveled, alternately overlapped, and nailed.

1. Grade: No. 1.
2. Length: 16 inches.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, Polymer-Modified Bitumen Sheet: ASTM D1970/D1970M, minimum 55-mil-thick sheet; glass-fiber-mat-reinforced, polymer-modified asphalt; with slip-resistant top surface and release backing; cold applied. Provide at eaves and at valleys, and where indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Carlisle WIP Products; a brand of Carlisle Construction Materials.
b. GAF.
c. Owens Corning.
d. Tamko Building Products, Inc.

2. Top Surface: Textured polymer film.

2.4 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D4586/D4586M, Type II, asbestos free.

B. Elastomeric Flashing Sealant: ASTM C920, Type S, Grade NS, one-part, non-sag, elastomeric polymer sealant; of class and use classifications required to seal joints and remain watertight; recommended in writing by manufacturer for installation of flashing systems.

C. Roofing Nails: ASTM F1667, stainless steel, Type 304, box-type wire nails, sharp pointed, and of sufficient length to penetrate a minimum of 3/4 inch into sheathing or to penetrate through roof sheathing less than 3/4 inch thick.

1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

2.5 METAL FLASHING AND TRIM

A. Comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim."

1. Sheet Metal: Copper.

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item unless otherwise specified in this Section or indicated on Drawings.

1. Apron Flashings: Fabricate with lower flange extending a minimum of 8 inches over and 4 inches beyond each side of downslope wood roofing and 6 inches up the vertical surface.
2. Step Flashings: Fabricate with a head lap of 3 inches and a minimum extension of 8 inches both horizontally and vertically.
3. Cricket and Backer Flashings: Fabricate with concealed flange extending a minimum of 18 inches beneath upslope wood roofing and 6 inches beyond each side of chimney and 6 inches above the roof plane.
4. Counterflashings: Fabricate to cover 4 inches of base flashing measured vertically; and in lengths required so that no step exceeds 8 inches and overall length is no more than 10 feet.
5. Open-Valley Flashings: Fabricate from metal sheet not less than 24 inches wide in lengths not exceeding 10 feet, with 1-inch- high, inverted-V profile water diverter at center of valley and equal flange widths of not less than 11 inches.
6. Drip Edges: Fabricate in lengths not exceeding 10 feet with minimum 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.

C. Vent-Pipe Flashings: ASTM B749, Type L51121, at least 1/16 inch thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof and extending at least 6 inches from pipe onto roof.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored and that provisions have been made for flashings and penetrations through wood roofing.
3. Verify that vent stacks and other penetrations through roofing are installed and securely fastened.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT MATERIALS

A. Comply with underlayment manufacturer's written installation instructions and with recommendations in CSSB's "New Roof Construction Manual" and NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" applicable to products and applications indicated unless more stringent requirements are specified in the Section or indicated on Drawings.

B. Self-Adhering, Polymer-Modified Bitumen Sheet: Install, wrinkle free, on roof deck.

1. Comply with low-temperature installation restrictions of underlayment manufacturer.
2. Install lapped in direction that sheds water.
3. Lap sides not less than 4 inches. Lap ends not less than 6 inches, staggered 24 inches between succeeding courses.
4. Roll laps with roller.
5. Prime concrete, masonry, and metal surfaces to receive self-adhering sheet.
6. Eaves: Extend from edges of eaves 24 inches beyond interior face of exterior wall.
7. Rakes: Extend from edges of rakes 24 inches beyond interior face of exterior wall.

8. Valleys: Extend from lowest to highest point 18 inches on each side of centerline.
9. Hips: Extend 18 inches on each side.
10. Ridges: Extend 36 inches on each side.
11. Sidewalls: Extend 18 inches beyond sidewalls and return vertically against sidewalls not less than 8 inches.
12. Dormers, Chimneys, and Other Roof-Penetrating Elements: Extend 18 inches beyond penetrating elements and return vertically against penetrating elements not less than 4 inches.
13. Cover underlayment within seven days.

C. Metal-Flashed, Open-Valley Underlayment: Install one layer of 36-inch-wide felt underlayment centered in valley, running full length of valley, and on top of underlayment on field of roof that is woven through valley. Install all layers of underlayment in and through valley tight with no bridging.

1. Lap ends at least 12 inches in direction that sheds water, and seal with asphalt roofing cement.
2. Fasten to roof deck with underlayment nails located as far from valley center as possible and only to extent necessary to hold underlayment in place until installation of valley flashing.
3. Solidly cement valley underlayment to roof-field underlayment that is woven through valley using asphalt roofing cement.

3.3 INSTALLATION OF METAL FLASHING AND TRIM

A. Install metal flashings and other sheet metal to comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim."

1. Install metal flashings in accordance with recommendations for wood roofing in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems."

B. Apron Flashings: Extend lower flange over and beyond each side of downslope wood roofing and up the vertical surface.

C. Step Flashings: Install with a headlap of 3 inches and extend over underlying wood roofing and up the vertical face. Install with lower edge of flashing just upslope of, and concealed by, butt of overlying wood roofing. Fasten to roof deck only.

D. Cricket and Backer Flashings: Install against roof-penetrating elements extending concealed flange beneath upslope wood roofing and beyond each side.

E. Counterflashings: Coordinate with installation of base flashing and fit tightly to base flashing. Lap joints a minimum of 4 inches secured in a waterproof manner.

1. Install in reglets or receivers.

F. Open-Valley Flashings: Install centered in valleys, lapping ends at least 8 inches in direction that sheds water. Fasten upper end of each length to roof deck beneath overlap.

1. Adhere minimum 9-inch- wide strip of self-adhering, polymer-modified bitumen sheet to metal flanges and to underlying self-adhering, polymer-modified bitumen sheet. Place strips parallel to and over flanges so that they will be just concealed by installed roofing.
2. Provide a closure at the end of the inverted-V profile of the valley metal to minimize water and ice infiltration.

G. Rake Drip Edges: Install over underlayment materials and fasten to roof deck.

H. Eave Drip Edges: Install below underlayment materials and fasten to roof deck.

I. Pipe Flashings: Form flashing around pipe penetrations and wood roofing. Fasten and seal to wood roofing.

3.4 INSTALLATION OF WOOD ROOF SHINGLES

A. Install wood roof shingles in accordance with manufacturer's written instructions and recommendations in CSSB's "New Roof Construction Manual" and NRCA's "The NRCA Roofing Manual: Steep-Slope Roofing Systems."

B. Install drainage mat perpendicular to roof slope in parallel courses, butting edges and ends to form a continuous layer, and fasten to roof deck.

C. Install wood-shingle starter course along lowest roof edge.

1. Install in single layer.
2. Extend 1-1/2 inches over fascia.
3. Extend 1 inch over rake edge.

D. Install first course of wood roof shingles directly over starter course and in continuous straight-line courses across roof deck. Install second and succeeding courses of wood roof shingles in continuous straight-line courses across roof deck.

1. Extend 1-1/2 inches over rake edge.
2. Offset joints between shingles in succeeding courses a minimum of 1-1/2 inches. Do not align vertical joints in alternate courses.
3. Space shingles a minimum of 1/4 inch and a maximum of 3/8 inch apart.
4. Fasten each shingle with two nails spaced 3/4 to 1 inch from edge of shingle and 1-1/2 to 2 inches above butt line of succeeding course. Drive fasteners flush with top surface of shingles without crushing wood.
5. Maintain weather exposure of 5 inches for 16-inch- long shingles.

E. Open Valleys: Cut and fit wood roof shingles at open valleys, trimming upper concealed corners of shingles. Widen exposed portion of open valley 1/8 inch in 12 inches from highest to lowest point.

F. Ridge Units: Install units over wood roof shingles trimmed at apex of ridges and hips.

1. Maintain same exposure dimension of units as roof-shingle exposure.
2. Lap units at ridges to shed water away from direction of prevailing winds.
3. Alternate overlaps of units and fasten with concealed roofing nails of sufficient length to penetrate sheathing.
4. At unventilated ridges and hips, install concealed strip of self-adhering, polymer-modified bitumen sheet underlayment over apex shingles and below ridge units.

3.5 ROOFING INSTALLER'S WARRANTY

A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("the work") on the following project:

1. Owner: <Insert name of Owner>.
2. Owner Address: <Insert address>.
3. Building Name/Type: <Insert information>.
4. Building Address: <Insert address>.
5. Area of the Work: <Insert information>.
6. Acceptance Date: <Insert date>.
7. Warranty Period: <Insert time>.
8. Expiration Date: <Insert date>.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant the work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that, during Warranty Period, Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of the work as are necessary to correct faulty and defective work and as are necessary to maintain the work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to the work and other parts of the building, and to building contents, caused by:

    a. Lightning;
    b. Peak gust wind speed exceeding <Insert wind speed> mph;
    c. Fire;
    d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. Faulty construction of copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. Vapor condensation on bottom of roofing; and
    g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When the work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to the work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of the work.
4. During Warranty Period, if Owner allows alteration of the work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of the alterations, but only to the extent the alterations affect the work covered by this Warranty. If Owner engages Roofing Installer to perform the alterations, Warranty shall not become null and void unless Roofing Installer, before starting the alterations, notified Owner in writing, showing reasonable cause for claim, that the alterations would likely damage or deteriorate the work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a use or service more severe than originally specified, this Warranty shall become null and void on date of the change, but only to the extent the change affects the work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect the work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on the work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of the work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this <Insert day> day of <Insert month>, <Insert year>.

1. Authorized Signature: <Insert signature>.
2. Name: <Insert name>.
3. Title: <Insert title>.

END OF SECTION 073129

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured reglets.
2. Formed roof-drainage sheet metal fabrications.
3. Formed steep-slope roof sheet metal fabrications.
4. Through-wall flashing at anchored masonry veneer.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following

1. Underlayment materials.
2. Elastomeric sealant.
3. Butyl sealant.
4. Epoxy seam sealer.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
10. Include details of special conditions.
11. Include details of connections to adjoining work.

C. Samples: For each exposed product and for each color and texture specified, 12 inches long by actual width.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of coping and roof edge flashing that is FM Approvals approved.

B. Evaluation Reports: For copings and roof edge flashing, from ICC-ES showing compliance with ANSI/SPRI/FM 4435/ES-1.

C. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Special warranty.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

1.7 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

D. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-105. Identify materials with name of fabricator and design approved by FM Approvals.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Copper Sheet: ASTM B101-12, lead-coated copper.

1. Manufacturer: Subject to compliance with specifications:
   a. Hussey Copper Ltd.
   b. Revere Copper Products
   c. Arubis Inc.

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

B. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.

1. Manufacturer: Subject to compliance with specifications:
   a. Carlisle
   b. Owens Corning
   c. GCP Applied Technologies

2. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.

2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

   a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
   b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.

c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Copper Sheet: Copper, hardware bronze or passivated Series 300 stainless steel.

C. Solder:

1. For Copper: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead with maximum lead content of 0.2 percent.

D. Elastomeric Sealant: ASTM C920, elastomeric polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

H. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

I. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.

1. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
2. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
3. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
4. Accessories:

a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.

2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams:

1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters:

1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
2. Fabricate in minimum 96-inch- long sections.
3. Furnish flat-stock gutter brackets and gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than twice the gutter thickness.
4. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
5. Gutters with Girth up to 15 Inches: Fabricate from the following materials:

a. Copper: 16 oz./sq. ft.

B. Downspouts: Fabricate round downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.

1. Fabricate from the following materials:

a. Copper: 16 oz./sq. ft.

2.7 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:

1. Copper: 16 oz./sq. ft.

B. Valley Flashing: Fabricate from the following materials:

1. Copper: 16 oz./sq. ft.

C. Drip Edges: Fabricate from the following materials:

1. Copper: 16 oz./sq. ft.

D. Eave, Rake, Ridge, and Hip Flashing: Fabricate from the following materials:

1. Copper: 16 oz./sq. ft.

PART 3 - EXECUTION

3.1 INSTALLATION OF UNDERLAYMENT

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim.

1. Install in shingle fashion to shed water.
2. Lap joints not less than 2 inches.

B. Self-Adhering, High-Temperature Sheet Underlayment:

1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
2. Prime substrate if recommended by underlayment manufacturer.
3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.
6. Roll laps and edges with roller.
7. Cover underlayment within 14 days.

3.2 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners**,** solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.

5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
6. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
8. Do not field cut sheet metal flashing and trim by torch.

B. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
3. Use lapped expansion joints only where indicated on Drawings.

C. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance

D. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

E. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated.

a. Embed hooked flanges of joint members not less than 1 inch into sealant.
b. Form joints to completely conceal sealant.
c. When ambient temperature at time of installation is between 40 and 70 deg F set joint members for 50 percent movement each way.
d. Adjust setting proportionately for installation at higher ambient temperatures.

1) Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.

1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.
2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint.

a. Fill joint completely.
b. Completely remove flux and spatter from exposed surfaces.

4. Stainless Steel Soldering:

a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
b. Promptly remove acid-flux residue from metal after tinning and soldering.
c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

5. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.

3.3 INSTALLATION OF ROOF-DRAINAGE SYSTEM

A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters:

1. Join sections with riveted and soldered joints.
2. Provide for thermal expansion.
3. Attach gutters at eave or fascia to firmly anchor them in position.
4. Provide end closures and seal watertight with sealant.
5. Slope to downspouts.
6. Install gutter with expansion joints at locations indicated on Drawings, but not exceeding, 50 feet apart. Install expansion-joint caps.

C. Downspouts:

1. Join sections with 1-1/2-inch telescoping joints.
2. Provide hangers with fasteners designed to hold downspouts securely to walls.
3. Locate hangers at top and bottom and at approximately 60 inches o.c.
4. Provide elbows at base of downspout to direct water away from building.
5. Connect downspouts to underground drainage system via metal boot.

3.4 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard.

1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

C. Copings:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.

    a. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch centers.
    b. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch enters.

3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.

1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
2. Extend counterflashing 4 inches over base flashing.
3. Lap counterflashing joints minimum of 4 inches.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

3.5 INSTALLATION OF WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.6 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

3.8 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 07 62 00

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SECTION 07 71 00 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof-edge drainage systems.

B. Related Requirements:

1. Section 073129 "Wood Shingled and Shakes" for roofing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties.

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.

C. Samples: For each type of roof specialty and for each color and texture specified.

D. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

E. Samples for Verification:

1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
2. Include roof-edge drainage systems made from 12-inch lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For each type of roof specialty.

C. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTY

A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 073129 "Wood Shingled and Shakes”.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

2.2 ROOF-EDGE DRAINAGE SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Architectural Products Company.
2. Berger Building Products, Inc.
3. CopperCraft by FABRAL.

B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.

1. Copper Sheet: 20 oz./sq. ft., with zinc coating.
2. Gutter Profile: Half-round single bead according to SMACNA's "Architectural Sheet Metal Manual."
3. Corners: Factory mitered and soldered.
4. Gutter Supports: Gutter brackets with finish matching the gutters.
5. Gutter Accessories: Bronze wire ball downspout strainer.

C. Downspouts: Plain round complete with mitered and soldered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Copper: 16 oz./sq. ft., with zinc coating.

D. Copper Finish: Zinc coating.

2.3 MATERIALS

A. Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 or H01 temper.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
2. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.

B. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

C. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

D. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

E. Solder for Copper: ASTM B32, lead-free solder.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Copper Sheet Finishes:

1. Zinc coating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.3 INSTALLATION OF ROOF-EDGE DRAINAGE-SYSTEM

A. Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches apart. Attach ends with rivets and [seal with sealant] [solder] to make watertight. Slope to downspouts.

1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion-joint caps.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.

1. Connect downspouts to underground drainage system indicated.

3.4 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

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SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetration firestopping systems for the following applications:
    a. Penetrations in smoke partitions.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approval according to FM Approval 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."
3) FM Approval in its "Approval Guide."
4) <**Insert name of qualified testing and inspecting agency**>.

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist passage of smoke and other gases. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to requirements of the specifications:
   a. Hilti, Inc
   b. NUCO, Inc
   c. Tremco, Inc

B. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.

C. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

D. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

3.3 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION 07 84 13

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:

1. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:

a. Perimeter joints between interior wall surfaces and frames of interior doors, and dissimilar materials.
b. Joints between plumbing fixtures and adjoining walls, floors, and counters.
c. Other joints as indicated.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants. Samples can be installed in mock-up at Contractor’s option.

D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

E. Qualification Data: For Installer and testing agency.

G. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

H. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

I. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants, for which documented testing has not been previously performed by a qualified testing agency.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight (8) pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the [Notice to Proceed with] [commencement of] the Work.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
3. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:

    a. Each type of elastomeric sealant and joint substrate indicated.
    b. Each type of nonelastomeric sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.

4. Arrange for joint-sealant manufacturer's technical representative to be available for on-site representation as required to verify and/or make recommendations on specific products, applications or conditions.
5. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, correct cause of failure and retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less or more than those allowed by joint-sealant manufacturer for applications indicated.
4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

B. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

2.4 LATEX JOINT SEALANTS

A. Application: Interior, general purpose, non-structural joints, painted or unpainted.

1. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF.
2. Available Products:

    a. Pecora Corporation; AC-20+.
    b. Tremco; Tremflex 834.
    c. Sonneborn; Sonolac
3. Color: As selected by Architect from manufcturer’s full range of colors for non-painted joints. White, for painted joints.

2.5 SILICONE SEALANTS

A. Application: Interior FRP Panel Joints and Joints at Plumbing Fixtures

1. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Dow Corning Corporation; 799.
    b. GE Advanced Materials - Silicones; UltraGlaze SSG4000
    c. Tremco Incorporated; Tremsil 600.

2.6 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type Closed cell polyethylene or open-cell polyurethane or as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed elastomeric sealant joints as follows:

   a. Perform ten (10) tests for the first 500 feet of joint length for each type of elastomeric sealant and joint substrate.
   b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, Method B, Exposed Surface Finish Hand Pull Tab, Method C or Field-Applied Sealant Joint Hand Pull Flap in Appendix X1 in ASTM C 1193, as appropriate for type of joint-sealant application indicated.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
4. Inspect tested joints and report on the following:

   a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
   b. Whether sealants filled joint cavities and are free of voids.
   c. Whether sealant dimensions and configurations comply with specified requirements.

5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 08 03 14 - HISTORIC TREATMENT OF WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes historic treatment of wood doors in the form of the following:

1. Repairing, refinishing wood doors and trim.
2. Repairing, refinishing, and replacing hardware.
3. Replacing storm-screen unit.

B. Related Requirements:

1. Section 013591 "Historic Treatment Procedures."
2. Section 024296 "Historic Removal and Dismantling" for historic removal and dismantling work.
3. Section 028313 “Lead Paint Activity” for removal of exterior paint.

C. The Prudence Crandall House is listed on the National Register of Historic Places and is a National Historic Landmark. All work for this renovation project shall be performed in compliance with the Secretary of the Interiors Standards for the Treatment of Historic Structures.
All work activities must be undertaken with sufficient care to protect this historic resource and must be supervised by personnel who are familiar with the Secretary of Interior’s Standards for Restoration.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 01 20 00 "Contract Considerations."

1. Unit prices apply to authorized additions to and deletions from Work as authorized by Change Orders.

1.4 DEFINITIONS

A. Door: Generally, this term includes door frame, leaves, hardware, side panels or lights, fan light, transom, storm and screen doors, and storm vestibule unless otherwise indicated by context.

B. Wood Door Component Terminology: Wood door components for historic treatment work include the following classifications:

1. Frame Components: Head, jambs, stop, and threshold or sill.
2. Leaf Components: Stiles, rails, and muntins.
3. Exterior Trim: Exterior casing, brick mold, and cornice or drip cap.
4. Interior Trim: Casing.

1.5 SEQUENCING AND SCHEDULING

A. Perform historic treatment of wood doors in the following sequence, which includes work specified in this and other Sections:

1. Label each door frame with permanent opening-identification number in inconspicuous location.
2. Tag existing door leaves, storm doors, and storm-vestibule panels with opening-identification numbers and remove for on-site or off-site repair. Indicate on tags the locations on door of each component, such as "left-hand door leaf," "right-hand reverse door leaf," "top dutch-door leaf," "bottom dutch-door leaf," "first left-side storm-vestibule panel," and "second left-side storm-vestibule panel."
3. Remove door, dismantle hardware, and tag hardware with door opening-identification numbers.
4. In the shop, label each leaf, storm door, storm-vestibule panel, and screen-door unit with permanent opening-identification number in inconspicuous location and remove site-applied tags.
5. Install temporary protection and security at door openings.
6. Sort units by condition, separating those that need extensive repair.
7. Clean surfaces.
8. General Wood-Repair Sequence:

    a. Remove paint to bare wood in compliance with Section 028313 “Lead Paint Activity”.
    b. Rack frames slightly to inject adhesive into mortise and tenon joints; square frames to proper fit before adhesive sets.
    c. Repair wood by consolidation, member replacement, partial member replacement, and patching.
    d. Sand, prime, fill, sand again, and prime surfaces again for refinishing.

9. Repair, refinish, and replace hardware if required. Reinstall operating hardware.
10. Remove temporary protection and security at door openings.
11. Reinstall units.
12. Apply finish coats.
13. Install remaining hardware and weather stripping.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.

B. Shop Drawings: For locations and extent of wood-door repair and replacement work.

1. Include plans, elevations, sections, and details of replacement parts indicating materials, profiles, joinery, reinforcing, method of splicing into or attaching to existing wood door, accessory items, and finishes.
2. Include field-verified dimensions and the following:

    a. Full-size shapes and profiles with complete dimensions for replacement components and their jointing, showing relation of existing to new components.
    b. Templates and directions for installing hardware and anchorages.
    c. Identification of each new unit and its corresponding door locations in the building on annotated plans and elevations.
    d. Provisions for sealant joints, flashing and as required for location.

C. Samples for Initial Selection: For each type of exposed wood and finish.

1. Identify wood species, cut, and other features.
2. Include Samples of hardware and accessories involving color selection.

D. Samples for Verification: For the following products in manufacturer's standard sizes unless otherwise indicated, finished as required for use in the Work:

1. Replacement Units: 12-inch-long, full-size frame and leaf sections with applied finish.
2. Replacement Members: 12 inches long for each replacement member, including parts of frame, leaf, exterior trim, and interior trim.

    a. Additional Samples of replacement members that show fabrication techniques, materials, and finishes as requested by Architect.

3. Repaired Wood Door Members: Prepare Samples using existing wood door members removed from site, repaired, and prepared for refinishing.
4. Refinished Wood Door Members: Prepare Samples using existing wood door members removed from site, repaired, and refinished.
5. Hardware: Full-size units with each factory-applied or restored finish.
6. Weather Stripping: 12-inch-long sections.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For historic treatment specialist, including workers and wood-repair-material manufacturer.

B. Wood Door Historic Treatment Program: Submit before work begins.

1.8 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic treatment specialist, experienced in repairing, refinishing, and replacing historic material in whole and in part. Experience in fabricating and installing new work is not sufficient for this historic treatment work. Subject to compliance with requirements, historic specialty work shall be performed by a firm with a minimum of five (5) years successful experience with comparable restoration work including work on at least three (3) buildings listed on the National or State Registers under direction of SHPO, and employing personnel skilled in the restoration process and operations indicated, with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work. The qualifying historic treatment specialist shall be required to demonstrate its experience with names, dates, and locations of similar projects. This firm must designate a field supervisor, foreman, and tradesmen with commensurate experience for the duration of the work. Supervisors shall be on site when historic treatment begins and during its progress. Supervisors shall not be changed during Project except for causes beyond control of specialty firm. Should a supervisor be replaced, the new supervisor must demonstrate the requirements of the work by constructing new mock-ups. Resumes and experience must be approved by Owner prior to acceptance of bid. In the event of discrepancy, the more stringent requirements will govern.

B. A qualified historic wood-repair specialist, experienced in repairing, refinishing, and replacing wood in whole and in part.

C. Wood-Repair-Material Manufacturer Qualifications: A firm regularly engaged in producing wood consolidant and wood-patching compound that have been used for similar historic wood-treatment applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

D. Wood Door Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including protection of surrounding materials and Project site.

1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of

successful use on comparable projects, and demonstrations to show their effectiveness for this Project.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified historic treatment specialist to perform preconstruction testing on historic wood doors.

1. Provide test specimens representative of proposed materials and existing construction.
2. Test historic treatment products and methods for effectiveness and compliance with specified requirements.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Pack, deliver, and store products in suitable packs, heavy-duty cartons, or wooden crates; surround with sufficient packing material to ensure that products will not be deformed, broken, or otherwise damaged.

B. Store products inside a well-ventilated area, protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity, and where environmental conditions comply with manufacturer's requirements.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with historic treatment of wood doors only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.

PART 2 - PRODUCTS

2.1 HISTORIC TREATMENT OF WOOD DOORS, GENERAL

A. Quality Standard: Comply with applicable requirements in Section 12, "Historic Restoration Work," and related requirements in AWI/AWMAC/WI's "Architectural Woodwork Standards" for construction, finishes, grades of wood doors, and other requirements unless otherwise indicated.

1. Exception: Industry practices cited in the "Architectural Woodwork Standards," Section 12, Article 1.5, "Industry Practices," do not apply to the work of this Section.

2.2 SCREEN DOOR

A. General: Custom fabricated, tight fitting, and with operating and latching hardware.

1. Make screen door removable for cleaning and storage.

B. Wood Screen Door:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kingsland Architectural Millwork.
b. Weston Millwork Company.
c. Wood Window Workshop.

d. WOODSTONE Company (The).

2. Joint Construction: Mortise and tenon joints
3. Wood Species: Cedar.
4. Wood Cut: Plain sliced/plain sawn.
5. Wood Member Profiles: Match wood profiles of existing storm door.
6. Hardware: Three butt hinges, Thumb latch with pull andAs required to secure screen door to door frame.

2.3 WOOD-REPLACEMENT MATERIALS

A. Wood, General: Clear fine-grained lumber; kiln dried to a moisture content of 6 to 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide.

1. Species: Match species of each existing type of wood component or assembly unless otherwise indicated.

B. Frame Heads and Jambs and Exterior Trim: Match existing species.

C. Exterior Trim: Match existing species.

D. Thresholds or Sills: Match existing species.

E. Leaf Components: Match existing species.

F. Interior Trim: Match existing species.

2.4 WOOD-REPAIR MATERIALS

A. Source Limitations: Obtain wood consolidant and wood-patching compound from single source from single manufacturer.

B. Wood Consolidant: Ready-to-use product designed to penetrate, consolidate, and strengthen soft fibers of wood materials that have deteriorated because of weathering and decay and designed specifically to enhance the bond of wood-patching compound to existing wood.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Abatron, Inc.
b. ConServ Epoxy LLC.
c. Gougeon Brothers, Inc.
d. Protective Coating Company.
e. System Three Resins, Inc.

C. Wood-Patching Compound: Two-part epoxy-resin wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated because of weathering and decay. Compound shall be capable of filling deep holes and spreading to feather edge.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Abatron, Inc.
b. ConServ Epoxy LLC.
c. Gougeon Brothers, Inc.

d. System Three Resins, Inc.

2.5 HARDWARE

A. Primary Door Hardware, General: Reuse existing. See schedule for new screen door hardware.

2.6 WEATHER STRIPPING

A. Bronze spring leaf .008” minimum at head and jambs; bronze interlock at sills.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Pemko Manufacturing Co.
b. Reese Enterprises, Inc.
c. Zero International, Inc.

2.7 MISCELLANEOUS MATERIALS

A. Insect Screening:

1. Copper Wire Fabric: 16-by-16 count per sq. in. mesh of 0.011-inch-diameter copper wire.

B. Borate Preservative Treatment: Inorganic, borate-based solution, with disodium octaborate tetrahydrate as the primary ingredient; manufactured for preserving weathered and decayed wood from further damage by decay fungi and wood-boring insects; complying with AWPA P5; containing no boric acid.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Abatron, Inc.
b. Nisus Corporation.
c. System Three Resins, Inc.

C. Cleaning Materials:

1. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for each 5 gal. of solution required.
2. Mildewcide: Commercial, proprietary mildewcide or a solution prepared by mixing 1/3 cup of household detergent that contains no ammonia, 1 quart of 5 percent sodium hypochlorite bleach, and 3 quarts of warm water.

D. Adhesives: Wood adhesives with minimum 15- to 45-minute cure at 70 deg F, in gunnable and liquid formulations as recommended in writing by adhesive manufacturer for each type of repair and exposure conditions.

E. Fasteners: Use fastener metals that are noncorrosive and compatible with each material joined.

1. Match existing fasteners in material and type of fastener unless otherwise indicated.
2. Use concealed fasteners for interconnecting wood components.
3. Use concealed fasteners for attaching items to other work unless exposed fasteners are unavoidable or the existing fastening method.
4. For fastening metals, use fasteners of same basic metal as fastened metal unless otherwise indicated.

5. For exposed fasteners, use Phillips-type machine screws of head profile flush with metal surface unless otherwise indicated.
6. Finish exposed fasteners to match finish of metal fastened unless otherwise indicated.

F. Anchors, Clips, and Accessories: Fabricate anchors, clips, and door accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel complying with requirements in ASTM B633 for SC 3 (Severe) service condition.

2.8 WOOD DOOR FINISHES

A. Unfinished Replacement Units: Provide exposed exterior and interior wood surfaces of replacement units unfinished; smooth, filled, and suitably prepared for on-site priming and finishing.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect adjacent materials from damage by historic treatment of wood doors.

B. Clean wood doors of mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. After cleaning, rinse thoroughly with fresh water. Allow to dry before repairing or painting.

C. Condition replacement wood members and replacement units to prevailing conditions at installation areas before installing.

3.2 HISTORIC TREATMENT OF WOOD DOORS, GENERAL

A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from the door interior and exterior at 5 feet away.

B. General: In treating historic items, disturb them as minimally as possible and as follows:

1. Stabilize and repair wood doors to reestablish structural integrity and weather resistance while maintaining the existing form of each item.
2. Remove coatings and apply borate preservative treatment before repair. Remove coatings according to Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated.
3. Repair items in place where possible.
4. Install temporary protective measures to protect wood door work that is indicated to be completed later.
5. Refinish historic wood doors according to Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated.

C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and natural-fiber bristle brushing, that will not abrade wood substrate, reducing clarity of detail. Do not use abrasive methods such as sanding, wire brushing, or power tools except as indicated as part of the historic treatment program and as approved by Architect.

D. Repair and Refinish Existing Hardware: Dismantle door hardware; strip paint, repair, and refinish it to match finish Samples; and lubricate moving parts just enough to function smoothly.

E. Repair Wood Doors: Match existing materials and features, retaining as much original material as possible to perform repairs.

1. Unless otherwise indicated, repair wood doors by consolidating, patching, splicing, or otherwise reinforcing wood with new wood matching existing wood or with salvaged, sound, original wood.
2. Where indicated, repair wood doors by limited replacement matching existing material.

F. Replace Wood Units: Where indicated, duplicate and replace units with units made from salvaged, sound, original wood or with new wood matching existing wood. Use surviving prototypes to create patterns for duplicate replacements.

1. Do not use substitute materials unless otherwise indicated.
2. Compatible substitute materials may be used.

G. Protection of Openings: Where doors are indicated for removal, cover resultant openings with temporary enclosures so that openings are weathertight during repair period.

H. Identify removed doors, frames, leaves, and members with numbering system corresponding to door locations to ensure reinstallation in same location. Key doors, leaves, and members to Drawings showing location of each removed unit. Permanently label units in a location that will be concealed after reinstallation.

3.3 WOOD DOOR PATCH-TYPE REPAIR

A. General: Patch wood members that exhibit depressions, holes, or similar voids and that have limited amounts of rotted or decayed wood.

1. Remove leaves and storm doors from door frames before performing patch-type repairs at meeting or sliding surfaces unless otherwise indicated..
2. Verify that surfaces are sufficiently clean and free of paint residue before patching.
3. Treat wood members with wood consolidant before applying patching compound. Coat wood surfaces by brushing, applying multiple coats until wood is saturated and unable to absorb more. Allow treatment to harden before filling void with patching compound.
4. Remove rotted or decayed wood down to sound wood.

B. Apply borate preservative treatment to accessible surfaces either before applying wood consolidant or after removing rotted or decayed wood. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom. Allow treatment to dry.

C. Apply wood-patching compound to fill depressions, nicks, cracks, and other voids created by removed or missing wood.

1. Prime patch area with application of wood consolidant or manufacturer's recommended primer.
2. Mix only as much patching compound as can be applied according to manufacturer's written instructions.
3. Apply patching compound in layers as recommended in writing by manufacturer until the void is completely filled.
4. Sand patch surface smooth and flush with adjacent wood, without voids in patch material, and matching contour of wood member.
5. Clean spilled compound from adjacent materials immediately.

3.4 WOOD DOOR MEMBER-REPLACEMENT REPAIR

A. General: Replace parts of or entire wood door members at locations indicated on Drawings.

1. Remove leaves and storm doors from doors before performing member-replacement repairs unless otherwise indicated.
2. Verify that surfaces are sufficiently clean and free of paint residue before repair.
3. Remove broken, rotted, and decayed wood down to sound wood.

4. Custom fabricate new wood to replace missing wood; either replace entire wood member or splice new wood part into existing member.
5. Secure new wood using finger joints, multiple dowels, or splines with adhesive and nailing to ensure maximum structural integrity at each splice. Use only concealed fasteners. Fill nail holes and patch surface to match surrounding sound wood.

B. Apply borate preservative treatment to accessible surfaces after replacements are made. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom.

C. Repair remaining depressions, holes, or similar voids with patch-type repairs.

D. Clean spilled materials from adjacent surfaces immediately.

E. Reinstall units removed for repair into original openings.

F. Weather Stripping: Replace nonfunctioning and install missing weather stripping to ensure full-perimeter weather stripping for each exterior leaf.

3.5 SCREEN DOOR INSTALLATION

A. Fit wood storm doors at each door jamb indicated. Verify that storm door and door frames are correctly tagged with opening-identification numbers.

B. Adjust hardware, clips, and removable fasteners for a tight fit with uniform joints. Uninstall and reinstall door at least once to ensure proper fit.

C. Install and leave screen door in place when directed by Architect to suit the season.

D. Install unit by mounting to door frames according to manufacturer's written instructions.

3.6 WEATHER STRIPPING INSTALLATION

A. Install weather stripping for tight seal of joints as demonstrated in samples submitted for verification and approval.

3.7 FIELD QUALITY CONTROL

A. Manufacturers Field Service: Engage a factory-authorized, wood-repair-material service representative for consultation and Project-site inspection and to provide on-site assistance if requested by Architect.

3.8 ADJUSTING

A. Adjust existing and replacement operating leaves, screens, hardware, weather stripping, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

3.9 CLEANING AND PROTECTION

A. Protect door surfaces from contact with contaminating substances resulting from construction operations. Monitor door surfaces adjacent to and below exterior concrete and masonry during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances contact door surfaces, remove contaminants immediately.

B. Clean exposed surfaces immediately after historic treatment of wood doors. Avoid damage to coatings and finishes. Remove excess sealants, glazing and patching materials, dirt, and other substances.

END OF SECTION 08 03 14

SECTION 08 03 52 - HISTORIC TREATMENT OF WOOD WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes historic treatment of wood windows in the form of the following:

1. Removing existing glazing, documenting location, storing glazing, and replacing in sash after windows have been restored.

2. Repairing wood windows and trim.
3. Replacing wood window frames and sash units.
4. Reglazing.
5. Repairing, refinishing, and replacing hardware.
6. Repairing storm windows.

B. Related Requirements:

1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.
2. Section 024296 "Historic Removal and Dismantling" for historic removal and dismantling work.
3. Section 028213 “Asbestos Abatement” for removal of glazing compound.
4. Section 028313 “Lead Paint Activity” for removal of exterior paint.

C. The Prudence Crandall House is listed on the National Register of Historic Places and is a National Historic Landmark. All work for this renovation project shall be performed in compliance with the Secretary of the Interiors Standards for the Treatment of Historic Structures.
All work activities must be undertaken with sufficient care to protect this historic resource and must be supervised by personnel who are familiar with the Secretary of Interior’s Standards for Restoration.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 01 20 00 "Contract Considerations."

1. Unit prices apply to authorized additions to and deletions from Work as authorized by Change Orders.

1.4 DEFINITIONS

A. Glazing: Includes glass, glazing points, glazing tapes, glazing sealants, and glazing compounds.

B. Window: Includes window frame, sash, hardware, storm window, and exterior and interior shutters unless otherwise indicated by context.

C. Wood Window Component Terminology: Wood window components for historic treatment work include the following classifications:

1. Frame Components: Head, jambs, and sill.
2. Sash Components: Stiles and rails, parting bead, stop, and muntins.
3. Exterior Trim: Exterior casing, brick mold, and cornice or drip cap.
4. Interior Trim: Casing, stool, and apron.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of wood windows.
2. Review methods and procedures related to historic treatment of wood windows including, but not limited to, the following:

a. Historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Materials, material application, sequencing, tolerances, and required clearances.
c. Fire-protection plan.
d. Wood window historic treatment program.
e. Coordination with building occupants.

1.6 SEQUENCING AND SCHEDULING

A. Perform historic treatment of wood windows in the following sequence, which includes work specified in this and other Sections:

1. Label each window frame with permanent opening-identification number in inconspicuous location.
2. Tag existing window sash, glazing, storm windows, and shutters with opening-identification numbers and remove for on-site or off-site repair. Indicate on tags the locations on window of each component, such as "top sash," "bottom sash," and position within muntins.
3. Remove window, dismantle hardware, and tag hardware with opening-identification numbers.
4. Install temporary protection and security at window openings.
5. In the shop, label each sash, glass light, storm window, shutter, and louvered blind unit with permanent opening-identification number in inconspicuous location and remove site-applied tags.
6. Sort units by condition, separating those that need extensive repair.
7. Clean surfaces.
8. General Wood-Repair Sequence:

a. Remove paint to bare wood.
b. Rack frames slightly to inject adhesive into mortise and tenon joints; square frames to proper fit before adhesive sets.
c. Repair wood by consolidation, member replacement, partial member replacement, and patching.
d. Sand, prime, fill, sand again, and prime surfaces again for refinishing.

9. Repair, refinish, and replace hardware if required. Reinstall operating hardware.
10. Install stored glazing.
11. Remove temporary protection and security at window openings.
12. Reinstall units.
13. Apply finish coats.
14. Install remaining hardware and weather stripping.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, and sections showing locations and extent of repair and replacement work, with enlarged details of replacement parts indicating materials, profiles, joinery, reinforcing, method of splicing into or attaching to existing wood window, accessory items, and finishes.
2. Include field-verified dimensions and the following:

a. Full-size shapes and profiles with complete dimensions for replacement components and their jointing, showing relation of existing to new components.
b. Templates and directions for installing hardware and anchorages.
c. Identification of each new unit and its corresponding window locations in the building on annotated plans and elevations.
d. Provisions for sealant joints and flashing as required for location.

C. Samples for Initial Selection: For each type of exposed wood and finish.

1. Identify wood species, cut, and other features.
2. Include Samples of hardware and accessories involving color selection.

D. Samples for Verification: For the following products in manufacturer's standard sizes unless otherwise indicated, finished as required for use in the Work:

1. Replacement Units: 12-inch-long, full-size frame and sash sections with applied finish.
2. Replacement Members: 12 inches long for each replacement member, including parts of frame, sash, exterior trim, and interior trim.

a. Additional Samples of replacement members that show fabrication techniques, materials, and finishes as requested by Architect.

3. Repaired Wood Window Members: Prepare Samples using existing wood window members removed from site, repaired, and prepared for refinishing.
4. Refinished Wood Window Members: Prepare Samples using existing wood window members removed from site, repaired, and refinished.
5. Hardware: Full-size units with each factory-applied or restored finish.
6. Weather Stripping: 12-inch-long sections.
7. Glass: Full-size units for restoration of missing glazing.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For historic treatment specialist, including workers and wood-repair-material manufacturer.

B. Wood Window Historic Treatment Program: Submit before work begins.

1.9 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic treatment specialist, experienced in repairing, refinishing, and replacing historic material in whole and in part. Experience in fabricating and installing new work is not sufficient for this historic treatment work. Subject to compliance with

requirements, historic specialty work shall be performed by a firm with a minimum of five (5) years successful experience with comparable restoration work including work on at least three (3) buildings listed on the National or State Registers under direction of SHPO, and employing personnel skilled in the restoration process and operations indicated, with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work. The qualifying historic treatment specialist shall be required to demonstrate its experience with names, dates, and locations of similar projects. This firm must designate a field supervisor, foreman, and tradesmen with commensurate experience for the duration of the work. Supervisors shall be on site when historic treatment begins and during its progress. Supervisors shall not be changed during Project except for causes beyond control of specialty firm. Should a supervisor be replaced, the new supervisor must demonstrate the requirements of the work by constructing new mock-ups. Resumes and experience must be approved by Owner prior to acceptance of bid. In the event of discrepancy, the more stringent requirements will govern.

B. A qualified historic wood-repair specialist, experienced in repairing, refinishing, and replacing wood windows in whole and in part.

C. Wood-Repair-Material Manufacturer Qualifications: A firm regularly engaged in producing wood consolidant and wood-patching compound that have been used for similar historic wood-treatment applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

D. Wood Window Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including protection of surrounding materials and Project site.

1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Pack, deliver, and store products in suitable packs, heavy-duty cartons, or wooden crates; surround with sufficient packing material to ensure that products are not deformed, broken, or otherwise damaged.

B. Store products inside a well-ventilated area and protect from weather, moisture, soiling, abrasion, extreme temperatures, and humidity, and where environmental conditions comply with manufacturer's requirements.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with historic treatment of wood windows only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.

PART 2 - PRODUCTS

2.1 HISTORIC TREATMENT OF WOOD WINDOWS, GENERAL

A. Quality Standard: Comply with applicable requirements in Section 12, "Historic Restoration Work," and related requirements in AWI/AWMAC/WI's "Architectural Woodwork Standards" for construction, finishes, grades of wood windows, and other requirements unless otherwise indicated.

1. Exception: Industry practices cited in Section 12, Article 1.5, Industry Practices, of the Architectural Woodwork Standards do not apply to the work of this Section.

2.2 REPLICATED WOOD WINDOW UNITS

A. Replicated Wood Window Frames and Sash: Custom-fabricated replacement wood units and trim, with operating and latching hardware.

1. Joint Construction: Joints matching existing.
2. Wood Species: Match wood species of exterior window trim and sash parts.
3. Wood Cut: Match cut of existing exterior wood window trim and sash parts.
4. Wood Window Members and Trim: Match profiles and detail of existing window members and trim.
5. Glazing Stops: Provide replacement glazing stops coordinated with glazing system indicated.
6. Exposed Hardware: Reuse existing exposed window hardware.
7. Weather Stripping: Full-perimeter and meeting rail weather stripping for each operable sash.

2.3 STORM WINDOWS

A. General: Existing aluminum storm windows to be removed, repaired and reinstalled.

2.4 WOOD-REPLACEMENT MATERIALS

A. Wood, General: Clear fine-grained lumber; kiln dried to a moisture content of 6 to 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide.

1. Species: Match species of each existing type of wood component or assembly unless otherwise indicated.

B. Frame Heads and Jambs and Exterior Trim: Match existing species.

C. Exterior Trim: Match existing species.

D. Sills: Match existing species.

E. Sash Components: Match existing species.

F. Interior Trim: Match existing species.

2.5 WOOD-REPAIR MATERIALS

A. Source Limitations: Obtain wood consolidant and wood-patching compound from single source from single manufacturer.

B. Wood Consolidant: Ready-to-use product designed to penetrate, consolidate, and strengthen soft fibers of wood materials that have deteriorated due to weathering and decay and designed specifically to enhance the bond of wood-patching compound to existing wood.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Abatron, Inc.
b. ConServ Epoxy LLC.
c. Gougeon Brothers, Inc.
d. Protective Coating Company.

e. System Three Resins, Inc.

C. Wood-Patching Compound: Two-part epoxy-resin wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated due to weathering and decay. Compound shall be capable of filling deep holes and spreading to feather edge.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Abatron, Inc.
b. ConServ Epoxy LLC.
c. Gougeon Brothers, Inc.
d. Polymeric Systems, Inc.
e. System Three Resins, Inc.

2.6 GLAZING MATERIALS

A. Glass: Reuse existing glass, or provide historical glass replication.

B. Glazing Systems:

1. Traditional Glazing Products: Glazing points and oil-based glazing putty or latex glazing compound. Tint to required color according to manufacturer's written instructions.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) DAP Products Inc.
2) Sarco Putty Company, Inc.
3) United Gilsonite Laboratories (UGL).

2. Modern Glazing Products: Glazing points and single-component polyurethane glazing compound; ASTM C920, Type S, Grade NS, Class 25, Use G; struck uniformly to match taper of existing glazing putty (removed); colored as required to match painted sash.
3. Primers and Cleaners for Glazing: As recommended in writing by glazing material manufacturer.

2.7 HARDWARE

A. Window Hardware: Clean, adjust and reinstall.

2.8 WEATHER STRIPPING

A. Bronze spring leaf and compression-Type Weather Stripping: Compressible weather stripping designed for permanently resilient sealing under bumper or wiper action; completely concealed when window is closed.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Pemko Manufacturing Co.
b. Reese Enterprises, Inc.
c. Zero International, Inc.

2. Weather-Stripping Material:

a. Cellular Elastomeric Gaskets: Preformed; complying with ASTM C509.
b. Dense Elastomeric Gaskets: Preformed; complying with ASTM C864.

c. Bronze Spring Leaf Weatherstripping: .008” hemmed spring.

2.9 MISCELLANEOUS MATERIALS

A. Borate Preservative Treatment: Inorganic, borate-based solution, with disodium octaborate tetrahydrate as the primary ingredient; manufactured for preserving weathered and decayed wood from further damage by decay fungi and wood-boring insects; complying with AWPA P5; containing no boric acid.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Abatron, Inc.
b. Nisus Corporation.
c. System Three Resins, Inc.

B. Cleaning Materials:

1. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for each 5 gal. of solution required.
2. Mildewcide: Commercial, proprietary mildewcide or a solution prepared by mixing 1/3 cup of household detergent that contains no ammonia, 1 quart of 5 percent sodium hypochlorite bleach, and 3 quarts of warm water.

C. Adhesives: Wood adhesives for exterior exposure, with minimum 15- to 45-minute cure at 70 deg F, in gunnable and liquid formulations as recommended in writing by adhesive manufacturer for each type of repair.

D. Fasteners: Use fastener metals that are noncorrosive and compatible with each material joined.

1. Match existing fasteners in material and type of fastener unless otherwise indicated.
2. Use concealed fasteners for interconnecting wood components.
3. Use concealed fasteners for attaching items to other work unless exposed fasteners are unavoidable or the existing fastening method.
4. For fastening metals, use fasteners of same basic metal as fastened metal unless otherwise indicated.
5. For exposed fasteners, use Phillips-type machine screws of head profile flush with metal surface unless otherwise indicated.
6. Finish exposed fasteners to match finish of metal fastened unless otherwise indicated.

E. Anchors, Clips, and Accessories: Fabricate anchors, clips, and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel complying with requirements in ASTM B633 for SC 3 (Severe) service condition.

2.10 WOOD WINDOW FINISHES

A. Unfinished Replacement Units: Provide exposed exterior and interior wood surfaces of replacement units unfinished; smooth, filled, and suitably prepared for on-site priming and finishing.

PART 3 - EXECUTION

3.1 PREPARATION

A. All work to comply with Specification Sections 02 82 13 “Asbestos Abatement” and 02 83 13 “Lead Paint Activity”

B. Protect adjacent materials from damage by historic treatment of wood windows.

C. Clean wood windows of mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. After cleaning, rinse thoroughly with fresh water. Allow to dry before repairing or painting.

D. Condition replacement wood members and replacement units to prevailing conditions at installation areas before installing.

3.2 HISTORIC TREATMENT OF WOOD WINDOWS, GENERAL

A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from the window interior at 5 feet away and from the window exterior at 20 feet away.

B. General: In treating historic items, disturb them as minimally as possible and as follows:

1. Stabilize and repair wood windows to reestablish structural integrity and weather resistance while maintaining the existing form of each item.
2. Remove coatings and apply borate preservative treatment before repair. Remove coatings according to Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated.
3. Repair items in place where possible.
4. Install temporary protective measures to protect wood window work that is indicated to be completed later.
5. Refinish historic wood windows according to Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated.

C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and natural-fiber bristle brushing, that will not abrade wood substrate, reducing clarity of detail. Do not use abrasive methods such as sanding, wire brushing, or power tools except as indicated as part of the historic treatment program and as approved by Architect.

D. Repair and Refinish Existing Hardware: Dismantle window hardware; strip paint, repair, and refinish it to match finish samples; and lubricate moving parts just enough to function smoothly.

E. Repair Wood Windows: Match existing materials and features, retaining as much original material as possible to perform repairs.

1. Unless otherwise indicated, repair wood windows by consolidating, patching, splicing, or otherwise reinforcing wood with new wood matching existing wood or with salvaged, sound, original wood.
2. Where indicated, repair wood windows by limited replacement matching existing material.

F. Replace Wood Units: Where indicated, duplicate and replace units with units made from salvaged, sound, original wood or with new wood matching existing wood. Use surviving prototypes to create patterns for duplicate replacements.

1. Do not use substitute materials unless otherwise indicated.
2. Compatible substitute materials may be used.

G. Protection of Openings: Where sash or windows are indicated for removal, cover resultant openings with temporary enclosures so that openings are weathertight during repair period.

H. Identify removed windows, frames, sash, and members with numbering system corresponding to window locations to ensure reinstallation in same location. Key windows, sash, and members to Drawings showing location of each removed unit. Permanently label units in a location that will be concealed after reinstallation.

3.3 WOOD WINDOW PATCH-TYPE REPAIR

A. General: Patch wood members that exhibit depressions, holes, or similar voids, and that have limited amounts of rotted or decayed wood.

1. Remove sash from windows before performing patch-type repairs at meeting or sliding surfaces unless otherwise indicated. Reglaze units before reinstallation.
2. Verify that surfaces are sufficiently clean and free of paint residue before patching.
3. Treat wood members with wood consolidant before applying patching compound. Coat wood surfaces by brushing, applying multiple coats until wood is saturated and unable to absorb more. Allow treatment to harden before filling void with patching compound.
4. Remove rotted or decayed wood down to sound wood.

B. Apply borate preservative treatment to accessible surfaces either before applying wood consolidant or after removing rotted or decayed wood. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom. Allow treatment to dry.

C. Apply wood-patching compound to fill depressions, nicks, cracks, and other voids created by removed or missing wood.

1. Prime patch area with application of wood consolidant or manufacturer's recommended primer.
2. Mix only as much patching compound as can be applied according to manufacturer's written instructions.
3. Apply patching compound in layers as recommended in writing by manufacturer until the void is completely filled.
4. Sand patch surface smooth and flush with adjacent wood, without voids in patch material, and matching contour of wood member.
5. Clean spilled compound from adjacent materials immediately.

3.4 WOOD WINDOW MEMBER-REPLACEMENT REPAIR

A. General: Replace parts of or entire wood window members at locations indicated on Drawings and where damage is too extensive to patch.

1. Remove sash from windows before performing member-replacement repairs unless otherwise indicated.
2. Verify that surfaces are sufficiently clean and free of paint residue before repair.
3. Remove broken, rotted, and decayed wood down to sound wood.
4. Custom fabricate new wood to replace missing wood; either replace entire wood member or splice new wood part into existing member.
5. Secure new wood using finger joints, multiple dowels, or splines with adhesive and nailing to ensure maximum structural integrity at each splice. Use only concealed fasteners. Fill nail holes and patch surface to match surrounding sound wood.

B. Apply borate preservative treatment to accessible surfaces after replacements are made. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom.

C. Repair remaining depressions, holes, or similar voids with patch-type repairs.

D. Clean spilled materials from adjacent surfaces immediately.

E. Glazing: Reglaze units before reinstallation.

F. Reinstall units removed for repair into original openings.

G. Weather Stripping: Replace nonfunctioning and install missing weather stripping to ensure full-perimeter and meeting rail weather stripping for each operable sash.

3.5 GLAZING

A. Remove glass and glazing from openings, store glass for reinstallation, and prepare surfaces for reglazing.

B. Size any replacement glass as required by Project conditions to provide necessary bite on glass, minimum edge and face clearances, with reasonable tolerances.

C. Apply primers to joint surfaces where required for adhesion of glazing system, as determined by preconstruction testing.

D. Install setting bead, side beads, and back bead against stop in glazing rabbets before setting glass.

E. Install glazing points and compound.

3.6 WOOD WINDOW UNIT REPLACEMENT

A. General: Replace existing wood window frame units with new custom-fabricated units to match existing at locations indicated on Drawings and where damage is too extensive to repair.

B. Apply borate preservative treatment to accessible surfaces before finishing. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom.

C. Mill glazed members to accommodate glass thickness. Glaze units before installation.

D. Install units, hardware, weather stripping, accessories, and other components as indicated on Drawings.

E. Install units level, plumb, square, true to line, without distortion or impeding movement; anchored securely in place to structural support; and in proper relation to wall flashing, trim, and other adjacent construction.

F. Set sill members in bed of sealant for weathertight construction unless otherwise indicated.

G. Install window units with new anchors into existing openings.

H. Weather Stripping: Install full-perimeter and meeting rail weather stripping for each operable sash.

I. Metal Protection: Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

J. Disposal of Removed Units: Remove from Owner's property and legally dispose of them.

3.7 STORM WINDOW INSTALLATION

A. Reinstall salvaged aluminum storm windows at each window.

3.8 WEATHER STRIPPING INSTALLATION

A. Install weather stripping for tight seal of joints as demonstrated in samples submitted for verification and approval.

3.9 FIELD QUALITY CONTROL

A. Manufacturers Field Service: Engage wood-repair-material manufacturers' factory-authorized service representatives for consultation and Project-site inspection and to provide on-site assistance if requested by Architect.

3.10 ADJUSTING

A. Adjust existing and replacement operating sash, screens, hardware, weather stripping, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

3.11 CLEANING AND PROTECTION

A. Protect window surfaces from contact with contaminating substances resulting from construction operations. Monitor window surfaces adjacent to and below exterior concrete and masonry during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances contact window surfaces, remove contaminants immediately.

B. Clean exposed surfaces immediately after historic treatment of wood windows. Avoid damage to coatings and finishes. Remove excess sealants, glazing and patching materials, dirt, and other substances.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction.

END OF SECTION 08 03 52

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SECTION 09 03 20 - HISTORIC TREATMENT OF PLASTER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Repair and replacement of historic interior lime plaster and wood lath substrate.

B. Related Requirements:

1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.
2. Section 090391 "Historic Treatment of Plain Painting" for paint removal, surface preparation for refinishing, and refinishing of historic plaster surfaces.

C. The Prudence Crandall House is listed on the National Register of Historic Places and is a National Historic Landmark. All work for this renovation project shall be performed in compliance with the Secretary of the Interiors Standards for the Treatment of Historic Structures.
All work activities must be undertaken with sufficient care to protect this historic resource and must be supervised by personnel who are familiar with the Secretary of Interior's Standards for Restoration.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 01 20 00 "Contract Considerations."

1. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to historic treatment of plaster including, but not limited to, the following:

a. Verify historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Materials, material application, colors, patterns, and sequencing.
c. Fire-protection plan.
d. Plasterwork historic treatment program.

1.5 SEQUENCING AND SCHEDULING

A. Perform historic treatment of plaster in the following sequence, which includes work specified in this and other Sections:

1. Dismantle existing surface-mounted objects and hardware that overlie plaster surfaces except items indicated to remain in place. Tag items with location identification and protect.
2. Verify that temporary protections have been installed.
3. Examine condition of plaster surfaces.
4. Clean plaster surface and remove paint and other finishes to the extent required.
5. Repair and replace existing plaster and supports to the degree required for a uniform, tightly adhered surface on which to paint or apply other finishes.
6. Cure repaired surfaces and allow them to dry for proper finishing.
7. Paint and apply other finishes.
8. Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for product application and use.

B. Samples for Initial Selection: For each exposed product that will be exposed and not be painted or otherwise finished and for each color and texture specified.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified historic treatment specialist.

B. Plasterwork Historic Treatment Program: Submit before work begins.

1.8 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic treatment specialist, experienced in repairing, refinishing, and replacing historic material in whole and in part. Experience in fabricating and installing new work is not sufficient for this historic treatment work. Subject to compliance with requirements, historic specialty work shall be performed by a firm with a minimum of five (5) years successful experience with comparable restoration work including work on at least three (3) buildings listed on the National or State Registers under direction of SHPO, and employing personnel skilled in the restoration process and operations indicated, with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work. The qualifying historic treatment specialist shall be required to demonstrate its experience with names, dates, and locations of similar projects. This firm must designate a field supervisor, foreman, and tradesmen with commensurate experience for the duration of the work. Supervisors shall be on site when historic treatment begins and during its progress. Supervisors shall not be changed during Project except for causes beyond control of specialty firm. Should a supervisor be replaced, the new supervisor must demonstrate the requirements of the work by constructing new mock-ups. Resumes and experience must be approved by Owner prior to acceptance of bid. In the event of discrepancy, the more stringent requirements will govern.

B. Historic Plastering Specialist Qualifications: A qualified historic plastering specialist with expertise in matching and performing the types of historic plasterwork repairs required.

C. Plasterwork Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work and protection of surrounding materials and Project site.

1. Include methods and procedures to protect plastered surfaces from damage caused by construction operations, including, but not limited to, exposure to moisture, vibration, mechanical damage, and soiling.
2. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.

D. Mockups: Prepare mockups of historic treatment processes for each type of plaster repair and reconstruction work to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation.

1. Locate mockups on existing surfaces where directed by Architect.
2. Number and Size: Two wall surfaces of at least 20 sq. ft. or approximately 48 inches in least dimension to represent surfaces and conditions for application of each type of plaster repair and reconstruction under same conditions as the completed Work. Include at least the following:

a. Install 4-sq. ft. area of wet-applied plaster replacement.
b. Patch 10-sq. ft. area of wet-applied plaster replacement.
c. Repair 3 linear ft. of plaster cracks.
d. Reattach 4-sq. ft. area of delaminated plaster that has not fallen.

3. Simulate finished lighting conditions for review of mockups.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

B. Store materials on elevated platforms, under cover, and in a dry location with ambient temperatures continuously maintained at not less than 45 deg F.

C. Store hydrated lime and factory-prepared lime putty in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

D. Store materials not in use in tightly covered containers.

E. Store lime putty covered with water in sealed containers.

F. Store sand where grading and other required characteristics can be maintained and contamination avoided.

G. Handle cast-plaster fabrications to prevent overstressing, chipping, defacement, and other damage.

1.10 FIELD CONDITIONS

A. Comply with plaster-material manufacturers' written instructions.

B. Temperatures: Maintain temperatures in work areas at not less than 55 deg F or greater than 80 deg F for at least seven days before application of plaster, continuously during application, and for seven days after plaster has set or until plaster has dried.

C. Conditioning: Acclimatize cast-plaster fabrications to ambient temperature and humidity of spaces in which they are installed. Remove packaging and move units into installation spaces not less than 48 hours before installing them.

D. Field Measurements: Where cast-plaster fabrications are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

E. Avoid conditions that result in plaster drying out too quickly.

1. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
2. Maintain relative humidity levels for prevailing ambient temperature that produce normal drying conditions.
3. Ventilate work areas in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

PART 2 - PRODUCTS

2.1 LIME-PLASTER MATERIALS

A. Hydrated Lime: ASTM C206, Type N.

B. Lime Putty: Slaked hydrated lime or factory-prepared lime putty according to ASTM C1489.

C. Sand Aggregates: ASTM C897.

1. Finish-Coat Sand: Match size, texture, and gradation of existing sand as closely as possible. Blend several sands if necessary to achieve suitable match.

D. Fiber: 1/2 to 1 inch in length; composed of natural linen, cotton, hemp, or jute fiber or alkali-resistant glass or polypropylene fiber; free of grease, waxes, and oils; and beaten well to separate fibers before blending into unfibered plaster material.

1. Proportion of Fiber to Unfibered Plaster Material: 3.5 oz./cu. ft. of unfibered plaster material, adjusted as required to produce a well-fibered, cohesive, spreadable, stiff mix with fibers uniformly distributed.

E. Fabric Reinforcing: Coarse, open-weave, sackcloth made of natural linen, cotton, hemp, or jute; free of grease and oils or Coarse, open-weave, alkali-resistant fiberglass or polypropylene fabric, free of grease, waxes, and oils.

2.2 LATH

A. Wood Lath: 1/4 inch by 1-1/4 inch sound, straight-grained, wood strips

2.3 TRIM ACCESSORIES

A. General: According to ASTM C1063 for lime plaster; coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:

1. Cornerbeads: Fabricated from zinc or zinc-coated (galvanized) steel.

a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
b. Small nose cornerbead with perforated flanges; use on curved corners.
c. Small nose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing unit masonry corners.
d. Bull nose cornerbead, radius of 3/4 inch minimum, with expanded flanges; use at locations indicated on Drawings.

2. Casing Beads: Fabricated from zinc or zinc-coated (galvanized) steel; square-edged style; with expanded flanges.

2.4 MISCELLANEOUS MATERIALS

A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Fasteners for Attaching Lath to Substrates:

1. For Lime Plaster: ASTM C1063.
2. For Wood Lath: ASTM C841 requirements for wood-floor-runner or wood-furring fasteners unless otherwise indicated on Drawings.

C. Wire Ties: ASTM A641/A641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter, unless otherwise indicated.

D. Plaster-Stabilization Materials: Acrylic emulsion(s) and related installation products shall have proven effectiveness in reattaching delaminated plaster and shall have been used previously by historic treatment specialist with successful results.

1. Acrylic Emulsion(s), General: Aqueous emulsion(s) of acrylic polymer, adhesive to plaster and plaster substrates, nontoxic, and non-reemulsifiable after curing.
2. Prewet Solution: Low-viscosity acrylic emulsion.
3. Adhesive: Thickened acrylic emulsion; thickener as recommended in writing by resin manufacturer and historic treatment specialist.

E. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Little possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:

a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
b. Leave an unintended residue on surfaces.

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT OF PLASTER, GENERAL

A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from building interior at 5 feet away from surface.

B. General: In treating historic plaster, disturb it as minimally as possible and as follows unless otherwise indicated:

1. Dismantle loose, damaged, or deteriorated plaster, lath, and support systems that cannot be repaired.
2. Verify extent of plaster deterioration against that indicated on Drawings. Consult Architect on types and extent of required work.
3. Verify that substrate surface conditions are suitable for repairs.
4. Provide lath, furring, and support systems for plaster included in the work of this Section.
5. Replace lost details in new, wet-applied and cast plaster that replicate existing or indicated plaster configurations.
6. Leave repaired plasterwork in proper condition for painting or applying other finishes as indicated.
7. Install temporary protective measures to protect historic surfaces that shall be treated later.

C. Illumination: Perform plastering work with adequate, uniform illumination that does not distort the flatness or curvature of surfaces.

3.2 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate and environmental conditions, installation tolerances, and other conditions affecting performance of the Work.

1. If existing substrates cannot be prepared to an acceptable condition for plastering work, notify Architect in writing.
2. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.

B. Masonry Substrates: Verify that mortar joints are struck flush. Notify Architect of undocumented masonry substrate without flush joints. Proceed with plastering as directed by Architect.

C. Begin historic plastering work only after unsatisfactory conditions have been corrected.

3.3 PREPARATION FOR PLASTERING

A. Substrates: Prepare according to plaster manufacturer's written instructions and as follows:

1. Clean surfaces to remove dust, loose particles, grease, oil, incompatible curing compounds, form-release agents, and other foreign matter and deposits that could impair bond with plaster.
2. Remove ridges and protrusions greater than 1/8 inch and fill depressions greater than 1/4 inch with patching material. Allow to set and dry.

3.4 PLASTER REMOVAL AND REPLACEMENT, GENERAL

A. Dismantle plaster that is damaged or deteriorated to the limits indicated. Carefully dismantle areas along straight edges that lie over supports, without damaging surrounding plasterwork.

B. Maintain lath and supporting members in an undamaged condition so far as practicable. Dismantle damaged lath and supports that cannot be repaired or re-secured and replace with new work of same type.

C. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.

D. Do not deviate more than plus or minus 1/8 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed on surface.

E. Clean substrate surfaces to remove grease, waxes, oils, waterborne staining, debris, and other foreign matter and deposits that could impair bond with repair material.

F. Wet wood lath and masonry bases before plaster application. Keep substrate damp to the touch but without visible water droplets.

G. Wet remaining plaster abutting the replacement plaster before installing new plasterwork.

H. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.

I. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

3.5 FLAT LIME-PLASTER REMOVAL AND REPLACEMENT

A. General: Dismantle deteriorated plaster to existing sound plaster at locations indicated on Drawings, or as directed by Architect.

1. Inspect for lath deterioration. If any, replace lath.
2. Sand bonding surfaces of repair area, and clean the surface with a nonmetallic bristle brush.
3. Wet substrate to damp condition, but without visible water droplets, then install new plaster to original profiles.

B. Lime-Plaster Base Coats:

1. Scratch Coat: 1 part lime putty, 2-1/2 parts base-coat sand. Add fiber to mix and evenly distribute it without clumps just before spreading.
2. Brown Coat: 1 part lime putty, 3 parts base-coat sand.

C. Lime-Plaster Finish Coats:

1. Finish-Coat Mix for Smooth-Troweled Finish: As required to match finish of design reference sample.

D. Lime-Plaster Finishes: Match finish(es) of design reference sample(s).

1. Provide smooth-troweled finish unless otherwise indicated.
2. thick.

E. Hairline cracking within the plaster or plaster separation at edge of a replacement is unacceptable. Completely dismantle such work and reinstall or repair as a crack repair.

3.6 REMOVING AND INSTALLING LATH AND ACCESSORIES

A. General: Dismantle existing plaster as necessary to expose deteriorated or rusted lath, wire ties, and support system, back to firm substrates and supports. Repair with new materials, well secured to existing lath in good condition and to building structure.

1. Cutting: Cut lath so it can be taken out completely from one support to the next. Cut to avoid cracking surrounding plaster.
2. Cut out existing base-coat plaster beyond the edges of the new lath to permit new plaster to extend onto the old lath. Then step subsequent plaster coats to permit new plaster to extend over the old material.
3. Fasten new lath to support system and to good existing lath. Wire tie at least every 6 inches.
4. Install new lath according to ASTM C1063 for lime plaster.

B. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.

C. Wood Lath: Install wood lath in same orientation and spacing as remaining wood lath and with lath ends supported by furring or framing. Stagger ends of adjacent laths over different supports, not aligned, and secure with fasteners at each end and spaced a maximum of 24 inches o.c. into supports.

3.7 PATCH-TYPE REPAIR

A. General: Patch voids, fractured surfaces, and crushed areas in otherwise sound plaster that are larger than cracks at locations indicated on Drawings or as directed by Architect.

1. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
2. Inspect for deterioration of supporting plaster and lath, and repair or replace deteriorated material as required for a sound substrate.
3. Rake perimeter of hole to sound plaster, and slightly undercut existing plaster to enable replacement plaster to tuck behind existing plaster.
4. Replace missing lath in kind. Bridge gaps in wood lath with expanded-metal lath, overlapping wood by 6 inches and fastening them together.
5. Clean hole to remove loose materials and other foreign matter and deposits that could impair bond with repair material. Where grease, waxes, oils, waterborne staining, or other foreign matter and deposits that could impair bond with repair material have penetrated into the plaster, enlarge the hole to remove these deposits.
6. Wet substrate to damp condition, but without visible water droplets, then install patch material to original profiles.
7. Maintain adjacent plasterwork in an undamaged condition so far as practicable.

B. Lime-Plaster Mix: 3 parts lime putty, 1 part gypsum neat plaster or gypsum gaging plaster.

C. Finishing: Finish flat surfaces flush and with same texture as adjacent existing plaster. For molded plaster shapes, tool surface to restore the sharp edges and the shape of the molded shape to original contours.

D. Hairline cracking within the plaster or plaster separation at edge of a patch is unacceptable. Completely dismantle such work and reinstall or repair.

3.8 HAIRLINE CRACK REPAIR

A. General: Repair cracks 1/32 inch in width or narrower in otherwise sound plaster at locations indicated on Drawings, or as directed by Architect.

1. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
2. Maintain adjacent plasterwork in an undamaged condition so far as practicable.

B. Existing Topcoat: Open crack in existing topcoat to at least 1/8 inch in width and check for broken fiber reinforcement in base coats.

C. Existing Base Coats: Do not open crack wider in existing base coats unless inspection or other indication shows that the fiber reinforcement has broken. Where inspections indicate failure of fiber reinforcement, proceed as for a large crack repair, but only for length of crack with broken fiber reinforcement.

D. Clean out crack to remove loose materials and other foreign matter and deposits that could impair bond with repair material. Where grease, waxes, oils, waterborne staining, or other foreign matter and deposits that could impair bond with repair material have penetrated into the topcoat plaster, widen the crack and sand surface of the exposed basecoat to remove these deposits.

E. Wet substrate to damp condition, but without visible water droplets.

F. Force finish-coat plaster without aggregate into crack, filling crack to original plaster profile.

G. Finishing: Finish flat surfaces flush and with same texture as adjacent existing plaster. For molded plaster shapes, tool surface to restore the sharp edges and the shape of the molded shape to original contours.

3.9 LARGE CRACK REPAIR

A. General: Repair cracks over 1/32 inch in width in otherwise sound plaster at locations indicated on Drawings, or as directed by Architect.

1. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
2. Maintain adjacent plasterwork in an undamaged condition so far as practicable.

B. Open crack to at least 1/8 inch in width and full depth with V-groove tool, and check for bond separation or lath deterioration.

C. Abrade side surfaces of crack and remove inner crack debris by gouging (keying) the inside area of the crack.

D. Clean out crack to remove loose materials and other foreign matter and deposits that could impair bond with repair material. Where grease, waxes, oils, waterborne staining, or other foreign matter and deposits that could impair bond with repair material have penetrated into the plaster, widen the crack to remove these deposits.

E. Wet substrate to damp condition, but without visible water droplets.

F. Install finish-coat plaster to fill crack to original plaster profile.

G. Finishing: Finish flat surfaces flush and with same texture as adjacent existing plaster. For molded plaster shapes, tool surface to restore the sharp edges and the shape of the molded shape to original contours.

H. Offset Cracks: If the crack is offset in surface plane by more than 1/8 inch, dismantle the plaster on each side of the crack, a minimum width of 6 inches and down to the lath or other substrate. Then, repair as specified for flat-plaster removal and replacement.

3.10 REATTACHMENT OF DELAMINATED PLASTER

A. General: Reattach plaster that has detached from its wooden lath at locations indicated on Drawings, or as directed by Architect.

1. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
2. Maintain adjacent plasterwork in an undamaged condition so far as practicable.

B. Verify extent of detachment of plaster that has not yet fallen by tapping on plaster surface and evaluating the hollow or solid resonance.

C. Protect floors from spillage and debris in the vicinity of work. Use materials resistant to the passage of fluids used in work.

D. Drill 1/4-inch injection ports (holes) through the plaster spaced 3 to 6 inches apart over surface of detached plaster. Dislodge loose plaster particles, and vacuum debris from holes.

E. Prewet injection ports, gaps at edges of lost plaster, back of plaster, and wooden lath with prewet solution.

F. Inject adhesive into ports, enough to fill gaps between detached plaster and lath, and inject into gaps at edges of lost plaster.

G. Clean off excess and smeared adhesive while wet.

H. Apply temporary battens over surface of treated plaster to prevent further separation during repair work. Secure battens in place against plaster with screws through the battens and plaster and into the wood lath or braces supported from floor below.

I. Maintain temporary battens in place for a week or more, allowing adhesive to coalesce and dry.

J. Remove battens, patch holes and missing plaster, and repair cracks.

3.11 INSTALLATION TOLERANCES

A. Completed plaster installation shall not deviate from a true plane by more than 1/8 inch as measured by a 5-foot straightedge placed at any location on a surface, except where existing plaster is retained as a substrate for new plasterwork.

3.12 CLEANING AND PROTECTION

A. Protect work of other trades against damage. Promptly remove plaster from surfaces not indicated to be repaired or plastered. Do not scratch or damage finished surfaces.

B. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

C. Correct damage to other historic surfaces and to new work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. Remove temporary protection and enclosure of other work.

END OF SECTION 090320

SECTION 09 03 91 - HISTORIC TREATMENT OF PLAIN PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes historic treatment of plain painting as follows:

1. Removing existing paint in compliance with Section 02 83 13 “Lead Paint Activity”.
2. Repairing substrates.
3. Plain painting of historic surfaces.

B. Related Requirements:

1. Section 01 35 91 "Historic Treatment Procedures" for general historic treatment requirements.
2. Section 02 82 13 “Asbestos Abatement” for work relating to windows.
3. Section 02 83 13 “Lead Paint Activity” for preparation of surfaces.

C. The Prudence Crandall House is listed on the National Register of Historic Places and is a National Historic Landmark. All work for this renovation project shall be performed in compliance with the Secretary of the Interiors Standards for the Treatment of Historic Structures.
All work activities must be undertaken with sufficient care to protect this historic resource and must be supervised by personnel who are familiar with the Secretary of Interior’s Standards for Restoration.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 01 20 00 "Contract Considerations."

1. Unit prices apply to authorized additions to and deletions from Work as authorized by Change Orders.

1.4 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

H. Historic Paint Materials: Paint materials manufactured to match historic paint formulations; either custom-formulated products or standard products of manufacturers of historic paint materials.

I. Modern Paint Materials: Paint materials not designed to match historic paint formulations but that may be required to match historic paint colors.

J. Plain Painting: For historic treatment, this means painting that requires attention to historic treatment requirements, but no special, decorative or artistic painting skill.

K. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

L. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of painting.
2. Review methods and procedures related to historic treatment of painting including, but not limited to, the following:

    a. Verify historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
    b. Materials, material application, colors, patterns, and sequencing.
    c. Fire-protection plan.
    d. Plain painting historic treatment program.
    e. Coordination with building occupants.

1.6 SEQUENCING AND SCHEDULING

A. Perform historic treatment of painting in the following sequence, which includes work specified in this and other Sections:

1. Dismantle existing surface-mounted objects and hardware except items indicated to remain in place. Tag items with location identification and protect.
2. Verify that temporary protections have been installed.
3. Examine condition of surfaces to be painted.
4. Remove existing paint to the degree required for each substrate and surface condition of existing paint.
5. Apply paint system.
6. Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.

B. Samples: For each type of paint system and each pattern, color, and gloss; in sizes indicated below.

1. Include stepped Samples defining each separate coat, including fillers and primers. Resubmit until each required sheen, color, and texture is achieved.
2. For each painted color being matched to a standardized color-coding system, include the color chips from the color-coding-system company with Samples.
3. Include a list of materials for each coat of each Sample.
4. Label each Sample for location and application.
5. Sample Size:

    a. Plain Painted Surfaces: 4-by-8-inch Samples for each color and material, on hardboard.

C. Product List: For each paint product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current MPI's "MPI Approved Products List" for each MPI-product category specified in paint systems, with the proposed product highlighted.
3. VOC content.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For historic treatment specialist(s) and paint-remover manufacturer.

B. Plain Painting Historic Treatment Program: Submit before work begins.

C. Preconstruction Test Reports: For cleaning materials, paint removers and paint coatings and systems.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra paint materials, from the same production run, that match products applied and that are packaged with protective covering for storage and identified with labels describing contents, including material, finish, source, and location on building.

1. Quantity: Furnish Owner with an additional 5 percent, but not less than 1 gal. or one case, as appropriate, of each material and color applied.

1.10 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic treatment specialist, experienced in repairing, refinishing, and replacing historic material in whole and in part. Experience in fabricating and installing new work is not sufficient for this historic treatment work. Subject to compliance with requirements, historic specialty work shall be performed by a firm with a minimum of five (5) years successful experience with comparable restoration work including work on at least three (3) buildings listed on the National or State Registers under direction of SHPO, and employing personnel skilled in the restoration process and operations indicated, with a record of successful in-service performance that demonstrates the firm’s qualifications to perform this work. The qualifying historic treatment specialist shall be required to demonstrate its experience with names, dates, and locations of similar projects. This firm must designate a field supervisor, foreman, and tradesmen with commensurate experience for the duration of the work. Supervisors shall be on site when historic treatment begins and during its progress. Supervisors shall not be changed during Project except for causes beyond control of specialty firm. Should a supervisor be replaced, the new supervisor must demonstrate the requirements of the work by constructing new mock-ups. Resumes and experience must be approved by Owner prior to acceptance of bid. In the event of discrepancy, the more stringent requirements will govern

B. Historic Painting Specialist Qualifications: A qualified historic painting specialist with expertise in matching and touching up existing painting. Experience only in new painting work is insufficient experience for historic treatment work.

C. Paint-Remover Manufacturer Qualifications: A firm regularly engaged in producing paint removers that have been used for similar historic painting applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

D. Plain Painting Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including protection of surrounding materials and Project site and control of runoff during cleaning, paint removal, repainting, and other processes.

1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.

E. Mockups: Prepare mockups of historic treatment processes for each type of coating system and substrate indicated and each color and finish required to demonstrate aesthetic effects and to set quality standards for materials and execution. Duplicate appearance of approved Sample submittals.

1. Locate mockups on existing surfaces where directed by Architect.
2. Surface-Preparation Mockups: On existing surfaces using applicable specified methods of cleaning and other surface preparation, provide mockup sample of at least 100 sq. ft..
3. Coating Mockups: Two wall surfaces of at least 100 sq. ft. to represent surfaces and conditions for application of each type of coating system under same conditions as the completed Work.

    a. Plain painted surfaces.
    b. Stained or natural wood.

4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.11 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified historic treatment specialist to perform preconstruction testing of cleaning materials, paint removers and compatibility of paint coatings and systems for each type of historic painted surface.

1. Use test areas as indicated and representative of proposed materials and existing construction.
2. Propose changes to materials and methods to suit Project.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste daily.

1.13 FIELD CONDITIONS

A. Weather Limitations: Proceed with historic treatment of painting only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.

B. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

C. Do not apply paint in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer for surface preparation and during paint application and drying periods.

D. Concealed and undocumented historic items, murals, and similar objects encountered during historic treatment remain Owner's property. Carefully protect each item or object.

1. Coordinate with Owner's historical adviser, who will establish special procedures for protection.

PART 2 - PRODUCTS

2.1 PREPARATORY CLEANING MATERIALS

A. Water: Potable.

B. Hot Water: Water heated to a temperature of 140 to 160 deg F.

C. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for every 5 gal. of solution required.

D. Mildewcide: Commercial proprietary mildewcide or a job-mixed solution prepared by mixing 1/3 cup of household detergent that contains no ammonia, 1 quart of 5 percent sodium hypochlorite bleach, and 3 quarts of warm water.

E. Abrasives for Ferrous Metal Cleaning: Aluminum oxide paper, emery paper, fine steel wool, steel scrapers, and steel-wire brushes of various sizes.

F. Rust Remover: Manufacturer's standard phosphoric acid-based gel formulation, also called "naval jelly," for removing corrosion from iron and steel.

2.2 PAINT REMOVERS

A. Alkaline Paste Paint Remover: Manufacturer's standard alkaline paste or gel formulation for removing paint from masonry, stone, wood, plaster, or metal as required to suit Project; and containing no methylene chloride.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
b. EaCo Chem, Inc.
c. PROSOCO, Inc.

B. Covered or Skin-Forming Alkaline Paint Remover: Manufacturer's standard covered or skin-forming alkaline paste or gel formulation for removing paint from masonry, stone, wood, plaster, or metal as required to suit Project; and containing no methylene chloride.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. American Building Restoration Products, Inc.
b. Dumond Chemicals, Inc.

C. Low-Odor, Solvent-Type Paste Paint Remover: Manufacturer's standard low-odor, water-rinsable, solvent-type paste, gel, or foamed emulsion formulation for removing paint from masonry, stone, wood, plaster, or metal as required to suit Project; and containing no methanol or methylene chloride.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cathedral Stone Products, Inc.
b. EaCo Chem, Inc.
c. PROSOCO, Inc.

D. Covered, Solvent-Type Paste Paint Remover: Manufacturer's standard, low-odor, covered, water-rinsable, solvent-type paste or gel formulation for removing paint from masonry, stone, wood, plaster, or metal as required to suit Project; and containing no methanol or methylene chloride.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Dumond Chemicals, Inc.
b. PROSOCO, Inc.
c. American Building Restoration Products, Inc.

2.3 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As determined by museum personnel and state agency.

2.4 MODERN PAINT MATERIALS, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Transition Coat: Paint manufacturer's recommended coating for use where a residual existing coating is incompatible with the paint system.

2.5 MODERN PAINT MATERIAL MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Benjamin Moore & Co.
2. Sherwin Williams Paint
3. ICC Dulux

2.6 MODERN PAINT MATERIALS

A. Interior:

1. Primer Sealer: Latex
2. Finish: Two-coats, Latex.

B. Exterior:

1. Primer Sealer:
   a. Bare Wood: Oil-based primer
   b. Previously painted wood: Latex Primer
2. Finish: Two coats, Latex.

2.7 PATCHING MATERIALS

A. Wood-Patching Compound: Two-part, epoxy-resin, wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated due to weathering and decay. Compound shall be capable of filling deep holes and spreading to feather edge.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Abatron, Inc.
   b. ConServ Epoxy LLC.
   c. System Three Resins, Inc.

PART 3 - EXECUTION

3.1 PROTECTION

A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist chemical solutions being used unless the solutions will not damage adjacent surfaces. Use protective materials that are UV resistant and waterproof. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
2. Do not apply chemical solutions during winds of sufficient force to spread them to unprotected surfaces.
3. Neutralize and collect alkaline and acid wastes before disposal.
4. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3.2 HISTORIC TREATMENT OF PAINTING, GENERAL

A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from building interior at 5 feet away from painted surface and from building exterior at 20 feet away from painted surface.

B. Execution of the Work: In treating historic items, disturb them as minimally as possible and as follows:

1. Remove failed coatings and corrosion and repaint.
2. Verify that substrate surface conditions are suitable for painting.
3. Allow other trades to repair items in place and retain as much original material as possible before repainting.
4. Reproduce original, historic paint systems where indicated or scheduled.
5. Install temporary protective measures to protect historic painted surfaces that shall be treated later.

C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and lightly hand sanding, that will not abrade softer substrates, reducing clarity of detail. Do not use abrasive methods such as rotary sanding, rotary wire brushing, or power tools except as indicated as part of the historic treatment program and as approved by Architect.

D. Heat Processes: Do not use torches, heat guns, or heat plates.

3.3 EXAMINATION

A. Examine substrates and conditions, with historic treatment specialist present, for compliance with requirements for maximum moisture content and other conditions affecting performance of painting work. Comply with paint manufacturer's written instructions for inspection.

B. Maximum Moisture Content of Substrates: Do not begin application of coatings unless moisture content of exposed surface is below the maximum value recommended in writing by paint manufacturer and not greater than the following maximum values when measured with an electronic moisture meter appropriate to the substrate material:

1. Wood: 15 percent.

C. Alkalinity: Do not begin application of coatings unless surface alkalinity is within range recommended in writing by paint manufacturer. Conduct alkali testing with litmus paper on exposed plaster, cementitious, and masonry surfaces.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

1. If existing surfaces cannot be prepared to an acceptable condition for proper finishing by using specified surface-preparation methods, notify Architect in writing.

E. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.4 PREPARATORY CLEANING

A. General: Use only the gentlest, appropriate method necessary to clean surfaces in preparation for painting. Clean all surfaces, corners, contours, and interstices.

B. Detergent Cleaning: Wash surfaces by hand using clean rags, sponges, and bristle brushes. Scrub surface with detergent solution and bristle brush until soil is thoroughly dislodged and can be removed by

rinsing. Use small brushes to remove soil from joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet. Rinse with water applied by clean rags or sponges.

C. Solvent Cleaning: Use solvent cleaning to remove oil, grease, smoke, tar, and asphalt from painted or unpainted surfaces before other preparation work. Wipe surfaces with solvent using clean rags and sponges. If necessary, spot-solvent cleaning may be employed just prior to commencement of paint application, provided enough time is allowed for complete evaporation. Use clean solvent and clean rags for the final wash to ensure that all foreign materials have been removed. Do not use solvents, including primer thinner and turpentine, that leave residue.

D. Mildew: Clean off existing mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. Rinse with water applied by clean rags or sponges.

3.5 PAINT REMOVAL

A. General: Remove paint where indicated. Where cleaning methods have been attempted and further removal of the paint is required because of incompatible or unsatisfactory surfaces for repainting, remove paint to extent required by conditions.

1. Application: Apply paint removers according to paint-remover manufacturer's written instructions. Do not allow paint removers to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.

    a. Apply materials to all surfaces, corners, contours, and interstices, to provide a uniform final appearance without streaks.
    b. After work is complete, remove protection no longer required. Remove tape and adhesive marks.

2. Brushes: Use brushes that are resistant to chemicals being used.

    a. Metal Substrates: If using wire brushes on metal , use brushes of same metal composition as metal being treated.
    b. Wood Substrates: Do not use wire brushes.

3. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that spray methods do not damage surfaces.

    a. Equip units with pressure gages.
    b. Unless otherwise indicated, hold spray nozzle at least 6 inches from surface and apply material in horizontal, back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.
    c. For chemical spray application, use low-pressure tank or chemical pump suitable for chemical indicated, equipped with nozzle having a cone-shaped spray.
    d. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
    e. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.

B. Paint Removal with Hand Tools: Remove paint manually using hand-held scrapers, wire brushes, sandpaper, and metallic wool as appropriate for the substrate material. Do not use other methods except as indicated as part of the historic treatment program and as approved by Architect.

C. Paint Removal with Alkaline Paste Paint Remover:

1. Remove loose and peeling paint using water, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply paint remover to dry, painted surface with brushes.
3. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and paint residue.
5. Use mechanical methods recommended in writing by manufacturer to remove chemicals and paint residue.
6. Repeat process if necessary to remove all paint.

D. Paint Removal with Covered or Skin-Forming Alkaline Paint Remover:

1. Remove loose and peeling paint using water, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply paint remover to dry, painted surface with brushes or as recommended in writing by manufacturer.
3. Apply cover according to manufacturer's written instructions.
4. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
5. Scrape off paint and remover.
6. Rinse with cold water applied by low-pressure spray to remove chemicals and paint residue.
7. Use mechanical methods recommended in writing by manufacturer to remove chemicals and paint residue.
8. For spots of remaining paint, apply alkaline paste paint remover according to "Paint Removal with Alkaline Paste Paint Remover" Paragraph.

E. Paint Removal with Solvent-Type Paste Paint Remover:

1. Remove loose and peeling paint using water, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply thick coating of paint remover to dry, painted surface with natural-fiber cleaning brush, deep-nap roller, or large paintbrush. Apply in one or two coats according to manufacturer's written instructions.
3. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and paint residue.
5. Use mechanical methods recommended in writing by manufacturer to remove chemicals and paint residue.
6. Repeat process if necessary to remove all paint.

F. Paint Removal with Covered, Solvent-Type Paste Paint Remover:

1. Remove loose and peeling paint using water, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply paint remover to dry, painted surface with natural-fiber cleaning brush, deep-nap roller, or large paint brush or as recommended in writing by manufacturer.
3. Apply cover according to manufacturer's written instructions.
4. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
5. Scrape off paint and remover.
6. Rinse with cold water applied by low-pressure spray to remove chemicals and paint residue.
7. Use mechanical methods recommended in writing by manufacturer to remove remaining chemicals and paint residue.

3.6 SUBSTRATE REPAIR

A. General: Repair substrate surface defects that are inconsistent with the surface appearance of adjacent materials and finishes.

B. Wood Substrate:

1. Repair wood defects including dents and gouges more than 1/8 inch in size and all holes and cracks by filling with wood-patching compound and sanding smooth. Reset or remove protruding fasteners.
2. Where existing paint is allowed to remain, sand irregular buildup of paint, runs, and sags to achieve a uniformly smooth surface.

3.7 PAINT APPLICATION, GENERAL

A. Comply with manufacturers' written instructions for application methods unless otherwise indicated in this Section.

B. Prepare surfaces to be painted according to the Surface-Preparation Schedule and with manufacturer's written instructions for each substrate condition.

C. Apply a transition coat over incompatible existing coatings.

D. Blending Plain Painted Surfaces: When painting new substrates patched into existing surfaces or touching up missing or damaged finishes, apply coating system specified for the specific substrate. Apply final finish coat over entire surface from edge to edge and corner to corner.

3.8 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage paint-remover manufacturer's factory-authorized service representative for consultation and Project-site inspection, and provide on-site assistance when requested by Architect.

B. Paint Material Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for composition and dry film thickness.

1. Paint Composition: The following procedure may be performed at any time and as often as Owner deems necessary during the period when paints are being applied:

a. Testing agency will sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
b. Testing agency will perform tests for compliance of paint materials with product requirements.
c. If test results show materials being used do not comply with product requirements, Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

2. Dry Film Thickness:

a. Contractor shall touch up and restore painted surfaces damaged by testing.
b. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written instructions, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written instructions.

3.9 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.10 SURFACE-PREPARATION SCHEDULE

A. General: Before painting, prepare surfaces for painting according to applicable requirements specified in this schedule.

1. Examine surfaces to evaluate each surface condition according to paragraphs below.
2. Where existing degree of soiling prevents examination, preclean surface and allow it to dry before making an evaluation.
3. Repair substrate defects according to "Substrate Repair" Article.

END OF SECTION 090391

SECTION 10 14 26 – POST AND PANEL/PYLON SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.1.1 SUMMARY

A. This Section includes the following:

1. Sign Face Sheet Aluminum – Bright Wide Angle Reflective Sheeting
2. Sign Face Sheet Aluminum – Type I Reflective Sheeting
3. Sign Face Sheet Aluminum – Type III Reflective Sheeting

B. Related Sections include the following:

1. Division 3, Section 03 30 53 " Miscellaneous Cast-In-Place Concrete."

C. If there any discrepancies found between these specifications and related drawings and details, the most restrictive requirement and/or material/part shall be applied by the Contractor without compensation.

1.2 REFERENCES

A. State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, including current supplemental and the Town of Canterbury Transportation Department details and requirements.

B. Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD).

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sign Face Sheet Aluminum – Bright Wide Angle Reflective Sheeting shall conform to the requirements of Section 12.08 and Article M.18.09, M.18.13, M.18.14 and M.18.15 of the State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, including current supplement, the Town of Canterbury Transportation Department details and requirements, and the notes and details included on the plans.

B. Sign Face Sheet Aluminum – Type I Reflective Sheeting shall conform to the requirements of Section 12.08 and Article M.18.09, M.18.13, M.18.14 and M.18.15 of the State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, including current supplement, the Town of Canterbury Transportation Department details and requirements, and the notes and details included on the plans.

C. Sign Face Sheet Aluminum – Type III Reflective Sheeting shall conform to the requirements of Section 12.08 and Article M.18.09, M.18.13, M.18.14 and M.18.15 of the State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817,

including current supplement, the Town of Canterbury Transportation Department details and requirements, and the notes and details included on the plans.

D. Sign mounting shall be the U-channel, V-Lock socket systems, and as indicated on construction documents details sheets.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All work shall be in accordance with the Section 12.08.03 of the State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, the Town of Canterbury Department of Traffic and Parking, including current supplement and details, and the notes and details included on the plans.

3.2 AS-BUILT

1. Provide an as built of all of the signs installed and the type consistent with the design descriptions.

END OF SECTION 10 14 26

SECTION 22 07 19 – PLUMBING PIPING INSULATION

1.1 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic hot-water piping.
2. Supplies and drains for handicap-accessible lavatories and sinks.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Indoor Piping Insulation Schedule," articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

D. Mineral-Fiber, Preformed Pipe Insulation:

1. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.

2.3 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.4 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers,:

1. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Keep insulation materials dry during application and finishing.

F. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

G. Install insulation with least number of joints practical.

H. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

I. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

J. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

N. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.3 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

3.4 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.6 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Underground piping.
2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.7 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot Water: Insulation shall be the following:

1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Domestic Cold Water: Insulation shall be the following:

1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

C. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities: Insulation shall be the following:

1. Protective Shielding Guards

D.

END OF SECTION 22 07 19

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SECTION 22 11 16 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.3 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

C. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.

2.3 PIPING JOINING MATERIALS

A. Copper, Brass, or Bronze Pressure-Seal-Joint Fittings:

1. Fittings: Cast-brass, cast-bronze, or wrought-copper with EPDM O-ring seal in each end. Sizes NPS 2-1/2and larger with stainless steel grip ring and EPDM O-ring seal.
2. Minimum 200-psig working-pressure rating at 250 deg F.

3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Apollo Flow Controls; Conbraco Industries, Inc.
   b. Elkhart Products Corporation.
   c. Mueller Industries, Inc.
   d. NIBCO INC.
   e. Viega LLC.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install shutoff valve immediately upstream of each dielectric fitting.

D. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

G. Install piping to permit valve servicing.

H. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
3. Vertical Piping: MSS Type 8 or 42, clamps.
4. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
6. Base of Vertical Piping: MSS Type 52, spring hangers.

E. Install hangers for copper piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

F. Support horizontal piping within 12 inches of each fitting.

G. Support vertical runs of copper piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.3 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

    a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
    b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

        1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
        2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

    c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
    d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

   a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
   b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
   c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
   e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
   f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

   a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
   b. Fill and isolate system according to either of the following:

      1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

   c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
   d. Repeat procedures if biological examination shows contamination.
   e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.6 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:

1. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.

END OF SECTION

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SECTION 22 13 16 - SANITARY WASTE, AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Condensate drainage pipe and fittings: ABS

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

B. Field quality-control reports.

1.4 WARRANTY

A. Listed manufacturers to provide labeling and warranty of their respective products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

2.2 PIPING MATERIALS

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

2.4 ABS PIPE AND FITTINGS

A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

B. Solid-Wall ABS Pipe: ASTM D 2661, Schedule 40.

C. Cellular-Core ABS Pipe: ASTM F 628, Schedule 40.

D. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.

E. Solvent Cement: ASTM D 2235.

2.5 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. Shielded, Nonpressure Transition Couplings:

   a. Standard: ASTM C 1460.
   b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
   c. End Connections: Same size as and compatible with pipes to be joined.

B. Check valves: As recommended and supplied by condensate pump manufacturer used on this project.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.

1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.

    a. Straight tees, elbows, and crosses may be used on vent lines.

3. Do not change direction of flow more than 90 degrees.
4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

    a. Reducing size of waste piping in direction of flow is prohibited.

K. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Waste Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

L. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

N. Install sleeves for piping penetrations of walls, ceilings, and floors.

3.2 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.

3.3 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Waste Drainage Piping: Shielded, nonpressure transition couplings.

3.4 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for pipe hanger and support devices and installation specified:

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
3. Vertical Piping: MSS Type 8 or Type 42, clamps.
4. Install individual, straight, horizontal piping runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

5. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install hangers for cast-iron soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

D. Install hangers for PVC piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Equipment: Connect waste piping as indicated.

    a. Provide shutoff valve if indicated and union for each connection.
    b. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

F. Make connections to condensate pumps provided by mechanical contractor.

3.6 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

    a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.

    a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
    b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
    c. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.

    a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
    b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
    c. Air pressure must remain constant without introducing additional air throughout period of inspection.
    d. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.7 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Repair damage to adjacent materials caused by waste and vent piping installation.

3.8 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil, sanitary, condensate and waste piping NPS 4 and smaller shall match adjacent piping in regards to both material and size, and be any of the following:

1. Cellular-core ABS pipe, ABS socket fittings, and solvent-cemented joints.
2. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

1. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION

SECTION 22 41 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Faucets.
2. Lavatories.
3. Water closets.
4. Toilet seats.
5. Supply fittings.
6. Waste fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 LAVATORIES

A. Lavatories, LAV-1: Rectangular, vitreous china, counter mounted.

1. Vitreous-China Lavatories:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) American Standard.

2) Gerber Plumbing Fixtures LLC.
3) Kohler Co.
4) Sloan Valve Company.

2. Fixture:

a. Standards: ASME A112.19.2/CSA B45.1 for vitreous-china lavatories, and ICC/ANSI A117.1 for ADA.
b. Type: Flat-rim with ledge.
c. Rectangular Nominal Size: 19 by 16 inches.
d. Faucet-Hole Punching: Three holes, 2-inch centers.
e. Faucet-Hole Location: Rim.
f. Color: White.

B. Faucets: Single-control mixing valve.

1. General-Duty, Copper- or Brass-Underbody Faucets:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) American Standard.
2) Delta Faucet Company.
3) Moen Incorporated.

b. Standard: ASME A112.18.1/CSA B125.1, and ICC/ANSI A117.1 for ADA.

2. General: coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
3. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
4. Finish: Polished chrome plate.
5. Maximum Flow Rate: 0.5 gpm.
6. Centers: 4 inches.
7. Mounting: Deck, exposed.
8. Valve Handle(s): Lever.
9. Inlet(s): NPS 3/8 tubing, with NPS 1/2 male adaptor.
10. Spout: Rigid.
11. Spout Outlet: Spray.
12. Operation: Compression, manual.
13. Drain: Grid.
14. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
15. Waste Fittings: Comply with requirements in "Waste Fittings" Article.

2.2 WATER CLOSETS

A. Water Closets WC-1: Floor mounted, floor outlet, close coupled (gravity tank), vitreous china.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard.
b. Kohler Co.
c. Zurn Industries, LLC.

2. Bowl:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Bowl Type: Siphon jet.
c. Height: Height: Handicapped/elderly, complying with ICC/ANSI A117.1.
d. Rim Contour: Elongated.

e. Water Consumption: Water saving.
f. Color: White.
g. Handle: on right side of tank.

3. Toilet Seat:

a. Standard: IAPMO/ANSI Z124.5.
b. Material: Plastic.
c. Type: Commercial (Standard).
d. Shape: Elongated rim (Open front).
e. Configuration: Open front without cover.
f. Size: Elongated.
g. Hinge Type: Check.
h. Hinge Material: Plastic.
i. Seat Cover: Not required.
j. Color: White.

4. Supply Fittings:

a. Standard: ASME A112.18.1/CSA B125.1.
b. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
c. Stop: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.

1) Operation: Wheel handle Insert type.

d. Riser:

1) Size: NPS 3/8.
2) Material: Chrome-plated, soft-copper flexible tube riser.

2.3 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Lavatory Supply Fittings:

1. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
2. Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.

a. Operation: Wheel handle Insert type.

3. Risers:

a. Size: NPS 3/8 for lavatories.
b. Size: NPS 3/8 for kitchen sinks.
c. Material: Chrome-plated, soft-copper flexible tube riser.

2.4 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 offset tailpiece for accessible lavatories.

C. Drain: Grid type with NPS 1-1/2 offset tailpiece for accessible kitchen sinks.

D. Trap:

1. Size: NPS 1-1/2 by NPS 1-1/4 for lavatories.
2. Size: NPS 1-1/2 for kitchen sinks.
3. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated-brass or -steel wall flange.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install plumbing fixtures level and plumb according to roughing-in drawings.

B. Install floor-mounted water closets on closet flange attachments to drainage piping.

C. Install counter-mounting fixtures in and attached to casework.

D. Install pedestal lavatories on pedestals and secured to wood blocking in wall.

E. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

F. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

G. Install toilet seats on water closets.

H. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

I. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes unless otherwise indicated.

J. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings.

K. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

3.2 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks.

3.3 ADJUSTING

A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.4 CLEANING AND PROTECTION

A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.

B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed plumbing fixtures and fittings.

D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

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SECTION 23 01 30.52 - EXISTING HVAC AIR DISTRIBUTION SYSTEM CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cleaning existing HVAC air-distribution ducts, plenums, and system components.

1.2 DEFINITIONS

A. ACAC: American Council for Accredited Certification.

B. AIHA-LAP: American Industrial Hygiene Association Lab Accreditation Program

C. ASCS: Air systems cleaning specialist.

D. CESB: Council of Engineering and Scientific Specialty Boards.

E. CMI: Certified Microbial Investigator.

F. CMC: Certified Microbial Consultant.

G. CMR: Certified Microbial Remediator.

H. CMRS: Certified Microbial Remediation Supervisor.

I. EMLAP: Environmental Microbiology Laboratory Accreditation Program.

J. IEP: Indoor Environmental Professional.

K. IICRC: Institute of Inspection, Cleaning, and Restoration Certification.

L. NADCA: National Air Duct Cleaners Association.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. ASCS Qualifications: A certified member of NADCA

1. Certification: Employ an ASCS certified by NADCA on a full-time basis.
2. Supervisor Qualifications: Certified as an ASCS by NADCA.

B. IEP Qualifications: CMI who is certified by ACAC and accredited by CESB.

C. IEP Qualifications: CMC who is certified by ACAC and accredited by CESB.

D. CMR Qualifications: Certified by ACAC and accredited by CESB.

E. CMRS Qualifications: Certified by ACAC and accredited by CESB.

PART 2 - PRODUCTS

2.1 HVAC CLEANING AGENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Apex Engineering Products Corporation.
2. BBJ Environmental Solutions.
3. Goodway Technologies Corporation.

2.2 ANTIMICROBIAL SURFACE TREATMENT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bio-Cide International, Inc.
2. Contec, Inc.
3. Ecolab, Inc.

B. Description: Specific product selected shall be as recommended by the IEP based on the specific antimicrobial needs of the specific Project conditions.

1. Formulated to kill and inhibit growth of microorganisms.
2. EPA-registered for use in HVAC systems and for the specific application in which it will be used.
3. Have no residual action after drying, with zero VOC off-gassing.
4. OSHA compliant.
5. Treatment shall dry clear to allow continued visual observation of the treated surface.

PART 3 - EXECUTION

3.1 PREPARATION

A. Inspect HVAC air-distribution ducts, plenums, and system components to determine appropriate methods, tools, and equipment required for performance of the Work.

B. Cleaning Plan: Prepare a written plan for air-distribution system cleaning that includes strategies and step-by-step procedures.

C. Proceed with work only after conditions detrimental to performance of the Work have been corrected and cleaning plan has been approved.

D. Provide service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry and for inspection.

E. Mark the position of manual volume dampers and air-directional mechanical devices inside the system prior to cleaning.

3.2 CLEANING

A. Comply with NADCA ACR.

B. Remove non-adhered substances and deposits from within the HVAC system.

C. Systems and Components to Be Cleaned: All air-distribution equipment.

D. Collect debris removed during cleaning. Ensure that debris is not dispersed outside the HVAC system during the cleaning process.

1. Particulate Collection: For particulate collection equipment, include adequate filtration to contain debris removed. Locate equipment downwind and away from all air intakes and other points of entry into the building.
2. HEPA filtration with 99.97 percent collection efficiency for particles sized 0.3 micrometer or larger shall be used where the particulate collection equipment is exhausting inside the building,

E. Control odors and mist vapors during the cleaning and restoration process.

F. Mark the position of manual volume dampers and air-directional mechanical devices inside the system prior to cleaning. Restore them to their marked position on completion of cleaning.

G. System components shall be cleaned so that all HVAC system components are visibly clean. On completion, all components must be returned to those settings recorded just prior to cleaning operations.

H. Clean all air-distribution devices, registers, grilles, and diffusers.

I. Air-Distribution Systems:

1. Create service openings in the HVAC system as necessary to accommodate cleaning.
2. Mechanically clean air-distribution systems specified to remove all visible contaminants, so that the systems are capable of passing the HVAC System Cleanliness Tests (see NADCA ACR).

J. Debris removed from the HVAC system shall be disposed of according to applicable Federal, state, and local requirements.

K. Mechanical Cleaning Methodology:

1. Source-Removal Cleaning Methods: The HVAC system shall be cleaned using source-removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and to safely remove these contaminants from the facility. No cleaning method, or combination of methods, shall be used that could potentially damage components of the HVAC system or negatively alter the integrity of the system.

    a. Use continuously operating vacuum-collection devices to keep each section being cleaned under negative pressure.
    b. Cleaning methods that require mechanical agitation devices to dislodge debris that is adhered to interior surfaces of HVAC system components shall be equipped to safely remove these devices. Cleaning methods shall not damage the integrity of HVAC system components or damage porous surface materials, such as duct and plenum liners.

2. Cleaning Mineral-Fiber Insulation Components:

    a. Fibrous-glass thermal or acoustical insulation elements present in equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment while the HVAC system is under constant negative pressure and shall not be permitted to get wet according to NADCA ACR.

b. Cleaning methods used shall not cause damage to fibrous-glass components and will render the system capable of passing the HVAC System Cleanliness Tests (see NADCA ACR).
c. Fibrous materials that become wet shall be discarded and replaced.

L. Application of Antimicrobial Treatment:

1. Apply antimicrobial agents and coatings if active fungal growth is determined by the IEP to be at Condition 2 or Condition 3 status according to IICRC S520, as analyzed by a laboratory accredited by AIHA-LAP with an EMLAP certificate, and with results interpreted by an IEP. Apply antimicrobial agents and coatings according to manufacturer's written recommendations and EPA registration listing after the removal of surface deposits and debris.
2. Apply antimicrobial treatments and coatings after the system is rendered clean.
3. Apply antimicrobial agents and coatings directly onto surfaces of interior ductwork.
4. Microbial remediation shall be performed by a qualified CMR and CMRS.

3.3 CLEANLINESS VERIFICATION

A. Verify cleanliness according to NADCA ACR, "Verification of HVAC System Cleanliness" Section.

B. Surface-Cleaning Verification: Perform visual inspection for cleanliness. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.

C. Prepare a written cleanliness verification report.

3.4 RESTORATION

A. Restore and repair HVAC air-distribution ducts, plenums, and components according to NADCA ACR, "Restoration and Repair of Mechanical Systems" Section.

B. Restore service openings capable of future reopening. Comply with requirements in Section 23 31 13 "Metal Ducts."

C. Replace fibrous-glass materials that cannot be restored by cleaning or resurfacing. Comply with requirements in Section 23 31 13 "Metal Ducts".

D. Replace damaged insulation according to Section 23 07 13 "Duct Insulation."

E. Ensure that closures do not hinder or alter airflow.

F. New closure materials, including insulation, shall match opened materials and shall have removable closure panels fitted with gaskets and fasteners.

G. Restore manual volume dampers and air-directional mechanical devices inside the system to their marked position on completion of cleaning.

END OF SECTION

SECTION 23 05 19 - METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Liquid-in-glass thermometers.
2. Duct-thermometer mounting brackets.
3. Thermowells.
4. Dial-type pressure gages.
5. Gage attachments.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

A. Plastic-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. REOTEMP Instrument Corporation.
   b. WATTS.
   c. Weiss Instruments, Inc.

2. Standard: ASME B40.200.
3. Case: Plastic; 7-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass.
8. Stem: Aluminum, brass, or stainless steel and of length to suit installation.

   a. Design for Air-Duct Installation: With ventilated shroud.
   b. Design for Thermowell Installation: Bare stem.

9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.3 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion in piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CSA.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 DIAL-TYPE PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Ashcroft Inc.
   b. Blue Ribbon Corp.
   c. WATTS.

2. Standard: ASME B40.100.
3. Case: Liquid-filled type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Stainless steel.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Siphons: Loop-shaped section of stainless-steel pipe with NPS 1/4 or NPS 1/2 pipe threads.

C. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending a minimum of 2 inches into fluid to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install valve and snubber in piping for each pressure gage for fluids (except steam).

I. Install test plugs in piping tees.

J. Install permanent indicators on walls or brackets in accessible and readable positions.

K. Install connection fittings in accessible locations for attachment to portable indicators.

L. Install thermometers in the following locations:

1. Inlet and outlet of each hydronic zone.
2. Inlet and outlet of each hydronic boiler.
3. Inlet and outlet of each hydronic coil in air-handling units.
4. Two inlets and two outlets of each hydronic heat exchanger.
5. Outside-, return-, supply-, and mixed-air ducts.

M. Install pressure gages in the following locations:

1. Discharge of each pressure-reducing valve.
2. Inlet and outlet of each boiler, hot-water coil connection.
3. Suction and discharge of each pump.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow space for service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each hydronic zone shall be the following:

1. Industrial-style, liquid-in-glass type.

B. Thermometers at inlet and outlet of each hydronic boiler shall be the following:

1. Industrial-style, liquid-in-glass type.

C. Thermometers at inlet and outlet of each hydronic coil in air-handling units and built-up central systems shall be the following:

1. Industrial-style, liquid-in-glass type.

D. Thermometers at outside-, return-, supply-, and mixed-air ducts shall be the following:

1. Industrial-style, liquid-in-glass type.

E. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Heating, Hot-Water Piping: 0 to 250 deg F.

B. Scale Range for Air Ducts: 0 to 150 deg F 0 to 150 deg F and minus 20 to plus 70 deg C.

3.6 PRESSURE-GAGE SCHEDULE

A. Pressure gages at suction and discharge of each pump shall be one of the following:

1. Liquid-filled Open-front, pressure-relief, direct-mounted, metal case.
2. Sealed, direct-mounted, plastic case.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Heating, Hot-Water Piping: 0 to 100 psi.

END OF SECTION

SECTION 23 05 23.12 - BALL VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brass ball valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
3. ASME B16.18 for solder-joint connections.
4. ASME B31.1 for power piping valves.
5. ASME B31.9 for building services piping valves.

C. Refer to HVAC valve schedule articles for applications of valves.

D. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream piping unless otherwise indicated.

F. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
2. Handlever: For quarter-turn valves smaller than NPS 4.

G. Valves in Insulated Piping:

1. Include 2-inch stem extensions.
2. Extended operating handle of nonthermal-conductive material, and protective sleeves that allow operation of valves without breaking the vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRASS BALL VALVES

A. Brass Ball Valves, Two-Piece with Regular Port and Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Milwaukee Valve Company.
   b. NIBCO INC.
   c. WATTS.

2. Description:

   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig.
   c. CWP Rating: 600 psig.
   d. Body Design: Two piece.
   e. Body Material: Forged brass.
   f. Ends: Threaded.
   g. Seats: PTFE.
   h. Stem: Brass.
   i. Ball: Chrome-plated brass.
   j. Port: Regular.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified SWP classes or CWP ratings are unavailable, the same types of valves with higher SWP classes or CWP ratings may be substituted.

B. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option or press-end option is indicated in valve schedules below.
2. For Steel Piping, NPS 2 and Smaller: Threaded ends.

3.3 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller: Brass ball valves, two piece, with brass trim, and regular port.

END OF SECTION

SECTION 23 05 23.14 - CHECK VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bronze swing check valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.1 for power piping valves.
6. ASME B31.9 for building services piping valves.

C. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

D. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream piping unless otherwise indicated.

F. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE SWING CHECK VALVES

A. Bronze Swing Check Valves with Nonmetallic Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. NIBCO INC.
c. WATTS.

2. Description:

a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: PTFE.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install swing check valves for proper direction of flow in horizontal position with hinge pin level.

3.2 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Pump-Discharge Check Valves:

a. NPS 2 and Smaller: Bronze swing check valves with nonmetallic disc.

B. If valves with specified SWP classes or CWP ratings are unavailable, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules.

3.4 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze swing check valves with nonmetallic disc, Class 125.

END OF SECTION

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Equipment supports.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 23 05 16 "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
3. Section 23 05 48.13 "Vibration Controls for HVAC" for vibration isolation devices.
4. Section 23 31 13 "Metal Ducts" for duct hangers and supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated, or epoxy powder-coated.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

B. Copper Pipe and Tube Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-plated steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-plated steel.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. National Pipe Hanger Corporation.
2. Pipe Shields Inc.
3. Piping Technology & Products, Inc.

B. Insulation-Insert Material for Hot Piping: Water-repellent-treated, ASTM C 533, Type I calcium silicate with 100-psi ASTM C 552, Type II cellular glass with 100-psi or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psi minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hilti, Inc.

b. ITW Ramset/Red Head; Illinois Tool Works, Inc.
c. MKT Fastening, LLC.

B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. B-line, an Eaton business.
b. Empire Tool and Manufacturing Co., Inc.
c. Hilti, Inc.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MATERIALS

A. Aluminum: ASTM B 221.

B. Carbon Steel: ASTM A 1011/A 1011M.

C. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

D. Stainless Steel: ASTM A 240/A 240M.

E. Grout: ASTM C 1107/C 1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus **200 lb**.

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled strut systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 07 72 00 "Roof Accessories" for curbs.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structure.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

4. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1/2 inch.

3.6 PAINTING

A. Touchup: Clean abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

   1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780/A 780M.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use thermal-hanger shield inserts for insulated piping and tubing.

H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
6. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
7. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
10. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
11. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
12. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
13. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.

I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. C-Clamps (MSS Type 23): For structural shapes.
2. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.

b. Medium (MSS Type 32): 1500 lb.
c. Heavy (MSS Type 33): 3000 lb.

3. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
4. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

M. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.

N. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

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SECTION 23 05 48.13 - VIBRATION CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Open-spring isolators.
5. Housed-spring isolators.
6. Restrained-spring isolators.
7. Housed-restrained-spring isolators.
8. Pipe-riser resilient supports.
9. Resilient pipe guides.
10. Elastomeric hangers.
11. Spring hangers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Delegated-Design Submittal: For each vibration isolation device.

1. Include design calculations for selecting vibration isolators.

PART 2 - PRODUCTS

2.1 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads: .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CADDY; a brand of nVent.
b. Kinetics Noise Control, Inc.
c. Vibration Management Corp.

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties.
5. Surface Pattern: Smooth pattern.
6. Infused nonwoven cotton or synthetic fibers.
7. Load-bearing metal plates adhered to pads.

2.2 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts: .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ace Mountings Co., Inc.
    b. CADDY; a brand of nVent.
    c. California Dynamics Corporation.

2. Mounting Plates:

    a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
    b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

3. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.3 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators: .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. CADDY; a brand of nVent.
    b. Kinetics Noise Control, Inc.
    c. Vibration Isolation.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
7. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.4 PIPE-RISER RESILIENT SUPPORT

A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch-thick neoprene.

1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
2. Maximum Load Per Support: 500 psigon isolation material providing equal isolation in all directions.

2.5 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch-thick neoprene.

1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.6 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods: .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. CADDY; a brand of nVent.
   b. Kinetics Noise Control, Inc.
   c. Mason Industries, Inc.

2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.7 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression: .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. CADDY; a brand of nVent.
   b. Kinetics Noise Control, Inc.
   c. Mason Industries, Inc.

2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
8. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
9. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

PART 3 - EXECUTION

3.1 VIBRATION CONTROL DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points.

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

END OF SECTION

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SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Brady Corporation.
   b. Brimar Industries, Inc.
   c. Carlton Industries, LP.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
3. Letter Color: Black.
4. Background Color: White.
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Fasteners: Stainless-steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Carlton Industries, LP.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

C. Letter Color: White.

D. Background Color: Red.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

2.4 DUCT LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Carlton Industries, LP.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

C. Letter Color: Black.

D. Background Color: Yellow.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Condenser-Water Piping: Black letters on a safety-orange background.
2. Heating Water Piping: Black letters on a safety-orange background.
3. Refrigerant Piping: Black letters on a safety-white background.

3.4 DUCT LABEL INSTALLATION

A. Install plastic-laminated duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For cold-air supply ducts.
2. Yellow: For hot-air supply ducts.
3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.

B. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet Insert dimension in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. The project entails installing new air handlers on an existing air distribution system and modifying the existing hot water system. This Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems including

1) Air handlers
2) Diffusers and grilles.

2. Balancing Hydronic Piping Systems:

a. Constant-flow hydronic systems.
b. Variable-flow hydronic systems.

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

F. TDH: Total dynamic head.

1.3 ACTION SUBMITTALS

A. TAB Report: Documentation indicating that Work complies with ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

1.4 INFORMATIONAL SUBMITTALS

A. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

B. Certified TAB reports.

1.5 QUALITY ASSURANCE

A. TAB Specialists Qualifications: Certified by AABC.

1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
2. TAB Technician: Employee of the TAB specialist and certified by AABC as a TAB technician.

B. TAB Specialists Qualifications: Certified by NEBB or TABB.

1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB or TABB.
2. TAB Technician: Employee of the TAB specialist and certified by NEBB or TABB as a TAB technician.

C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

I. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.

J. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.

K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

L. Examine system pumps to ensure absence of entrained air in the suction piping.

M. Examine operating safety interlocks and controls on HVAC equipment.

N. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures for balancing the systems.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:

   a. Duct systems are complete with terminals installed.
   b. Volume, smoke, and fire dampers are open and functional.
   c. Clean filters are installed.
   d. Fans are operating, free of vibration, and rotating in correct direction.
   e. Variable-frequency controllers' startup is complete and safeties are verified.
   f. Automatic temperature-control systems are operational.
   g. Suitable access to balancing devices and equipment is provided.

2. Hydronics:

   a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
   b. Piping is complete with terminals installed.
   c. Systems are flushed, filled, and air purged.
   d. Strainers are pulled and cleaned.
   e. Control valves are functioning per the sequence of operation.
   f. Shutoff and balance valves have been verified to be 100 percent open.
   g. Pumps are started and proper rotation is verified.
   h. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
   i. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 23 33 00 "Air Duct Accessories."

3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 07 13 "Duct Insulation," Section 23 07 16 "HVAC Equipment Insulation," and Section 23 07 19 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Section 23 31 13 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
    c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
    d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

2. Measure fan static pressures as follows:

    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.
    c. Measure static pressure across each component that makes up the air-handling system.

d. Report artificial loading of filters at the time static pressures are measured.

3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Obtain approval from commissioning authority for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

1. Measure airflow of submain and branch ducts.
2. Adjust submain and branch duct volume dampers for specified airflow.
3. Re-measure each submain and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlets and outlets airflow.
3. Adjust each inlet and outlet for specified airflow.
4. Re-measure each inlet and outlet after they have been adjusted.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:

1. Check liquid level in expansion tank.
2. Check highest vent for adequate pressure.
3. Check flow-control valves for proper position.
4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
5. Verify that motor starters are equipped with properly sized thermal protection.
6. Check that air has been purged from the system.

3.7 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

A. Adjust pumps to deliver total design gpm.

1. Measure total water flow.

a. Position valves for full flow through coils.
b. Measure flow by main flow meter, if installed.
c. If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.

2. Measure pump TDH as follows:

a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
c. Convert pressure to head and correct for differences in gage heights.
d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.

3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.

B. Adjust flow-measuring devices installed in mains and branches to design water flows.

1. Measure flow in main and branch pipes.
2. Adjust main and branch balance valves for design flow.
3. Re-measure each main and branch after all have been adjusted.

C. Adjust flow-measuring devices installed at terminals for each space to design water flows.

1. Measure flow at terminals.
2. Adjust each terminal to design flow.
3. Re-measure each terminal after it is adjusted.
4. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
5. Perform temperature tests after flows have been balanced.

D. For systems with pressure-independent valves at terminals:

1. Measure differential pressure and verify that it is within manufacturer's specified range.
2. Perform temperature tests after flows have been verified.

E. For systems without pressure-independent valves or flow-measuring devices at terminals:

1. Measure and balance coils by either coil pressure drop or temperature method.
2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

F. Verify final system conditions as follows:

1. Re-measure and confirm that total water flow is within design.
2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
3. Mark final settings.

G. Verify that memory stops have been set.

3.8 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.9 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.

6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.
i. Center-to-center dimensions of sheave and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.
m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in sq. ft..
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Water flow rate in gpm.
i. Water pressure differential in feet of head or psig.
j. Entering-water temperature in deg F.
k. Leaving-water temperature in deg F.
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig.
n. Refrigerant suction temperature in deg F.
o. Inlet steam pressure in psig.

G. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated airflow rate in cfm.
h. Indicated velocity in fpm.
i. Actual airflow rate in cfm.

j. Actual average velocity in fpm.
k. Barometric pressure in psig.

I. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Entering-water temperature in deg F.
c. Leaving-water temperature in deg F.
d. Water pressure drop in feet of head or psig.
e. Entering-air temperature in deg F.
f. Leaving-air temperature in deg F.

J. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Service.
d. Make and size.
e. Model number and serial number.
f. Water flow rate in gpm.
g. Water pressure differential in feet of head or psig.
h. Required net positive suction head in feet of head or psig.
i. Pump rpm.
j. Impeller diameter in inches.
k. Motor make and frame size.
l. Motor horsepower and rpm.
m. Voltage at each connection.
n. Amperage for each phase.
o. Full-load amperage and service factor.
p. Seal type.

2. Test Data (Indicated and Actual Values):

a. Static head in feet of head or psig.
b. Pump shutoff pressure in feet of head or psig.
c. Actual impeller size in inches.
d. Full-open flow rate in gpm.
e. Full-open pressure in feet of head or psig.
f. Final discharge pressure in feet of head or psig.
g. Final suction pressure in feet of head or psig.
h. Final total pressure in feet of head or psig.
i. Final water flow rate in gpm.
j. Voltage at each connection.
k. Amperage for each phase.

K. Instrument Calibration Reports:

1. Report Data:

    a. Instrument type and make.
    b. Serial number.
    c. Application.
    d. Dates of use.
    e. Dates of calibration.

3.10 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of commissioning authority.

B. Commissioning authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

E. If TAB work fails, proceed as follows:

1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
3. If the second verification also fails, design professional may contact AABC Headquarters regarding the AABC National Performance Guaranty.

F. Prepare test and inspection reports.

3.11 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

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SECTION 23 07 13 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, exposed supply located in unconditioned space.
2. Indoor, exposed return located in unconditioned space.

B. Related Sections:

1. Section 23 07 16 "HVAC Equipment Insulation."
2. Section 23 07 19 "HVAC Piping Insulation."
3. Section 23 31 13 "Metal Ducts" for duct liners.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C553, Type II and ASTM C1290, Type III with factory-applied FSP jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. CertainTeed Corporation.
    b. Johns Manville; a Berkshire Hathaway company.
    c. Owens Corning.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. CertainTeed Corporation.
    b. Johns Manville; a Berkshire Hathaway company.
    c. Owens Corning.

2.2 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. 3M.
    b. CertainTeed Corporation.
    c. Johns Manville; a Berkshire Hathaway company.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Eagle Bridges - Marathon Industries.
   c. Foster Brand; H. B. Fuller Construction Products.

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Eagle Bridges - Marathon Industries.
   c. Foster Brand; H. B. Fuller Construction Products.

2.4 MASTICS AND COATINGS

A. Materials shall be compatible with insulation materials, jackets, and substrates.

B. Vapor-Retarder Mastic: Water based; suitable for indoor use on below ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Foster Brand; H. B. Fuller Construction Products.
   c. Knauf Insulation.

2. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Comply with MIL-PRF-19565C, Type II, for permeance requirements, with supplier listing on DOD QPD - Qualified Products Database.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Eagle Bridges - Marathon Industries.
   c. Knauf Insulation.

2. Water-Vapor Permeance: ASTM E96, greater than 1.0 perm at manufacturer's recommended dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.

2.5 Color: White. SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Eagle Bridges - Marathon Industries.
   c. Foster Brand; H. B. Fuller Construction Products.

2. Materials shall be compatible with insulation materials, jackets, and substrates.

3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.

2.7 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Avery Dennison Corporation, Specialty Tapes Division.
   b. Compac Corporation.
   c. Knauf Insulation.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.8 SECUREMENTS

A. Aluminum Bands: ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ITW Insulation Systems; Illinois Tool Works, Inc.
   b. RPR Products, Inc.

B. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) AGM Industries, Inc.
      2) Hardcast, Inc.
      3) Midwest Fasteners, Inc.

   b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   c. Spindle: Stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.

d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

2. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) AGM Industries, Inc.
2) Gemco.
3) Hardcast, Inc.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) AGM Industries, Inc.
2) Gemco.
3) Hardcast, Inc.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

4. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Gemco.
2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. C & F Wire.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

C. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.

D. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 84 13 "Penetration Firestopping." Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

   a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
   b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. Impale insulation over pins and attach speed washers.
f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

   a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
   b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
   c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
   d. Do not overcompress insulation during installation.
   e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.6 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, exposed supply located in unconditioned space .
2. Indoor, exposed return located in unconditioned space.

B. Items Not Insulated:

1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Exposed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches thick and 3-lb/cu. ft. nominal density with FSK (Re-inforced Foil, aka FRK) laminate facing.

B. Exposed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches thick and 3-lb/cu. ft. nominal density with FSK (Re-inforced Foil, aka FRK) laminate facing.

END OF SECTION

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SECTION 23 07 16 - HVAC EQUIPMENT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following HVAC equipment that is not factory insulated:

1. Expansion/compression tanks.
2. Air separators.

B. Related Sections:

1. Section 23 07 13 "Duct Insulation."
2. Section 23 07 19 "HVAC Piping Insulation."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail removable insulation at equipment connections.
4. Detail application of field-applied jackets.
5. Detail application at linkages of control devices.
6. Detail field application for each equipment type.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C795.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

E. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C553, Type II and ASTM C1290, Type II with factory-applied vinyl jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. CertainTeed Corporation.
   b. Johns Manville; a Berkshire Hathaway company.
   c. Owens Corning.

F. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied FSK jacket complying with ASTM C1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. CertainTeed Corporation.
   b. Johns Manville; a Berkshire Hathaway company.
   c. Owens Corning.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C449.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Ramco Insulation, Inc.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Foster Brand; H. B. Fuller Construction Products.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.

2.4 MASTICS AND COATINGS

A. Materials shall be compatible with insulation materials, jackets, and substrates.

B. Vapor-Retarder Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Knauf Insulation.

2. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Comply with MIL-PRF-19565C, Type II, for permeance requirements, with supplier listing on DOD QPD - Qualified Products Database.
5. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Pittsburgh Corning Corporation.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.

B. FSK Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Mon-Eco Industries, Inc.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Childers Brand; H. B. Fuller Construction Products.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for equipment.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Foster Brand; H. B. Fuller Construction Products.
b. Vimasco Corporation.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. 3M.
b. Avery Dennison Corporation, Specialty Tapes Division.
c. Knauf Insulation.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. 3M.
b. Ideal Tape Co., Inc., an American Biltrite Company.
c. Knauf Insulation.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.9 SECUREMENTS

A. Aluminum Bands: ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ITW Insulation Systems; Illinois Tool Works, Inc.
b. RPR Products, Inc.

B. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) AGM Industries, Inc.
2) Gemco.
3) Midwest Fasteners, Inc.

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Gemco.
2) Midwest Fasteners, Inc.

b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
c. Spindle: Nylon, 0.106-inch-diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) AGM Industries, Inc.

2) Gemco.
3) Midwest Fasteners, Inc.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) AGM Industries, Inc.
2) Gemco.
3) Midwest Fasteners, Inc.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

5. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, stainless steel.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

J. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints.

K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

N. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.3 INSTALLATION OF EQUIPMENT, TANK, AND VESSEL INSULATION

A. Mineral-Fiber, Pipe and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.
2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:

    a. Do not weld anchor pins to ASME-labeled pressure vessels.

b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
d. Do not overcompress insulation during installation.
e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
f. Impale insulation over anchor pins and attach speed washers.
g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches.
8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

B. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.

1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
2. Seal longitudinal seams and end joints.

3.4 FINISHES

A. Equipment Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections: Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.6 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment that is not factory insulated.

C. Heating-Hot-Water Expansion/Compression Tank Insulation: Mineral-Fiber Pipe and Tank: 1 inch thick with factory applied FSK jacket.

D. Heating-Hot-Water Air-Separator Insulation: Mineral-Fiber Pipe and Tank: 2 inches thick with factory applied FSK jacket.

END OF SECTION

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SECTION 23 07 19 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Heating hot-water piping, indoors.
2. Refrigerant suction and hot-gas piping, indoors and outdoors.

B. Related Sections:

1. Section 23 07 13 "Duct Insulation."
2. Section 23 07 16 "HVAC Equipment Insulation."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at pipe expansion joints for each type of insulation.
3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
4. Detail removable insulation at piping specialties.
5. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C795.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

E. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Pittsburgh Corning Corporation.

2. Block Insulation: ASTM C552, Type I.
3. Special-Shaped Insulation: ASTM C552, Type III.
4. Board Insulation: ASTM C552, Type IV.
5. Preformed Pipe Insulation without Jacket: Comply with ASTM C552, Type II, Class 1.
6. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C552, Type II, Class 2.
7. Factory fabricate shapes according to ASTM C450 and ASTM C585.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C534, Type I for tubular materials.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Aeroflex USA, Inc.
    b. Armacell LLC.
    c. K-Flex USA.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C1290, Type I.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. CertainTeed Corporation.
    b. Johns Manville; a Berkshire Hathaway company.
    c. Owens Corning.

H. Mineral-Fiber, Preformed Pipe Insulation:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Johns Manville; a Berkshire Hathaway company.
    b. Manson Insulation Inc.
    c. Owens Corning.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C449.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Ramco Insulation, Inc.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Foster Brand; H. B. Fuller Construction Products.

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Aeroflex USA, Inc.
b. Armacell LLC.
c. K-Flex USA.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Mon-Eco Industries, Inc.

E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Mon-Eco Industries, Inc.

2.4 MASTICS AND COATINGS

A. Materials shall be compatible with insulation materials, jackets, and substrates.

B. Vapor-Retarder Mastic: Water based; suitable for indoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Knauf Insulation.

2. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Comply with MIL-PRF-19565C, Type II, for permeance requirements, with supplier listing on DOD QPD - Qualified Products Database.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Foster Brand; H. B. Fuller Construction Products.
   c. Knauf Insulation.

2. Water-Vapor Permeance: ASTM E96, greater than 1.0 perm at manufacturer's recommended dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Foster Brand; H. B. Fuller Construction Products.
   c. Pittsburgh Corning Corporation.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.

B. FSK Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Foster Brand; H. B. Fuller Construction Products.
   c. Mon-Eco Industries, Inc.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Foster Brand; H. B. Fuller Construction Products.
   b. Vimasco Corporation.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Airex Manufacturing.
   b. Johns Manville; a Berkshire Hathaway company.
   c. Speedline Corporation.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

   a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. 3M Industrial Adhesives and Tapes Division.
   b. Avery Dennison Corporation, Specialty Tapes Division.
   c. Knauf Insulation.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. 3M Industrial Adhesives and Tapes Division.
b. Ideal Tape Co., Inc., an American Biltrite Company.
c. Knauf Insulation.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.10 SECUREMENTS

A. Aluminum Bands: ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ITW Insulation Systems; Illinois Tool Works, Inc.
b. RPR Products, Inc.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. C & F Wire.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

E. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Heating-Hot-Water Supply and Return, 200 Deg F and Below: Insulation shall be one of the following:

1. Cellular Glass: 2 inches thick with factory applied ASJ.
2. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick with factory applied ASJ .

B. Refrigerant Suction and Hot-Gas Piping: Flexible elastomeric 1 inch thick.

C. Refrigerant Suction and Hot-Gas Flexible Tubing: Flexible elastomeric, 1 inch thick.

3.11 OUTDOOR, BELOW GRADE PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping: Flexible elastomeric, 1/2 inch thick.

B. Refrigerant Suction and Hot-Gas Flexible Tubing: Flexible elastomeric, 1/2 inch thick.

C. Below grade refrigerant piping to be installed within a protective sleeve constructed from 4 in. corrugated watertight polyethylene pipe. Joints shall be sealed to provide watertight protection for refrigerant pipe

3.12 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping: Insulation shall be **one of** the following:

1. Cellular Glass: 2 inches thick.
2. Flexible Elastomeric: 2 inches thick.
3. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

B. Refrigerant Suction and Hot-Gas Flexible Tubing: Insulation shall be one of the following:

1. Flexible Elastomeric: 2 inches thick.
2. Polyolefin: 2 inches thick.

END OF SECTION

SECTION 23 09 00 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.

B. Related Sections include the following:

1. Section 230519 "Meters and Gages for HVAC Piping" for measuring equipment that relates to this Section.
2. Sequence of Operations presented on the drawings for requirements that relate to this Section.

1.3 DEFINITIONS

A. I/O: Input/output.

B. PID: Proportional plus integral plus derivative.

C. RTD: Resistance temperature detector.

1.4 ACTION SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.
1. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Bill of materials of equipment indicating quantity, manufacturer, and model number.
2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
3. Wiring Diagrams: Power, signal, and control wiring.
4. Details of control panel faces, including controls, instruments, and labeling.
5. Written description of sequence of operation.
6. Schedule of dampers including size, leakage, and flow characteristics.
7. Schedule of valves including flow characteristics.
8. Controlled Systems:

a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.

c. Written description of sequence of operation including schematic diagram.
d. Points list.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. Include the following:

1. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.
2. Interconnection wiring diagrams with identified and numbered system components and devices.
3. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
4. Calibration records and list of set points.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.

B. System Software: Update to latest version of software at Project completion.

1.8 COORDINATION

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.

B. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.

C. Coordinate equipment with Section 262416 "Panelboards" to achieve compatibility with starter coils and annunciation devices.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 CONTROL SYSTEM DEVICES

A. Available Manufacturers:
1. Honeywell International Inc.; Home & Building Control.
2. Johnson Controls, Inc.; Controls Group.
3. MAMAC Systems, Inc.
4. McQuay International.
5. Neptronics
6. Siemens Building Technologies, Inc.
7. Staefa Control System Inc.; Siemens Building Technologies, Inc.
8. TAC Americas, INC.
9. Taco
10. TCS/Basys Controls.
11. tekmar Control Systems, Inc.
12. Teletrol Systems Incorporated.
13. Temco Controls Ltd. USA.
14. Tour & Andersson Control, Inc.
15. Trane; Worldwide Applied Systems Group
16. Triangle MicroSystems, Inc.
17. Weil McClain

B. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories to control mechanical systems.

2.3 STAND-ALONE BOILER CONTROLLER

A. Basis-of-Design Product: Subject to compliance with requirements, provide Model 274 Boiler control, product of Tekmar Control Systems, Inc or comparable product by one of the following:
a. Weil McLain
b. Honeywell.

B. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.

1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip; 72-hour battery backup.

2. Control of up to 4 boilers

3. Control of primary/secondary pumps

4. Powered system pump output
5. Enclosure: Dustproof rated for operation at 32 to 120 deg F (0 to 50 deg C).
6. Input voltage 120VAC

2.4 STAND-ALONE AHU CONTROL PANEL

A. Basis-of-Design Product: Subject to compliance with requirements, provide Model HAFC201-4, a product of Taco Comfort Solutions, or comparable product by one of the following:
a. Carrier Corp
b. Neptronic.

B. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.

1. Configuration:

a. Local DIP switches;
b. diagnostic LEDs;
c. sealed relays
d. wiring termination to terminal strip.
e. Universal thermostat compatibility

2. Input voltage 120VAC

2.5 ANALOG CONTROLLERS

A. Electronic Controllers: Wheatstone-bridge-amplifier type, in steel enclosure with provision for remote-resistance readjustment. Identify adjustments on controllers, including proportional band and authority.

1. Single controllers can be integral with control motor if provided with accessible control readjustment potentiometer.

B. Speed Controllers: Solid-state model providing field-adjustable proportional control of motor speed from maximum to minimum of 55 percent and on-off action below minimum fan speed. Controller shall briefly apply full voltage, when motor is started, to rapidly bring motor up to minimum speed. Equip with filtered circuit to eliminate radio interference.

2.6 STATUS SENSORS

A. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch wg (0 to 1240 Pa).

B. Status Inputs for Pumps: Differential-pressure switch with pilot-duty rating and with adjustable pressure-differential range of 8 to 60 psig (55 to 414 kPa), piped across pump.

C. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.

D. Voltage Transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.

E. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.

F. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

2.7 THERMOSTATS

A. Available Manufacturers:

1. Honeywell

2. Erie Controls.
3. Danfoss Inc.; Air-Conditioning and Refrigeration Div.
4. Heat-Timer Corporation.
5. Sauter Controls Corporation.
6. tekmar Control Systems, Inc.
7. Theben AG - Lumilite Control Technology, Inc.
8.

B. Electric, solid-state, microcomputer-based room thermostat with remote sensor.

1. Automatic switching from heating to cooling.
2. Preferential rate control to minimize overshoot and deviation from set point.
3. Set up for four separate temperatures per day.
4. Instant override of set point for continuous or timed period from 1 hour to 31 days.
5. Short-cycle protection.
6. Humidity setting range of 40% to 80% RH
7. 1 assignable output to control dehumidification
8. Programming based on every day of week.
9. Selection features include degree F or degree C display, 12- or 24-hour clock, keyboard disable, remote sensor, and fan on-auto.
10. Battery replacement without program loss.
11. Thermostat display features include the following:

    a. Time of day.
    b. Actual room temperature.
    c. Programmed temperature.
    d. Programmed time.
    e. Duration of timed override.
    f. Day of week.
    g. System mode indications include "heating," "off," "fan auto," and "fan on."

2.8 HUMIDISTATS

A. Available Manufacturers:

1. MAMAC Systems, Inc.
2. ROTRONIC Instrument Corp.
3. Honeywell.

B. Wall-mounting humidistats: Electric, 2-position type with adjustable, 2 percent throttling range, 20 to 80 percent operating range, and single- or double-pole contact

C. Duct-Mounting Humidistats: Electric insertion, 2-position type with adjustable, 2 percent throttling range, 20 to 80 percent operating range, and single- or double-pole contacts.

2.9 LIQUID TEMPERATURE SWITCHES

A. Thermostat and Switch for Temperature Control in Pipe Applications:
1. Description:
    a. Two-position control.
    b. Field-adjustable set point.
    c. Manual reset.
    d. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Performance:
    a. Operating Temperature Range: 65 to 200 deg F.
    b. Temperature Differential Deadband: 5 to 30 deg F, adjustable.
    c. Enclosure Ambient Temperature: 150 deg F.
    d. Sensing Element Pressure Rating: 200 psig.
    e. Voltage: 120-V ac.
    f. Current: 8 FLA.
    g. Switch Type: SPDT snap switch.
3. Construction:
    a. Vapor-Filled Immersion Element: Copper, nominal 3 inches (75 mm)long.
    b. Temperature Scale: Fahrenheit, visible on face.
    c. Set-Point Adjustment: Screw.
    d. Enclosure: Painted metal, NEMA 250, Type 1.
    e. Electrical Connections: Screw terminals.
    f. Conduit Connection: 3/4-inch.

2.10 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

1. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
2. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.

1. Available Manufacturers:

a. Belimo Aircontrols (USA), Inc.
b.

2. Valves: Size for torque required for valve close off at maximum pump differential pressure.

3. Coupling: V-bolt and V-shaped, toothed cradle.
4. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
5. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.
6. Power Requirements (Two-Position Spring Return): 24-V ac.
7. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
8. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
9. Temperature Rating: 40 to 104 deg F (5 to 40 deg C).
10. Run Time: 30 seconds.

11. Actuator Housing: Molded or die-cast zinc or aluminum. Terminal unit actuators may be high-impact plastic with ambient temperature rating of 50 to 140 deg F (10 to 60 deg C) unless located in return-air plenums.

2.11 CONTROL VALVES

A. Manufacturers:

1. Danfoss Inc.; Air Conditioning & Refrigeration Div.
2. Erie Controls.
3. Hayward Industrial Products, Inc.
4. Magnatrol Valve Corporation.
5. Neles-Jamesbury.
6. Parker Hannifin Corporation; Skinner Valve Division.
7. Pneuline Controls.
8. Sauter Controls Corporation.
9.

B. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

C. Hydronic system globe valves shall have the following characteristics:

1. NPS 2 (DN 50) and Smaller: Class 125 bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity repackable under pressure.
2. Internal Construction: Replaceable plugs and stainless-steel or brass seats.

a. Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom.

b. Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom.

3. Sizing: 3-psig (21-kPa) maximum pressure drop at design flow rate or the following:

a. Two Position: Line size.
b. Two-Way Modulating: Either the value specified above or twice the load pressure drop, whichever is more.
c. Three-Way Modulating: Twice the load pressure drop, but not more than value specified above.

4. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.
5. Close-Off (Differential) Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150 percent of total system (pump) head for two-way valves and 100 percent of pressure differential across valve or 100 percent of total system (pump) head.

2.12 CONTROL CABLE

A. Provide manufacture's recommended cable

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that power supply is available to control units .

3.2 INSTALLATION

A. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches (1220 mm) above the floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

B. Install labels and nameplates to identify control components according to Section 230553 "Identification for HVAC Piping and Equipment."

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Section 260533 "Raceways and Boxes for Electrical Systems."

B. Install building wire and cable according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Install signal and communication cable:

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway.
3. Install concealed cable in raceway.
4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.

5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safeties.
3. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
4. Test each point through its full operating range to verify that safety and operating control set points are as required.
5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
6. Test each system for compliance with sequence of operation.
7. Test software and hardware interlocks.

C. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.5 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.
2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
4. Control System Inputs and Outputs:

    a. Check analog inputs at 0, 50, and 100 percent of span.
    b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
    c. Check digital inputs using jumper wire.
    d. Check digital outputs using ohmmeter to test for contact making or breaking.
    e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Temperature:

    a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
    b. Calibrate temperature switches to make or break contacts.

6. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
7. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
8. Provide diagnostic and test instruments for calibration and adjustment of system.
9. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls.

END OF SECTION 230900

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SECTION 23 09 23.19 - MOISTURE INSTRUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes moisture switches, sensors, and transmitters.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Include diagrams for power, signal, and control wiring.
3. Include number-coded identification system for unique identification of wiring, cable, and tubing ends.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MOISTURE SWITCHES

A. Humidistat for Duct Applications:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Schneider Electric USA, Inc.

2. Description:

   a. Two-position control.
   b. Field-adjustable set point.
   c. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. Performance:

   a. Relative Humidity Range: 15 to 95 percent.
   b. Relative Humidity Differential: 5 percent.
   c. Ambient Temperature: 40 to 135 deg F.
   d. Voltage: 120-V ac.
   e. Current: 7.2 FLA.
   f. Switch Type: SPDT snap switch.

4. Construction:

a. Enclosure: Metal, NEMA 250, Type 1.
b. Electrical Connections: Screw terminals.

B. Humidistat for Space Applications:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Schneider Electric USA, Inc.
b. Honeywell
c. Johnson Controls

2. Description:

a. Two-position control.
b. Field-adjustable set point.
c. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. Performance:

a. Relative Humidity Range: 10 to 90 percent.
b. Relative Humidity Differential: 5 percent.
c. Ambient Temperature: 40 to 135 deg F.
d. Voltage: 24-V ac.
e. Pilot Duty: 60 VA.
f. Switch Type: SPDT snap switch.

4. Construction:

a. Enclosure: Plastic, NEMA 250, Type 1.
b. Electrical Connections: Cable, 6 inches long.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install products level, plumb, parallel, and perpendicular with building construction.

B. Properly support instruments, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a force.

C. Fastening Hardware:

1. Stillson wrenches, pliers, and other tools that cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening nuts.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

D. Install products in locations that are accessible and that permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

3.2 MOISTURE INSTRUMENTS INSTALLATION

A. Mounting Location: Rough-in instrument-mounting locations before setting instruments and routing, cable, wiring, tubing, and conduit to final location.

B. Mounting Height:

1. Mount instruments in user-occupied space to match mounting height of light switches unless otherwise indicated on Drawings. Mounting height shall comply with codes and accessibility requirements.
2. Mount switches and transmitters located in mechanical equipment rooms and other similar space not subject to code, state, and Federal accessibility requirements within a range of 42 to 72 inches above the adjacent floor, grade, or service catwalk or platform.

    a. Make every effort to mount at 60 inches.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

B. Install engraved phenolic nameplate with instrument identification[on face of ceiling directly below instruments concealed above ceilings].

3.4 CHECKOUT PROCEDURES

A. Check installed products before continuity tests and calibration.

B. Check instruments for proper location and accessibility.

C. Check instruments for proper installation on direction of flow, elevation, orientation, insertion depth, or other applicable considerations that impact performance.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain instrumentation and control devices.

B. Coordinate video with operation and maintenance manuals and classroom instruction for use by Owner in operating, maintaining, and troubleshooting.

C. Record videos on DVD disks.

D. Owner shall have right to make additional copies of video for internal use without paying royalties.

END OF SECTION

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SECTION 23 09 23.27 - TEMPERATURE INSTRUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Air temperature switches.
2. Liquid temperature switches.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Include number-coded identification system for unique identification of wiring, cable, and tubing ends.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 AIR TEMPERATURE SWITCHES

A. Thermostat and Switch for Low Temperature Control in Duct Applications:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Honeywell International Inc.
   b. Siemens Industry, Inc., Building Technologies Division.

2. Description:

   a. Two-position control.
   b. Field-adjustable set point.
   c. Manual reset.
   d. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. Performance:

   a. Operating Temperature Range: 15 to 55 deg F.
   b. Temperature Differential: 5 deg F, non-adjustable and additive.

c. Enclosure Ambient Temperature: Minus 20 to 140 deg F.
d. Sensing Element Maximum Temperature: 250 deg F.
e. Voltage: 120-V ac.
f. Current: 16 FLA.
g. Switch Type: Two SPDT snap switches operate on coldest 12-inchsection along element length.

4. Construction:

a. Vapor-Filled Sensing Element: Nominal 20 feet long.
b. Dual Temperature Scale: Fahrenheit and Celsius visible on face.
c. Set-Point Adjustment: Screw.
d. Enclosure: Painted metal, NEMA 250, Type 1.
e. Electrical Connections: Screw terminals.
f. Conduit Connection: 1/2-inch trade size.

B. Thermostat and Switch for High Temperature Control in Duct Applications:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Schneider Electric USA, Inc.

2. Source Limitations: Obtain temperature-measuring sensors and transmitters and airflow from single manufacturer.
3. Description:

a. Two-position control.
b. Field-adjustable set point.
c. Manual reset.
d. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

4. Performance:

a. Temperature Range: 100 to 160 deg F.
b. Temperature Differential: 5 deg F.
c. Ambient Temperature: Zero to 260 deg F.
d. Voltage: 120-V ac.
e. Current: 16 FLA.
f. Switch Type: SPDT snap switch.

5. Construction:

a. Sensing Element: Helical bimetal.
b. Enclosure: Metal, NEMA 250, Type 1.
c. Electrical Connections: Screw terminals.
d. Conduit Connection: 1/2-inch trade size.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install products level, plumb, parallel, and perpendicular with building construction.

B. Properly support instruments, tubing, piping, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a force.

C. Fastening Hardware:

1. Stillson wrenches, pliers, and other tools that cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening nuts.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

D. Install products in locations that are accessible and that permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

E. Corrosive Environments:

1. Use products that are suitable for environment to which they are subjected.
2. If possible, avoid or limit use of materials in corrosive environments.
3. When conduit is in contact with a corrosive environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
4. Where instruments are located in a corrosive environment and are not corrosive resistant from manufacturer, field install products in a NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.2 TEMPERATURE INSTRUMENT INSTALLATIONS

A. Mounting Location:

1. Roughing In:

a. Outline instrument mounting locations before setting instruments and routing cable, wiring, tubing, and conduit to final location.
b. Provide independent inspection to confirm that proposed mounting locations comply with requirements indicated and approved submittals.

1) Indicate dimensioned locations with mounting height for all surface-mounted products on Shop Drawings.
2) Do not begin installation without submittal approval of mounting location.

c. Complete installation rough-in only after confirmation by independent inspection is complete and approval of location is documented for review by Owner and Architect on request.

2. Install switches and transmitters for air and liquid temperature associated with individual air-handling units and associated connected ductwork and piping near air-handling units co-located in air-handling unit system control panel to provide service personnel a single and convenient location for inspection and service.
3. Install liquid and steam temperature switches and transmitters for indoor applications in mechanical equipment rooms. Do not locate in user-occupied space unless indicated specifically on Drawings.
4. Install air temperature switches and transmitters for indoor applications in mechanical equipment rooms. Do not locate in user-occupied space unless indicated specifically on Drawings.
5. Mount switches and transmitters on walls, floor-supported freestanding pipe stands, or floor-supported structural support frames. Use manufacturer's mounting brackets to accommodate field mounting. Securely support and brace products to prevent vibration and movement.

B. Special Mounting Requirements:

1. Protect products installed outdoors from solar radiation, building and wind effect with stand-offs and shields constructed of Type 316 stainless.
2. Temperature instruments having performance impacted by temperature of mounting substrate shall be isolated with an insulating barrier located between instrument and substrate to eliminate effect.

Where instruments requiring insulation are located in finished space, conceal insulating barrier in a cover matching the instrument cover.

C. Mounting Height:

1. Mount temperature instruments in user-occupied space to match mounting height of light switches unless otherwise indicated on Drawings. Mounting height shall comply with codes and accessibility requirements.
2. Mount switches and transmitters located in mechanical equipment rooms and other similar space not subject to code or state and Federal accessibility requirements within a range of 42 to 72 inches above the adjacent floor, grade, or service catwalk or platform.

    a. Make every effort to mount at 60 inches.

D. Seal penetrations to ductwork, plenums, and air-moving equipment to comply with duct static-pressure class and leakage and seal classes indicated using neoprene gaskets or grommets.

E. Space Temperature Sensor Installation:

1. Conceal assembly in an electrical box of sufficient size to house sensor and transmitter, if provided.
2. Install electrical box with a faceplate to match sensor cover if sensor cover does not completely cover electrical box.
3. In finished areas, recess electrical box within wall.
4. In unfinished areas, electrical box may be surface mounted if electrical light switches are surface mounted. Use a cast-aluminum electric box for surface-mounted installations.
5. Align electrical box with other electrical devices such as visual alarms and light switches located in the vicinity to provide a neat and well-thought-out arrangement. Where possible, align in both horizontal and vertical axis.

F. Low-Limit Air Temperature Switch Installation:

1. Install multiple low-limit switches to maintain coverage over entire cross-sectional area of air tunnel.
2. Fasten and support sensing element with manufacturer-furnished clips to keep element taut throughout entire length.
3. Mount switches outside of airstream at a location and mounting height to provide easy access for switch set-point adjustment and manual reset.
4. Install on entering side of cooling coil unless otherwise indicated on Drawings.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

B. Install engraved phenolic nameplate with instrument identification[and on face of ceiling directly below instruments concealed above ceilings].

3.4 CLEANING

A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed interior and exterior surfaces.

B. Wash and shine glazing.

C. Polish glossy surfaces to a clean shine.

3.5 CHECK-OUT PROCEDURES

A. Check installed products before continuity tests, leak tests, and calibration.

B. Check temperature instruments for proper location and accessibility.

C. Verify sensing element type and proper material.

D. Verify location and length.

E. Verify that wiring is correct and secure.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections[with the assistance of a factory-authorized service representative]:

1. Perform according to manufacturer's written instruction.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Prepare test and inspection reports.

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain temperature instruments.

END OF SECTION

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SECTION 23 21 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes pipe and fitting materials and joining methods for the following:

1. Plastic pipe and fittings.
2. Joining materials.
3. Transition fittings.
4. Dielectric fittings.
5. Bypass chemical feeder.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Pipe.
2. Fittings.
3. Joining materials.
4. Bypass chemical feeder.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:

1. Hot-Water Heating Piping: 100 psig at 200 deg F.
2. Makeup-Water Piping: 80 psig at 73 deg F.
3. Condensate-Drain Piping: 150 deg F.
4. .

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.

C. DWV Copper Tubing: ASTM B 306, Type DWV.

D. Grooved, Mechanical-Joint, Wrought-Copper Fittings: ASME B16.22.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anvil International.
b. Star Pipe Products.
c. Victaulic Company.

2. Grooved-End Copper Fittings: ASTM B 75, copper tube or ASTM B 584, bronze casting.
3. Grooved-End-Tube Couplings: Rigid pattern unless otherwise indicated; gasketed fitting. Ductile-iron housing with keys matching pipe and fitting grooves, prelubricated EPDM gasket rated for minimum 230 deg F for use with housing, and steel bolts and nuts.

E. Wrought-Copper Unions: ASME B16.22.

2.3 PLASTIC PIPE AND FITTINGS

A. CPVC Plastic Pipe: ASTM F 441/F 441M, with wall thickness as indicated in "Piping Applications" Article.

1. CPVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM F 438 for Schedule 40 pipe; ASTM F 439 for Schedule 80 pipe.

B. PVC Plastic Pipe: ASTM D 1785, with wall thickness as indicated in "Piping Applications" Article.

1. PVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM D 2466 for Schedule 40 pipe; ASTM D 2467 for Schedule 80 pipe.

2.4 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Solvent Cements for CPVC Piping: ASTM F 493.

F. Solvent Cements for PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.5 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Charlotte Pipe and Foundry Company.
b. Uponor.
c. Viega LLC.

2. One-piece fitting with one threaded brass or copper insert and one solvent-cement-joint end of material and wall thickness to match plastic pipe material.

B. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Charlotte Pipe and Foundry Company.
b. IPEX USA LLC.
c. NIBCO INC.

2. Brass or copper end, solvent-cement-joint end of material and wall thickness to match plastic pipe material, rubber gasket, and threaded union.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and pressure-seal joints.
2. Schedule 40, Grade B steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; and threaded joints.

B. Makeup-water piping installed aboveground shall be[**either of**] the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

C. Condensate-Drain Piping: Type M, drawn-temper copper tubing, wrought-copper fittings, and soldered joints or Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.

D. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

3.2 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install valves according to the following:

1. Section 23 05 23.12 "Ball Valves for HVAC Piping."
2. Section 23 05 23.14 "Check Valves for HVAC Piping."

Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Comply with requirements in Section 23 05 53 "Identification for HVAC Piping and Equipment" for identifying piping.

3.3 HANGERS AND SUPPORTS

A. Comply with requirements in Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

C. Install hangers for copper tubing and steel piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Support vertical runs of copper tubing and steel piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

E. Install hangers for plastic piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced code, and authorities having jurisdiction requirements, whichever are most stringent.

F. Support horizontal piping within 12 inches of each fitting and coupling

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

F. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Pressure Piping: Join ASTM D 1785 schedule number, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.

G. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

H. Plain-End Mechanical-Coupled Joints: Prepare, assemble, and test joints in accordance with manufacturer's written installation instructions.

I. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.

3.5 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in Section 23 05 19 "Meters and Gages for HVAC Piping."

3.6 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION

SECTION 23 21 16 - HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hydronic specialty valves.
2. Air-control devices.
3. Strainers.
4. Connectors.

B. Related Requirements:

1. Section 23 05 23.12 "Ball Valves for HVAC Piping" for specification and installation requirements for ball valves common to most piping systems.
2. Section 23 05 23.14 "Check Valves for HVAC Piping" for specification and installation requirements for check valves common to most piping systems.
3. Section 23 09 23.11 "Control Valves" for automatic control valve and sensor specifications, installation requirements, and locations.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product:

1. Include construction details and material descriptions for hydronic piping specialties.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.
3. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

B. Safety Valves and Pressure Vessels: Shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 HYDRONIC SPECIALTY VALVES

A. Bronze, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bell & Gossett; a Xylem brand.
    b. NIBCO INC.
    c. TACO Comfort Solutions, Inc.

2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

2.2 AIR-CONTROL DEVICES

A. Manual Air Vents:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. Hays Fluid Controls.
    c. TACO Comfort Solutions, Inc.

2. Body: Bronze.
3. Internal Parts: Nonferrous.
4. Operator: Screwdriver or thumbscrew.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/8.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 225 deg F.

B. Expansion Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AMTROL, Inc.
    b. Bell & Gossett; a Xylem brand.
    c. TACO Comfort Solutions, Inc.

2. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature, with taps in bottom of tank for tank fitting and taps in end of tank for gage glass. Tanks shall be factory tested after taps are fabricated and shall be labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
3. Air-Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless-steel ball check, 100-gal. unit only; sized for compression-tank diameter. Provide tank fittings for 125-psig working pressure and 250 deg F maximum operating temperature.
4. Tank Drain Fitting: Brass body, nonferrous internal parts; 125-psig working pressure and 240 deg F maximum operating temperature; constructed to admit air to compression tank, drain water, and close off system.
5. Gage Glass: Full height with dual manual shutoff valves, 3/4-inch-diameter gage glass, and slotted-metal glass guard.

C. Hydraulic separator/Air Separator:
1. Description:
    a. Hydraulically separates primary and secondary circuits.
    b. Separates and vents air from the system.

c. Separates and collects impurities in the circuits.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armstrong Products, Inc.
b. Bell & Gossett; a Xylem brand.
c. TACO Comfort Solutions, Inc.

3. Tank: steel

4. 4 threaded taps for fluid flow

5. 1 threaded tap on bottom for drain

6. 1 threaded tap on top with air separator

7. Brass vent head
8. Maximum Working Pressure: Up to 175 psig.
9. Maximum Operating Temperature: Up to 270 deg F.

2.3 STRAINERS

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: Stainless-steel, 40-mesh strainer, or perforated stainless-steel basket.
4. CWP Rating: 125 psig.

2.4 CONNECTORS

A. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

C. Install check valves at each pump discharge and elsewhere as required to control flow direction.

D. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

E. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.2 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.

C. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 and larger.

D. Install expansion tanks above the air separator. Install tank fitting in tank bottom and charge tank. Use manual vent for initial fill to establish proper water level in tank.

1. Install tank fittings that are shipped loose.
2. Support tank from floor or structure above with sufficient strength to carry weight of tank, piping connections, fittings, plus tank full of water. Do not overload building components and structural members.

E. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure that tank is properly charged with air to suit system Project requirements.

END OF SECTION

SECTION 23 21 23 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Close-coupled, in-line centrifugal pumps.
2. Automatic condensate pump units.

1.2 DEFINITIONS

A. ECM: Electronically commutated motor.

B. EPDM: Ethylene propylene diene monomer.

C. FKM: Fluoroelastomer polymer.

D. HI: Hydraulic Institute.

E. NBR: Nitrile rubber or Buna-N.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of pump.

B. Shop Drawings: For each pump.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.

B. Seismic Qualification Data: Certificates, for pumps, accessories, and components, from manufacturer.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong Pumps, Inc.
2. Bell & Gossett
3. Grundfos Pumps Corporation.
4. TACO Comfort Solutions, Inc.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally or vertically.

C. Pump Construction:

1. Casing: Radially split, cast iron, with threaded gauge tappings at inlet and outlet, replaceable bronze wear rings, and threaded companion-flange connections.
2. Impeller: ASTM B584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For constant-speed pumps, trim impeller to match specified performance.
3. Pump Shaft Sleeve: Type 304 stainless steel.
4. Pump Stub Shaft: Type 316 stainless steel.
5. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless steel spring, and EPDM rubber bellows and gasket. Include water slinger on shaft between motor and seal.
6. Seal Flushing: Flush, cool, and lubricate pump seal by directing pump discharge water to flow over the seal.

D. Shaft Coupling: Rigid, axially-split spacer coupling to allow service of pump seal without disturbing pump or motor.

E. Motor: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."

1. Enclosure : Totally enclosed, fan cooled.
2. NEMA Premium Efficient motors as defined in NEMA MG 1.
3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
5. Variable-speed motor (P-3)
6. Constant speed motor (P-1 & P-2)
7. Provide integral pump motor variable-speed controller (P-3).

F. Capacities and Characteristics:

1. See drawing Schedules.

2.3 AUTOMATIC CONDENSATE PUMP UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grundfos Pumps Corporation.
2. Hartell Pumps; Milton Roy.
3. Little Giant Pump Co.

B. Description: Packaged units with corrosion-resistant pump, **plastic** tank with cover, and automatic controls. Collects and removes condensate from fan coil units, air handling units, condensing boilers, and

similar components. Include factory- or field-installed check valve and 72-inch-minimum, electrical power cord with plug.

C. Capacities and Characteristics:

1. Tank Capacity: 1 gal.
2. Pump Capacity: 3.5 gpm.
3. Maximum Lift: 20 feet.
4. Motor Horsepower: 1/18.
5. Electrical Characteristics:

    a. Volts: 120 V.
    b. Phase: Single.
    c. Hertz: 60 Hz.
    d. Maximum Overcurrent Protection: 15 A.

2.4 INTEGRAL PUMP MOTOR VARIABLE-SPEED CONTROLLERS

A. Where specified or scheduled, provide pumps with an integral pump motor speed controller.

1. Motor: Operates as constant- or variable-speed pump with speed regulated by an integrated variable-speed drive.
2. Integrated Pump Controller: Supports direct communication with the building management system (BMS) with built-in support for the following protocols: BACnet MS/TP.
3. Commissioning and pump set up access to pump controls via the following:

    a. A web interface (data exchange).
    b. A user interface located on the face of speed controller to adjust modes and mode values.
    c. An electronic display that reads real-time mode set values, flow, head, speed, and power and that locks out unauthorized adjustment of pump.

4. Provide electronics with "Auto" as factory default but slope of the proportional curve will automatically match the required system curve, constant pressure control (delta-p/c), variable differential pressure control (delta-p/v), constant curve duty (uncontrolled pump), and rpm regulation. RPM (speed) regulation can be accomplished by the following:

    a. Manual (via user interface or HTML).
    b. Remote via 0 to 10 V dc.
    c. Data protocol communications with the BMS.

5. Pump Electronics: Standard with multiple digital inputs and one external digital output to be available for additional mechanical room control and pump status monitoring.
6. Controller: Mounted on or adjacent to the motor. Provide enclosure rated to UL Type 12.
7. Electronically Protected Pumps: Rated for continuous duty and with built-in startup circuit. Provide overcurrent, line surge and current limit protection, thermal monitoring, heat sink status and over temperature protection.
8. Pump capable of being monitored continuously via integrated Internet link.
9. Integrated pump controller system to have the following features:

    a. Controller software shall be capable of sensorless control in variable-volume systems without need for pump-mounted (internal/external) or remotely mounted differential pressure sensor.
    b. Integrated Pump Controller Sensorless Control: Operates under Quadratic Pressure Control (QPC) to ensure that head reduction with reducing flow conforms to quadratic control curve.
    c. Controller:

        1) Minimum head of 40 percent of design duty head.
        2) User-adjustable control mode settings and minimum/maximum head set points using built-in programming interface.

d. Controller Integrated Control Software:

1) Capable of controlling pump performance for non-overloading power at every point of operation.
2) Capable of maintaining flow rate data.

2.5 ELECTRONICALLY COMMUTATED MOTOR (ECM)

A. Provide pumps so they are specified or scheduled with ECM.

1. Synchronous, constant torque, ECM with permanent magnet rotor. Rotor magnets to be time-stable, nontoxic ceramic magnets (Sr-Fe).
2. Driven by a frequency converter with an integrated power factor correction filter. Conventional induction motors will not be acceptable.
3. Each motor with an integrated variable-frequency drive, tested as one unit by manufacturer.
4. Motor speed adjustable over full range from 0 rpm to maximum scheduled speed.
5. Variable motor speed to be controlled by a 0- to 10 V-dc or 4- to 20-mA input.
6. Integrated motor protection verified by UL to protect the pump against over-/undervoltage, overtemperature of motor and/or electronics, overcurrent, locked rotor, and dry run (no-load condition).

PART 3 - EXECUTION

3.1 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Automatic Condensate Pump Units: Install units for collecting condensate and extend to open drain.

E. Equipment Mounting: Install in-line pumps with continuous-thread hanger rods and elastomeric hangers of size required to support weight of in-line pumps.

1. Comply with requirements for hangers and supports specified in Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."

3.2 ALIGNMENT

A. Engage a factory-authorized service representative to perform alignment service.

B. Perform alignment service. When required by manufacturer to maintain warranty coverage, engage a factory-authorized service representative to perform it.

C. Comply with requirements in HI standards for alignment of pump and motor shaft. Add shims to the motor feet and bolt motor to base frame. Do not use grout between motor feet and base frame.

D. Comply with pump and coupling manufacturers' written instructions.

E. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with nonshrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.3 PIPING CONNECTIONS

A. Where installing piping adjacent to pump, allow space for service and maintenance.

B. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

C. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

D. Install triple-duty valve on discharge side of pumps.

E. Install Y-type strainer and shutoff valve on suction side of pumps.

1. Use startup strainer for initial system startup. Install permanent strainer element before turnover of system to Owner.

F. Install pressure gauges on pump suction and discharge or at integral pressure-gauge tapping, or install single gauge with multiple-input selector valve.

G. Install check valve on each condensate pump unit discharge unless unit has a factory-installed check valve.

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 26 05 26 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 26 05 53 "Identification for Electrical Systems."
2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring in accordance with Section 26 05 23 "Control-Voltage Electrical Power Cables."

3.6 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's written instructions.

2. Check piping connections for tightness.
3. Clean strainers on suction piping. Use startup strainer for initial startup.
4. Perform the following startup checks for each pump before starting:

    a. Verify bearing lubrication.
    b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
    c. Verify that pump is rotating in correct direction.

5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
6. Start motor.
7. Open discharge valve slowly.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

C. Hydronic pumps will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps.

END OF SECTION

SECTION 23 23 00 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Refrigerant pipes and fittings.
2. Refrigerant piping valves and specialties.
3. Refrigerants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve, refrigerant piping, and refrigerant piping specialty.

B. Shop Drawings:

1. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
2. Show interface and spatial relationships between piping and equipment.
3. Shop Drawing Scale: 1/4 inch equals 1 foot.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8/A5.8M.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Working Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

G. Copper Pressure-Seal Fitting for Refrigerant Piping:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Conex Banninger.
   b. Parker Hannifin, Sporlan Division.

2. Standard: UL 207; certified by UL for field installation. Certification as a UL-recognized component alone is unacceptable.
3. Housing: Copper.
4. O-Rings: HNBR or compatible with specific refrigerant.
5. Tools: Manufacturer's approved special tools.
6. Minimum Rated Pressure: 700 psig

2.3 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Danfoss Inc.
   b. Parker Hannifin Corp.
   c. Paul Mueller Company.

2. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
3. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
4. Operator: Rising stem and hand wheel.
5. Seat: Nylon.
6. End Connections: Socket, union, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Danfoss Inc.

b. Parker Hannifin Corp.
c. Paul Mueller Company.

2. Body and Bonnet: Forged brass or cast bronze.
3. Packing: Molded stem, back seating, and replaceable under pressure.
4. Operator: Rising stem.
5. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
6. Seal Cap: Forged-brass or valox hex cap.
7. End Connections: Socket, union, threaded, or flanged.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. Danfoss Inc.
c. Parker Hannifin Corp.

2. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
3. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
4. Piston: Removable polytetrafluoroethylene seat.
5. Closing Spring: Stainless steel.
6. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
7. End Connections: Socket, union, threaded, or flanged.
8. Maximum Opening Pressure: 0.50 psig.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Danfoss Inc.
b. Heldon Products; Henry Technologies.
c. Paul Mueller Company.

2. Body: Forged brass with brass cap including key end to remove core.
3. Core: Removable ball-type check valve with stainless-steel spring.
4. Seat: Polytetrafluoroethylene.
5. End Connections: Copper spring.
6. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with AHRI 760 and UL 429; listed and labeled by a National Recognized Testing Laboratory (NRTL).

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Danfoss Inc.
b. Parker Hannifin Corp.
c. Paul Mueller Company.

2. Body and Bonnet: Plated steel.
3. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
4. Seat: Polytetrafluoroethylene.
5. End Connections: Threaded.
6. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 208-V ac coil.
7. Working Pressure Rating: 400 psig.

8. Maximum Operating Temperature: 240 deg F.

F. Thermostatic Expansion Valves: Comply with AHRI 750.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Danfoss Inc.
   b. Heldon Products; Henry Technologies.
   c. Paul Mueller Company.

2. Body, Bonnet, and Seal Cap: Forged brass or steel.
3. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
4. Packing and Gaskets: Non-asbestos.
5. Capillary and Bulb: Copper tubing filled with refrigerant charge.
6. Suction Temperature: 40 deg F.
7. Superheat: Adjustable.
8. Reverse-flow option (for heat-pump applications).
9. End Connections: Socket, flare, or threaded union.
10. Working Pressure Rating: 700 psig.

G. Moisture/Liquid Indicators:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Danfoss Inc.
   b. Heldon Products; Henry Technologies.
   c. Parker Hannifin Corp.

2. Body: Forged brass.
3. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
4. Indicator: Color coded to show moisture content in parts per million (ppm).
5. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
6. End Connections: Socket or flare.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 240 deg F.

H. Permanent Filter Dryers: Comply with AHRI 730.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Danfoss Inc.
   b. Heldon Products; Henry Technologies.
   c. Parker Hannifin Corp.

2. Body and Cover: Painted-steel shell.
3. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
4. Desiccant Media: Activated alumina.
5. Designed for reverse flow (for heat-pump applications).
6. End Connections: Socket.
7. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
8. Maximum Pressure Loss: 2 psig.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 deg F.

2.4 REFRIGERANTS

A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Arkema Inc.
    b. DuPont Fluorochemicals Div.
    c. Genetron Refrigerants; Honeywell International Inc.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

C. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type K, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

D. Safety-Relief-Valve Discharge Piping: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

E. Install a full-size, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

    1. Install valve so diaphragm case is warmer than bulb.
    2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
    3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping adjacent to machines to allow service and maintenance.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

J. Install refrigerant piping in protective conduit where installed belowground.

K. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install traps and double risers to entrain oil in vertical runs.
3. Liquid lines may be installed level.

L. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

M. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

N. Identify refrigerant piping and valves according to Section 23 05 53 "Identification for HVAC Piping and Equipment."

O. Install sleeve seals for piping penetrations of concrete walls and slabs.

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Support horizontal piping within 12 inches of each fitting.

E. Support vertical runs of copper tubing to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

SECTION 23 31 13 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

B. Related Sections:

1. Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 23 33 00 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Seismic-restraint devices.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top and bottom of ducts.
5. Dimensions of all duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.
13. Basement and 1st Floor Plan.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and with performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Startup."

D. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

E. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized sheet steel unless otherwise indicated.
2. For ducts exposed to weather, construct of Type 316 stainless steel indicated by manufacturer to be suitable for outdoor installation.

B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
2. For ducts with longest side 36 inches or greater, use flange joint connector Type T-22, T-24, T-24A, T-25a, or T-25b. Factory-fabricated flanged duct connection system may be used if submitted and approved by engineer of record.

C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible." All longitudinal seams shall be Pittsburgh lock seams unless otherwise specified for specific application.

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized sheet steel unless otherwise indicated.
2. For ducts exposed to weather, construct of Type 316 stainless steel indicated by manufacturer to be suitable for outdoor installation.
3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. McGill AirFlow LLC.
    b. Nordfab Ducting.
    c. Sheet Metal Connectors, Inc.

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).

C. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Factory- or Shop-Applied Antimicrobial Coating:

1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested in accordance with ASTM D 3363.
4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
5. Shop-Applied Coating Color: White.
6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

E. Tie Rods: Galvanized steel, 1/4-inch-minimum diameter for lengths 36 inches or less; 3/8-inch-minimum diameter for lengths longer than 36 inches.

2.5 DUCT LINER

A. Fiberglass-Free Duct Liner: Made from partially recycled cotton or polyester products and containing no fiberglass. Airstream surface overlaid with fire-resistant facing to prevent surface erosion by airstream, complying with NFPA 90A or NFPA 90B. Treat natural-fiber products with antimicrobial coating.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acoustical Surfaces, Inc.
b. Bonded Logic, Inc.
c. Ductmate Industries, Inc.

2. Maximum Thermal Conductivity: 0.24 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature when tested in accordance with ASTM C 518.
3. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested in accordance with ASTM E 84; certified by an NRTL.
4. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place, but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpmor greater.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

a. Fan discharges.
b. Intervals of lined duct preceding unlined duct.

c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

   a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.6 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
10. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
11. Service: Indoor or outdoor.
12. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.7 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.

B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts in maximum practical lengths with fewest possible joints.

D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

J. Install heating coils, cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.

K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

L. Elbows: Use long-radius elbows wherever they fit.

1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.

M. Branch Connections: Use lateral or conical branch connections.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts at a minimum to the following seal classes in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
3. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
4. Unconditioned Space, Exhaust Ducts: Seal Class C.
5. Unconditioned Space, Return-Air Ducts: Seal Class B.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Fasteners appropriate for construction materials to which hangers are being attached.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 23 33 00 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness in accordance with "Description of Method 3 - NADCA Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

    a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

C. Duct system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. For cleaning of existing ductwork, see Section 23 01 30.52 "Existing HVAC Air Distribution System Cleaning."

C. Use duct cleaning methodology as indicated in NADCA ACR.

D. Use service openings for entry and inspection.

1. Provide openings with access panels appropriate for duct static-pressure and leakage class at dampers, coils, and any other locations where required for inspection and cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 23 33 00 "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

E. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

F. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

G. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans in accordance with NADCA ACR. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents in accordance with manufacturer's written instructions after removal of surface deposits and debris.

3.8 STARTUP

A. Air Balance: Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class as indicated below.

B. Supply Ducts:

1. Ducts Connected to Constant-Volume Air-Handling Units:

a. Pressure Class: Positive 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 2.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

C. Return Ducts:

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 2.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

D. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.
2. Stainless-Steel Ducts:

a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Galvanized.

E. Liner:
1. Supply-Air Ducts: Fiberglass-Free Duct Liner, 1-1/2 inches thick.
2. Return-Air Ducts: Fiberglass-Free Duct Liner, 1-1/2 inches thick.
3. Supply Fan Plenums: Fiberglass-Free Duct Liner, 1-1/2 inches thick.
4. Return- and Exhaust-Fan Plenums: Fiberglass-Free Duct Liner, 2 inches thick.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Conical spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.

END OF SECTION

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SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Control dampers.
4. Fire dampers.
5. Flange connectors.
6. Duct-mounted access doors.
7. Flexible connectors.
8. Duct accessory hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control-damper installations.
d. Wiring Diagrams: For power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A653/A653M.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless-Steel Sheets: Comply with ASTM A480/A480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.

C. Aluminum Sheets: Comply with ASTM B209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Lloyd Industries, Inc.
3. Ruskin Company.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm.

D. Maximum System Pressure: 2-inch wg.

E. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded corners or mechanically attached and mounting flange.

F. Blades: Multiple single-piece blades, center pivoted, maximum 6-inch width, 0.050-inch-thick aluminum sheet with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Extruded vinyl, mechanically locked.

I. Blade Axles:

1. Material: Galvanized steel.
2. Diameter: 0.20 inch.

J. Tie Bars and Brackets: Galvanized steel.

K. Return Spring: Adjustable tension.

L. Bearings: synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Screen Mounting: Front mounted in sleeve.

    a. Sleeve Thickness: 20 gauge minimum.
    b. Sleeve Length: 6 inches minimum.

6. Screen Mounting: Rear mounted.
7. Screen Material: Galvanized steel.
8. Screen Type: Bird.
9. 90-degree stops.

2.4 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. McGill AirFlow LLC.
    b. Nailor Industries Inc.
    c. Ruskin Company.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

    a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
    b. Mitered and welded corners.
    c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Galvanized-steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

    a. Stainless-steel sleeve.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

B. Jackshaft:

1. Size: 1-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.5 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. McGill AirFlow LLC.
3. Ruskin Company.

B. Frames:

1. Hat shaped.
2. 0.094-inch-thick, galvanized sheet steel.
3. Mitered and welded corners.

C. Blades:

1. Multiple blade with maximum blade width of 6 inches.
2. Parallel-blade design.
3. Galvanized-steel.
4. 0.064 inch thick single skin.

5. Blade Edging: Closed-cell neoprene.
6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

D. Blade Axles: 1/2-inch-diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

E. Bearings:

1. Stainless-steel sleeve.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.6 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Ward Industries; a brand of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gauge and Shape: Match connecting ductwork.

2.7 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. McGill AirFlow LLC.
3. Ruskin Company.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

   a. Double wall, rectangular.
   b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
   c. Vision panel.
   d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
   e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

   a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
   b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
   c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.
   d. Access Doors Larger Than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.
2. Door: Single wall with metal thickness applicable for duct pressure class.
3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
4. Factory set at 3.0- to 8.0-inch wg.
5. Doors close when pressures are within set-point range.
6. Hinge: Continuous piano.
7. Latches: Cam.
8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch-thick, fibrous-glass or polystyrene-foam board.

2.8 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Ward Industries; a brand of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

2.9 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream and downstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. At each change in direction and at maximum 50-foot spacing.
7. Control devices requiring inspection.
8. Elsewhere as indicated.

H. Install access doors with swing against duct static pressure.

I. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.

J. Label access doors according to Section 23 05 53 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

K. Install flexible connectors to connect ducts to equipment.

L. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION

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SECTION 23 81 26 - SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes split-system air-conditioning units consisting of separate evaporator-fan and compressor-condenser components.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: 10 year(s) from date of Substantial Completion.

b. For Parts: One and ½ years from date of Substantial Completion.
c. For Labor: One and ½ year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Carrier 39S Horizontal Indoor units mated with Carrier 24VNA condensing units (products of Carrier Corporation; a unit of United Technologies Corp) or comparable product by one of the following:

1. Aaon, Inc.
2. Trane.
3. YORK; a Johnson Controls company.

2.2 INDOOR UNITS (5 TONS OR LESS)

A. Concealed Evaporator-Fan Components:

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
4. Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch; leak tested to 300 psig underwater; with a two-position control valve.
5. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
6. Fan Motors:

    a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
    b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
    c. Wiring Terminations: Connect motor to chassis wiring with plug connection.

7. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
8. Filters: 2” MERV 8.
9. Condensate Drain Pans:

    a. Fabricated with two percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends), and to direct water toward drain connection.

        1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
        2) Depth: A minimum of 2 inches deep.

    b. Single-wall, stainless-steel sheet.
    c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

        1) Minimum Connection Size: NPS 1.

    d. Pan-Top Surface Coating: Asphaltic waterproofing compound.

e. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

    a. Compressor Type: Scroll.
    b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
    c. Refrigerant: R-410A.
    d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Fan: Aluminum-propeller type, directly connected to motor.
4. Motor: Permanently lubricated, with integral thermal-overload protection.
5. Low Ambient Kit: Permits operation down to 45 deg F.
6. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

1. Compressor time delay.
2. 24-hour time control of system stop and start.
3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection including auto setting.

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. Drain Hose: For condensate.

2.5 CAPACITIES AND CHARACTERISTICS

A. Cooling Capacity:

1. Total: See drawings.
2. Sensible: See drawings.
3. SEER: See drawings.
4. Entering-Leaving Air Temperature:

    a. Dry Bulb: See drawings.
    b. Wet Bulb: See drawings.

B. Indoor Unit:

1. Fan Motor Electrical Characteristics:

a. Volts: 208 V ac.
b. Phase: Single.
c. Frequency: 60 Hz.

2. Airflow: See drawings.

C. Outdoor Unit:

1. Type: Air cooled.
2. Electrical Characteristics:

a. Volts: 208.
b. Phase: Single.
c. Frequency: 60 Hz.
d. Minimum Circuit Ampacity: See drawings.
e. Maximum Overcurrent Protection: See drawings.
f. Fan Motor Full-Load Amperes: See drawings.
g. Compressor Full-Load Amperes: See drawings.
h. Compressor Locked-Rotor Amperes: < See drawings.

3. Sound-Pressure Level: See drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Equipment Mounting:

1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 03 30 00 "Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation devices specified in Section 23 05 48.13 "Vibration Controls for HVAC."

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

1. Water Coil Connections: Comply with requirements specified in Section 23 21 13 "Hydronic Piping" and Section 23 21 16 "Hydronic Piping Specialties." Connect hydronic piping to supply and return coil connections with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

C. Duct Connections: Duct installation requirements are specified in Section 23 31 13 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Section 23 33 00 "Air Duct Accessories."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION

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SECTION 23 84 16.16 - INDOOR, MECHANICAL DEHUMIDIFICATION UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes packaged, factory-assembled and -tested, refrigerant-type, indoor, mechanical dehumidification units designed for indoor installation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of indoor, mechanical dehumidification unit.

B. Shop Drawings: For each indoor, mechanical dehumidification unit.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Field quality-control reports.

C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL.

1.6 COORDINATION

A. Coordinate sizes and locations of concrete bases. Cast anchor-bolt inserts into bases.

B. Coordinate installation of equipment supports.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of indoor, mechanical dehumidification units that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than two years from date of Substantial Completion.
2. Warranty Period for Refrigerant Coils: Manufacturer's standard, but not less than five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INDOOR, MECHANICAL DEHUMIDIFICATION UNIT MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ultra-Aire.
2. Honeywell
3. April Aire.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1.

C. ASHRAE 62.1 Compliance: Section 5, "Systems and Equipment" and Section 7, "Construction and System Start-up."

D. ASHRAE 15 Compliance: "Safety Standard for Refrigeration Systems."

E. Capacities and Characteristics:

1. Airflow through Unit: See drawings
2. Supply Fan: See drawings
3. Refrigeration System: See drawings
4. Electrical Characteristics: See drawings

    a. Volts: 120 V ac.
    b. Phase: Single phase.
    c. Hertz: 60 Hz.
    d. Full-Load Amperes.
    e. Minimum Circuit Ampacity.
    f. Maximum Overcurrent Protection.

2.3 CASINGS

A. Casing: Single-wall construction with interior corrosion-resistant coating and exterior baked-enamel powder-coated steel or aluminum, stainless-steel fasteners, knockouts for electrical and piping connections, condensate drain connection, and lifting lugs.

1. Access: Removable panels with neoprene compression gaskets and cam latches.
2. Insulation: Minimum 2-inch-thick, glass-fiber-insulation fill or closed cell foam, with thermal breaks.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

B. Drain Pan and Connection: Stainless steel; insulated and complying with ASHRAE 62.1.

2.4 FANS

A. Supply Fans: See drawings

1. Blades: Forward curved.
2. Type: Housed, centrifugal.

3. Blade and Housing Material: Galvanized steel with baked-enamel finish.
4. Drive: Direct-driven with keyed motor shaft.

B. Fan Motor: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."

1. Enclosure Type: Totally enclosed, fan cooled.

2.5 FILTERS

A. Pleated:

1. Thickness: Manufacturer's standard depth.
2. MERV Rating: MERV 13, according to ASHRAE 52.2.

2.6 REFRIGERATION SYSTEM

A. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IES 90.1.

B. Refrigerant Coils with Multiple Refrigerant Circuits:

1. Tubes: Copper.
2. Fins:

a. Material: Copper.
b. Fin Spacing: Maximum 12 fins per inch.

3. Fin and Tube Joints: Mechanical bond.
4. Headers: Seamless-copper headers with brazed connections.
5. Frames: Galvanized-steel frame.
6. Coatings: Corrosion-resistant coating.
7. Ratings: Designed, tested, and rated according to ASHRAE 33 and AHRI 410.
8. Source Quality Control: Factory test to minimum 450-psig internal pressure and to minimum 300-psig internal pressure while underwater.

C. Compressors: Hermetic, scroll compressors with integral vibration isolators and crankcase heaters that de-energize during compressor operation; with thermal-expansion valves, filter-dryers, sight glasses, compressor service valves, and liquid- and suction-line service valves.

1. Refrigerant: R-410A.
2. Capacity Control:

a. Cycle compressor.

3. Low-Pressure Cutout: Manual reset after three automatic-reset failures.
4. High-Pressure Cutout: Manual reset.
5. Compressor Motor Overload Protection: Manual reset.
6. Antirecycling Timing Device: Prevent compressor restart for five minutes after shutdown.
7. Defrost Cycle: Adjustable timer shuts off supply fan. Compressor cycles until suction-line temperature confirms thawed evaporator coil. Timer limits defrost time to 10 minutes.

2.7 CONTROLS

A. Comply with requirements in Section 23 09 23 "Direct Digital Control (DDC) System for HVAC" for control equipment and in Section 23 09 93.11 "Sequence of Operations for HVAC DDC."

B. Control Panel: Integral service compartment containing fan-motor thermal and overload cutouts, compressor thermal and overload cutouts, 115-V control transformer if required, magnetic contactors for fan and compressor motors, and a nonfused factory-mounted and -wired disconnect switch for single external electrical power connection.

C. Operating Control: Space humidistat cycles the compressor. Humidistat shall incorporate fan on-off-auto switch.

2.8 ACCESSORIES

A. Water-Cooling Heat Exchanger: Coaxial, vented, double-wall construction; with three-way refrigerant control valve.

B. Smoke Detectors: Photoelectric detector located in return-air plenum, to de-energize unit.

1. Operating Voltage: 24 V dc, nominal.
2. Self-Restoring: Detectors do not require resetting or readjusting after actuation to restore them to normal operation.
3. Plug-in Arrangement: Detector and associated electronic components mounted in module with tamper-resistant connection to fixed base with twist-locking plug. Terminals in fixed base accept building wiring.
4. Integral Visual-Indicating Light: Digital-display type indicating detector operation.
5. Sensitivity can be tested and adjusted in-place after installation.
6. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the fire-alarm control panel.
7. Sensor: Digital display or infrared light source with matching silicon-cell receiver.
8. Detector Sensitivity: Between 2.5 and 3.5 percent/foot of smoke obscuration when tested according to UL 268A.
9. Integral Thermal Detector: Fixed-temperature type with 135 deg F setting.

C. Electrical Convenience Outlet: 115 V ac fused, duplex, straight-blade receptacles, separately fused and located inside control panel.

2.9 MATERIALS

A. Steel:

1. ASTM A 36/A 36M for carbon structural steel.
2. ASTM A 568/A 568M for steel sheet.

B. Stainless Steel:

1. Manufacturer's standard grade for casing.
2. Manufacturer's standard type, ASTM A 240/240M for bare steel exposed to airstream or moisture.

C. Galvanized Steel: ASTM A 653/A 653M.

D. Aluminum: ASTM B 209.

E. Corrosion-Resistant Coating: Coat with a corrosion-resistant coating capable of withstanding a 3,000-hour salt-spray test according to ASTM B 117.

1. Standards:

a. ASTM B 117 for salt spray.
b. ASTM D 2794 for minimum impact resistance of 100 in/lb
c. ASTM B 3359 for cross hatch adhesion of 5B.

2. Application: Immersion.
3. Thickness: 1 mil.
4. Gloss: Minimum gloss of 60 on a 60-degree meter.

2.10 SOURCE QUALITY CONTROL

A. Verification of Performance: Factory test and rate dehumidification units according to AHRI 910.

B. Sound-Power-Level Ratings: Factory test and rate dehumidification units according to AHRI 575.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine walls, floors, and roofs for suitable conditions where dehumidification units will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Equipment Mounting:

1. Install dehumidification units on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 03 30 00 "Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation devices specified in Section 23 05 48.13 "Vibration Controls for HVAC."

3.3 PIPING CONNECTIONS

A. Where piping is installed adjacent to dehumidification units, allow space for service and maintenance of dehumidification units.

B. Connect piping to dehumidification units mounted on vibration isolators with flexible connectors.

C. Connect condensate drain pans using minimum NPS 1-1/4 copper tubing. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan, and install cleanout at changes in direction.

D. Duct installation requirements are specified in Section 23 31 13 "Metal Ducts." Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination in roof-mounted frames. Where indicated, terminate return-air duct through roof structure, and insulate the space between roof and bottom of dehumidification unit.

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems".

C. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 26 05 53 "Identification for Electrical Systems".
2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inchhigh.
3. Locate nameplate where easily visible.

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring between control devices.

C. Connect control wiring according to Section 26 05 23 "Control-Voltage Electrical Power Cables."

D. Connect smoke detector to fire alarm system.

3.6 CLEANING

A. Clean dehumidification units internally, on completion of installation, according to manufacturer's written instructions. Clean fan interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheels, cabinets, and coils' entering-air face.

B. After completing system installation, testing, and startup service of dehumidification units, clean filter housings and install new filters.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain dehumidification units.

END OF SECTION

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Metal-clad cable, Type MC, rated 600 V or less.
3. Fire-alarm wire and cable.
4. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

D. Conductor Insulation:

1. Type THHN and Type THWN-2: Comply with UL 83.

2.2 FIRE-ALARM WIRE

A. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

B. Signaling Line Circuits: Twisted, shielded pair.

C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.

1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: One hole with standard barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION APPLICATIONS AND WIRING METHODS

A. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

B. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

3.4 INSTALLATION OF FIRE-ALARM WIRING

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method: Install wiring in metal pathway according to Section 28 05 28 "Pathways for Electronic Safety and Security."

1. Install plenum cable in environmental airspaces, including plenum ceilings.
2. Fire-alarm circuits and equipment control wiring associated with fire-alarm system shall be installed in a dedicated pathway system. This system shall not be used for any other wire or cable.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Color-Coding: Color-code fire-alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire-alarm system junction boxes and covers red.

E. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the fire-alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.5 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

D. Comply with requirements in Section 28 31 11 "Digital, Addressable Fire-Alarm System" for connecting, terminating, and identifying wires and cables.

3.6 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.7 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

END OF SECTION

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.
3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.3 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

D. Conduit Hubs: Mechanical type, terminal with threaded hub.

E. Lay-in Lug Connector: Mechanical type, aluminum terminal with set screw.

F. Straps: Solid copper, [cast-bronze clamp. Rated for 600 A.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

END OF SECTION

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.
    c. ERICO International Corporation.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut; Atkore International.
    g. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Cooper B-Line, Inc.
        2) Empire Tool and Manufacturing Co., Inc.
        3) Hilti, Inc.
        4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
        5) MKT Fastening, LLC.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
4. Toggle Bolts: All-steel springhead type.
5. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Boxes, enclosures, and cabinets.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. GRC: Comply with ANSI C80.1 and UL 6.
3. EMT: Comply with ANSI C80.3 and UL 797.
4. FMC: Comply with UL 1; [zinc-coated steel] [or] [aluminum].
5. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.

1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Fittings, General: Listed and labeled for type of conduit, location, and use.
3. Fittings for EMT:

    a. Material: Steel.
    b. Type: Setscrew or compression.

C. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

B. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

D. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

E. Gangable boxes are allowed.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated.

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 1/2-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. EMT: Use setscrew or compression, fittings. Comply with NEMA FB 2.10.
3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.

B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

C. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

D. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

H. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

I. Support conduit within 12 inches of enclosures to which attached.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

O. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

P. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Conduit extending from interior to exterior of building.
4. Conduit extending into pressurized duct and equipment.
5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
6. Where otherwise required by NFPA 70.

Q. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 36 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

R. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

S. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

T. Locate boxes so that cover or plate will not span different building finishes.

U. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

V. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION

SECTION 26 05 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Underground-line warning tape.
3. Warning labels and signs.
4. Instruction signs.
5. Equipment identification labels.
6. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 incheS wide; compounded for outdoor use.

2.3 FLOOR MARKING TAPE

A. 2-inch wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.4 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.

2.5 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

2.6 INSTRUCTION SIGNS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

2.7 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench [or concrete envelope]exceeds 16 inches overall.

F. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.

B. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

C. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

D. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

E. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

F. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch high letters for emergency instructions at equipment used for power transfer.

G. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

   a. Indoor Equipment: Adhesive film label. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.
   b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
   c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

   a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive label.
   b. Enclosures and electrical cabinets.
   c. Switchgear.
   d. Switchboards.
   e. Emergency system boxes and enclosures.
   f. Enclosed switches.
   g. Enclosed circuit breakers.
   h. Enclosed controllers.
   i. Variable-speed controllers.
   j. Push-button stations.
   k. Power transfer equipment.
   l. Contactors.
   m. Remote-controlled switches, dimmer modules, and control devices.
   n. Power-generating units.
   o. Monitoring and control equipment.

END OF SECTION

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lighting and appliance branch-circuit panelboards.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.

1.4 INFORMATIONAL SUBMITTALS

A. Panelboard schedules for installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 FIELD CONDITIONS

A. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period. Comply with requirements in Section 01 78 30 "Warranties and Bonds" for administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer’s standard warranties on products and special warranties.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

D. Enclosures: Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.

E. Incoming Mains Location: Convertible between top and bottom.

F. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

G. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Compression type, with a lug on the neutral bar for each pole in the panelboard.
3. Ground Lugs and Bus-Configured Terminators: Compression type, with a lug on the bar for each pole in the panelboard.

H. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

B. Mains: circuit breaker.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.

b. Instantaneous magnetic trip element for short circuits.

2. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Breaker handle indicates tripped status.
c. UL listed for reverse connection without restrictive line or load ratings.
d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.

2.4 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install panelboards and accessories according to NECA 407.

C. Mount top of trim 90 inches above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box.

E. Install overcurrent protective devices and controllers not already factory installed.

F. Install filler plates in unused spaces.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

A. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

B. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 26 24 16

SECTION 26 27 13 - ELECTRICITY METERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes equipment for electricity metering by utility company.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For electricity-metering equipment.

1. Dimensioned plans and sections or elevation layouts.
2. Wiring Diagrams: For power, signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:

1. Application and operating software documentation.
2. Software licenses.
3. Software service agreement.
4. Hard copies of manufacturer's operating specifications, design user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy Submittal.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, store, and handle modular meter center according to NECA 400.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Architect's written permission.

1.9 COORDINATION

A. Electrical Service Connections: Coordinate with utility companies and components they furnish as follows:

1. Comply with requirements of utilities providing electrical power services.
2. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

PART 2 - PRODUCTS

2.1 EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY

A. Meters will be furnished by utility company.

B. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.

C. Meter Sockets: Comply with requirements of electrical-power utility company.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with equipment installation requirements in NECA 1.

B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads and extend grounding connections as required by utility company.

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Connect a load of known kilowatt rating, 1.5 kW minimum, to a circuit supplied by metered feeder.
2. Turn off circuits supplied by metered feeder and secure them in off condition.
3. Run test load continuously for eight hours minimum, or longer, to obtain a measurable meter indication. Use test-load placement and setting that ensures continuous, safe operation.

4. Check and record meter reading at end of test period and compare with actual electricity used, based on test-load rating, duration of test, and sample measurements of supply voltage at test-load connection. Record test results.

C. Electricity metering will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

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SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard-grade receptacles, 125 V, 20 A.
2. GFCI receptacles, 125 V, 20 A.
3. Toggle switches, 120/277 V, 20 A.
4. Occupancy sensors.
5. Wall plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Comply with NFPA 70.

C. RoHS compliant.

D. Comply with NEMA WD 1.

E. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.

F. Wall Plate Color: For plastic covers, match device color.

G. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

A. Duplex Receptacles, 125 V, 20 A:

1. Description: Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498 and FS W-C-596.

2.3 GFCI RECEPTACLES, 125 V, 20 A

A. Duplex GFCI Receptacles, 125 V, 20 A:

1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type: Non-feed through.
4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

2.4 TOGGLE SWITCHES, 120/277 V, 20 A

A. Single-Pole Switches, 120/277 V, 20 A:

1. Standards: Comply with UL 20 and FS W-S-896.

2.5 WALL PLATES

A. Single Source: Obtain wall plates from same manufacturer of wiring devices.

B. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Steel with white baked enamel, suitable for field painting.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
2. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
3. Install wiring devices after all wall preparation, including painting, is complete.

C. Device Installation:

1. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
2. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

D. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

F. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

This page is intentionally left blank.

SECTION 26 28 13 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600 V ac and less for use in the following:

a. Enclosed switches.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-5: **250**-V, zero- to 600-A rating, 200 kAIC, time delay.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.2 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nonfusible switches.
2. Enclosures.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period. Comply with requirements in Section 01 78 30 "Warranties and Bonds" for administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer’s standard warranties on products and special warranties.

1. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

C. Comply with NFPA 70.

2.2 NONFUSIBLE SWITCHES

A. Type HD, Heavy Duty, Three Pole, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1).

C. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

PART 3 - EXECUTION

3.1 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

3.2 INSTALLATION

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Architect's written permission.
4. Comply with NFPA 70E.

B. Coordinate layout and installation of switches and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

C. Install individual wall-mounted switches with tops at uniform height unless otherwise indicated.

D. Comply with NFPA 70 and NECA 1.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, grounding, and clearances.
c. Verify that the unit is clean.

d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
e. Verify that fuse sizes and types match the Specifications and Drawings.
f. Verify that each fuse has adequate mechanical support and contact integrity.
g. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.

C. Enclosed switches will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION

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SECTION **26 51 19** - **LED INTERIOR LIGHTING**

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following types of LED luminaires:

1. Downlight.
2. Strip light.
3. Surface mount, nonlinear.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of luminaire.

B. Product test reports.

C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Provide luminaires from a single manufacturer for each luminaire type.

1.6 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five years from date of Substantial Completion. Comply with requirements in Section 01 78 30 "Warranties and Bonds" for administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer’s standard warranties on products and special warranties.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Ambient Temperature: 41 to 104 deg F.

1. Relative Humidity: Zero to 95 percent.

B. Altitude: Sea level to 1000 feet.

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI.

C. Recessed luminaires shall comply with NEMA LE 4.

2.3 DOWNLIGHT (drawing E-301).

A. Manufacturers:

1. Lithonia.
2. Metalux.
3. Lightolier.

B. Nominal Operating Voltage: 120 V ac.

C. Lamp:

1. Minimum 575 lm.
2. Minimum allowable efficacy of 80 lm/W.
3. CRI of minimum 80. CCT of 2700 K.
4. Rated lamp life of 35,000 hours to L70.
5. Dimmable from 100 percent to 0 percent of maximum light output.
6. Internal driver.
7. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear anodized finish.
3. Universal mounting bracket.
4. Integral junction box with conduit fittings.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames,

lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:

1. Fixed lens.
2. Wide light distribution.
3. Tempered Fresnel glass.
4. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
5. Glass: Annealed crystal glass unless otherwise indicated.
6. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

G. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.
4. Recessed luminaires shall comply with NEMA LE 4.

2.4 STRIP LIGHT (Drawing E-300).

A. Manufacturers:

1. Lithonia.
2. Metalux.
3. Lightolier.

B. Nominal Operating Voltage: 120 V ac.

C. Lamp:

1. Minimum 750 lm.
2. Minimum allowable efficacy of 80 lm/W.
3. CRI of minimum 80 <Insert number>. CCT of 3000 K.
4. Rated lamp life of 35,000 hours to L70.
5. Internal driver.
6. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear anodized finish.
3. With integral mounting provisions.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping of luminaire without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers:

1. Tempered Fresnel glass.
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Glass: Annealed crystal glass unless otherwise indicated.
4. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

G. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.

2.5 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Steel:

1. ASTM A 36/A 36M for carbon structural steel.
2. ASTM A 568/A 568M for sheet steel.

C. Stainless Steel:

1. Manufacturer's standard grade.
2. Manufacturer's standard type, ASTM A 240/240 M.

D. Galvanized Steel: ASTM A 653/A 653M.

E. Aluminum: ASTM B 209.

2.6 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.7 LUMINAIRE SUPPORT

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

E. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.2 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION

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SECTION 28 46 21.11 - ADDRESSABLE FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Duct smoke detectors.
5. Heat detectors.
6. Notification appliances.
7. Remote annunciator.
8. Addressable interface device.
9. Digital alarm communicator transmitter.

1.2 ACTION SUBMITTALS

A. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire-alarm system design.
b. NICET-certified, fire-alarm technician; Level III minimum.

B. Product Data: For each type of product, including furnished options and accessories.

C. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery-size calculations.
7. Include input/output matrix.
8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector.
10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.

a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
b. Show field wiring required for HVAC unit shutdown on alarm.
c. Locate detectors according to manufacturer's written recommendations.

12. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:

a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
c. Complete wiring diagrams showing connections between all devices and equipment.
d. Riser diagram.
e. Record copy of site-specific software.
f. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

1) Equipment tested.
2) Frequency of testing of installed components.
3) Frequency of inspection of installed components.
4) Requirements and recommendations related to results of maintenance.
5) Manufacturer's user training manuals.

g. Manufacturer's required maintenance related to system warranty requirements.
h. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.

C. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period. Comply with requirements in Section 01 78 30 "Warranties and Bonds" for administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.

1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Provide system manufacturer's certification that all components provided have been tested as, and will operate as a system.

B. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn/strobe evacuation.

C. All components provided shall be listed for use with the selected system.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm and specific initiating device at fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Record events in the system memory.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.

3. Loss of communication with any addressable sensor, input module, relay, control module, or remote annunciator.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Supervisory Signal Actions:

1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit and remote annunciators.
3. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.

2.3 FIRE-ALARM CONTROL UNIT

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Faraday.
2. Fire-Lite Alarms, Inc.; a Honeywell International company.
3. GE UTC Fire & Security; A United Technologies Company.
4. Notifier.
5. Siemens Industry, Inc.; Fire Safety Division.

B. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.
2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

D. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

1. Pathway Class Designations: NFPA 72, Class B.
2. Pathway Survivability: Level 0.

E. Notification-Appliance Circuit:

1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

F. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

G. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

H. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

2.4 MANUAL FIRE-ALARM BOXES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Faraday.
2. Fire-Lite Alarms, Inc.; a Honeywell International company.
3. GE UTC Fire & Security; A United Technologies Company.
4. Notifier.
5. Siemens Industry, Inc.; Fire Safety Division.

B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38.

1. Dual-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.

2.5 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be two-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

a. Primary status.
b. Device type.
c. Present average value.
d. Present sensitivity selected.
e. Sensor range (normal, dirty, etc.).

2.6 DUCT SMOKE DETECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Faraday.
2. Fire-Lite Alarms, Inc.; a Honeywell International company.
3. GE UTC Fire & Security; A United Technologies Company.
4. Notifier.
5. Siemens Industry, Inc.; Fire Safety Division.

B. Description: Photoelectric-type, duct-mounted smoke detector.

C. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72.

2. General Characteristics:

a. Detectors must be four-wire type.
b. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
c. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
d. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
e. Detector address must be accessible from FACU and must be able to identify detector's location within system and its sensitivity setting.
f. Operator at FACU, having designated access level, must be able to manually access the following for each detector:

1) Primary status.
2) Device type.
3) Present average value.
4) Present sensitivity selected.
5) Sensor range (normal, dirty, etc.).

g. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with supplied detector for smoke detection in HVAC system ducts.
h. Each sensor must have multiple levels of detection sensitivity.
i. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
j. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.7 HEAT DETECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Faraday.
2. Fire-Lite Alarms, Inc.; a Honeywell International company.
3. GE UTC Fire & Security; A United Technologies Company.
4. Notifier.

B. General Requirements for Heat Detectors: Comply with UL 521.

1. Temperature sensors shall test for and communicate the sensitivity range of the device.

C. Heat Detector, Combination Type: Actuated by either a fixed temperature or a rate of rise.

1. Mounting: Twist-lock base interchangeable with smoke-detector base.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

D. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.8 NOTIFICATION APPLIANCES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. GE UTC Fire & Security; A United Technologies Company.
2. Siemens Industry, Inc.; Fire Safety Division.
3. System Sensor.
4. Wheelock; a brand of Eaton.

B. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464.

D. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch-high letters on the lens.

1. Mounting: Wall mounted unless otherwise indicated.
2. Flashing shall be in a temporal pattern, synchronized with other units.
3. Strobe Leads: Factory connected to screw terminals.
4. Mounting Faceplate: Factory finished, red.

2.9 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.

4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply.
5. Loss of power.
6. Low battery.
7. Abnormal test signal.
8. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.

C. Equipment Mounting: Install fire-alarm control unit on finished floor.

D. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.

E. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.
2. Mount manual fire-alarm box on a background of a contrasting color.
3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.

F. Smoke- or Heat-Detector Spacing: Comply with NFPA 72.

G. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

H. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.

J. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.2 PATHWAYS

A. Pathways above recessed ceilings and in nonaccessible locations may be routed exposed.

1. Exposed pathways located less than 96 inches above the floor shall be installed in EMT.

B. Pathways shall be installed in EMT.

C. Exposed EMT shall be painted red enamel.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 27 05 53 "Identification for Communications Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.5 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by Engineer and authorities having jurisdiction.

B. Perform the following tests and inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

    a. Inspection shall be based on completed record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter.
    b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

D. Fire-alarm system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 28 46 21.11

SECTION 28 46 21.15284621.15 - ASPIRATING SMOKE DETECTION (ASD)

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes details of the VESDA-E VEA Air-sampling Smoke Detection (ASD) products to assist in their installation and commissioning. VESDA-E VEA range provides 40 point-addressable smoke detection points. The Point-addressable VESDA VEA ASD is referred to as ASD throughout this document.

B. ASD SYSTEM INFORMATION

1. An Early Warning Fire Detection System like the Point-addressable VESDA-E VEA ASD System shall be installed throughout the areas nominated on the drawings.
2. The ASD system shall consist of:

a. Highly sensitive LASER-based smoke sensor module with replaceable filter
b. High capacity pump and a rotary valve connected to a network of individual microbore tubes with individual sampling points on microbore tubes.
c. An LED display, and when required an optional LCD display may be provided to monitor each ASD detector.
d. Optional relay module to annunciate individual alarms for the sampling points connected to the microbore tubes.
e. Optional VESDAnet networking to annunciate alarms and faults through High Level Interface (HLI) and / or on monitoring software such as VSM.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and assembly within building.
3. Include diagrams for power, signal, and control wiring. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
4. Product data and building drawings shall be submitted and shall include tubing layout, operational calculations and performance criteria. Tools such as ASPIRE may be used to generate this material.
5. To be drawn to scale, and coordinated with each other, using input from installers of the items involved.

C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Material test reports.

C. Product test reports.

D. Field quality-control reports.

E. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

B. A copy of the manufacturer's installation, operation and maintenance manuals shall be supplied upon completion of the installation.

C. System commissioning data shall be supplied (in a format recommended by the manufacturer and per the instructions provided by the manufacturer) within 30 days of completion of the installation.

D. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.5 QUALITY ASSURANCE

A. ASD Installer qualifications:

1. The equipment installer shall be authorized and trained by the manufacturer and shall have the ability to design a system based on code requirements.
2. The installer shall be capable of providing calculations, design, and testing documents upon request.

B. Manufacturer:

1. The manufacturer shall have a minimum of 35 years production experience in the design and manufacture of high sensitivity air sampling smoke detection systems.
2. The manufacturer shall be certified as meeting ISO 9001:2008 for manufacturing.
3. The manufacturer and their representatives shall make available adequate accreditation training to all personnel involved in the supply, installation, commissioning, operation and maintenance of the ASD system.

C. The ASD must be of a type submitted to, tested, approved, and/or listed to the Standards mentioned below by a Nationally Recognized Testing Laboratory (NRTL):

UL268 and UL268A: UL (Underwriters Laboratories Inc), USA

D. The ASD shall be installed to comply with one or more of the following codes or standards:

1. NFPA Standards, US
2. NEC Standards, US
3. Fire Industry Association (FIA), Code of Practice for Design, Installation, Commissioning & Maintenance of Aspirating Smoke Detector (ASD) Systems
4. Local codes and standards

E. Equipment Supplier

1. The equipment supplier shall be authorized and trained by the manufacturer to calculate/design, install, test and maintain the ASD system.

2. The equipment supplier shall be able to produce a certificate of training from the manufacturer.

F. Installer
1. The equipment installer shall be authorized and trained by the manufacturer and shall have the ability to design a system based on code requirements.
2. The installer shall be capable of providing calculations, design, and testing documents upon request.

G. Warranty
1. The manufacturer shall guarantee the product by warranty for a period of two years.
2. Any damage to the ASD due to poor handling or operating shall be complete by a factory-trained installer.

H. Training
1. The manufacturer and their representative shall make available adequate accreditation training to all personnel involved in the supply, installation, commissioning, operation and maintenance of the ASD system.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components of system that fail(s) in materials or workmanship within specified warranty period. Comply with requirements in Section 01 78 30 "Warranties and Bonds" for administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer’s standard warranties on products and special warranties.

B. Any damage to the ASD due to poor handling or operating outside its operational limits will void its warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or a comparable product by one of the following:

1. Honeywell Gamewell FCI, 12 Clintonville Road, Northford CT 06118, Part Number VEA-040-A00-GW with accessories requires for a complete and operational system.
2. Notifier.
3. Xtralis.
4. Siemens.
5. Wormald.

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. The ASD system shall:

1. Consist of a highly sensitive LASER-based light scattering smoke sensor module, filter, rotary valve, pump, microbore tubes and sampling points.
2. Be modular, with each detector having display with indicator LEDs and a reset control button and/or optionally with a LCD Display showing detector status including fault categories and smoke level relative to the fire alarm setting.

3. Consist of an air sampling microbore tube network with each tube having individual sampling point at the end to transport air to the detection system.
4. Support up to 40 point-addressable detection points with two individual smoke detection chambers each supporting 20 detection points.
5. Support optional equipment which may include a dedicated graphics package such as VSM.
6. Be tested and approved to cover up to 3,345 sq. m. (36,000 sq. ft.) area subject to system design and local regulatory requirements.
7. Be approved to provide Early Warning Fire Detection (EWFD) / Class A / Class B and Standard Fire Detection (SFD) / Class C.
8. Generate a global detector level fire alarm during smoke event and then identify the fire location through addressable detection sampling points by scanning through the rotary valve.
9. Provide four output levels for the global detector alarm corresponding to Alert, Action, Fire 1 and Fire 2.
10. Provide individual sampling point tube Fire 1 alarm once global Fire 1 alarm is raised.
11. Allow:

    a. Detection of sampling point and microbore tube blockage.
    b. Detection of microbore tube breakage and sampling point presence at set intervals.
    c. Cleaning of sampling point at set intervals.

12. Have a facility to perform centralized smoke testing.
13. Report any fault on the detector by direct communications on the SLC loop of a fire alarm control panel or a monitoring software tool running on a PC or hand-held device such as a tablet or smart phone.
14. Be capable of setting filter life based on the environment.

C. Detection Technology: The Detection Chamber shall employ a highly sensitive LASER light source.

D. Detection Method - The detection sensing method shall use a laser light source and at least one photodiode spaced inside the detection chamber to detect smoke particles. Smoke detection shall include:

1. Minimizing the effect of large dust particles on the true smoke obscuration.
2. Settable filter life based on the environment with notification when filter maintenance is required.

E. Absolute Calibration: The detection chamber shall be factory calibrated and shall not use adaptive algorithms or drift compensation techniques to adjust the sensitivity or detector output from that established during commissioning.

2.3 PERFORMANCE

A. Global Alarm Levels

1. The ASD system shall Generate a global detector level fire alarm during smoke event and then identify the fire location through addressable detection sampling points by scanning through the rotary valve.
2. The ASD system shall have four (4) selectable global alarm thresholds. The four alarm levels may be used as follows:

    a. Alarm Level 1 (Alert) - Activate a visual and audible alarm in the fire risk area.
    b. Alarm Level 2 (Action) - Activate the electrical/electronic equipment shutdown relay and activate visual and audible alarms in the Security Office or other appropriate location.
    c. Alarm Level 3 (Fire 1) - Initiate an alarm condition in the Fire Alarm Control Panel to call the Fire Brigade and activate all warning systems.
    d. Notes-The alarm level functions as listed Above are possible scenarios. Consideration should be given to the best utilization of these facilities for each application and the requirements of Local Authorities Having Jurisdiction.

B. -Alarm Level Selection

1. The ASD system global alarm and sampling point alarm shall have following three (3) settings available for selection Fire 1 level:

    a. High = 1.6% obs/m (0.5% obs/ft)
    b. Enhanced = 4% obs/m (1.3% obs/ft)
    c. Standard = 8% obs/m (2.5% obs/ft)

C. Default Alarm Settings

1. Selection for the alarm levels shall be determined by the requirements of the protected environment. However, the setting for Fire 1 (Alarm Level 3) shall always appear as 100% on the bar graph scale. Default settings of the ASD unit shall be:

    a. Alarm Level 1 (Alert) 25% of Fire-1
    b. Alarm Level 2 (Action) Automatically set midway between Alert and Fire-1
    c. Alarm Level 3 (Fire 1) Enhanced
    d. Alarm Level 4 (Fire 2) 2.0% obs/m (0.625% obs/ft)

D. Default Settings for the Alarm/Fault delays

1. Alarm Level 1 (Alert) 10 seconds
2. Alarm Level 2 (Action) 10 seconds
3. Alarm Level 3 (Fire 1) 10 seconds
4. Alarm Level 4 (Fire 2) 10 seconds
5. Air Flow Fault 4 minutesD

2.4 COMMUNICATIONS

A. Intelligent Fire Alarm Control Panel Connectivity

1. The ASD shall be capable of connection to an E3 Series or S3 Series Fire Alarm Control Panel (FACP) via a Signaling Line Circuit (SLC) using the communications protocol native to the system, without the use of any additional hardware.
2. The FACP shall be capable of monitoring and annunciating up to four smoke event thresholds on the ASD and several trouble conditions.
3. The FACP shall be capable of monitoring and annunciating individual alarms for the sampling points connected to the microbore tubes on the ASD.
4. Each event threshold shall be capable of being assigned a discrete type ID at the FACP, including Aspiration Alarm, Aspiration Pre-Alarm, Aspiration Supervisory, Aspiration Non-Fire, and Aspiration Air Reference, which will determine how the event will be annunciated at the FACP.
5. The FACP shall support flexible system programming for all event levels, and shall be capable of simultaneous activation of multiple event levels.
6. The following operations shall be able to be performed on the ASD via the FACP:

    a. Disable/enable
    b. Reset airflow baseline

7. Detector trouble conditions annunciated at the FACP shall include indications for:

    a. Low air flow
    b. High air flow
    c. Configuration (programming) fault
    d. Device in service mode
    e. Communications loss
    f. Time lost or not set
    g. Aspiration fault
    h. Filter fault
    i. Detector fault
    j. Detector initializing warning

k. Power fault.

B. Secondary Communications

1. Detectors shall provide inbuilt secondary communications for monitoring and configuration using the following physical media:

a. USB
b. 10/100 BaseT Ethernet
c. WiFi (802.11b/g)

2.5 COMPONENTS

A. Detectors shall incorporate the following features:

1. For the VEA Detector, the Smoke Sensor Module, Filter, Pump, Rotary valve and Relay Outputs shall be housed in a metal enclosure and shall be arranged in such a way that air is drawn from the fire risk area by the pump and a sample is passed through a sample filter and the smoke sensor module.
2. The detector shall employ a highly sensitive LASER light source and a photodiode.
3. The detector shall have 40 microbore sampling tube inlets and must employ a flow measurement arrangement to detect individual flow per tube.
4. The detector shall generate a global detector level fire alarm (Fire-1) during smoke event and then identify the fire location through addressable sampling point detection point by scanning the rotary valve.
5. The detector shall have four output levels for the global detector alarm corresponding to Alert, Action, Fire 1 and Fire 2. The Fire-1 level shall be selectable from three options corresponding to sampling point sensitivity of High = 1.6% obs/m (0.5% obs/ft), Enhanced = 4% obs/m (1.3% obs/ft), and Standard = 8% obs/m (2.5% obs/ft).
6. The detector shall have two pre-alarm smoke alarm thresholds with adjustable Alert threshold set to a % of Fire-1 threshold and Action threshold set in the middle of Alert and Fire-1 thresholds.
7. The detector shall have global Fire-2 alarm automatically set to 2xFire-1 setting.
8. The detector shall have a test port per detection chamber to facilitate centralized smoke test under user control.
9. The detector shall have ability to perform leak test by isolating the external microbore tube network to ensure integrity of internal detection air path.
10. The detector shall employ modular construction allowing field replacement of the filter, smoke sensor module, rotary valve and the pump.
11. The detector shall also incorporate facilities to transmit the following fault categories:

a. Detector
b. Air flow
c. Filter
d. System
e. Zone
f. Network
g. Power
h. Chamber
i. Module

12. The filter shall be a disposable filter cartridge and shall be capable of filtering particles in excess of 20 microns from the air sample.
13. A second filter shall be ultrafine, removing more than 99% of contaminant particles of 0.3microns or larger, to provide a clean air barrier around the detector’s optics to prevent contamination and increased service life.
14. The pump shall be a capable of allowing for multiple microbore sampling tube runs up to 100m (328ft) each with a transport time per applicable local codes.
15. The Assembly must contain seven or more pre-configured relays. The relays must be rated at 2 Amp at 30 VDC.

16. The detector shall have built-in event and smoke logging. It shall store smoke levels, alarm conditions, operator actions and faults. The date and time of each event shall be recorded. Each detector shall allow storage of up to 20,000 events and does not require the presence of a display in order to do so.
17. The detector shall incorporate a galvanically isolated General Purpose Input (GPI) which activates in the event of an applied voltage of 5 to 50VDC and assigned to Reset function.
18. The detector shall incorporate a monitored voltage-free input assigned to Reset function, to be used with isolated relay contacts, which is supervised using a 10k Ohm terminating resistor.

B. Displays

1. The VEA detectors shall provide an LED user interface; four LEDs to indicate Alert, Action, Fire 1 and Fire2 alarm events; one trouble LED; one disable / standby LED; and power On / Off indication. All LEDs shall have appropriate symbols without any text.
2. In addition to the LED user interface, the VEA detector shall optionally provide an LCD user interface with following characteristics:

    a. Color LCD touch screen user interface with bar graph display.
    b. Alarm threshold indicators for Alert, Action and Fire 1.
    c. Fault icons indicating faults for these categories: detector, chamber, filter, flow, aspirator, network, power and external module where applicable.
    d. A touch screen interface to allow scrolling through status screens on the LCD.

C. Microbore Sampling Tube Network

1. Microbore Sampling Tube

    a. The microbore sampling tube shall comply with the following requirements:

        1) 6mm (0.24”) OD / 4mm (0.16”) ID and 4mm (0.16”) OD / 2.5mm (0.1”) ID tubes shall be used.
        2) Tubes shall have adequate marking to meet local codes and standards.
        3) Tubes shall be UL listed / recognized.
        4) Tubes shall be approved for use in the protected environment.

    b. Where false ceilings are installed, the sampling tubes shall be installed above the ceiling, and sampling points shall be installed on the ceiling and connected to the sampling tube.
    c. The sampling tubes shall be of the same length or use the manufacturer’s guidelines to run tubes of the required lengths using two diameter tubes (6mm (0.24”) and 4mm (0.16”) OD).
    d. Maximum tube length shall be up to 100m (328ft), however shorter tube lengths may be accommodated in accordance with the manufacturer’s guidelines.
    e. All joints in the sampling tubes must be air tight and made by using manufacturer recommended connectors.

2. Sampling Points shall comply with the following requirements:

    a. Sampling points shall not be separated by more than the maximum distance allowed for conventional point detectors as specified in the local codes and standards. Intervals may vary according to calculations. For AS1670.1-2004 the maximum allowable distance is 10.2m. For FIA the maximum allowable distance is 10.6m. For NFPA the maximum allowable distance is 30ft.
    b. Each sampling point shall be identified in accordance with Codes or Standards.
    c. Sample point shall have inbuilt mechanism to enable sampling point testing and microbore tube integrity testing from the VEA detector.

D. Software

1. Monitoring

a. The system shall have available software to monitor all devices connected to a system. Such software shall be provided to run on:

1) PC-based, Android-based or iOS-based hardware.
2) A dedicated monitoring device mounted remotely from any detector.

2. Configuration and Programming

a. Configuration and programming may be performed using a Windows® application such as Xtralis VSC running on a PC by direct connection to a detector or through Ethernet network.
b. Configuration and programming tool shall support the following features at a minimum:

1) Programming of any device on the VESDAnet system as per the device documentation.
2) Viewing of the status of any device in the system.
3) Adjustment of the alarm thresholds of a nominated detector.
4) Setting of Day/Night, weekend and holiday sensitivity threshold settings.
5) Multi-level password control.
6) Programmable latching or non-latching relay operation.
7) Programmable energized or de-energized relays.
8) Programmable high and low flow settings for airflow supervision.
9) Number of microbore tubes in use and input maximum length of a microbore tube.
10) Programming if sampling points are used on a VEA detector.
11) Programmable maintenance intervals.
12) Facilities for referencing with time dilution compensation.
13) Testing of relays assigned to a specific zone to aid commissioning.

3. Security

a. The following security measures shall be provided

1) Connectivity via wireless access shall support WPA2 encryption with encryption key.
2) Access to a detector via Ethernet or WiFi shall be protected using a detector password specific to the detector and in addition to the WiFi encryption key.
3) All software connecting to a detector or peripheral shall support an authentication protocol to verify that it has been supplied by the manufacturer of the system.

4. Upgrading

a. There shall be provision for field upgrading the firmware in the system using a USB memory key connected directly to the detector, avoiding the need for a separate PC for this function.

E. Power Supply and Batteries

1. The system shall be powered from a regulated supply of nominally 24V DC. The battery charger and battery shall comply with the relevant Codes, Standards or Regulations. Typically 24 hours standby battery backup is required followed by 30 minutes in an alarm condition.
2. Local Power Supply Standards that may apply:

a. UL 1481 Listed - provided the power supply and standby batteries have been appropriately sized / rated to accommodate the system's power requirements.
b. US Telecommunication Central Office Power Supply - the system shall operate on negative 48 VDC (provided continuously from the telephone central office power source) converted to 24VDC.
c. EN 54-4 approved power supply for use in Europe.
d. In accordance with AS 1670.1-2004 and NZS4512: 2003.

2.6 SOURCE QUALITY CONTROL

A. The installation and programming of the ASD shall be completed by a factory-trained installer.

B. System will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all materials before installation. Reject materials that are wet, moisture damaged, or mold damaged.

3.2 PREPARATION

3.3 INSTALLATION

A. The contractor shall install the entire detection system in accordance with the national and local codes and manufacturer's System Design Manual.

B. ASD Detector Mounting

1. The detector shall be capable of vertical mounting with sample air inlet port(s) directed on the right hand side for microbore tube entry.
2. The detector shall be capable of mounting directly to a wall using screw fasteners or by using a stainless steel mounting bracket such as the VSP-970.

C. Transport Time

1. Wherever possible the transport time (i.e. the time taken by smoke sampled to reach the detector) for the least fa-vorable sampling point i.e. from the longest microbore tube shall be less than less than 90 seconds.
2. Local codes and standards may also apply. For example:

a.	NFPA 72	The Americas	120 Seconds
b.	NFPA 76	The Americas	60 Second

D. Comply with NECA 1.

E. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for cable trays specified in Division 26 Section "Cable Trays for Electrical Systems."
3. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceways and Boxes for Electrical Systems."

F. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

G. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.4 FIELD QUALITY CONTROL

A. System commissioning

1. Detector configuration

a. There shall be provision for a PC software tool such as VSC to configure all user modifiable parameters of the VEA detector.

B. Commissioning Tests

1. The contractor shall allow for the manufacturer's representative to attend commissioning of the entire installation in the presence of the owner and/or their representative.
2. All necessary instrumentation, equipment, materials and labor shall be provided by the Contractor.
3. The Contractor shall record all tests and system configuration and a copy of these results shall be retained on site in the System Log Book.

C. System Checks

1. Visually check all microbore tubes to ensure that all tube joints, fittings, sampling points, etc., comply with the Specification.
2. Check the system to ensure the following features are operational and programmed in accordance with the specification.

a. Alarm threshold levels (for both day and night settings),
b. Time delays,
c. Number of tubes in use,
d. Detector SLC address,
e. Display address where applicable,
f. Clock time and date,
g. Air flow fault thresholds,
h. Touch screen operable where applicable,
i. Units set to U.S./S.I. (for US only) or metric for other regions,
j. Check to ensure that all ancillary warning devices operate as specified.
k. Check interconnection with Fire Alarm Control Panel to ensure correct operation and reporting on the correct SLC address.

D. Final Tests, Contractor shall:

1. Introduce smoke into each detection chamber through the local test ports provided on the detector to ensure test ports are functional.
2. Verify that transport time from the sampling port connected to the longest microbore tube does not exceed the local code requirements using smoke signal rise on the VSC / VSM or the LCD display.
3. Activate the appropriate Fire Alarm zones and advise all concerned that the system is fully operational. Fill out the logbook and commissioning report accordingly.

E. System will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.5 MAINTENANCE AND SERVICE

A. Sample Filter

1. The detector shall incorporate a replaceable cartridge-style filter such as VSP-972 to remove large contaminants from the sampled air.
2. The filter shall be accessible by opening the cover to the field wiring terminal area.
3. Once accessible, the filter shall be removable and replaceable using a readily available tool.

B. Spare Parts

1. The detector shall incorporate a replaceable Pump such as VSP-973, follow manufacturer's instruction to replace the Pump.
2. The detector shall incorporate a replaceable Smoke Sensor Module such as VSP-971, follow manufacturer's instruction to replace the Chamber Assembly.
3. The detector shall incorporate a replaceable Rotary Valve such as VSP-974, follow manufacturer's instruction to replace the Rotary Valve.
4. The detector shall incorporate a replaceable Front Covers such as VSP-975 LED Front Cover and VSP-976 LCD Front Cover, follow manufacturer's instruction to replace the Front Covers.

3.6 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 7 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 28 46 21.15284621.15

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SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. This Section includes the following:

1. Protecting existing trees and vegetation to remain including installation of staging fencing and temporary safety barricade.
2. Removing trees and other vegetation.
3. Clearing and grubbing.
4. Topsoil and subsoil stripping and stockpiling.
5. Removing above- and below- grade site improvements and off-site disposal.
6. Removal and/or on-site pulverizing of designated pavements.
7. Disconnecting, capping or sealing, and removing site utilities or abandoning site utilities in place.
8. Temporary erosion and sedimentation control.

B. Related Sections include the following:

1. Division 01 Section "Execution Requirements".
2. Division 01 Section "Temporary Facilities and Controls".
3. Division 31 Section "Earth Moving".
4. Division 32 Section "Turf and Grasses".

C. If there any discrepancies found between these specifications and related drawings and details, the most restrictive requirement and/or material/part shall be applied by the Contractor without compensation.

1.3 DEFINITIONS

A. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other non-soil materials.

B. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

C. Form 817: "Standard Specifications for Roads, Bridges, and Incidental Construction", State of Connecticut, Department of Transportation, Form 817”, with latest edition and supplement.

D. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

H. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

I. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

J. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

K. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.5 MATERIALS OWNERSHIP

A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared and demolished materials shall become Contractor's property and shall be removed from the Project site.

1.6 SUBMITTALS

A. Photographs or video sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.

B. Topsoil stripping and stockpiling program.

C. Record drawings according to Division 1, Section "Project Closeout."

1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

D. Burning not allowed on the site.

E. Product data for safety barricade and root inoculant.

1.7 QUALITY ASSURANCE

A. Preconstruction Conference: Conduct conference at Project site to comply with requirements in Division 01, Section "Project Coordination". Coordinate meeting with project sediment and erosion control requirements.

B. All work shall comply with all codes, rules, regulations, laws and ordinances for the Town of Canterbury, the State of Connecticut, and all other authorities having jurisdiction.

1.8 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing indicated removal and alteration work on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Peripheral areas outside the Contract limit line shall not be disturbed or used for storing materials.

C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

D. Notify utility locator service or Call Before You Dig for area where Project is located before site clearing.

E. Review and verify all limits or improvements to be removed prior to commencing demolition operations.

F. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

G. Tree- and Plant-Protection Zones: Protect according to requirements on the drawings and details.

H. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

I. Inspection: Verify existing condition of all items scheduled for demolition or removal. The Owner assumes no responsibility for the actual condition of structures or utilities to be demolished. Do not proceed with any work that will result with unsafe conditions causing a continuing or permanent hazard. Ascertain that all work scheduled for demolition can be safely accomplished in a proper time period.

J. Benchmarks: Protect all survey monuments, benchmarks, and property boundary pins. Replace if destroyed by Contractor’s operations. Relocate designated monuments where and as directed by the Town of Canterbury. Coordinate and schedule work with Owner.

K. Permits/Fees: Coordinate with appropriate utility companies and pay any disconnect fees and obtain permits as necessary.

L. Provide 48 hours notice prior to conducting any site demolition operation.

1.9 REFERENCES

A. State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, as amended and including current supplemental specifications.

B. “2002 Connecticut Guidelines for Soil Erosion and Sediment Control” by The Connecticut Council on Soil and Water Conservation in cooperation with the Connecticut Department of Environmental Protection.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31, Section "Earth Moving."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

2.2 SOIL EROSION AND SEDIMENTATION CONTROL

A. This item shall consist of temporary erosion control measures as shown on the Plans, or as ordered by the Construction Manager, Town of Canterbury Officials, Erosion and Sedimentation Inspecting Engineer or Qualify Professional, during the life of the contract to control water pollution, soil erosion, and siltation through the use of common erosion control methods including hay bales and siltation fences and silt sacks, construction entrances / anti-tracking pads, and combination of the listed materials as defined in the Sedimentation & Erosion Control Plan. The temporary erosion control measures contained herein and as shown on the contract drawings shall be installed and coordinated to assure economical, effective, and continuous erosion control throughout the construction period. The Contractor shall install and maintain the devices during construction. Contractor shall have a log of the erosion control inspections.

1. SILTATION FENCE:

a. Synthetic filter fabric should be a pervious sheet of polypropylene, nylon, polyester, ethylene or similar filaments and shall be certified by the manufacturer or supplier as conforming to the requirements in Table 1 below.

TABLE 1 – GEOTEXTILE SILT FENCING MINIMUM REQUIREMENTS

Physical Property	Test Method	Minimum Requirement
Grab tensile strength (lbs.)	ASTM D4632	124 lbs.
Grab Elongation	ASTM D4632	15 X 20%
Trapezoidal tear	ASTM D4533	65 lbs.
UV Resistance at 500 hrs	ASTM D4355	80%
Apparent opening size (AOS)	ASTM D4751	30 US Std. Sieve
Water Flow rate	ASTM D4491	10 gpm/ft^2
Permittivity	ASTM D4491	0.1 sec $^{-1}$
Roll sizes		3.0 ft. x 1500 ft. 3.5 ft. x 330 ft.

b. The geotextile shall be non-rotting, acid and alkali resistant and have sufficient strength and permeability for the purpose intended, including handling and backfill operations. Filaments in the geotextile shall be resistant to absorption. The filament network must be dimensionally stable and resistant to de-lamination. The geotextile shall be free of any chemical treatment or coating that will reduce its permeability. The geotextile shall also be free of any flaws or defects which will alter its physical properties. Torn or punctured geotextiles shall not be used. The geotextile shall be on the Connecticut Department of Transportation's "Qualified Product List".

c. The geotextile silt fence must be staked, and the geotextile entrenched to a minimum depth of six inches below the existing surface. The supporting posts shall be at least 42 inches long made of either 1.5-inch square hardwood stakes or steel posts with projections for fastening the geotextile and possessing a minimum strength of 0.5 pound per linear foot. The support posts shall be driven to a depth of at least 12 inches into existing ground and never installed more than 10 feet apart.

d. Siltation fence shall be stored in a manner that will protect it from the elements. If stored outdoors, it shall be elevated and protected with a waterproof cover. Both the geotextile and threads associated with the fence shall be resistant to chemical attack, mildew, and rot. Each roll of fabric shall be labeled or tagged to provide product identification as well as inventory and quality control purposes.

2. HAY BALES:

The hay bales shall be made of hay or straw with 40 pounds minimum weight and 120 pounds maximum weight held together by twine or wire.

The stakes for anchoring hay bales shall be a minimum of 36 inches long and made of either hardwood with dimensions of at least 1.5 inches square or steel posts with a minimum weight of 0.5 pounds per linear foot.

The hay bales shall be entrenched to a minimum depth of 4 inches below the existing surface. Place the hay bales in a single row in the trench, lengthwise, with ends of adjacent bales tightly abutting on another and the binding oriented around the sides rather than along the tops and bottoms of the bale in order to prevent premature rotting of the bindings.

Anchor each bale with at least 2 stakes, driving the first stake in each bale toward the previous laid bale to force the bales together. Stakes must be driven a minimum of 18 inches into the ground. Fill any gaps between the bales with hay or straw to prevent water from escaping between the bales.

Backfill the bales with the excavated trench material to a minimum depth of 4 inches on the uphill side of the bales. Tamp down by hand or machine and compact the soil. Cover the disturbed area immediately uphill from the hay bale barrier with loose hay or straw to increase the barriers efficiency.

Hay bales shall be stored in a manner that will protect them from the elements. If stored outdoors, they shall be elevated and protected with a waterproof cover.

3. SILT SACKS:

The silt sack to be manufactured from a woven polypropylene geotextile and sewn by a double needle machine, using a high strength nylon thread. The silt sack seams have a certified average wide width strength per ASTM D-4884 standards as follows or approved equal:

Silt sack Style	Test Method	Minimum Values
Regular Flow	ASTM D-4884	165.0lbs./in

The silt sack will be manufactured to fit the opening of the catch basin or drop inlet. the silt sack will have the following features: two dump straps attached at the bottom to facilitate the emptying of the silt sack; the silt sack will also have lifting loops as an integral part of the system to be used to lift the silt sack from the basin. The silt sack will have a restraint cord approximately halfway up the sack to keep the sides away from the catch basin walls, this yellow cord is also a visual means of indicating when the sack should be emptied. Once the strap is covered with sediment, the silt sack should be emptied, cleaned, and placed back into the basin.

The geotextile fabric will be woven polypropylene fabric with the following properties or approved equal:

Silt sack Regular Flow

Property	Test Method	Minimum Value
Grab Tensile	ASTM D-4632	300 lbs.
Grab Elongation	ASTM D-4632	20%
Puncture	ASTM D-4633	120 lbs.
Mullen Burst	ASTM D-3786	800 psi
Trapezoid Tear	ASTM D-4533	120 lbs.
UV Resistance	ASTM D-4355	80%
Apparent Opening	ASTM D-4751	40 US Sieve
Flow Rate	ASTM D-4491	40 Gal/Min/Ft.^{2}
Permittivity	ASTM D-4491	0.55 sec^{-1}

Silt sacks are to be installed in those locations as shown on the Plans to protect newly installed drainage structures and existing drainage structures.

4. EROSION CONTROL BLANKET:

The extended-term double net erosion control blanket shall be a machine-produced mat of 70% agricultural straw and 30% coconut fiber with a functional longevity of up to 24 months. The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with a heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and an approximate 0.63 x 0.63 in mesh, and on the bottom side with a lightweight photodegradable polypropylene netting with an approximate 0.50 x 0.50 mesh. The blanket shall be sewn together on 1.50-inch centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches from the edge) as an overlap guide for adjacent mats.

Material Content

Matrix	70% Straw Fiber 30% Coconut Fiber	0.35 lbs./sq.yd. 0.15 lbs./sq.yd.
Netting	Top: Heavyweight photodegradable with UV additives	3 lbs./1,000 sq.ft.
Thread	Degradable	
Index Property	Test Method	Typical
Thickness	ASTM D6525	0.35 in.
Resiliency	ECTC Guidelines	75%
Water Absorbency	ASTM D6475	7.87 oz/sy
Swell	ECTC Guidelines	30%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	1.11 oz-in
Light Penetration	ASTM D6567	6.2%
Tensile Strength - MD	ASTM D6818	362.5 lbs/ft.
Elongation - MD	ASTM D6818	29.4%
Tensile Strength - TD	ASTM D6818	136.8 lbs/ft.
Elongation - TD	ASTM D6818	27.6%
Biomass Improvement	ASTM D7322	481%

Include manufacturer's recommended steel wire staples, 6 inches long. Blankets shall be installed with overlap to adjacent mats as specified by the manufacturer. Staples shall be installed using manufacturer's recommended staple pattern and quantity based on the soil type and application. The matting used shall be specifically intended for "slope stabilization" applications, shall be

consistent with the manufacturer's recommendations for the intended use and shall be on the Connecticut Department of Transportation's "Qualified Product List".

5. CONSTRUCTION ENTRANCE:

The construction entrance is a stone stabilized pad located at points of vehicular ingress and egress on a construction site. The location, dimensions and details of the construction entrance are shown on the plans and in accordance with these specifications.

The stone used for this work shall conform to the requirements of the State of Connecticut Department of Transportation "Standard Specifications for Roads, Bridges and Incidental Construction", Form 817, as amended and including current supplemental specifications section M.01.01, Size No. 3.

The fibers in the geotextile used shall consist of synthetic polymers composed of at least 85% by weight polypropylenes, polyesters, polyamides, polyethylene, polyolefin's or polyvinyl-chlorides. The fibers shall be formed into a stable network of filaments or yarns retaining dimensional stability relative to each other. The geotextile used shall be specifically intended for "road stabilization" applications, shall be consistent with the manufacturer's recommendations for the intended use and shall be on the Connecticut Department of Transportation's "Qualified Product List".

The area of the construction entrance shall be cleared of all vegetation, roots and other organic or unsuitable material. At poorly drained locations install subsurface drainage insuring the outlet to the drains are free flowing. If using geotextile in place of free draining material, unroll the geotextile in a direction parallel to the roadway entrance in a loose manner permitting it to conform to the surface irregularities when the stone is placed. Unless otherwise specified by the manufacturer, the minimum overlap of geotextile panels joined without sewing according to the manufacturer's recommendations. The geotextile may be temporarily secured with pins recommended or provided by the manufacturer but they shall be removed prior to placement of the stone. Place the stone according to the locations, dimensions and depth as shown on the plans.

The construction entrance shall be maintained in a condition that will prevent tracking, flowing and washing of sediment onto paved surfaces. Provide periodic top dressing with additional stone or additional length as conditions demand. Repair any measures used to trap sediment as needed. Immediately remove all sediment spilled, dropped, washed or tracked onto paved surfaces. Roads adjacent to a construction site shall be left clean at the end of each day.

When the construction entrance is no longer needed, or upon project completion, the anti-tracking pad shall be removed in its entirety and the area shall be restored as directed. The pad materials and sediments shall be removed to a location approved by the Construction Manager.

6. Sediment barriers (silt fence/haybale/stone/silt fence/haybale) are to be installed in as shown on the Plans, according to details provided.

7. Silt trap, diversion berm, water bars are to be installed in as shown on the Plans, according to details provided.

8. Washout areas are to be installed in as shown on the Plans, according to details provided.

2.3 SAFETY BARRICADE

A. The Safety Barricade shall be a temporary, polypropylene construction fence, fully stabilized for UV resistance, with 2 inch by 4.5 inch apertures.

1. Color: Orange, height 4'0".
2. Top tension rope – 3/8" braided nylon/polypropylene rope.

B. POSTS: Heavy gauge channel steel posts 6'0" long.

2.4 ROOT INOCULANT

A. Inoculant shall be rooting growth hormone containing mycorrhizae.

2.5 ANTIRUST COATING

A. Antirust Coating shall be fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #23 (surface-tolerant, anticorrosive metal primer) or SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.

2.6 STAGING FENCING

A. Staging Fencing: Chain Link Fence, minimum 6'0" height, 11 gauge with 1-1/2" OD posts at 10'-0" maximum on center spacing. Top tension wire required.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements.

C. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

D. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Temporary grass cover shall be a quick growing species, suitable to the area, which will provide temporary cover, and will not compete with the grasses sown for permanent cover.

C. If temporary or permanent seeding cannot be done within the seeding season, use the temporary netting and mulching measure to protect the site and delay seeding until the next recommended seeding period.

D. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

E. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

F. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE PROTECTION

A. Erect and maintain a safety barricade around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete. Post spacing 6'0". Securely attach fencing to posts, including providing a top tension line, woven through top of fabric.

1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.

B. Do not excavate within drip line of trees, unless otherwise indicated.

C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

1. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
2. Coat cut faces of roots more than 1-1/2 inches in diameter with emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
3. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.4 UTILITIES

A. Arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.
2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Construction Manager and/or Owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Construction Manager's written permission.

D. Excavate for and remove underground utilities indicated to be removed.

E. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024120 "Selective Site Demolition."

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots. Selectively clear trees and prune branches with in 20' of clearing limit line or property line. Pruning to conform to Class III Standards.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Selectively prune and cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Completely remove stumps, roots, obstructions, and debris typically extending to a depth of 36 inches below any subgrade.
4. Use only hand methods for grubbing within drip line of remaining trees.
5. Chip removed tree branches and dispose of off-site or use for temporary ground cover to prevent erosion.
6. Along property lines, notify Construction Manager before beginning clearing operations. Coordinate clearing, grubbing and selective pruning with Construction Manager, to maintain as much existing vegetation as is practical.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding 8-inch loose depth and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Prepare areas of existing loam so as to provide clump free topsoil. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.
1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
2. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.
3. Where trees are indicated to remain, hold stripping a sufficient distance away to prevent damage to the root system.
4. No topsoil stripping is required where proposed fills are greater than 12’ in height.

C. Stockpile materials away from edge of excavations without intermixing with other soil materials. Grade and shape stockpiles to drain surface water, in locations approved by the Owner and consistent with sediment and erosion control requirements.
1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within drip line of remaining trees.
3. Stockpile surplus topsoil and allow for respreading entire amount of approved-stripped topsoil or haul excess topsoil to locations designated by the Owner. All excess approved topsoil remains the property of the Owner.

3.7 SUBSOIL STRIPPING

A. After topsoil is fully stripped, strip existing subsoil in all proposed pavement areas, within building footprint, in areas of shallow cuts, and in areas of shallow (less than 6’ height) fills.

B. Strip subsoil to whatever depths are encountered in a manner to prevent intermingling with topsoil and general fill.

3.8 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove all slabs, paving, handicap ramp, handicap ramp railings, curbs, and all base/subbase material as indicated to full depths encountered, unless specifically noted otherwise.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically, perpendicular and parallel to direction of traffic.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

C. Remove existing site improvements, including pavements fences of various types, and signage.

D. Remove and salvage or reinstall site signage as indicated on plans. Coordinate new location with Owner and Construction Manager.

E. Remove and reinstall flagpole and associated hardware.

3.9 DISPOSAL

A. Disposal: Remove unsuitable soil material, cleared and grubbed material, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property. No burning or burying on site is permitted.

B. Accumulation of disposal/waste materials on-site is not permitted.

C. All pavement demolition material remains the property of the Contractor, except as specifically noted to be retained or permitted to be re-used on-site.

D. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work

3.10 MAINTENANCE OF EXISTING SITE AREAS

A. The Contractor shall maintain all areas within the project limits, for the duration of the contract. The maintenance will include the continuous mowing of undisturbed lawn areas within project limits, as well as the removal of any debris within fenced off areas.

B. The Contractor shall maintain all temporary and permanent erosion and sediment within the project limits, for the duration of the contract.

C. This maintenance will also disposition of temporary measures
1. All temporary erosion and sediment control measures shall be disposed of within thirty (30) days after final site stabilization is achieved or after the temporary measures are no longer needed as determined by owner.

D. Trapped sediment and other disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion.

E. Substantial Completion of Erosion Control Measures:
1. At the time specified in the contract documents, and subject to compliance with specified materials and installation requirements, contractor shall receive a Substantial Completion Certificate for temporary erosion control measures.
2. Maintenance of Erosion Control Measures after Substantial Completion:
   a. Contractor shall be responsible for maintaining temporary erosion control measures as specified in the drawings and contract documents until such time as work has been accepted by owner as specified in Section 01 77 00, Closeout Procedures.
   b. Include the continuous mowing of undisturbed lawn areas within project limits, as well as the removal of any debris within fenced off areas.

F. Final Completion and Acceptance of Erosion Control Measures:

1. After engineer and owner have determined that the drainage area has stabilized, contractor shall remove all remaining temporary erosion control measures.
2. Any damage to the site shall be repaired to the satisfaction of engineer and at no cost to owner.

END OF SECTION 31 10 00

SECTION 31 20 00 – EARTH MOVING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.1 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing sub-grades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
3. Sub-base course for concrete walks and pavements.
4. Sub-base course and base course for asphalt paving.
5. Subsurface drainage backfill for utility structure and trenches.
6. Excavating and backfilling trenches for utilities, for buried utility structures, and other.

B. Related Sections:

1. Division 1 Section "Construction Progress Documentation" for recording pre-excavation and earth moving progress.
2. Division 1 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also, for temporary site fencing if not in another Section.
3. Division 3, Section 03 30 00 "Cast-in-Place Concrete" for granular course beneath the walkway and building slab-on-grade.
4. Division 3, Section 03 30 53 "Miscellaneous Cast-in-Place Concrete" for granular course miscellaneous cast concrete items on-grade.
5. Divisions 33, 22, 23, and 26 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
6. Division 31, Section 31 10 00 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
7. Division 31, Section 31 23 19 "Dewatering" for lowering and disposing of ground water during construction.
8. Division 31, Section 31 50 00 "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
9. Division 32, Section 32 92 00 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

C. If there any discrepancies found between these specifications and related drawings and details, the most restrictive requirement and/or material/part shall be applied by the Contractor without compensation.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation. Native material on site is not suitable for backfill.

   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.

   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the sub-base course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated sub-grade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill. Native material on site may not suitable. Sieve analysis required.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above sub-grade elevations and to lines and dimensions indicated.

   1. Authorized Additional Excavation: Excavation below sub-grade elevations or beyond indicated lines and dimensions as directed by Construction Manager. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

   2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.

   3. Unauthorized Excavation: Excavation below sub-grade elevations or beyond indicated lines and dimensions without direction by Structural Engineer. Unauthorized excavation, as well as remedial work directed by Construction Manager, shall be without additional compensation.

G. Common Fill: Soil materials used to raise existing grades in grass area.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

   1. Excavation of Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.

   2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.

I. <u>All excavated material that fall with definition “rock” and “boulder”, to be excavated and disposed off-site, and is not eligible for compensation under allowance and is part of base bid. If necessary, void to be filled with suitable material and compacted. Also, is part of the base bid.</u>

J. Structures: Sheds, slabs, tanks, manholes, catch basins, yard drains, storm drain cleanouts, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

K. Sub-base Course: Aggregate layer placed between the sub-grade and base course for hot-mix asphalt pavement, or aggregate layer placed between the sub-grade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

L. Sub-grade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below sub-base, drainage fill, drainage course, or topsoil materials.

M. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

N. Unsatisfactory soil: Any soil not meeting Conn. DOT Form 817 or project requirements, including ledge, shell or rock. Unsatisfactory soil or material shall be removed off site at the Contractor's expense.

O. Polluted soil: Soil affected by a release of a substance at a concentration above the analytical detection limit for such substance. The regulations of Connecticut State agencies section 22a-133k-1 through 22a-133k-3 and as supplemented and amended.

P. Contaminated soil: Soil where contamination is found that exceeds the State of Connecticut DEP Remediation Standards.

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct pre-excavation conference at Project site.

1. Review methods and procedures related to earthmoving, including, but not limited to, the following:

a. Personnel and equipment needed to make progress and avoid delays.

b. Coordination of Work with utility locator service.

c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.

d. Extent of trenching by hand or with air spade.

e. Field quality control

1.4 SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles: drainage fabric and separation fabric.

2. Controlled low-strength material, including design mixture.

3. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:

1. Geotextile: 12 by 12 inches.

2. Warning Tape: 12 inches long; of each color

C. Qualification Data: For qualified testing agency.

A. Material Test Reports: From an approved qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

Complete mechanical/sieve analysis classification according to Form 817 and ASTM D 2487 and shall be testing one (1) sample per every 200 cubic yards of on-site or borrow soil material proposed to be used for common fill and backfill. Washed sieve shall be performed for 200 sieve on all materials.

Laboratory compaction curve according to ASTM D 1557 for each on-site or borrow soil material proposed for common fill, granular fill, structural, and backfill.

Report of actual unconfined compressive strength and/or results of bearing tests of each stratum tested.

Test sampling shall conform to the requirements of ASTM D-75, and ASTM D-3665.

B. No blasting allowed.

C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

D. Provide certification that any imported fill material is not “polluted soil” in accordance with the regulations of Connecticut State agencies section 22a-133k-1 through 22a-133k-3 and as supplemented and amended.

E. All installation of materials prior to testing and/or review and response by Architect/Engineer is at Contractor’s risk.

F. Final As-built to be prepared of all items location and elevations by a CT Licensed Land Surveyor in paper, Mylar and AutoCAD format and provided to the owner.

1.5 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

B. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division 1, Section "Project Coordination".

a) Before commencing earthwork, meet with representatives of the governing authorities, Owner, Architect, Engineer, consultants, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

C. Testing: Compaction tests will be required by the Owner and will be paid for by the Owner. No specific testing schedule has been established at this time. If tests indicate that density requirements have not been achieved, the Contractor shall continue compacting.

D. All retesting in these areas shall be paid for by the Contractor. See Division 1, Section “Quality Control Services”. Contractor is required to compensate testing laboratory, directly, for all material test reports.

E. Density and Compaction Testing: The Contractor is responsible to schedule compaction tests and to allow adequate time for the proper execution of said tests.

F. Protect all benchmarks, monuments, and property boundary pins. Replace if destroyed by Contractor’s operations.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Construction Manager.

C. Utility Locator Service: Notify "Call Before You Dig" (1-800-922-4455 or 811) before beginning any earth moving work and/or demolition operations.

D. Do not commence earth moving operations until temporary site fencing and erosion and sedimentation control measures, specified in Division 31 Section 31 10 00 "Site Clearing," and Phasing Plans Care in place.

E. Do not commence earth moving operations until plant-protection measures for Tree Protection are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.

2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 – PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. **Native on-site soil**: The on-site excavated soils should not be used for backfill beneath paved parking and drives where within 3 feet of finished grade. On site soils should not be used as controlled fills where within 3 feet of the finished pavement grades. To use native soil on-site will require to meet Common fill requirements below. The dry density after compaction shall not be less than 95% of the dry density for that soil when tested in accordance with AASHTO T 180, Method D. Each layer of the embankment shall be compacted at optimum moisture content. The native soil compaction to be approved by a Geotechnical Engineer.

C. The use of the on-site soils would be limited by the natural water content of the soils and weather conditions. Where these soils are used, they should be placed in layers not to exceed 6" with kneading type compaction (i.e., with sheep's foot rollers) to break down any chunks of soil. Where the subgrades are wet, the initial layer of fill in such areas would have to be crushed stone or off-site sand and gravel. The use of on-site excavation material in controlled fills, may require temporary stockpiling, if work is done during wet periods or if such excavated material is taken from areas lying below a level which is 2 feet above the found groundwater levels. The placement of the crushed stone or sand and gravel layers as an initial step after stripping of topsoil will lessen potential extra expenditures required to mitigate disturbed areas.

D. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM or Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter, and conforming to non-polluted soil in accordance with the CT DEEP RSR definitions, and determined by the special inspector as suitable. To confirm that the soil is satisfactory, composite sample of the material to be obtained and used from source stockpile. The soil shall be tested at one (1) sample per 200 c.y. to be delivered to the construction site.

E. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145 or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
2. All soils conforming to polluted soil in accordance with the CT DEEP RSR definitions.
3. Excavated ledge, shell or rock materials that not suitable to reuse on site and/or doesn't meet project specifications.

F. Structural Fill and Backfill, for slab at grade underlayment (to 4" below the slab bottom) the material should conform to the following or be 3/8" crushed stone:

Percent Passing	Sieve Size
100	3.5”
50-100	¾ “
25-75	No. 4

The fraction, passing the No.4 sieve shall have less than 15%, passing the No. 200 sieve. All backfill, and fill must be compacted to at least 95% of modified optimum density.

G. Granular fill. Shall comply with the Standard Specifications M.02.01 items 1 or 2

H. Sub-base Material: Shall comply with the Standard Specifications M.02.02 items 1 or be 3/8" crushed stone conforming to M.01.01 #8 or the material should conform to the following:

Percent Passing	Sieve Size
100	3.5”
50-100	¾ “
25-75	No.4

The fraction, passing the No.4 sieve shall have less than 15%, passing the No. 200 sieve. All backfill, and fill must be compacted to at least 95% of modified optimum density.

Where the sub-grades are wet, place an initial 10"+ layer of 3/4" crushed stone (Form 817, M.01.01 #6) to provide a stable subgrade for the heavy equipment required to place controlled fills and the pavement sections.

I. Gravel Aggregate Base: Shall comply with the Standard Specifications M.02.01.

J. Processed aggregate base: Shall comply with the Standard Specifications M.05.01. Where the sub-grades are wet, place an initial 10"+ layer of 3/4" crushed stone (Form 817, M.01.01 #6) to provide a stable subgrade for the heavy equipment required to place controlled fills and the pavement sections.

K. Rolled Bank Gravel Surface course: Shall comply with the CT DOT FORM 817 Specifications M.02.03.

L. Gravel aggregate for base used under concrete sidewalks and walks: shall comply with the CT DOT FORM 817 Specifications M.02.01.

M. Engineered fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

N. Crushed Stone: Clean, sound material free of debris, waste, frozen materials and organic material conforming to Form 817, Article M.01.01 size as indicated on Drawings.

O. Pea Gravel: Clean, sound material free of debris, waste, frozen materials and organic material conforming to Form 817, Article M.01.01 #8 size as indicated on Drawings.

P. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand;

4. Storm and Sanitary sewer pipe bedding material: CT DOT 817 M.08.03. If ground water encountered use ¾" clean crushed stone conforming to CT DOT FORM 817 M.01.01 #6.

5. Conduit bedding: use sand CT DOT M.03.01-2.

6. Initial Backfill for storm pipes as defined on the drawings and details. Class 1 or 2 conforming to ASTM D2321. For gradation see chart at the end of this specification.

7. Flowable fill to be used as backfill where identified on the drawings. The flowable fill mix should be designed to meet all strength and flowability requirements. A suggested strength ranges between 50 psi and 100 psi the 28-day strength; mixes that have 28-day compressive strengths greater than 100 psi should be avoided due to increased difficulty in future excavation, if needed. The flowable fill should be able to flow into all voids between the pipe and the trench walls. The mix design should be laboratory tested prior to installation ensure that the proper results are obtained during field batching. The field mix may also require monitoring and adjustments to maintain the proper mix and properties. These variations in the field mix can be due to many factors including water content, temperature and humidity during placement.

8. Bedding for ALL storm water and septic sewer structures use ¾" clean crushed stone conforming to the requirements of Section M.01.01 for No.6 stone of the State of Connecticut Department of Transportation "Standard Specifications for Roads, Bridges and Incidental Construction", Form 817, including current supplemental and edition.

Q. Drainage Course: Narrowly graded mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

R. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.

S. Sand: Shall comply with the Standard Specifications M.03.01.2.

T. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

U. General /Common Fill:

Material used to establish subgrade elevations may be either:

9. Approved soil material, obtained from off-site, certified to conform to the following grain size gradation.

i. Borrow/Granular Fill (AASHTO TYPE A-1-a)

a. Bank run material: free of shale, clay, slag, friable material and debris.

b. The material must be within the following limits:

SIEVE SIZE	PERCENT BY WEIGHT PASSING SIEVE
4 inches	99
No. 4 (4.75mm)	30 to 70
No. 200 (75 micro m)	3 to 15

10. If native material available from excavation on site, the material shall meet the specification for general fill as described below or approved by Architect prior to placement. Maximum size 8".

a. Sound, earthen material with 95% passing the 4-inch sieve.

b. Percent of material by weight passing Number 200 sieve shall not exceed 20% when tested in accordance with AASHTO T-27.

ii. All material used for common/general filling shall be clean, free of clay and organic material and capable of satisfactory compaction.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: As specified by subsurface drainage manufacturer or as identified of the CT DOT Qualified Product list. Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:
3. Retain subparagraph above or first four subparagraphs below. Strength values below correspond to AASHTO M 288 Survivability Class 2 for subsurface drainage applications. Revise if other strength values are required.
4. Grab Tensile Strength: 157 lbf; ASTM D 4632.
5. Sewn Seam Strength: 142 lbf; ASTM D 4632.
6. Tear Strength: 56 lbf; ASTM D 4533.
7. Puncture Strength: 56 lbf; ASTM D 4833.
8. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
9. Permittivity: 0.5 per second, minimum; ASTM D 4491.
10. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: As identified of the CT DOT Qualified Product list. Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:
3. Grab Tensile Strength: 247 lbf; ASTM D 4632.
4. Sewn Seam Strength: 222 lbf; ASTM D 4632.
5. Tear Strength: 90 lbf; ASTM D 4533.
6. Puncture Strength: 90 lbf; ASTM D 4833.
7. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
8. Permittivity: 0.02 per second, minimum; ASTM D 4491.
9. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting, low-density, flowable concrete material produced from the following:

1. Portland Cement: ASTM C 150, Type I or Type II, meeting State of Connecticut DOT standards for use as mix-water for cast-in-place concrete.
2. Fly Ash: ASTM C 618, Class C or F.
3. Normal-Weight Aggregate: ASTM C 33, 3/8-inch nominal maximum aggregate size.
4. Foaming Agent: ASTM C 869.
5. Water: ASTM C 94.
6. Air-Entraining Admixture: ASTM C 260

B. Produce low-density, controlled low-strength material with the following physical properties:

1. As-Cast Unit Weight: 30 to 36 lb./cu. ft. at point of placement, when tested according to ASTM C 138.
2. Compressive Strength: 50psi to 100 psi, when tested according to ASTM C 495.

a) Produce conventional-weight, controlled low-strength material with 50-psi to 100-psi compressive strength when tested according to ASTM C 495.

2.4 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 4 inches wide and 4 mils thick, continuously inscribed with a description of the utility with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 – EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Preparation of sub-grade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."

C. Protect and maintain erosion and sedimentation controls, during earthwork operations.

D. Provide protective insulating materials to protect sub-grades and foundation soils against freezing temperatures or frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. It is the Contractor's responsibility and expense to protect the project Site from surface and ground water damage regardless of the project status: project continue or has been stopped for any reason.

B. Prevent surface water and ground water from entering excavations, from ponding on prepared sub-grades, and from flooding Project site and surrounding area.

C. Protect sub-grades from softening, undermining, washout, and damage by rain or water accumulation.

D. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

Explosives: do not use explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to sub-grade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

B. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

1. Measurements in subparagraphs below are examples only; revise to suit Project conditions and office standards.
2. 24 inches outside of concrete forms other than at footings.
3. 12 inches outside of concrete forms at footings.
4. 6 inches outside of minimum required dimensions of concrete cast against grade.
5. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
6. 6 inches beneath bottom of concrete slabs on grade.
7. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

C. Classified Excavation: Excavate to sub-grade elevations. Material to be excavated will be classified as earth.

D. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed.

E. Polluted soil: Excavate to design limits and stockpile separately from all other soil. Dispose off-site in accordance with State of Connecticut DEEP regulations with manifest, the same protocol as contaminated and hazardous soil. The contractor is responsible for engaging a special inspector qualified and trained to sample the soils identified as polluted and any other soils where concerns become apparent. The special inspector must submit to a licensed laboratory under a chain of custody for the characterization for the disposal criteria of the selected facility.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavate by hand to indicated lines, cross sections, elevations, and sub-grades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

1. Cut and protect roots according to requirements for tree protection and trimming.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and sub-grades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, and where indicated on the drawings, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit, or as indicated on Drawings.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe. Shape sub-grade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench sub-grade.

1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed sub-grade.

2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.

3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed sub-grade.

4. Excavate trenches 12 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree and Plant Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and sub-grades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3. Cut and protect roots according to requirements on the drawings.

3.8 LONG TERM SLOPES, if applicable.

A. Long Term Slopes in earth cuts and fills shall be 2:1, or flatter. Over excavation and back blading of cut slope surfaces should be avoided. The back-blading operation can leave potential areas, where future sloughing could initiate. Slopes, which are steeper than 2H:1V, will require proper compaction, permeant erosion blanket installation immediately to address possible sloughing. There should be an underdrain and a crushed stone wedge at the base of all cut slopes in excess of 4 feet in height.

The requirements for compactor size and loose lift thickness are as follows:

Static Weight	Dynamic Force	Lift Thickness
10 Tons	20 Tons	12”
7.5 Tons	15 Tons	10”
5 Tons	10 Tons	8”
2 Tons	4 Tons	7”
1 Ton	2 Tons	6”
< 1 Ton	< 2 Tons	< 5”

3.9 SUB-GRADE INSPECTION

Notify Construction Manager when excavations have reached required sub-grade.

If Construction Manager determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

Proof-roll sub-grade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated sub-grades.

i. Completely proof-roll sub-grade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.

ii. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Construction Manager, and replace with compacted backfill or fill as directed.

iii. Where the sub-grades are wet, place an initial 10"+ layer of 3/4" crushed stone (Form 817, M.01.01 #6) to provide a stable subgrade for the heavy equipment required to place controlled fills and the pavement sections.

Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

Reconstruct sub-grades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Construction Manager, without additional compensation.

3.10 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Engineer.
B. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Engineer.

3.11 STORAGE OF SOIL MATERIALS

Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

A. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

B. Stockpile unsatisfactory soils separately from all others.

C. Stockpile polluted soil separately from all others. Cover with 2 layers of 6 mil polyethylene with anchoring to prevent blow off.

3.12 BACKFILL

Place and compact backfill in excavations promptly, but not before completing the following:

A. Construction below finish grade including, where applicable, sub-drainage, dampproofing, waterproofing, and perimeter insulation.

B. Surveying locations of underground utilities for Record Documents.

C. Testing and inspecting underground utilities.

D. Removing concrete formwork.

E. Removing trash and debris.

F. Removing temporary shoring and bracing, and sheeting.

G. Installing permanent or temporary horizontal bracing on horizontally supported walls.

H. Place backfill on sub-grades free of mud, frost, snow, or ice.

3.13 UTILITY TREANCH BACKFILL

A. Place backfill on sub-grades free of mud, frost, snow, or ice.
B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete." and Section 033053 "Miscellaneous Cast-in-Place Concrete."
D. Trenches under pavement: Backfill as specified on Drawings.
E. Backfill voids with satisfactory soil while removing shoring and bracing.
F. Place and compact initial backfill as specified on the Drawings, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
G. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
H. Controlled Low-Strength Material/ Flowable fill: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.
I. Place and compact final backfill of satisfactory soil to final sub-grade elevation.
J. Controlled Low-Strength Material/ Flowable fill: Place final backfill of controlled low-strength material to final sub-grade elevation.
K. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below sub-grade under pavements and slabs.

3.14 SOIL FILL

Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory/ common fill soil material.
2. Under walks and pavements, use satisfactory/ granular fill soil material.
3. Under steps and ramps, use granular fill.
4. Under building slabs, use granular and crushed stone fill.
5. Under tanks and subsurface structures use granular fill and crushed stone fill.

Place soil fill on sub-grades free of mud, frost, snow, or ice.

3.15 SOIL MOISTURE CONTROL

Uniformly moisten or aerate sub-grade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

i. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

ii. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.16 COMPACTION OF SOIL BACKFILLS AND FILLS

Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698 or ASTM D 1557:

i. Under structures, building slabs, steps, and pavements, scarify and re-compact top 12 inches of existing sub-grade and each layer of backfill or fill soil material at 95 percent.

ii. Under walkways, scarify and re-compact top 6 inches below sub-grade and compact each layer of backfill or fill soil material at 92 percent.

iii. Under turf or unpaved areas, scarify and re-compact top 6 inches below sub-grade and compact each layer of backfill or fill soil material at 85 percent.

iv. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.17 GRADING

General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

i. Provide a smooth transition between adjacent existing grades and new grades.

ii. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish sub-grades to required elevations within the following tolerances:

i. Grading inside Building Lines: Finish sub-grade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.18 SUBSURFACE DRAINAGE

Subsurface Drain: Place subsurface drainage geotextile around perimeter of sub-drainage trench. Place a minimum of 4-inch or as shown on the drawings and details of clean crushed stone, conforming to the requirements of Section M.01.01 of the State of Connecticut Department of Transportation "Standard Specifications for Roads, Bridges and Incidental Construction", Form 817, including current supplemental and edition, on subsurface drainage geotextile to support sub-drainage pipe. Encase sub-drainage pipe in a minimum of 12 inches of clean crushed stone or as shown on the drawings and details, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 12 inches.

i. Compact each filter material layer with a minimum of two passes of a plate-type vibratory compactor.

3.19 SUB-BASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

Place sub-base course and base course on sub-grades free of mud, frost, snow, or ice.

On prepared sub-grade, place sub-base course and base course under pavements and walks as follows:

i. Install separation geotextile (if required) on prepared sub-grade according to manufacturer's written instructions, overlapping sides and ends.

ii. Place base course material over sub-base course under hot-mix asphalt pavement.

iii. Shape sub-base course and base course to required crown elevations and cross-slope grades.

iv. Place sub-base course and base course 6 inches or less in compacted thickness in a single layer.

v. Place sub-base course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.

vi. Compact sub-base course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698 or ASTM D 1557.

3.20 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

Place drainage course on sub-grades free of mud, frost, snow, or ice.

On prepared sub-grade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

i. Install sub-drainage geotextile (if required) on prepared sub-grade according to manufacturer's written instructions, overlapping sides and ends.

ii. Place drainage course 6 inches or less in compacted thickness in a single layer.

iii. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.

iv. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.21 FIELD QULITY CONTROL

Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.

2. Determine that fill material classification and maximum lift thickness comply with requirements.

3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.

4. Sample and submit to a licensed laboratory to submit to the disposal facility for their disposal criteria for polluted soil.

5. Sample and submit to a licensed laboratory any soils that exhibit or are suspected of exhibiting characteristics of contaminated soil.

Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing and inspection.

Allow testing agency to inspect and test sub-grades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work complies with requirements.

Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

i. Paved and Slab Areas: At sub-grade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three (3) tests.

ii. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than two (2) tests.

When testing agency reports that sub-grades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; re-compact and retest until specified compaction is obtained.

Where excavated material meets the definition of polluted soil, stockpile separately, cover with 6 mil polyethylene

The contractor is responsible for identifying polluted, contaminated soil, and the cost for laboratory testing, removal, replacement, and disposal.

3.22 PROTECTION

Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and re-compact.

Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.23 DISPOSAL OF SURPLUS AND WASTE MATERIALS

Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, polluted soil, trash, and debris, and legally dispose of it off Owner's property.

Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Special Inspector or dispose off site.

1. Remove waste materials, including unsatisfactory soil (including ledge, shell, rock), trash, and debris, and legally dispose of them off Owner's property.

Dispose of all “Polluted soil” and “Contaminated Soil” in full conformance with State of Connecticut DEEP regulations, including all laboratory testing for classification, loading, hauling, and disposal.

END OF SECTION 31 20 00

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SECTION 31 23 19 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. This Section includes construction dewatering.

B. Related Sections include the following:

1. Division 1 Section "Temporary Facilities and Controls" for temporary utilities and support facilities.
2. Division 31, Section 31 50 00 "Excavation Support and Protection."
3. Division 31, Section 31 20 00 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.

C. If there any discrepancies found between these specifications and related drawings and details, the most restrictive requirement and/or material/part shall be applied by the Contractor without compensation.

1.3 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control ground-water flow into excavations and permit construction to proceed on dry, stable sub-grades.

1. Maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to sub-grades and permanent structures is prevented.
2. Prevent surface water from entering excavations by grading, dikes, or other means.
3. Accomplish dewatering without damaging existing buildings adjacent to excavation.
4. Remove dewatering system if no longer needed.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer licensed in the State of Connecticut..

1. Include plans, elevations, sections, and details.
2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
4. Include written plan for dewatering operations including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, land surveyor, and professional engineer.

B. Field quality-control reports.

C. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

D. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

B. Regulatory Requirements: Comply with water disposal requirements of authorities having jurisdiction.

C. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Construction Manager and /or Architect and then only after arranging to provide temporary utility services according to requirements indicated.

B. Project-Site Information: A geotechnical report has not been prepared for this Project

1. Make additional test borings and conduct other exploratory operations necessary for dewatering.

C. Survey adjacent structures and improvements, employing a qualified land surveyor, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Construction Manager and /or Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
3. Prevent surface water from entering excavations by grading, dikes, or other means.

4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared sub-grades, and from flooding site and surrounding area.
2. Protect sub-grades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 311000 "Site Clearing," during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

E. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed, or until dewatering is no longer required.

F. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry sub-grades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, sub-grade softening, and slope instability.

G. Reduce hydrostatic head in water-bearing strata below sub-grade elevations of foundations, drains, sewers, and other excavations.

1. Maintain piezometric water level a minimum of 24 inches below surface of excavation.

H. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

I. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.

1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

J. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

3.3 OBSERVATION WELLS

A. Provide, take measurements, and maintain at least the minimum number of observation wells or piezometers indicated and additional observation wells as may be required by authorities having jurisdiction.

B. Observe and record daily elevation of ground water and piezometric water levels in observation wells.

C. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. Suspend construction activities in areas where observation wells are not functioning properly until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.

1. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

3.4 FIELD QUALITY CONTROL

A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

D. Prepare reports of observations.

3.5 PROTECTION

A. Protect and maintain dewatering system during dewatering operations.

B. Promptly repair damages to adjacent facilities caused by dewatering.

C. It is the Contractor's responsibility and expense to protect the project Site from surface and ground water damage regardless of the project status: project continue or has been stopped for any reason.

END OF SECTION 31 23 19

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SECTION 31 50 00 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1.2 The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.3 SUMMARY

A. Section includes temporary excavation support and protection systems.

B. Related Sections:

1. Division 31, Section 31 20 00 "Earth Moving" for excavating and backfilling and for controlling surface-water runoff and ponding.
2. Division 31, Section 31 23 19 "Dewatering" for dewatering excavations.

C. If there any discrepancies found between these specifications and related drawings and details, the most restrictive requirement and/or material/part shall be applied by the Contractor without compensation.

1.4 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.
1. Review existing utilities and subsurface conditions.
2. Review coordination for interruption, shutoff, capping, and continuation of utility services.
3. Review proposed excavations.
4. Review proposed equipment.
5. Review monitoring of excavation support and protection system.
6. Review coordination with waterproofing.
7. Review abandonment or removal of excavation support and protection system

1.5 SUBMITTALS

A. Shop Drawings for Information: Prepared by or under the supervision of a qualified professional engineer licensed in the state of Connecticut for excavation support and protection systems.

1. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.

B. Product Data: For each type of product.

1. Include construction details, material descriptions, performance properties, and dimensions of individual components and profiles, and calculations for excavation support and protection system.

C. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer.

1. Include plans, elevations, sections, and details.
2. Show arrangement, locations, and details of soldier piles, piling, lagging, tiebacks, bracing, and other components of excavation support and protection system according to engineering design.
3. Indicate type and location of waterproofing.
4. Include a written plan for excavation support and protection, including sequence of construction of support and protection coordinated with progress of excavation.

D. Qualification Data: For Installer and professional engineer.

E. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Photographs: Show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems. Submit before Work begins.

G. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Owner's written permission.

B. Project-Site Information: A geotechnical report has not been prepared for this Project.

1. Perform test borings and conduct other exploratory operations if necessary for excavation support and protection according to the performance requirements.

C. Survey Work: Engage a qualified land surveyor to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Construction Manager and Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide, design, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.

1. Contractor Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer.
2. Prevent surface water from entering excavations by grading, dikes, or other means.
3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.

4. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

2.2 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

1. Corners: Site-fabricated mechanical interlock or Roll-formed corner shape with continuous interlock.

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of size and strength required for application 4 inches.

E. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

F. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

G. Tiebacks: Steel bars, ASTM A 722/A 722M.

H. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.

D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier.

B. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet-piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

C. Cut tops of sheet piling to uniform elevation at top of excavation.

3.3 TIEBACKS

A. Tiebacks: Drill, install, grout, and tension tiebacks. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.
2. Maintain tiebacks in place until permanent construction is able to withstand lateral soil and hydrostatic pressures.

3.4 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Structural and /or Geotechnical Engineer.
2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Construction Manager and Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.

C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.6 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlaying construction and abandon remainder.

2. Fill voids immediately with approved backfill compacted to density specified in Division 31, Section 312000 "Earth Moving."

3. Repair or replace, as approved by Construction Manager, adjacent work damaged or displaced by removing excavation support and protection systems.

3.7 AS BUILT RECORD DRAWING if trench support is left in place.

A. Provide a record drawing of all constructed items prepared by a Licensed Land Surveyor licensed in Connecticut. Provide a statement that the as built record conforms with the design, or as acceptable by the design engineer.

END OF SECTION 31 50 00

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SECTION 32 12 16 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.1.1 SUMMARY

A. This Section includes the following:

1. Cold milling of existing asphalt pavement.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt paving.
4. Asphalt curbs.
5. Asphalt surface treatments
6. Pavement-marking paint.

B. Related Sections include the following:

1. Division 2, Section 02 41 20 "Selective Site Demolition" for demolition and removal of existing asphalt pavement.
2. Division 31, Section 31 20 00 "Earth Moving" for subgrade preparation, fill material, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
3. Division 32, Section 32 13 73 "Concrete Paving Joint Sealants" for joint sealants and fillers at pavement terminations.

C. If there any discrepancies found between these specifications and related drawings and details, the most restrictive requirement and/or material/part shall be applied by the Contractor without compensation.

1.2 REFERENCES

A. State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, including current editions and supplemental.

B. AASHTO Standard Specifications for Transportation Materials and Methods of Sampling and Testing, 1986 Edition, as amended.

1.3 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

B. DOT: Department of Transportation

1.4 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

    a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
    b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Include technical data and tested physical and performance properties.
2. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
3. Job-Mix Designs: For each job mix proposed for the Work.
4. Pavement marking paint and seal materials.

B. Qualification Data: For qualified manufacturer and testing agency.

C. Material Certificates: For each paving material, from manufacturer.

D. Material Test Reports: For each paving material, by a qualified agency

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the State of Connecticut DOT in which Project is located.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817 for asphalt paving work.

D. Pre-installation Conference: Conduct conference at the Project Site.

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

    a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
    b. Review condition of sub-grade and preparatory work.
    c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
    d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking and pavement coating materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking and pavement coating materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if sub-grade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F.
2. Tack Coat: Minimum surface temperature of 60 deg F.
3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of as noted below in this specification for different pavement makings and applications.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. Processed aggregate base shall conform to the requirements of Section 3.04 and M.05 of the State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, including current supplemental.

2.2 ASPHALT MATERIALS

A. Bituminous Concrete shall conform to the requirements of Section 4.06 and M.04 of the State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, including current supplemental.

2.3 AUXILIARY MATERIALS

A. Gravel sub-base shall conform to the requirements of Section 2.12 and M.02 of the State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, including current supplemental.

B. Tack coat shall conform to the requirements of Section 4.06 and M.04 of the State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, including current supplemental.

2.4 PAINTED PAVEMENT MARKINGS

A. Painted pavement markings, as noted on the plans, shall conform to the requirements of Section 12.10 and M.07 of the State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, including current supplemental.

1. Epoxy resin pavement markings

a. This item shall consist of furnishing and installing retroreflective white and yellow epoxy resin pavement markings of the width and color specified and epoxy resin pavement markings at

the locations indicated on the plans and in conformity with the plans, these specifications and as directed by the Construction Manager and /or Engineer.

b. Epoxy resin pavement markings includes epoxy resin installed with a truck-mounted machine such as center lines, lane lines, and shoulder lines.
c. Epoxy resin pavement markings include: parking stalls, and markings within areas such as paved islands, gore areas and paved medians.
d. Materials for this work shall conform to the requirements of Article M.07.22.
e. Equipment furnished shall include an applicator truck of adequate size and power, together with remote application equipment designed to apply an epoxy resin material in a continuous pattern and portable glass bead applicators, one for each size bead, designed to provide uniform and complete coverage of the epoxy binder by a controlled free-fall method. Pressurized glass bead application shall not be used. Before epoxy color is changed, equipment shall be cleaned out sufficiently to ensure that the color of material applied will be correct.
f. When working on a road it is contractor's responsibility for insuring vehicle and pedestrian traffic and worker's safety. Its cost shall be included in the bid price for this item.
g. For markings applied on pavements over one-year-old, equipment furnished shall also include a power washing machine capable of cleaning the pavement with a pressure of 2,400 to 2,800 psi with water heated to 180° F - 195° F. No chemicals shall be added to the water used in the process. The power washer shall be equipped with a turbo blast tip with an oscillating head and shall be capable of supplying a minimum of 5 gallons/minute gun.
h. All guns on the spray carriages shall be in full view of the operator(s) during operation.
i. Each vehicle furnished shall include at least one experienced operator, who shall be fully knowledgeable about all equipment operations and application techniques.
j. The Contractor shall also furnish one technical expert, who shall be fully knowledgeable about all equipment operations and application techniques, to oversee the project operation.
k. Pavement markings shall be applied in accordance with the details shown on the plans and the control points established by the Contractor and approved by the Construction Manager.
l. The road surface shall be cleaned at the direction of the Construction Manager just prior to application. Pavement cleaning shall consist of power washing using clean water heated to 180° F - 195° F at a pressure of 2,240 - 2,800 psi. The areas to be power washed shall include all areas where epoxy markings are to be applied and at least 1 inch beyond the area to be marked. The surface shall be cleaned to the satisfaction of the Construction Manager. For other pavement areas, cleaning shall consist of brushing with rotary broom (non-metallic), and any additional work as recommended by the material manufacturer and acceptable to the Construction Manager and /or Engineer. New Portland cement concrete surfaces shall be cleaned by abrasive blasting to remove any surface treatments and/or laitance. New bituminous concrete surfaces are not to be power washed.
m. All surfaces that are power washed shall be allowed to dry sufficiently prior to the application of the epoxy markings. The areas to be marked shall be broom cleaned immediately prior to the application of the epoxy markings. Glass beads shall be applied immediately after application of the epoxy resin marking to provide an immediate no-track system.
n. The Contractor will place necessary "spotting" at appropriate points to provide horizontal control for striping and to determine necessary starting and cutoff points. Broken line intervals will not be marked. Longitudinal joints, pavement edges and existing markings shall serve as horizontal control when so directed.
o. A tolerance of 0.25 inch under or 0.25 inch over the specified width shall be allowed for striping provided the variation is gradual and does not detract from the general appearance. Alignment deviations from the control guide shall not exceed 2 inches provided the variation is gradual and does not detract from the general appearance. Material shall not be applied over a longitudinal joint. Establishment of application tolerances shall not relieve the Contractor of the responsibility to comply as closely as practicable with the planned dimensions.
p. Operations shall be conducted only when the road surface temperature is at least 40° F. They shall be discontinued during periods of rain, and shall not continue until the Construction Manager determines that the pavement surface is dry enough to achieve adhesion.
q. The epoxy shall be uniformly applied to the surface to be marked to ensure a wet film thickness of the applied epoxy, without glass beads, of 20 mils +/- 1 mil.
r. Glass beads conforming to the requirements of Grading "B" (larger beads) shall be applied at a rate of 12 pounds per gallon of epoxy pavement marking material, immediately followed by a second drop of glass beads conforming to the requirements of Grading "A" (smaller beads) applied at a rate of 13 pounds per gallon of epoxy pavement marking material. Traffic cones, barricades, or some other acceptable method shall be used to protect the pavement markings until cured.

s. The material shall be in "no-tracking" condition within 15 minutes, or as allowed by the Construction Manager. The no-tracking time shall be determined by passing over the line with a passenger car or pickup truck in the simulated passing maneuver. A marking showing no visual deposition of the material to the pavement surface when viewed from a distance of 50 feet shall be considered as showing "no-tracking" and conforming to this requirement for time to no-track.

t. When stencils are used during the application of epoxy markings, care must be used when removing the stencils so that the epoxy resin does not drip on the road, sidewalk, grass, etc., and so that the applied markings have edges which are clean, straight and neat.

u. Epoxy resin pavement markings may be applied over existing painted markings provided they are sufficiently worn to allow adequate adhesion. If required by the Construction Manager, existing plastic, thermoplastic, epoxy or freshly painted markings shall be removed prior to the application of epoxy markings.

2. Thermoplastic pavement markings, symbols, and legends

a. This item shall consist of furnishing and installing retroreflective white and yellow Thermoplastic pavement markings of the width and color specified pavement markings, symbols and legends at the locations indicated on the plans and in conformity with the plans, these specifications and as directed by the Construction Manager and /or Engineer. See 3M All Weather Thermoplastic manufacturer specs attached at end of this specification for use or the Contractor may use an approved equal material.

b. Thermoplastic pavement markings include: stop bars, cross bars, cross walk bars, arrows, and legends.

c. Use equipment as required by manufacturer for this application. Before color is changed, equipment shall be cleaned out sufficiently to ensure that the color of material applied will be correct.

d. When working on a road it is contractor’s responsibility for insuring vehicle and pedestrian traffic and worker’s safety. Its cost shall be included in the bid price for this item.

e. For markings applied on pavements over one-year-old, equipment furnished shall also include a power washing machine capable of cleaning the pavement with a pressure of 2,400 to 2,800 psi with water heated to 180° F - 195° F. No chemicals shall be added to the water used in the process. The power washer shall be equipped with a turbo blast tip with an oscillating head and shall be capable of supplying a minimum of 5 gallons/minute gun.

f. All guns on the spray carriages shall be in full view of the operator(s) during operation.

g. Each vehicle furnished shall include at least one experienced operator, who shall be fully knowledgeable about all equipment operations and application techniques.

h. The Contractor shall also furnish one technical expert, who shall be fully knowledgeable about all equipment operations and application techniques, to oversee the project operation.

i. Pavement markings shall be applied in accordance with the details shown on the plans and the control points established by the Contractor and approved by the Construction Manager and /or Engineer.

j. The road surface shall be cleaned at the direction of the Construction Manager and /or Engineer just prior to application. Pavement cleaning shall consist of power washing using clean water heated to 180° F - 195° F at a pressure of 2,240 - 2,800 psi. The areas to be power washed shall include all areas where Thermoplastic marking symbols and legends are to be applied and at least 1 inch beyond the area to be marked. The surface shall be cleaned to the satisfaction of the Construction Manager and /or Engineer. For other pavement areas, cleaning shall consist of brushing with rotary broom (non-metallic), and any additional work as recommended by the material manufacturer and acceptable to the Construction Manager and /or Engineer. New Portland cement concrete surfaces shall be cleaned by abrasive blasting to remove any surface treatments and/or laitance. New bituminous concrete surfaces are not to be power washed.

k. All surfaces that are power washed shall be allowed to dry sufficiently prior to the application of the Thermoplastic markings. The areas to be marked shall be broom cleaned immediately prior to the application of the Thermoplastic markings.

l. First apply seal or approved equal primer-sealer to Portland Concrete Cement (PCC) and aged asphalt according to manufacturer’s recommended procedures. Make certain all solvent has evaporated and sealer has dried. Solvent left in the sealer will cause obstructions in the line commonly referred to as blistering and pin holing. If a sealer is applied at a heaver mil thickness, solvent can be trapped beneath the top dry film resulting in the same type of problem.

m. Primer-sealer application:

1. Apply primer-sealer cold, to a clean and dry surface.
2. Stir before use.
3. Follow manufacturer recommendations

n. Use White or/and Yellow (as specified on the drawings) All Weather Thermoplastic pavement marking system or approved equal:

1. For installation follow manufacturer recommendations.

o. Avoid contact with hot material. Do not breathe hot fumes. Heating material above 450°F may cause material to flash or ignite. Refer to material Safety Data Sheet (MSDS) for details.
p. Apply glass spheres uniformly using pressurized or gravity devices. Flooding of glass beads results in reduced retroreflectivity.
q. Hot molten thermoplastic will burn skin. Do not attempt to remove the thermoplastic from the skin. Cool under running water and seek medical attention immediately (refer to MSDS).
r. Always cover material and keep in a cool dry place.

EXECUTION

3.0 EXAMINATION

B. Verify that sub-grade is dry and in suitable condition to begin paving.

C. Proof-roll sub-grade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated sub-grades.

1. Completely proof-roll sub-grade in one direction**,** repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Construction Manager and/or Engineer, and replace with compacted backfill or fill as directed.

D. Proceed with paving only after unsatisfactory conditions have been corrected.

E. Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

3.1 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

1. Mill to a depth of to be samples taken and identify on field and consult to Engineer for approval.
2. Mill to a uniform finished surface free of gouges, grooves, and ridges.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. separate from milled hot-mix asphalt.
7. Patch surface depressions deeper than 1 inch after milling, before wearing course is laid.
8. Transport milled hot-mix asphalt to asphalt recycling facility.
9. Keep milled pavement surface free of loose material and dust.
10. Do not allow milled materials to accumulate on-site.

3.2 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Re-compact existing unbound-aggregate base course to form new subgrade.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.

1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Re-compact existing unbound-aggregate base course to form new subgrade.

C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

D. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

E. Placing Patch Material: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.3 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.4 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared sub-grade is ready to receive paving.

B. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.5 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated in table below.
2. Place hot-mix asphalt surface course in single lift and thicknesses indicated in table below.
3. Spread mix at minimum temperature of 250 deg F.
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.

2. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.6 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.7 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927 or AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 ASPHALT CURBS.

A. Construct hot-mix asphalt curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust. Spread mix at a minimum temperature of 250 deg F.

1. Asphalt Mix: Same as pavement surface-course mix.

B. Place hot-mix asphalt to curb cross section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.9 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.
2. Surface Course: 1/8 inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

C. Asphalt Traffic-Calming Devices: Compact and form asphalt to produce the contour indicated and within a tolerance of plus or minus 1/8 inch of height indicated above pavement surface.

3.10 SURFACE TREATMENTS

A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.

B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.

1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.11 PAVEMENT MARKING AND COATING

A. Do not apply pavement-marking paint or pavement heat reflective coating until layout, colors, and placement have been verified with Construction Manager and /or Engineer.

B. Allow paving to age for 30 days before starting pavement marking.

C. Prepare surfaces as directed above.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of un-compacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

    a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
    b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.13 3.15 PAVEMENT WARRANTY

A. The Contractor shall warrant and guarantee the quality of materials and workmanship to be free of any defects for a period of five years from the date of installation of asphalt pavement. This will include: any cracks larger than 1/8-inch wide will be filled with crack filler; tire scuff marks will be heated and re-tamped; and any heaving and/or sagging of the pavement in excess of the original installation specification tolerances. This Unconditional Warranty does not include damage caused by oil spills and normal wear and tear.

3.14 PAVEMENT MARKINGS ACCEPTANCE AND WARRANTY:

A. In order to be accepted, the applied markings must meet the following minimum retroreflectivity reading as measured using an LTL 2000 Retrometer with 30-meter geometry 1 to 2 weeks after installation:

B. White Epoxy 250 millicandelas per square foot per foot candle (millicandelas per square meter per lux)

C. Yellow Epoxy 175 millicandelas per square foot per foot candle (millicandelas per square meter per lux)

D. The Contractor shall warrant for the period and percentage level indicated below that the installation shall remain intact and serviceable. The installed material shall show no fading, lifting, shrinking, tearing, rollback, distortion or chipping due to vehicular traffic or normal maintenance activities including snow plowing. Although some wear is expected, the markings shall not wear out for the period and percentage level indicated below.

E. First Year

- Epoxy Resin and Thermoplastic Pavement Markings 95% linear feet.
- Epoxy Resin and Thermoplastic Pavement Markings, Symbols and Legends 95% square feet.

F. In addition, the epoxy resin pavement markings shall be warranted to retain a minimum retroreflective value of 150 millicandelas per foot candle (lux) per square foot (square meter) one year after installation. The measurements shall be made utilizing an LTL 2000 Retrometer with 30-meter geometry.

G. Determination of percentages of serviceability and minimum retroreflective values will be made jointly at the end of 1 year by the Contractor's representative and by the Construction Manager and /or Engineer. The decision of the Construction Manager and /or Engineer shall be final. The term "percentage of serviceability" shall be defined as follows: The percentage of serviceability of the markings shall apply to the total linear feet for particular Pavement Markings and total square feet for the particular Pavement Markings, Symbols and Legends measured on the project for payment.

H. The Contractor shall replace, entirely at the Contractor's expense, such amount of markings, if any, required to meet the above stated percentage. The Construction Manager and /or Engineer will indicate the areas and lines to be replaced to meet the above stated percentages. The Contractor shall also replace those markings that fail the minimum value for retroreflectivity. Replacement under either situation shall include all materials, equipment, labor and work incidental thereto.

I. The Contractor shall provide to the Owner, at no extra cost, any manufacturer's warranties or guarantees that exceed the minimum requirements stated previously, that are normally provided by the manufacturer.

J. These written warranties shall be provided when the documentation for the product is provided.

3.15 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in a CT DEEP -approved landfill.

1. Do not allow milled materials to accumulate on-site.

3.16 AS-BUILT

A. Provide a record drawing of all constructed items prepared by a Licensed Land Surveyor licensed in Connecticut. Provide a statement that the as built record conforms with the design, or as acceptable by the design engineer. As-built to be prepared in paper, Mylar and AutoCad format and provided to the Owner.

END OF SECTION 32 12 16

SECTION 32 13 13 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.1.1 SUMMARY

B. This Section includes exterior concrete paving for the following:
   1. Concrete Ramps and Steps.
   2. Concrete Walks.
   3. Concrete Cheek Walls
   4. Concrete Large Utility Pads
   5. Concrete Curb
   6. Salt Guard

C. Related Sections include the following:

   1. Division 31 Section 31 20 00 "Earth Moving" for subgrade preparation, grading, and sub-base course.
   2. Division 3, Section 03 30 53 "Miscellaneous Cast-in-Place Concrete" for general building applications of concrete.
   3. Division 32, Section 32 13 73 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

D. If there any discrepancies found between these specifications and related drawings and details, the most restrictive requirement and/or material/part shall be applied by the Contractor without compensation.

1.2 REFERENCES

A. State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, including current edition and supplemental.

B. Town of Canterbury Details and Specifications.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

   1. Review methods and procedures related to concrete paving, including but not limited to, the following:

a. Concrete mixture design.
b. Quality control of concrete materials and concrete paving construction practices.

2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete paving Subcontractor.

1.5 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.

D. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.
9. Salt guard.
10. ADA Warning Tiles.

E. Material Test Reports for:

1. Aggregates: Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

D. Field quality-control reports

1.6 QUALITY ASSURANCE

A. The Concrete installer must hold a current ACI flatwork certification.

B. Ready – Mix Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.

E. Mockups: Cast mockups of full-size sections of concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Construction Manager.
2. Notify Construction Manager seven days in advance of dates and times when mockups will be constructed.
3. Obtain Architect's approval of mockups before starting construction.
4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
5. Demolish and remove approved mockups from the site when directed by Architect.
6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1. Before submitting design mixes, review concrete pavement mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with concrete pavement to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixes.
c. Ready-mix concrete producer.
d. Concrete subcontractor.

1.7 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

D. The salt guard is to be applied to all concrete sidewalks, steps, ramps for the handicapped, driveway aprons, and other concrete surfaces on the site.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves of a radius 100 feet or less. Do not used notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Epoxy-Coated Welded Wire Fabric: ASTM A 884/A 884M, Class A, plain steel.

B. Epoxy-Coated Reinforcement Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 deformed bars.

C. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 plain steel bars.

D. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

E. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer coated wire bar supports.

G. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.

2.4 CONCRETE MATERIALS

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

B. Regional Materials: Concrete shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

C. Concrete for sidewalks, steps, ramps, walks, cheek walls, and aprons shall conform to;

1. Cast in place concrete shall be Class F, 4,400 psi, with a maximum water cement ratio of 0.45, slump limit of 4 inches +/- 1.0 inch and an air content of 6 percent +/- 1.5 percent. 2.
2. Concrete retarding materials shall be utilized when weather has an adverse effect on placement, all sidewalk placement shall take place between April 15th and October 15th unless previously requested and approved by the Engineer.
3. Contraction joints shall be placed parallel to length of walk. Joint spacing as shown on the design drawings. Jointing pattern shall not allow for joints at radius that create a “zero” edge.
4. Expansion joints shall utilize a full depth asphalt saturated cellulosic fiber strip or approved equal.
5. Use epoxy coated 18” long 5/8” diameter dowel with plastic sleeve one end 18” o.c. at all expansion joints as shown on the details.
6. Load plates, dowels and expansion joints shall be utilized at all locations where concrete is poured up against stationary objects.
7. Contraction Joints shall be ¼ of the overall depth of the concrete pour to ensure contraction of the material takes place at these locations.
8. Concrete shall utilize 6-inch square wire mesh; wire mesh shall have a minimum twelve-inch overlap. Wire mesh shall be placed on chairs spaced no more than eighteen inches on center.
9. Also, to the requirements of Section 9.21 and 9.24, and M.02.01, M.03, and M.06.01 of the State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, including current supplemental and the notes and details included on the plans.

D. Concrete for large utility pads shall conform to the requirements of Section 6.01 and M.03 of the State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, including current supplemental and Town of Canterbury standards, including current supplemental and the notes and details included on the plans. Concrete shall be 4,400 PSI, Class “F” concrete meeting the pertinent requirements of Section M.03.

E. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.

F. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

H. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

I. Epoxy-Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:

   a. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

K. Pigmented Mineral Dry-Shake Hardener: Factory-packaged, dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.

   a. Color: As selected by Architect from manufacturer's full range.

M. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch. Concrete retarding materials shall be utilized when weather has an adverse effect on placement, all sidewalk placement shall take place between April 15th and October 15th unless previously requested and approved by the Owner or Construction Manager. Concrete evaporation retarder is not preferred method. Preferred method is to use of wet cure for 7 days.

2.5 SALT GUARD

A. Salt guard protective compound acceptable to be used Consolideck Saltguard WB or approved equal. The salt guard is to be applied to all concrete sidewalks, ramps for the handicapped, driveway aprons, and other concrete surfaces on the site.

2.6 ADA DETECTIBLE WARNING TILES

A. Use Cast-In-Place (wet-set) replaceable tactile that is listed on the CT DOT Qualified Product List.

1. Composition: REP Tiles shall be manufactured using a matte finish exterior grade homogeneous (uniform color throughout thickness of product) glass and carbon reinforced polyester based Sheet Molding Compound (SMC) composite material. Truncated domes must contain fiberglass reinforcement within the truncated dome for superior structural integrity and impact resistance. A matte finish will be required on the Tactile Warning Surface for superior slip resistance performance superior to that offered by a gloss finish. Use of Tactile Warning Surface Products employing coatings or featuring layers of material with differing composition, performance, or color properties is expressly prohibited under this Section.
2. Color: Color shall be homogeneous throughout REP Tile. As selected by Landscape architect.
3. Domes: Square grid pattern of raised truncated domes of 0.2" nominal height, base diameter of 0.9" and top diameter of 0.45". The Federal Code of Regulations permits a truncated dome spacing range of 1.6"-2.4." For superior wheelchair, walker and shopping cart mobility, the preferred truncated dome spacing shall have a center-to- center (horizontally and vertically) spacing of 2.35", measured between the most adjacent domes on square grid.
4. Configuration: REP Tile sizes shall be as indicated on the Contract Drawings. The REP Tiles shall feature a minimum of eight (8) embedded corrosion resistant 1 ½" corrosion resistant concrete inserts with ½" x 1 ½" heavy duty steel bolts and washers. Bolts must be covered with a structural water tight cap. Bolts must be located BETWEEN the truncated domes (in the field) for maximum protection of the Bolt integrity. Bolts are NOT to be located in the truncated dome.

    1. The field area shall consist of a non-slip textured surface with a minimum static coefficient of friction of 0.80, wet and dry.
    2. At a minimum, REP Tile thickness shall measure ¼" nominal exclusive of the perimeter minimum 3/8" thick (nominal) by 1" wide flange. The body of the Tactile Warning Surface Tile must consist of a SOLID body for maximum strength and to eliminate the possibility of air entrapment and cracking.

B. Radius REP Tile:
1. Radius REP Tile measures 24"x 33.25" and features reverse score lines on each 24" dimension for a 10', 15', and 20' radius condition. The Radius REP Tile out of the box measures 11' - 6" radius.
2. Truncated domes feature proper dome alignment for a radius application. Radius REP Tile shall be cut to the appropriate configuration using the reverse score lines as a guide.

C. Truncated Dome Surface of REP Tile shall be protected with factory installed plastic sheeting for cleanliness during the installation process. Basic Installation Guidelines shall be printed on the plastic sheeting in both English and Spanish for customer convenience.

D. Dimensions: REP Tiles shall be held within the following dimensions and tolerances:
1. Length and Width:
Rectangular REP Tile:
2.35" Dome Spacing:[24"x24"] [24"x48"]

Radius REP Tile":
1.6" - 2.4" Dome Spacing [24"x33.25"]

E. Cleaning materials used on site shall have code acceptable low VOC solvent content and low flammability.

F. The Specifications of the concrete, sealants and related materials shall be in accordance with the Contract Documents and the guidelines set by their respective manufacturers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

A. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 312000 "Earth Moving."

C. Remove loose material from compacted sub-base surface immediately before placing concrete.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.

1. Apply epoxy repair coating to uncoated or damaged surfaces of epoxy-coated reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

F. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

3.4 JOINTS

A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.

1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
3. Provide tie bars at sides of pavement strips where indicated.
4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
5. Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
6. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows, to match jointing of existing adjacent concrete paving:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a ¼-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.

   a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch. wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

   a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

1. Radius: 1/4 inch.

3.5 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in.

B. Remove snow, ice, or frost from sub-base surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten sub-base to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with recommendations in ACI 301 for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery, at Project site, or during placement. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Sidewalk intersections shall be designed with corner radii that reasonably accommodates the turning movements of snow removal equipment, service vehicles, and the natural flow of pedestrian traffic. Minimum corner radius shall be five (5) feet

H. Sidewalks placed at building entrances shall not only be doweled into the foundation of the building but should be designed to accommodate a haunch that extends to frost to protect the door from becoming jammed during winter months.

I. The color of adjacent sidewalks shall also be evaluated to see if the new walks can match in color and finish.

J. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

K. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping to ensure proper densification of the concrete.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

2. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or derbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.

L. Concrete sidewalk wet cure shall commence immediately or no longer than 30 minutes after finishing and continue uninterrupted for a period of 7 days, 5 days minimum. Wet cure shall utilize a non-marking curing paper or other curing cover similar to Hydra Cure Cover S16.

M. Upon approval the contractor shall utilize a dissipating curing compound only if moisture curing is not feasible. Upon proper curing concrete sidewalks shall have joints filled with self-leveling sealer that matches the color of the concrete.

N. Sidewalks shall be treated with salt guard sealer in accordance with manufactures instructions.

O. Placement shall be witnessed by construction engineer, owner or architect.

P. Rigid Concrete Pavement Section: When concrete is used for the pavement subjected to heavy trucks, rigid concrete pavement shall be used. Concrete shall be 5 inches thick and reinforced with a minimum reinforcement consisting of 6x6-w2.9xW2.9 welded wire or equivalent. Dowels should be placed across slab expansion joints to limit differential settlements. The outer edges of concrete pavement are susceptible to damage as trucks move from the concrete to the adjacent bituminous concrete. Therefore, the concrete thickness of the outer 2 feet of the concrete pavement should be increased to 12 inches. Concrete pavements should be protected from construction traffic until a compressive strength of at least 2,500 psi has been achieved. The above sections represent minimum thicknesses and, as such, periodic maintenance should be anticipated. Concrete for rigid pavements should be air-entrained and placed with a maximum slump of 4 inches. Proper joint spacing will be required to reduce the likelihood of slab curling and shrinkage cracking. Joint spacing not to exceed 10 to 12 feet. Joints shall be sealed to reduce the likelihood of entry of foreign material. Concrete shall be in accordance with the specifications of CTDOT Form 817, M.03.01. Portland cement shall be Type I or II, f'c=4,400 psi.

Q. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

R. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact sub-base and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

S. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

T. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F , uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

U. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

C. No additional water shall be added to the surface to aid in finishing. If finishing aid is required, it shall be similar to Eucobar.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot long, unleveled straightedge not to exceed 1/2 inch.
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
5. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
6. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
7. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.

8. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
9. Joint Spacing: 3 inches.
10. Contraction Joint Depth: Plus 1/4 inch, no minus.
11. Joint Width: Plus 1/8 inch, no minus.

3.9 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Construction Manager and /or Engineer.

B. Allow concrete pavement to cure for 30 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils for Epoxy markings and 90 mils for Thermoplastic markings.

1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal for Epoxy markings.

2. For more information on paint markings see Section 32 12 16 – Bituminous Paving spec.

3.10 ADA DETECTIBLE WARNING TILES

A. Install the tiles according to manufacturer specifications.

B. Contractor shall provide all tools, equipment and services required for satisfactory installation per manufacturer’s instruction as Incidental Work. Equipment, which may be required include typical mason’s tools, a 2-foot long level with electronic slope readout, (2) 25-pound weights, and a rubber mallet with a piece of wood for tamping down the Tactile Warning Unit(s).

C. To the maximum extent possible, the REP Tiles shall be oriented such that the rows of in-line truncated domes are parallel with the direction of the ramp. When multiple REP Tiles regardless of size are used, the truncated domes shall be aligned between the tactile warning surface tiles and throughout the entire tactile warning surface installation.

D. In accordance with the Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Rights of Way (7/23/11, Access Board): Sections 304 + 305), Tactile Warning Surface Tile shall be located relative to the curb line as shown within Sections 304+305 of the Guidelines.

E. The REP Tiles shall be tamped or vibrated into the fresh concrete to ensure that there are no voids or air pockets, and the field level of the Tactile Warning Surface Tile is flush to the adjacent concrete surface or as the Drawings indicate to permit proper water drainage and eliminate tripping hazards between adjacent finishes.

F. On Continuous Runs: The Installer shall leave a 1/8” nominal gap between successive Tactile Warning Surface Tiles. As part of the concrete finishing operation, the Installer shall apply ¼” edge treatment around the perimeter of the Tactile Warning Surface Tiles to facilitate future replacement of the Tactile Warning Surface Tile. A Urethane Sealant such as Sikaflex 1a or BASF NP1 shall be applied to the edge treatment for a watertight Tactile Warning Surface Tile installation.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement.

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or 5000 sq. ft. or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39; test one specimen at seven days and two specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
8. When total quantity of a given class of concrete is less than 50 cu. yd., Engineer may waive compressive-strength testing if adequate evidence of satisfactory strength is provided.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated, and corrective procedures shall be provided for protecting and curing in-place concrete.

C. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. The testing laboratory must declare conformance or otherwise to the design specifications.

F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as the sole basis for approval or rejection.

G. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Engineer.

H. Concrete paving will be considered defective if it does not pass tests and inspections.

I. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

J. Prepare test and inspection reports.

3.12 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Engineer.

B. Drill test cores where directed by Engineer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

E. Protect Replaceable Tactile Warning Tiles against damage during construction period to comply with Cast In Place Replaceable Tactile Warning Surface Tiles manufacturer's Specifications.

F. During and after the Replaceable Tactile Warning Tile installation and the concrete curing stage, it is imperative that there are no walking, leaning or external forces placed on the Replaceable Tactile Warning Tile to rock the Replaceable Tactile Warning Tile, causing a void between the underside of the Replaceable Tactile Warning Tile and the concrete substrate.

G. Remove Protective Plastic Sheeting from Replaceable Tactile Warning Tile within 24 hours of installation of the Replaceable Tactile Warning Tile. Particularly under hot weather conditions (80 degrees or higher), plastic sheeting will adhere strongly (resulting in difficult removal of same) to Tactile Warning Surface Tile when not removed quickly.

H. If requested by the Project Manager, clean Replaceable Tactile Warning Tiles not more than four (4) days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean Replaceable Tactile Warning Tile by method specified by Tactile Warning Surface Products manufacturer.

3.13 AS-BUILT

A. Provide a record drawing of all constructed items prepared by a Licensed Land Surveyor licensed in Connecticut. Provide a statement that the as built record conforms with the design, or as acceptable by the design engineer. As-built to be prepared in paper, Mylar and AutoCad format and provided to the Owner.

END OF SECTION 32 13 13

SECTION 32 13 73 – CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.1.1 SUMMARY

B. This Section includes the following:

1. Expansion and contraction joints within cement concrete pavement.
2. Joints between cement concrete and asphalt pavement.
3. Cold-applied joint sealants.
4. Hot-applied joint sealants.
5. Joint-sealant backer materials.
6. Primers.

C. Related Sections include the following:
1. Division 32, Section 3212 16 "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
2. Division 32, Section 32 13 13 "Concrete Paving" for constructing joints in concrete pavement.

D. If there any discrepancies found between these specifications and related drawings and details, the most restrictive requirement and/or material/part shall be applied by the Contractor without compensation.

1.2 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Paving-Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

C. Qualification Data: For Installer.

D. Product Certificates: For each type of joint sealant and accessory.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1.4 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 COLD-APPLIED JOINT SEALANTS

A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type NS.

B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.

C. Multicomponent, Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.

D. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

E. Multicomponent, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade P, Class 25, for Use T.

2.3 HOT-APPLIED JOINT SEALANTS

A. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I.

B. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I or Type II.

C. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I, II, or III.

D. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type IV.

2.4 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.5 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backings.
2. Do not stretch, twist, puncture, or tear joint-sealant backings.
3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

3.6 PAVING-JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Joints within concrete paving.

1. Joint Location:

   a. Expansion and isolation joints in concrete paving.
   b. Contraction joints in concrete paving.
   c. Other joints as indicated.

2. Joint Sealant:
   a. Single-component, nonsag, silicone joint sealant
   b. Single-component, self-leveling, silicone joint sealant
   c. Multicomponent, nonsag, urethane, elastomeric joint sealant
   d. Single component, pourable, urethane, elastomeric joint sealant
   e. Multicomponent, pourable, urethane, elastomeric joint sealant
   f. Hot-applied, single-component joint sealant.
3. Joint-Sealant Color: Manufacturer's standard.

B. Joint-Sealant Application: Joints within concrete paving and between concrete and asphalt paving.

1. Joint Location:

   a. Joints between concrete and asphalt paving.

b. Joints between concrete curbs and asphalt paving.
c. Other joints as indicated.

2. Joint Sealant:
   a. Hot-applied, single-component joint sealant.

3. Joint-Sealant Color: Manufacturer's standard.

END OF SECTION 32 13 73

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SECTION 32 92 00 – TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.1.1 SUMMARY

1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Hydroseeding.
3. Erosion-control material(s).

B. If there any discrepancies found between these specifications and related drawings and details, the most restrictive requirement and/or material/part shall be applied by the Contractor without compensation.

C. Related Requirements:

1. Section 31 10 00 "Site Cleaning".
2. Section 31 20 00 “Earth Moving”.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM C602, Specification for Agricultural Liming Materials.
2. ASTM D5268, Specification for Topsoil Used for Landscaping Purposes.

1.4 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.5 SUBMITTALS

A. Submit under provisions of Section 01330.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

C. Product Certificates: For fertilizers, from manufacturer.

D. Planting Schedule: Indicating anticipated planting dates.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of meadows during a calendar year. Submit before expiration of required maintenance periods.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf and meadow establishment.
   1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Bulk Materials:

   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Accompany each delivery of bulk materials with appropriate certificates.

1.9 FIELD CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.

   1. Spring Planting: March 15 to June 15.
   2. Fall Planting: August 15 to October 15.

B. Begin Maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
   1. Seeded lawns: 60 days from date of Substantial Completion.

C. Mow lawn as soon as top growth is tall enough to cut. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Provide a minimum of two mowings within the maintenance period.

D. Maintenance shall consist of watering, control of weeds, application of herbicide, re- fertilizing and re-seeding as necessary to achieve a fully established lawn as specified.

E. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

A. Seed shall be manufactured by Lofts Seed (Pennington's) or approved equal. All grass seed shall be fresh, clean, of latest crop, and composed of the following varieties, mixed in proportions by weight testing to minimum percentages of purity and germination specified:

Seed Species:

1. Seed Mixture for sun: Loft's Tri-Plex General Mixtures:
   a. Nassau Kentucky Bluegrass: 60%
   b. Jamestown II Chewings Fescue: 20%
   c. Palmer II Perennial Ryegrass: 20%

2. Seed Mixture for shade: Loft's Tri-Plex Shade Mixtures:
   a. Shadow II Chewings Fescue: 65%
   b. Gold Rush Kentucky Bluegrass: 20%
   c. Palmer III Perennial Ryegrass: 15%

3. Seed Mixture for multi-purpose: Loft's Athletic Field Mixture:
   a. Turf-Type Tall Fescue (3 Robel Varieties): 80%
   b. Palmer III Perennial Ryegrass: 10%
   c. Gold Rush Kentucky Bluegrass: 10%

Seed shall be delivered pre-mixed to the Site in standard size sealed containers bearing the vendor's guaranteed statement attesting to the composition of the mixture and to the percentages of purity and germination of each variety. Seed shall be stored in such manner that its effectiveness is not impaired.

2.2 PLANTING MATERIALS

A. Topsoil: Topsoil shall meet requirements of CT DOT Form 817 M13.01.

B. Inorganic Soil Amendments

1. Topsoil Source: Reuse surface soil stockpiled on-site and supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Verify suitability of stockpiled surface soil to produce topsoil.
2. Topsoil Source: Reuse surface soil stockpiled on-site and supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Verify suitability of stockpiled surface soil to produce topsoil.

C. Inorganic Soil Amendments:

1. Lime: agricultural ground dolomitic limestone meet CT DOT Form 817 Section M.13.02 with minimum calcium carbonate equivalent shall be 90.

2. The material must comply with the following gradation:

Square Mesh Sieves	Percentage Passing By Weight
Pass #10	100
Pass #20	90
Pass #100	40

3. The Engineer reserves the right to draw such samples and perform such tests as he deems necessary to assure that these specifications are met.

4. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 sieve and a maximum 10 percent passing through No. 40 sieve.

D. Organic Soil Amendments

1. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8.

2. Peat: Finely divided or granular texture, with pH range of 6 to 7.5, containing partially decomposed moss peat, native, peat, or reed-sedge peat and having water-absorbing capacity of 1100 to 2200 percent.

3. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.

E. Fertilizer:

1. Slow- Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition meeting CT DOT Form 817 Section M.13.03 :
a. Composition: 10 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

F. Mulches:

1. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2. Peat Mulch: Finely divided or granular texture, with pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having high water absorbing capacity of 1100 to 2000 percent.

3. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8.

4. Wood Fiber Mulch: Shall be organic, dust free, bio-degradable, wood cellulose 100% recycled long fiber pulp, free of weeds or other foreign matter that might inhibit growth.

2.3 PLANTING SOIL MIX

A. Planting Soil Mix: Mix topsoil with soil amendments and fertilizers in the quantities as recommended by the plant grower, nursery or as recommended by CT DOT Form 817.

2.4 EROSION-CONTROL MATERIALS

a. Erosion-Control Blankets: A manufactured blanket composed of biodegrable/photodegradable natural or polymer fibers and/or filaments that have been mechanically, structurally or chemically bound together to form a continuous matrix. Install in strict adherence to manufacturers application for use, requirements and recommendations.

b. Erosion-Control Mats: A manufactured mat composed of non-biodegradable polymer or synthetic fibers mechanically, structurally or chemically bound together to form a continuous. Install in strict adherence to manufacturers use application for use, requirements and recommendations at thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

C. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

D. Uniformly moisten excessively dry soil that is not workable or which is dusty.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

F. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Construction Manager and Engineer and replace with new planting soil.

3.2 LAWN PREPARATION

A. Newly Graded Subgrades: Loosen subgrade to a minimum depth of eight (8) inches. Remove stones larger than one (1) inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planning soil mix.

2. If recommended as a result of topsoil analysis, lime shall be evenly distributed and thoroughly worked into the top three (3) inches of topsoil at the rate recommended by the soil analysis laboratory. Limestone shall be applied at least seven (7) days before applying fertilizer and chlordane. The ph content of topsoil shall be 6.0 to 7.0 before sod or seed is placed.

3. Commercial fertilizers shall be uniformly applied in all new grass areas. The application shall be within one week prior to placement seed at the rate recommended and worked lightly into the top two (2) inches of topsoil. Grass areas shall be watered thoroughly after the application of fertilizers.

4. Spread planting soil mix to a depth of six (6) inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

B. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare surface soil as follows:

1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.

2. Loosen surface soil to a depth of at least six (6) inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top four (4) inches. Till soil to a homogeneous mixture of fine texture.

3. Remove stones larger than one (1) inch in any dimension and sticks, roots, trash, and other extraneous matter.

4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus ½ inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.

D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

E. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

F. All lines and grades required for proper performance of work shall be established by the Contractor in the field and shall meet with the Construction Manager 's approval. Prior to the commencement of the seeding operation a site inspection shall be made by the Construction Manager and Landscape Contractor. A letter of acceptance of the site conditions shall be received by the Construction Manager prior to the contractor commencing with the seeding operation.

3.1 SEEDING

A. Planting shall progress only under favorable weather conditions during the proper season for such work. Unless otherwise authorized in writing by the Construction Manager, the following shall apply: Grass seed shall be placed only between April 1st and June 15th or only between August 15th and October 15th.

B. Sow seeds at the following rate or as recommended by manufacturer:

1. Sow seed mixture for sun at the rate of three and one half (3.5) lb/1000 sq ft.
2. Sow seed mixture for shade at the rate of four (4) lb/sq ft.
3. Sow seed mixture for multi-purpose fields at the rate of seven (7) 16/1000 sq ft.

C. Seeding shall be done on dry or moderately dry soil, and at times when wind does not exceed a velocity of five (5) miles per hour. Seeding shall be done in two directions, at right angles, in such a manner that a uniform stand shall result. Seed shall be sown evenly by hand, or with an approved mechanical spreader, to a depth not exceeding one-forth (1/4) inch, at the rate of five (5) pounds per one thousand (1000) square feet, or 217 pounds per acre of lawn area. After seeding the surface shall be evenly and lightly raked with a fine wood-toothed rake or other approved method, and rolled in both directions with a hand roller weighing not more than on hundred (100) pounds per foot of width, and then watered thoroughly with a fine spray. Light sprayings shall be continued as required until the grass has become established. The Contractor is responsible for providing water for the establishment and maintenance of lawn areas. The Contractor shall take necessary precautions to keep the area undisturbed until grass is established.

D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of two (2) tons/acre to form a continuous blanket 1-1/2 inches in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment. Securing of straw mulch shall be at the Contractor's discretion as to method or need and shall be his responsibility. Wood fiber mulch may be used in place of hay or straw at the rate of 1400 pounds per acre applied hydraulically at the same rate as the seed and fertilizer.

E. Areas which are on a slope steeper than one foot vertical to three feet horizontal or will receive concentrated run off of water shall receive 5 ounces' burlap or jute netting 5 feet wide, joints to overlap not less than one foot. Material shall be secured by means of peg or other approved methods. Alternate methods approved by the Engineer may be used.

3.3 PREPARATION FOR EROSION-CONTROL MATERIALS

A. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.

B. Fill cells of erosion-control mat with planting soil and compact before planting.

C. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

D. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.4 HYDROSEEDING

A. Hydroseeding: Mix specified seed, commercial fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

B. Mix slurry with non-asphaltic or fiber-mulch manufacturer's recommended tackifier.

C. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

D. Spray-apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre.

3.5 TURF RENOVATION

A. Renovate existing turf where indicated.

B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

C. Reestablish turf where settlement or washouts occur or where minor re-grading is required.

D. Install new planting soil as required.

E. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

F. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

G. Mow, dethatch, core aerate, and rake existing turf.

H. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

I. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

J. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.

K. Apply initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.

L. Apply seed and protect with hay mulch as required for new turf.

M. Water newly planted areas and keep moist until new turf is established.

3.6 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.

C. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.

D. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

E. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.

F. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

G. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

H. The Contractor shall keep all seed areas free from weeds and debris, such as stones, cables, bailing wire, and he shall mow at his own expense, on a one-time only basis, all slopes 4:1 or flatter and level turf established areas to a height of 3 inches when the grass growth attains a height of 6 inches.

I. Turf Postfertilization: Apply commercial fertilizer after initial mowing and when grass is dry.

J. Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.7 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove non-degradable erosion-control measures after grass establishment period.

3.2 INSPECTION AND ACCEPTANCE

A. All lawn areas will be inspected and accepted together, as one entire unit; and not in individual pieces, except as specifically authorized or directed by the Owner.

1. All seeded lawn areas will be inspected and accepted together.
2. No lawn areas will be accepted prior to Substantial Completion of the Project, nor prior to the completion of a minimum of two mowings.

B. Seeded Turf: 60 days from date of Substantial Completion.

C. Submit Written Notice: requesting inspection.

D. Maintenance: responsibilities end with final acceptance.

E. A satisfactory sealed lawn which is acceptable is defined as:

1. At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage.

2. Any part of the lawn that does not show a uniform dense lawn grass shall be reseeded and maintained until satisfactory.

F. Final Acceptance: will not be made until all damaged areas, including areas outside the property limits have been restored to their original conditions by topsoiling, seeding and other necessary operations.

G. Upon Stabilization of Lawn Areas: erosion control devices and protection fencing shall be removed and disposed of off-site.

3.8 AS BUILT

1. Final As-built of all site improvements location and elevations to be prepared by a CT Licensed surveyor and issued in paper, Mylar and AutoCad format, signed and sealed accuracy class A-2/T-2.

END OF SECTION 32 92 00

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SECTION 33 46 00 – SUBDRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.1.1 SUMMARY

A. Section Includes:
1. Foundation Dain Pipe and Fittings
2. Roof Drainage Pipe and Fittings
3. Junction Structures
4. Drainage Stone.
5. Geotextile filter fabrics.
6. Concrete encasement for piping, if require.

B. Related Sections include the following:

1. Division 31, Section 31 50 00 "Excavation Support and Protection."
2. Division 31, Section 31 23 19 "Dewatering”.

C. If there any discrepancies found between these specifications and related drawings and details, the most restrictive requirement and/or material/part shall be applied by the Contractor without compensation.

1.2 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

B. HDPE: High-density polyethylene

1.3 SUBMITTALS

A. Product Data:
1. PVC Polyvinyl chloride pipe as shown on the drawings.
2. HDPE High-density polyethylene pipe as shown on the drawings
3. Junction structures as shown on the drawings.
4. Drain stone as shown on the drawings.
5. Geotextile as shown on the drawings.
6. Concrete encasement for piping, if require.

B. Shop Drawings: Include plans, elevations, details, and attachments for the following:
1. Pipes, junction structures, including frames, covers, grates and other that applies to these structures.

C. Coordination Drawings: Show structures, pipe sizes, locations, and elevations. Include details of underground structures and connections. Show other piping in same trench and clearances from

sewerage system piping. Indicate interface and spatial relationship between piping and proximate structures.

D. Coordination Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1-inch equals 40 feet (1:500) and vertical scale of not less than 1 inch equals 4 feet (1:50). Indicate underground structures and pipe. Show types, sizes, materials, and elevations of other utilities crossing system piping.

E. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

1.4 PROJECT CONDITIONS

A. Call “CALL BEFORE YOU DIG (1-800-922-4455 or 811)“ 72 hours prior to any excavation.

PART 2 - PRODUCTS

2.1 FOUNDATION AND ROOF DRAINS

A. PVC DISTRIBUTION PIPE AND FITTINGS

1. For distribution pipes and fittings where indicated on drawings and details: PVC SCH.40, ASTM D 1785 or ASTM D 2665. Rubber compression gasket couplings, Harco Manufacturer, ASTM D 3139 or equal. Or solvent weld couplings/fittings using proper two step PVC solvent solution procedure. Due to proximity to the existing septic system, the solid discharge pipes must have tight joints meeting requirements of the current CT Public Health Code for On-Site Sewage Disposal Regulations and Technical Standards for Subsurface Sewage Disposal Systems on the Table 3.
2. Installation:
   a. Installation shall be in accordance with ASTM D2321 with a minimum cover of 1 foot over the pipe in single run applications.
   b. Provide 6-inch of bedding material in earth and 12-inch of bedding material in rock for PVC pipes. Bedding materials shall conform to CT DOT Form 817, section M.08.03, and shall be compacted to 90% Standard Proctor density. If ground water is encountered, Contractor to use No. 6 stone conforming to CT DOT FORM 817 Article M.01.01 instead of sand or sandy soil.

B. HDPE DISTRIBUTION PIPE AND FITTINGS

HDPE PIPE AND FITTINGS use WT IB PIPE (PER ASTM F2648) or approved equal

1. This specification describes 4- through 60-inch (100 to 1500 mm) WT IB pipe (per ASTM F2648) for use in gravity-flow land drainage applications.
2. Pipe Requirements:
   a. WT IB pipe (per AASHTO) shall have a smooth interior and annular exterior corrugations.
   b. 4- through 60-inch (100 to 1500 mm) pipe shall meet AASHTO M294, TYPE S or ASTM F2306.
   c. Manning’s “n” value for use in design shall be 0.012.
3. Joint Performance;
   a. Pipe shall be joined using a bell & spigot joint meeting AASHTO M252, ASSHTO M294 OR ASTM F2306. The joint shall be watertight according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly. 12- through 60-inch (300 to 1500 mm) diameters shall have an exterior bell wrap installed by the manufacturer.
4. Fittings:

a. Fittings shall conform to AASHTO M252, AASHTO M294, or ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the watertight joint performance requirements of AASHTO M252, AASHTO M294, or ASTM F2306.

5. Field Pipe and Joint Performance:
   a. To assure watertightness, field performance verification may be accomplished by testing in accordance with ASTM F2487. Appropriate safety precautions must be used when field-testing any pipe material. Contact the manufacturer for recommended leakage rates.
6. Material Properties:
   a. Virgin material for pipe and fitting production shall be high-density polyethylene conforming with the minimum requirements of cell classification 424420C for 4- through 10-inch diameters, and 435400C for 12- through 60-inch diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%. The 12- through 60-inch virgin pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 and 5.1 of AASHTO M294 and ASTM F2306 respectively.
7. Installation:
   a. Installation shall be in accordance with ASTM D2321 and ADS recommended installation guidelines, with a minimum cover in trafficked areas for 4- through 48-inch diameters shall be two foot and for 60-inch diameter the minimum cover shall be 1 ft. in single run applications.
   a. Use flowable fill to install risers 6ft. and higher.
   b. Bedding 4-inch of bedding material for pipes 6” to 24” and 6-inch of bedding from pipes 30” to 60”. Bedding materials shall conform to CT DOT Form 817, section M.08.03, and shall be compacted to 90% Standard Proctor density. If ground water is encountered, Contractor to use No. 6 stone conforming to CT DOT FORM 817 Article M.01.01 instead of sand or sandy soil.

C. Backfill to spring line and initial backfill shall consist of Class 1 (compacted).

D. JUNCTION STRUCTURE

1. Heavy-Traffic HS-20, Pre-cast Concrete structure: ASTM C 478, pre-cast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints conforming to the requirements of Section 5.07 of the State of Connecticut Department of Transportation “Standard Specifications for Road, Bridge and Incidental Construction”, Form 817 as amended and including the current supplemental specifications.
   a. Diameter: as indicated on the drawings and details.
   b. Ballast: Increase thickness of pre-cast concrete sections or add concrete to base section, as required to prevent flotation.
   c. Gaskets: ASTM C 443, rubber.
   d. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
2. Shop drawings shall be submitted to Engineer for approval.
3. Frame and Cover: Gray Iron Casting, ASTM – A 48/ A 48M-03, class 30B, Suitable for AASHTO HS-20 Highway Loading. Finish: bearing surface for frame & cover machined. Cover should be label “STORM DRAIN”.
4. Bedding material ¾” clean crushed stone conforming to the requirements of Section M.01.01 for No.6 stone of the State of Connecticut Department of Transportation “Standard Specifications for Roads, Bridges and Incidental Construction”, Form 817, including current supplemental and edition.
5. Backfill material below and to side of structure shall be ASTM D2321 Class 1 or Class 2 and shall be placed uniformly in 6-inch. lifts and compacted to a min. of 90% Standard Proctor density.

E. GEOTEXTILE FABRIC

1. The geotextile shall be non-rotting, acid and alkali resistant and have sufficient strength and permeability for the purpose intended, including handling and backfilling operations. Fibers shall be low water absorbent. The fiber network must be dimensionally stable and resistant to delamination. The geotextile shall be free of any chemical treatment or coating that will reduce its permeability.

The geotextile shall also be free of any flaws or defects, which will alter its physical properties. Torn or punctured geotextiles shall not be used. For each specific use, only geotextiles, which are already on the Connecticut Department of Transportation's "Qualified Products List" for the geotextile type, will be used. The Engineer reserves the right to reject any geotextile, which he deems unsatisfactory for a specific use. The brand name shall be labeled on the geotextile or the geotextile container. Geotextiles, which are susceptible to damage from sunlight or heat, shall be so identified by suitable warning information on the packaging material.

2. Geotextiles susceptible to sunlight damage shall not be used in any installations where exposure to light will exceed 30 days, unless specifically authorized in writing by the Engineer.

F. RIP RAP AND CRUSHED CLEAN STONE

Stone size as specified on the plans and details. Contractor to provide sieve analysis from Manufacturer that the stone meets required specification.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product.

G. CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: Class C or F 4500 psi minimum, with 0.45 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed steel.

2.2 SOIL MATERIALS

A. Soil materials are specified in Section 312000 " Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and areas for suitable conditions where sub-drainage systems are to be installed.

B. Locate and mark existing utilities, underground structures, and aboveground obstructions before beginning installation and avoid disruption and damage of services.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground drain piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

E. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

F. Use structures for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

G. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

H. Install gravity-flow piping and connect to building's drains, of sizes and in locations indicated. Terminate piping as indicated.

I. Install piping pitched down in direction of flow, at minimum slope of 0.5 percent, unless otherwise indicated.

3.2 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 20 00 "Earth Moving."

3.3 DRAIN PIPE INSTALLATION

A. Join and install pipe and fittings according to installations indicated previously.

B. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

C. Install drainage piping as indicated on the Plans and Details.

D. Install drain cleanouts as indicated on the Plans and Details.

E. Install level spreader as indicated on the Plans and Details.

3.4 PIPE JOINT CONSTRUCTION

A. Due to proximity to the existing septic system, solid pipes must have tight joints meeting requirements of the current CT Public Health Code for On-Site Sewage Disposal Regulations and Technical Standards for Subsurface Sewage Disposal Systems on the Table 3.

3.5 IDENTIFICATION

A. Arrange for installation of green warning tapes directly over piping. Comply with requirements for underground warning tapes specified in specified in Section 312000 "Earth Moving."

1. Install detectable warning tape over piping.

3.6 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
1. Place plug in end of incomplete piping at end of day and when work stops.
2. Flush piping between structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Re-inspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects:
1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate reports for each test.
5. Gravity-Flow Drain Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
a. Exception: Piping with watertight joints unless required by authorities having jurisdiction.
b. Option: Test plastic piping according to ASTM F 1417.
6. Leaks and loss in test pressure constitute defects that must be repaired.
7. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.7 CLEANING

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

B. Clean interior of piping of dirt and superfluous materials. Flush with water.

3.8 AS-BUILT

Final As-built of all underground structure and piping lines location and elevations to be prepared by a CT Licensed surveyor and issued in paper, Mylar and AutoCad format, signed and sealed accuracy class A-2/T-2.

END OF SECTION 33 46 00

Section 50 10 00
Existing Conditions Information

Prudence Crandall Assessment and Recommendations
March 17, 2017

- Elevation Photos 5-IIIA
- Structural 6-IIIB
- Mechanical 7-IIIC
- Architectural 8-IIID

Interior 3-D Model Walk

NOTE: For orientation and reference only.
https://tinyurl.com/y6rwp79r

Exterior Hi-Rez Drone Photographs

NOTE: For orientation and reference only.
https://tinyurl.com/y2e6tpqv

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III. PRUDENCE CRANDALL ELEVATION PHOTOS

A. Elevation Photos for Reference
B. Structural Assessment and Recommendations
C. Mechanical Assessment and Recommendations
D. Architectural Assessment and Recommendations

III.A PRUDENCE CRANDALL ELEVATION PHOTOS

View from northeast:
Intersection of Westminster Road and South Canterbury Road

View from the south and the Carter House

III.A PRUDENCE CRANDALL ELEVATION PHOTOS

View from the southwest and the Carter House rear yard.

View from the west and parking lot.

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III. PRUDENCE CRANDALL

A. Elevation Photos for Reference
B. **Structural Assessment and Recommendations**
C. Mechanical Assessment and Recommendations
D. Architectural Assessment and Recommendations

The Prudence Crandall Museum
c. 1800s
Canterbury, Connecticut

Updated Structural Condition Assessment Report

Final Report
March 23, 2017
(Update of September 22 2003 GNCB Report)

Prepared By:
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Table of Contents

Introduction

This report is an update to GNCB's September 22, 2003 Structural Condition Assessment Report including observations and recommendations for the maintenance, preservation, and stabilization of The Prudence Crandall Museum (the Museum) in Canterbury, CT. GNCB was retained by TLB Architecture to assess the condition of the Main House and Ell structures and note any changes in the condition since the 2003 survey and report.

Amy Jagaczewski of GNCB conducted a site visit on November 28, 2016. The survey was conducted by visual observation of all levels of the building. Existing conditions were compared to those discussed in the 2003 report and any new issues were noted. As the Reader reads through this report, 2016 updates to the 2003 observations and recommendations are identified in *italics*. Updated photographs with annotations are provided in **Appendix A: Annotated Photographs**. Evaluation of the building envelope is not within the scope of work for this project. Any items from the 2003 report involving the building envelope have been removed from this updated report as these items are being addressed by other consultants.

The 2003 report by GNCB provided structural framing plans and allowable live load plans. These plans are included in this report in **Appendix B: Structural Framing Plans** and **Appendix C: Allowable Live Load Plans**. The structural framing plans are updated to include new recommendations.

Building Description

The Prudence Crandall Museum, a building listed on the National Register of Historic Places, is located on the museum site in Canterbury, Connecticut at the intersection of Route 169 and Route 14. It is believed that the two story wood framed structure was built in the early nineteenth century for Squire Elisha Payne. In 1831, Prudence Crandall purchased the building and opened a young ladies boarding school. In 1969, the State of Connecticut obtained ownership of the building. Repairs were made at the direction of the State for the facility to be used for its current use as a museum.

The ell-shaped building is sited with its main gambrel roof ridge running in the north/south direction, and its front facade facing east. **(See Cover Photo)**. The gambrel roof is hipped at each end to form a gable pediment. The main building is approximately 44 feet wide by 34-feet deep with a 24 feet wide ell extending 30 feet to the rear. The one and a half story ell perpendicular to the main house has a shallow pitched gable roof. **(See Photo P01)**. The main house has a wide central hallway with four rooms on each floor that contain the exhibit spaces, gift shop and a library. The rear ell contains miscellaneous administrative and storage rooms with a basement below.

Occupancy

The summary of each room's safe occupancy denoted as maximum number of persons per room and live load capacity in pounds per square foot (psf) are based upon results of our structural analysis of the existing floor framing system for Prudence Crandall Museum and can be reviewed in **Appendix C: Floor Loading Key Plans** at the end of this report. **The live load capacity and maximum occupancy considers the condition of the existing structural floor framing members and their connections and are applicable once structural deficiencies and recommendations of this report have been remediated.** The occupancy loads are reduced to incorporate a factor of safety to account for unknown and concealed conditions, concealed connectors and the age of the structural members. This is common practice for framing of this vintage, especially that which has been modified over the structure's lifespan.

Observations

1. Main House

A. Attic Level/Roof Framing

(Refer to Appendix B, S-1.03 – Attic Floor Framing Plan and S-1.04 – Roof Framing Plan)

The walk-up attic in the main house is located beneath the symmetric double-pitched gambrel roof with hipped gable ends. This level is used for miscellaneous storage. The roof has an approximate slope of 10:12 rise to run at the lower incline that slopes down to zero headroom at the floor level at the exterior walls. The base of lower rafter ends is supported by a 2 inch thick by 11-inch wide top plate. **(See Photo P02)**. Some of the lower rafters are newer replacement members. The top plate also appears to be of newer dimension lumber. This member is placed on top of what is assumed to be the original perimeter eave girt. The girt is about 7 inches deep and 3 inches wider than the newer top plate.

Exposed wood roof rafters, 3-1/2 inches wide by 6 inches deep, are equally spaced at 32 inches on center along the length of the ridge. The rafters are sheathed with 2 by 8 wood decking gapped by a space of about ½ inch wide. The underside of the wood plank decking has water staining at various locations. The water staining apparently occurred prior to the 1996 replacement of the wood roof shingles.

The birds-mouth cut base of the upper roof rafters are supported by horizontal purlins at the change in roof pitch. **(See Photo P03)**. Some of the upper rafters still have some bark on their edges and others show signs of previous powder post beetle presence. The purlin dimension is 6 inches wide by 7-1/2 inches deep. Purlins span from post to post. Pairs of posts divide the attic into three bays along the width of the house. The four corner posts are braced with diagonal knee braces in both directions. Some dowels in the mortise and tenon joinery are missing.

At the northeast corner post there is a deep check which has deepened since GNCB's 2003 report from 3 inches deep to approximately 4 inches deep. The check width has also increased to approximately ¾ inches to 1 inch wide and now spans the full height of the post, not just its top half as noted in 2003. Additionally, there is now a gap between the base of the post and its support framing at the attic level of approximately 2 inches. **(See Photos P04 – P07)**.

The shoulder of the base of the post at the southeast corner is spaced about 2 inches above the mortised attic floor beam into which the tenon is inserted. **(See Photo P08)**. *The southwest post now has a 3 – 4 inch deep check on its north side which is approximately ¾ inches to 1 inch wide along its full height* **(See Photo 09**).

At the northeast corner at eave level, a small area of daylight shows through to the inside of the attic.

Wood cross ties of equal dimension to the purlins span from post to post in the east/west direction. The underside of the cross ties and purlins is about 7 feet above the attic floor. A pair of cross braces span in the north/south direction between the cross ties. One cross brace at the east side center bay and one on the west side south end bay are missing. **(See Photo P10)**.

A brick chimney at each gable end corbels sideways to project through the roof ridge. Where the chimney interrupts the roof ridge, a pair of diagonal braces frame between the roof rafters. At the north end, a short portion of the rafter framing is missing. **(See Photo P11)**. At the south end, there is ladder access to a roof hatch where there is only one diagonal brace. **(See Photo P12)**. At the west wall, there is a gap below both windows' lower sash that would permit water to enter. **(See Photo P13)**.

The attic floor planks noticeably deflect when walked across. Some of the planks have worked free of their nailing and are loose or can be lifted up. *This is especially noticeable along the center of the attic where almost all of the boards are now loose.* The wood floor planks are approximately 10 to 12 inches wide

and 1 inch thick and are laid in the north/south direction. In most areas there are two layers of attic floor plank decking. **(See Photos P14 and P15)**.

B. Second Floor Level/Attic Floor Framing

(Refer to Appendix B, S-1.03 – Attic Floor Framing Plan)

There is a single dog-legged enclosed wood stairway to descend from the attic level to the second floor level of the main house. At the edge of the stairwell there is a girder at floor level that spans in the east/west direction from the rear wall to the front wall. The girder is 7 inches wide by 7 inches deep with the bottom notched out to accept the top of beveled vertical wall studs. **(See Photo P16)**. *The plaster finish on this wall has diagonal cracks indicating that the attic framing is deflecting downward towards the center of the Main House.* **(See Photo P17)**.

A second girder to the north symmetrically matches the girder at the stairwell. A set of three beams per side, approximately 7 inches wide by 7 inches deep, frame into the girders. With an attic floor plank removed, two attic floor joists could be seen to span in an east/west direction parallel to the girder at the stairwell. The joists are 3-3/4 inches wide by 4 inches deep and are spaced at 25 inches on center. Joists were covered in a layer of plastic. Loose insulation filled the joist cavities beneath the attic floor deck. It is assumed that this joist framing is typical of the remainder of the attic. Viewed from the underside, second floor ceilings did not appear to have cracked except in the ceiling in the north closet of the northeast exhibit room where minor hairline cracks are visible. **(See Photo P18)**. *The south closet of this room has diagonal cracks in the wall due to deflections in the framing towards the center of the House.* **(See Photo P19)**.

Three of the four rooms on the second floor level are currently used as exhibit space. The fourth room is used as a library. **(See Photos P20 and P21)**. The finished floor consists of wood planks approximately 11 to 12 inches wide and 1 inch thick. Floor boards at this level were all well fastened to the framing and no

invasive measures were taken to remove the floor decking to view the concealed framing below. Most of the walls on the second floor level were sheathed with a textured gypsum board type material. Fireplace walls were finished with exposed plaster or wallpaper.

In the library at the northwest corner, there is a diagonal crack in the west wall that shows through the wallpaper. *This crack is longer and wider now than it was in 2003.* **(See Photos P22 and P23)**. The door opening in the passage between the southeast exhibit room to the southwest room is out of square.

Standing in the center hallway and looking southward to the ceiling level, the attic floor slopes downward to the front of the house. The hallway is finished with wallpaper that has a rectilinear pattern. When measured, the horizontal lines of the wallpaper were determined to be level. Using a line in the wallpaper as a reference, the bottom of the crown molding line at the west end of the hallway is 2-inches above the datum. Approximately 18 feet down the hallway to the front of the house, the bottom of the crown molding line matches the wallpaper line. This shows the magnitude that the attic floor girder has deflected. At the top of the staircase on the second floor, the wood stair stringer has a diagonal crack extending the distance of two stair treads.

C. First Floor Level/Second Floor Framing

(Refer to Appendix B, S-1.02 – Second Floor Framing Plan)

At the first floor level looking up to the ceiling, plaster finish concealed the construction of the second floor framing within. Judging from the second floor plank orientation and nailing pattern, it is assumed that second floor framing joists in the four corner rooms span in the east/west direction and are spaced between 22 and 25 inches on center. Owing to the depth of the total floor construction, the depth of the joists is approximately 7 inches deep. This was confirmed in one small area by exposed framing in the northeast room on the first floor looking up to the ceiling in a closet. It was reported that second floor

framing above in this room had been reinforced with steel members sometime in the 1970's. Also in this room, the wall above the fireplace has buckled slightly.

In the center hallway, the floor planks on the second floor are oriented from front to rear with a seam at about one third of the hall length. Therefore, it is likely that the second floor framing joists span north to south and are approximately 7 inches deep. On the first floor level, following suit of the level above, the door opening in the passage from the southeast to the southwest room was racked. It was noted that the floor in the center hallway slopes downward to the south toward the staircase and to the toe of the staircase. On the north wall of the hallway at the base of the encased arched wall opening, there is a gap between the floor board and the baseboard trim. **(See Photo P24)**. In the same archway, the trim at the top of the wall opening near the ceiling, has cracked. This area is below the corner of the library above where bookcases are stacked at the hall wall.

D. Basement Level/First Floor Framing

(Refer to Appendix B, S-1.01 – First Floor Framing Plan)

There is direct communication between the basement of the Main House and that of the rear Ell. Stair access from the first floor level to the basement is located at the rear Ell only. It is likely that there was a stairway leading from the main house to the basement below the center staircase before previous repairs were made.

It was reported that after the State of Connecticut obtained this site that structural work was undertaken prior to the opening of the museum. In the basement, first floor framing is exposed to view on the underside. Some of the framing appears to be replacement joists and beams with some older timbers remaining. The wood perimeter sill is framed with newer 6x6 members.

The first floor joists frame into the perimeter sills with approximately half-depth tenons. The reduced depth makes the joists susceptible to shear failure. Some joists are checking within this potential failure zone and one shear failure was

noted at the southeast corner of the first floor framing. **(See Photos P25 and P26)**.

At the area below the central staircase, an older beam that runs the length of the staircase above has deflected and is checked to a depth of about 3 inches. *This check has deepened to approximately 4 inches and now spans a good portion of the beam.* **(See Photos P27 - P29)**. The beam frames into a girder that serves as a header across the width of the hallway above. The girder has also deflected and sounds hollow when struck. There is evidence of insect damage in this area.

The first floor girder along the south side of the original stair opening which spans the full width of the house is deflected enough that the first floor wall planking is visible in the basement. **(See Photo P30)**. *Its half-lap splice connection at the west post is loose.* **(See Photo P31).** *The north full-width first floor girder is split where the kickers at its west post frame into it.* **(See Photo P32)**.

The fireplace foundations have been previously repaired. Cribbing, 6 by 6 members, is supported on a 12-inch wide by 6-inch deep beam on each side.

Except for a small area of concrete slab, the floor consists of sand laid over a vapor retarder. *The vapor retarder is rolling in in numerous places, especially in areas of higher traffic such as at the base of the stairs.* **(See Photo P33)**

At the south wall, much soft lime mortar has dissolved and is missing from the stone masonry joints. This has allowed water to enter into the basement. Hard Portland cement was used to patch some mortar joints. The sand floor near the south wall in particular was damp. **(See Photo P34)**. *Mortar is missing along the east wall as well and water staining was noted.* **(See Photo P35).**

2. Ell

A. Attic Level/Roof Framing

(Refer to Appendix B, S-1.03 – Attic Floor Framing Plan and S-1.04 – Roof Framing Plan)

The rear of the main house on the second floor opens to the front of the ell second floor. The rear ell second floor level is two feet lower than the main house. There is access up to the attic level through the center storage room on the second floor by means of a wood ladder through a hatchway in the ceiling. There is only about 3 feet of headroom height beneath the center ridge at the attic level in the ell. Sloping rafters are 4 inches wide by 6 inches deep spaced at about 3 feet on center. **(See Photo P36)**. The gable roof pitches at about 10:12 rise to run. The roof deck is similar to that of the main house.

At the east gable end of the ell at the attic level, it looks as though a window opening had been boarded up. *Directly above this opening is a rafter tail from the Main House which is split due to the loading conditions at the Main House and at the Ell.* Looking toward the west end down into the space above the stair area, there is a window opening fitted into a vertical plank wall that was closed up with lath and plaster. **(See Photo P37)**. This suggests that the ell is actually comprised of two accretions. *The ridge pole is discontinuous between the west and east sides of the ell. The east ridge pole is not supported at its ends as is typical for a ridge pole. However, since this ridge pole was intended to support load from the second floor (as is discussed in Section C below), it has dropped due to inadequate support. This layout is contributing to the floor deflections observed at the second floor.* **(See Photo P38)**.

B. Second Floor Level/Attic Floor Framing

(Refer to Appendix B, S-1.03 – Attic Floor Framing Plan)

In the rear ell, second floor ceiling joists form the attic floor. On the south side, 2 x 6 Douglas Fir Larch species, Grade #2 joists decked with plywood form a

catwalk platform that steps down to 1-1/4" wide by 4-inch deep joists on the north side. There is no decking on the north side.

On the second floor level, there is a hallway, office, workroom and storage rooms. On the south side, the ceiling height is 7 feet 2 inches high at the central portion of the ell, with the ceiling sloping downward to the exterior sidewalls to a height of three feet nine inches. On the north side, the ceiling height is only about 6 feet 7 inches high. The rafter end connections could not be viewed. The rooms are filled with heavy stored items.

In the northeast room in the ell, the plaster has been damaged due to moisture at the sloped ceiling level and down the face of the wall. **(See Photo P39)**. Viewing this corner from the exterior side, the main house roof slopes down toward the roof above the corner where the plaster is damaged. **(See Photo P40)**. *Extensive diagonal cracking in the wall finishes were observed in this room along the south wall and in the closet. The cracking is the result of movement in the second floor and roof framing.* **(See Photos P41 and P42)**.

At the stair wall of the ell on the second floor, a post projects into the northeast corner of the northwest room. It would be expected to find a counterpart post on the opposite south wall. On the south side, in the southwest room, there is no post projecting from the wall. A post was either removed or never existed. Due to lack of symmetry, it is more likely that a wall partition was moved to expand the room size and the post was removed. In this area, plaster is cracked at the wall/ceiling interface. Viewed from the exterior, the upper wall where a post would be expected to be located, is tipping out. **(See Photo P43)**.

C. First Floor Level/Second Floor Framing

(Refer to Appendix B, S-1.02 – Second Floor Framing Plan)

In the hallway at the top of the stairs down to the first floor, the floor is not level and there is a gap between the top of the wall and the ceiling. There is a comparable gap between the hall floor and the bottom of the wall to the central storage area. **(See Photos P44 through P46)**.

In the storage area, a ¾ inch diameter metal rod spans from the floor up through the attic floor to the ridge beam. The rod could easily be shaken when grasped, indicating that there is little force and that it is not performing as a tension member to support the floor. *The lack of tension in the rod is likely the result of the roof framing deflecting downward at a faster rate than the second floor framing.*

This floor area was opened up for review by a carpenter *(in 2003)* who has done work at this site over the years. A layer of strip flooring and two layers of wide floor planks were removed to view the floor structure. It was discovered that the 12 inch wide by 7-inch deep center beam that spans from east to west had dropped approximately 2-1/2 to 2-3/4 inches from its original position. **(See Photos P47 and P48)**. The ends of 4-inch wide by 6-inch deep joists spanning from the south side to the beam were actually supported by a first floor partition below and not the beam. Joists also spanned from the north side to the beam, in a staggered pattern relative to the south side joists. Except for the area where the carpenter opened up the floor, the second floor framing is concealed from view by the first floor ceiling and the floor deck on the second floor. *This area of the floor is currently covered up with plywood.* **(See Photo P49)**.

The second floor deck on the north side of the ell addition consists of wide wood planks. The floor deck is oriented in the north/south direction in the northeast corner room and east/west in the northwest corner workroom. The two rooms on the south end have two layers of floor planks surmounted by narrow 3-1/4 inch wide strip flooring oriented in the north/south direction.

The rooms on the first floor level of the ell are for use by the museum staff. **(See Photo P50)**. Filing and storage cabinets and office equipment are kept in the largest room. There is a diagonal crack in the plaster wall at the southwest corner of the room below the area where the beam above has dropped. **(See Photo P51)**. The door to the stairway to the basement is difficult to open and the bottom of the door scrapes the floor when it is pulled open.

D. Basement Level/First Floor Framing

(Refer to Appendix B, S-1.01 – First Floor Framing Plan)

The ell basement and the main house basement are one open ell-shaped space. From the ell area, there is an exit door directly to the exterior at the west end. The majority of the floor in the ell area consists of a concrete slab. As in the basement of the main house, there is a mixture of older and newer first floor framing members. There is no bearing wall between the east end of the ell and the rear of the main house. A ghost on the interior of the north foundation wall shows that the wall was removed. In its place, there is a 10-inch wide by 6-inch deep carrying beam that supports the house above. A beam spans from that carrying beam west to a girder that spans north/south along side of the stairway. The beam is supported by a pair of 10 inch wide by 7 inch deep beams that bear on a stone masonry basement "summer kitchen" fireplace with their overhanging ends supported by temporary jacks. **(See Photo P52)**. The wide flat beams have overloaded the fireplace, causing vertical cracks along the patched masonry joints. **(See Photo P53).**

Several joists that span from the west gable end toward the girder to the east of the stairway had been cut and re-supported by 4 by 4 posts where the stairway passes through. There was evidence of some deterioration of the surface of older wood joists in this area. **(See Photo P54)**.

Recommendations

Priority 1 (P1): *Address immediately*,*

Priority 2 (P2): *Address within 1 to 5 years,*

Priority 3 (P3): *Can be addressed within 5 to 10 years (maximum),*

*(*To allow for budgeting, final design, and construction, the term "immediately" can be taken to mean within the next 3 years for structural work)*

1. Main House

A. Attic Level/Roof Framing

- Wood shingled roofs require open sheathing, not solid decking, unless provision is made to permit air circulation on the underside. The gap between the roof decking is only about ½ inch wide. Board spacing is supposed to be equal to the shingle exposure to the weather. To improve this condition, increase ventilation in the attic for air to circulate, to allow wood shingles to dry. ***(P3)***

- Reinforce attic floor beams and re-support girders in accordance with drawing S-1.03 located in **Appendix B: Structural Framing Drawings**. Reinforcement is necessary so that attic framing members will safely carry the weight of the attic floor construction, roof support posts and code required load from the roof. ***(P1)***

- The attic level should not be considered as a storage area and items that are stored there should be removed. ***(P1)***

- Replace missing dowels in the mortise and tenon connection of the diagonal knee braces at the corner posts. ***(P3)***

- Stitch bolt the checked northeast corner post along its height to prevent the wood fibers from separating further. ***(P1)***

- *Stitch bolt the checked southwest corner post along its height to prevent the wood fibers from separating further.* ***(P1)***

- Replace missing cross braces that span between the cross ties. ***(P2)***
- At the roof ridge at the north end, replace missing rafter section. ***(P2)***
- Refasten loose attic floor planks to floor joists. *While the planks are fairly flexible, some shimming may be required to adequately fasten the boards.* ***(P1)***

B. Second Floor Level/Attic Floor Framing

- The attic floor girders have excessively deflected due to the long span between supporting members. This is reflected in the second floor hallway ceiling and girder deflections. It is necessary to reinforce and support attic floor beams and girders in accordance with the structural framing plans located in **Appendix B**. ***(P1)***
- The library room is heavily loaded with bookcases and stored items, including along the hallway wall and the corner where the wall is cracked. **(See Photo P-14)**. *The deflection in the framing and cracking in wall finishes is on-going. It is recommended that all stored items, filing cabinets and library stacks in the library room be* ***removed****. A design can be provided to reinforce this floor to an appropriate allowable storage load of 125psf but this will require extensive modification to the existing floor framing including sisters and supplementary framing.* ***(P1)***

C. First Floor Level/Second Floor Framing

- The four rooms on the first floor level of the main house appear to be in fairly good condition for a building of this age, however, due to analysis of the framing, it is recommended that the second floor framing be reinforced in accordance with drawings located in **Appendix B**. This will require new reinforcing steel channels for the floor girders and the addition of new steel tube columns (HSS sections) to support the hall girts through to the basement. The loads shown in **Appendix C: Floor Loading Key Plans** can be used as safe loads after this work is completed. ***(P1)***

D. Basement Level/First Floor Framing

- Where the stair trimmer beam has checked, install stitch bolts along its length to close the gap. Install a new joist along-side it to reinforce the existing beam. ***(P1)***
- *Install a splice plate at the loose and rotated half-lap splice in the south full-width girt.* ***(P1)***
- *The north full-width girt requires stitch bolts to close the split area above the kicker. Installing new posts as identified in* ***Appendix B*** *will relieve some of the load at this location.* ***(P1)***
- At the south *and east* foundation walls, remove existing mortar and replace with new mortar of appropriate mix to be compatible with the stone masonry. ***(P2)***
- Review structural drawings located in **Appendix B** for reinforcement and support of existing framing. *These drawings identify new post and footing locations required to support the framing above.*
- *The first floor joist at the southeast corner of the basement which has failed in shear should be stitch-bolted to prevent further splitting in the member.* ***(P1)***

2. Ell

A. Attic Level/Roof Framing

- Recommendations regarding the roof area are made in the next section as attic floor framing is the driving concern for improvements to the roof.

B. Second Floor Level/Attic Floor Framing

- It is recommended that no storage be allowed on the ell attic floor level. This framing is too light and has been modified such that no live load should be placed in this attic. Access to this level should be for inspection and maintenance only. ***(P1)***

- It is thought that a post on the south wall was removed, leaving rafter end connections to be compromised, allowing the top of the wall to tip outward and the wall to belly out several inches. Although the actual connection is concealed and cannot be verified without intervention, the upper north wall of the ell is also slightly bowing out. In addition to a probable missing post and bracing on the south side, sloping roof rafters attempt to push the walls of the one and a half story ell outward. The purpose of ceiling joists is not only to form the ceiling framing, but also to connect with the roof rafters to hold the outside walls in alignment. The ceiling joist rafter ties need to be installed within the lower one-third of height, measured from the top of the plate to the top of the ridge to prevent the walls from pushing out. The ceiling joists are actually located up to two thirds of the distance from the floor to the ridge. As a means to remedy this condition to prevent the rafters from pushing the walls outward, install a new microlam structural ridge beam supported by new columns at each end in accordance with structural framing drawings located in **Appendix B.** ***(P1)***

C. First Floor Level/Second Floor Framing

- It is surmised that the 12-inch by 7-inch center beam was left unsupported when a chimney at the gable end was removed and allowed the beam and the floor that it supported to drop down. It is recommended to install a new post/column to support the beam end from the second floor framing level down through the first floor and down to the basement, supported on a concrete footing. ***(P1)***

- Remove as much dead load as possible, i.e. heavy stored items, to relieve the load on the floor framing. This floor can be used as posted in **Appendix C** but without heavy storage units such as bookshelves or filing cabinets. ***(P1)***

D. Basement Level/First Floor Framing

- Re-support the framing in the fireplace area so as not to bear on the stone masonry with permanent columns supported on reinforced concrete footings. ***(P2)***
- Mentioned above, provide support for the dropped second floor framing beam from that level down to the basement. ***(P1)***
- At the stairway, install a new header and trimmer to support this area. Review structural framing drawings located in **Appendix B** for reference. ***(P2)***
- *Shim the ends of the west joists tight to the masonry wall with hardwood shims.* ***(P3)***

Limitations

This report has been prepared exclusively for the specific application to The Prudence Crandall Museum in Canterbury, CT in accordance with generally accepted engineering and historic preservation practices, including the Secretary of the Interior's Standards for the Treatment of Historic Properties. No other warranty, express or implied, is made.

In the event that any changes in condition of the building, or site areas occur following the preparation of our report, the conclusions and recommendations contained in this report should not be considered valid unless the changed conditions are reviewed and conclusions of this report modified or verified in writing.

The analysis and recommendations in this report are based upon data obtained from limited field observations. These observations are limited to a visual assessment of the exposed building elements. If discrepancies, unforeseen conditions or undesirable conditions more extensive than originally thought become evident in the field, it will be necessary to re-evaluate the recommendations contained in this report.

The details described and shown are general recommendations to be instituted to provide safe, long-term structural integrity and stability. If work is to proceed, GNCB is available to provide the necessary bid-level contract drawings and technical specifications to allow this work to be performed by a competent restoration contracting firm.

Appendix A: Annotated Photographs

Photo P01: View of Museum looking northeast.

Photo P02: Main House rafter framing into top plate along eave.

Photo P03: Upper and lower rafters of Main House frame into roof purlin.

Photo P04: Check in Main House northeast corner post (2003 Condition).

Photo P05: Current condition of check in northeast corner post at its top.

Photo P06: Current condition of check in northeast corner post at its base.

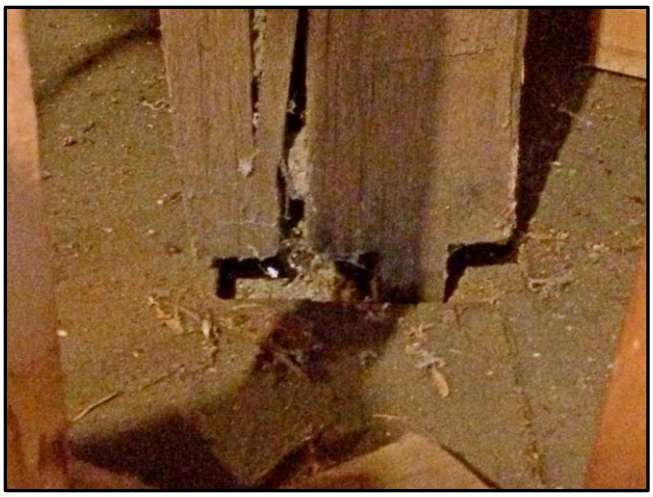


Photo P07: Gap between base of northeast roof corner post and its support at the attic framing.

Photo P08: Gap between base of southeast corner post and its support at the attic framing has not changed.

Photo P09: Check along north side of southwest post.

Photo P10: Missing cross-ties between purlin ties in Main House.

Photo P11: Missing rafter portion at north side of Main House roof.

Photo P12: Roof hatch access.

Photo P13: Gap between lower sash of window.

Photo P14: 2003 condition of attic floor decking.

Photo P15: Current condition of attic floor decking. Note that most boards along center of attic can be lifted by hand.

Photo P16: Attic girder at top of staircase from second floor to attic.

Photo P17: Cracks in wall below attic girder from previous photo.

Photo P18: Crack in ceiling of north closet of second floor northeast room.

Photo P19: Cracks in wall of south closet of second floor northeast room.

Photo P20: 2003 Library conditions in second floor northwest room.

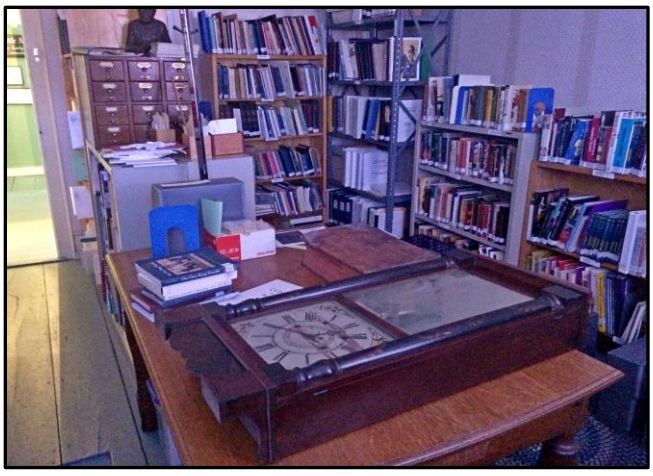


Photo P21: Current library conditions in second floor northwest room.

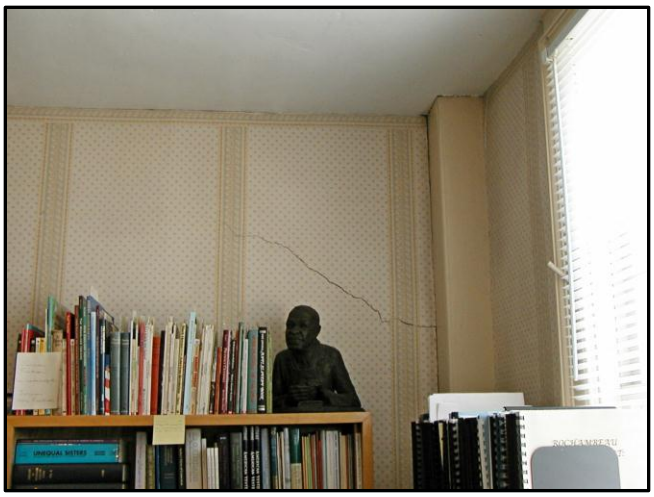


Photo P22: Crack in library wall in 2003.

Photo P23: Current crack in library wall.

Photo P24: Gap at base of hallway pilaster at north wall of first floor.

Photo P25: Two joists framing into east perimeter sill. Far joist has failed in shear and near joist is deeply checked at potential shear failure zone.

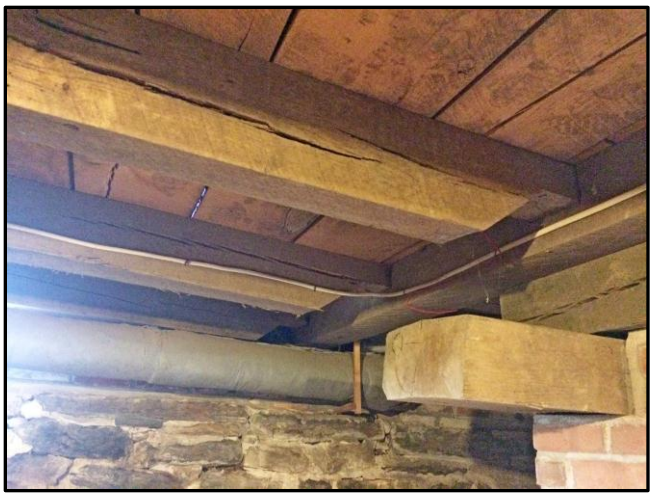


Photo P26: West support condition of joists shown in previous photo. Joists here are mildly checked in potential shear failure zone.

Photo P27: 2003 Condition of framing below first floor stairwell.

Photo P28: Current condition of framing below first floor stairwell. Note that deep check now spans full length of beam at north side of stairwell.

Photo P29: Beam from previous two photos viewed at its east support showing increased depth of check.

Photo P30: Deflection in first floor south full-width girder is deflected enough to view first floor wall framing above.

Photo P31: Half-lap splice of beam from previous photo is loose.

Photo P32: First looking up at underside of floor north full-width girder is split where post kickers frame into it.

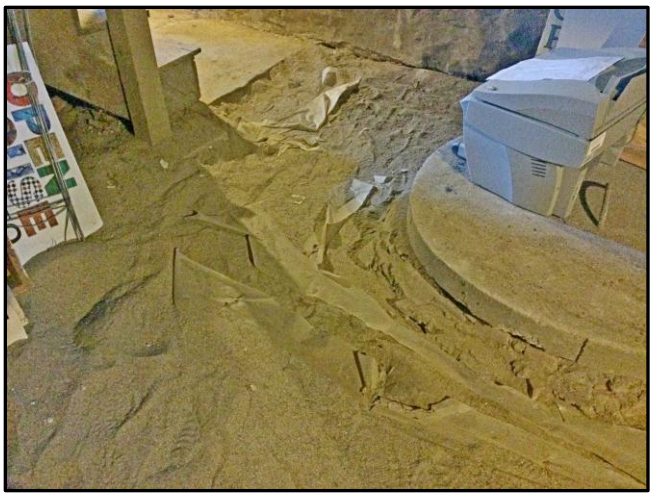


Photo P33: Vapor retarder is rolling up in areas of high traffic.

Photo P34: Missing mortar and water staining at south foundation wall.

Photo P35: Missing mortar and water staining at east foundation wall.

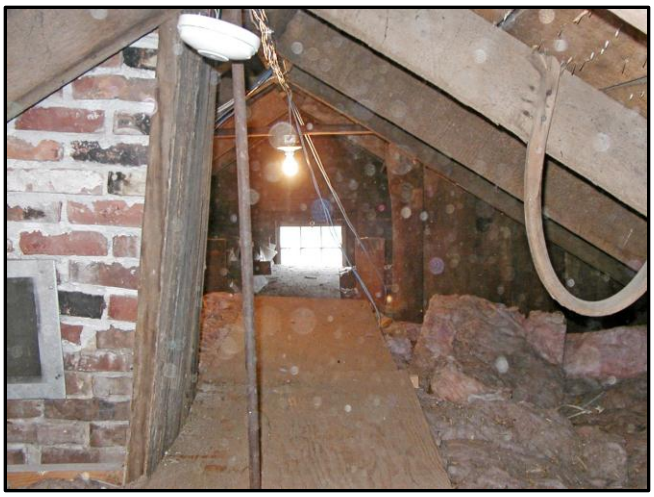


Photo P36: View of ell roof framing looking west. Note hanger rod for second floor framing.

Photo P37: Wall planking near center of attic indicating that this was at one point an exterior wall.

Photo P38: Ridge pole is unsupported at its west end.

Photo P39: Water damage in northeast wall (noted in 2003 – damage has not changed).

Photo P40: View of ell west exterior showing downward slope of roof.

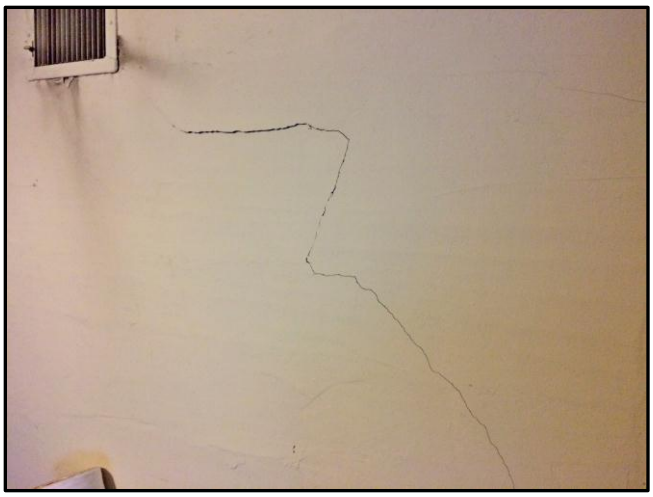


Photo P41: Crack in south wall of northeast room.

Photo P42: Cracks in closet wall of northeast room.

Photo P43: View of ell east exterior showing wall tipping outward.

Photo P44: View of deflections in second floor framing from 2003 report.

Photo P45: View of gap in second floor wall/ceiling finishes from 2003 report.

Photo P46: Current gap between wall/ceiling finishes. Gap appears to have remained constant.

Photo P47: Photo of second floor framing at deflected area from 2003 Report.

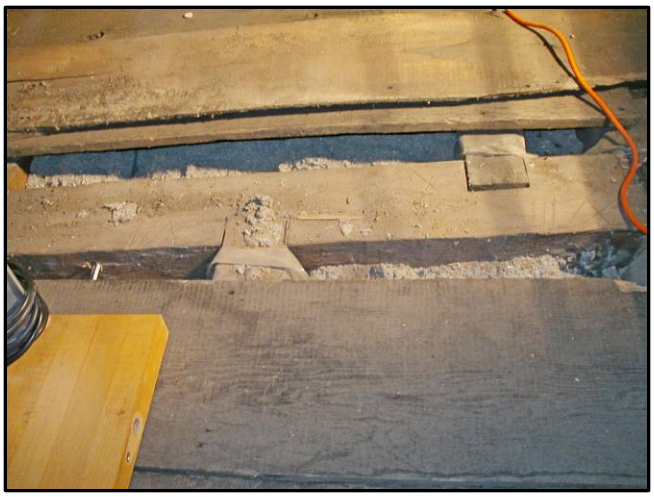


Photo P48: Photo of second floor framing at deflected area showing joists from 2003 Report.

Photo P49: Plywood covering is currently in place at deflected area of second floor framing.

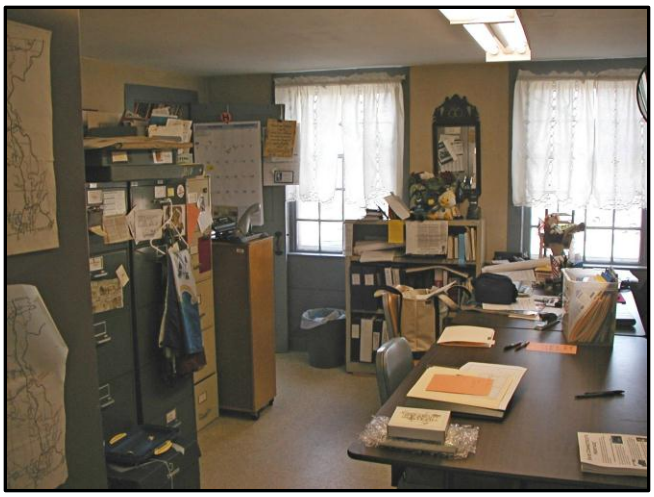


Photo P50: First floor of ell being used as office space.

Photo P51: Crack in partition wall below second floor framing has not substantially increased.

Photo P52: Shoring post at end of chimney girt.

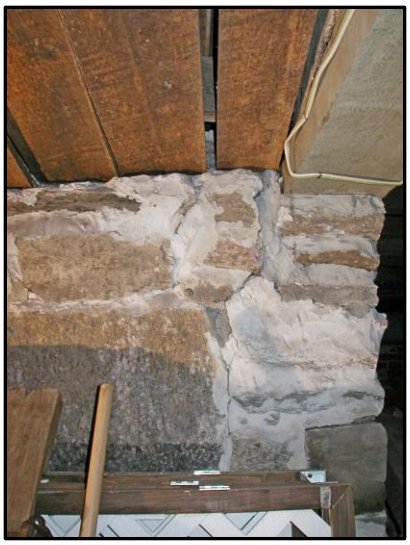


Photo P53: Vertical crack in masonry where chimney girt is supported.

Photo P54: Individual posts at joists on west side of ell.

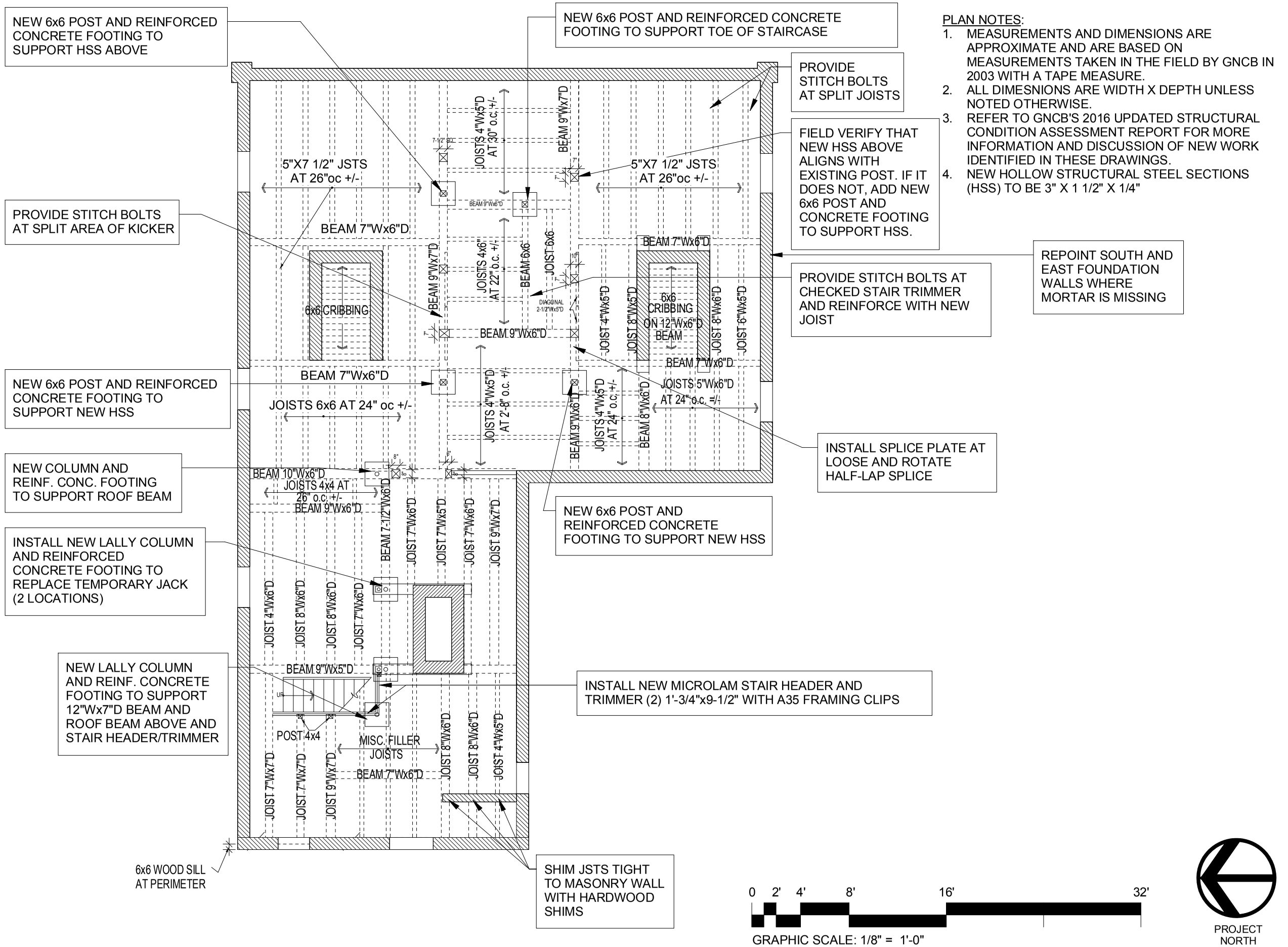
Appendix B: Structural Framing Plans

S-1.01 First Floor Framing Plan

S-1.02 Second Floor Framing Plan

S 1.03 Attic Floor Framing Plan

S 1.04 Roof Framing Plan



1 First Floor Framing Plan
1/8" = 1'-0"

PLAN NOTES:

1. MEASUREMENTS AND DIMENSIONS ARE APPROXIMATE AND ARE BASED ON MEASUREMENTS TAKEN IN THE FIELD BY GNCB IN 2003 WITH A TAPE MEASURE.
2. ALL DIMESNIONS ARE WIDTH X DEPTH UNLESS NOTED OTHERWISE.
3. REFER TO GNCB'S 2016 UPDATED STRUCTURAL CONDITION ASSESSMENT REPORT FOR MORE INFORMATION AND DISCUSSION OF NEW WORK IDENTIFIED IN THESE DRAWINGS.
4. NEW HOLLOW STRUCTURAL STEEL SECTIONS (HSS) TO BE 3" X 1 1/2" X 1/4"

GNCB Consulting Engineers, P.C.
130 ELM STREET
POST OFFICE BOX 802
OLD SAYBROOK
CONNECTICUT 06475
PHONE: 860 388 1224
FAX: 860 388 4613
GNCBENGINEERS.COM

No.	DESCRIPTION	DATE

ISSUED DRAWINGS

The Prudence Crandall Museum

1 South Canterbury Rd.
Canterbury, CT

Condition Assessment

First Floor Framing Plan

SCALE:	1/8" = 1'-0"
PROJECT NUMBER:	16178
DATE:	03/23/2017
DRAWN BY:	MD/AJ
CHECKED BY:	JFN

S-1.01

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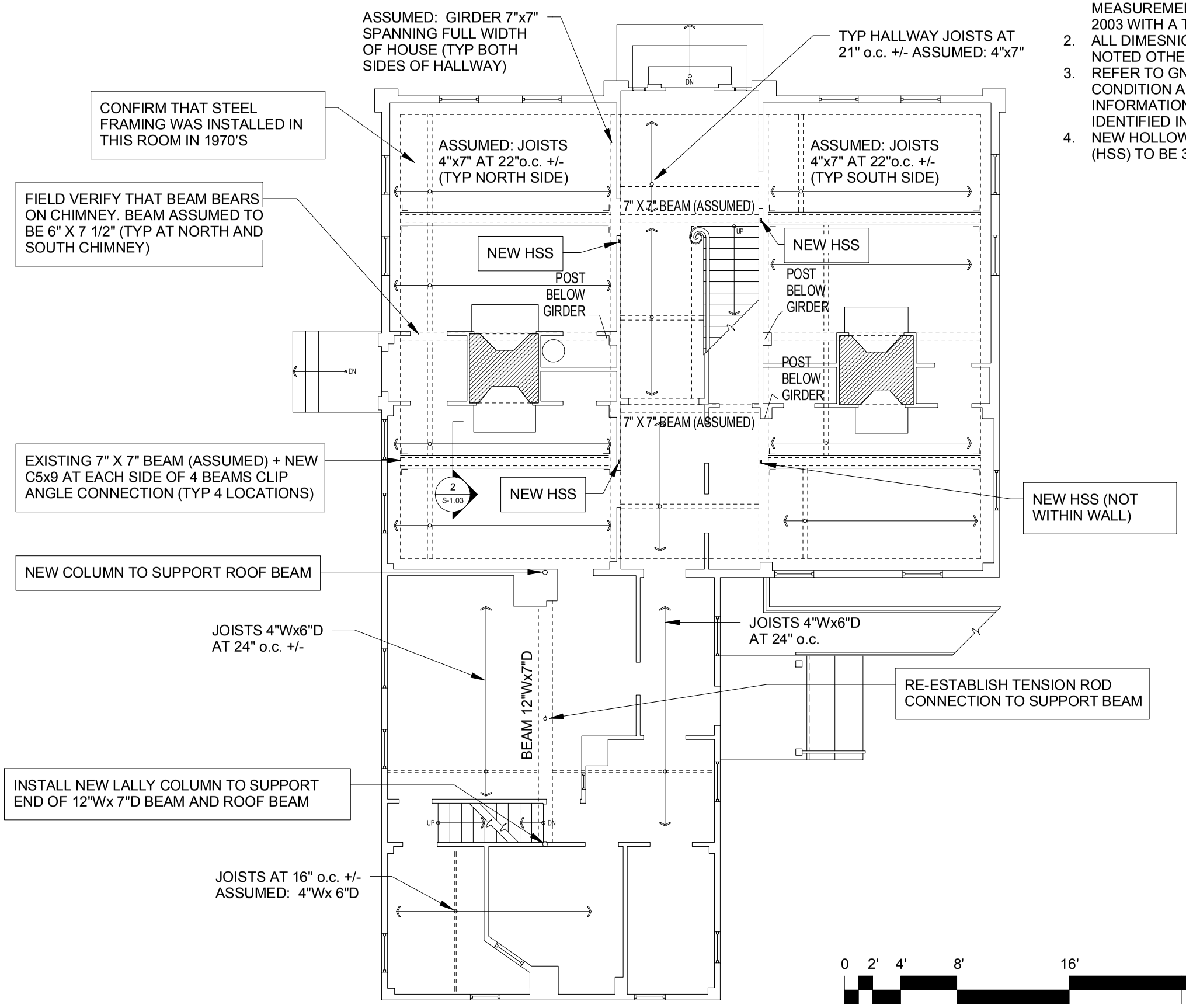

1 Second Floor Framing Plan
1/8" = 1'-0"

PLAN NOTES:

1. MEASUREMENTS AND DIMENSIONS ARE APPROXIMATE AND ARE BASED ON MEASUREMENTS TAKEN IN THE FIELD BY GNCB IN 2003 WITH A TAPE MEASURE.
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No.	DESCRIPTION	DATE

ISSUED DRAWINGS

The Prudence Crandall Museum

1 South Canterbury Rd.
Canterbury, CT

Condition Assessment

Second Floor Framing Plan

SCALE:	1/8" = 1'-0"
PROJECT NUMBER:	16178
DATE:	03/23/2017
DRAWN BY:	MD/AJ
CHECKED BY:	JFN

S-1.02

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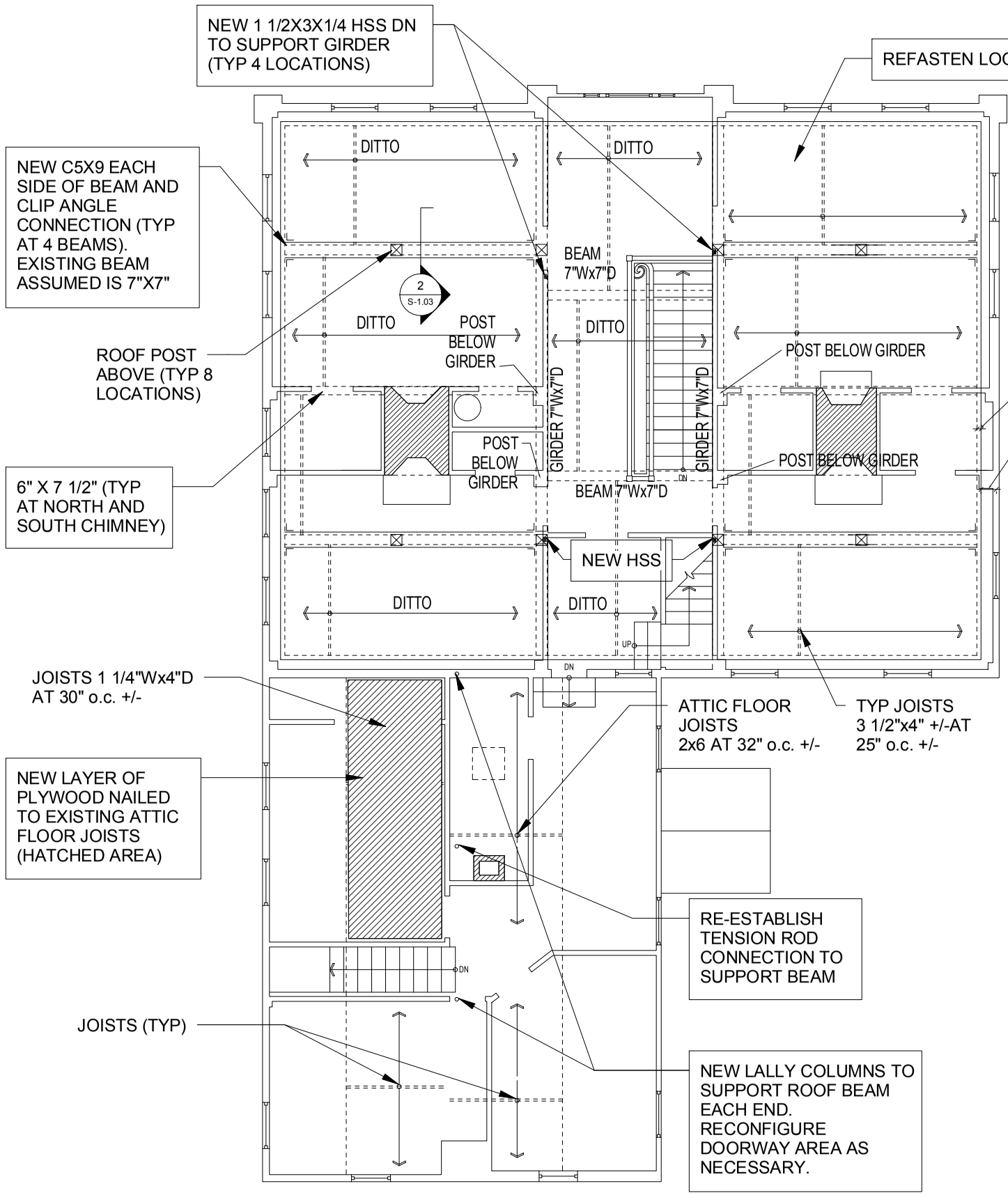

1 Attic Framing Plan
1/8" = 1'-0"

PLAN NOTES:

1. MEASUREMENTS AND DIMENSIONS ARE APPROXIMATE AND ARE BASED ON MEASUREMENTS TAKEN IN THE FIELD BY GNCB IN 2003 WITH A TAPE MEASURE.
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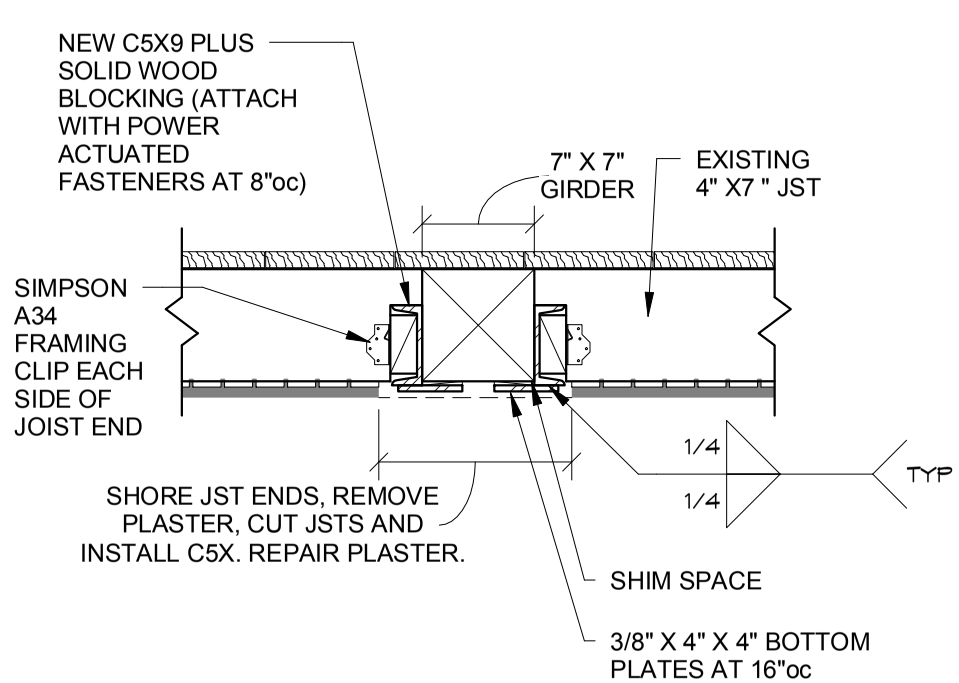

2 C5x9 REINFORCEMENT DETAIL
1" = 1'-0"

0 2' 4' 8' 16' 32'

GRAPHIC SCALE: 1/8" = 1'-0"

PROJECT NORTH

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No.	DESCRIPTION	DATE

ISSUED DRAWINGS

The Prudence Crandall Museum

1 South Canterbury Rd.
Canterbury, CT

Condition Assessment

Attic Floor Framing Plan

SCALE:	As indicated
PROJECT NUMBER:	16178
DATE:	03/23/2017
DRAWN BY:	MD/AJ
CHECKED BY:	AJ

S-1.03

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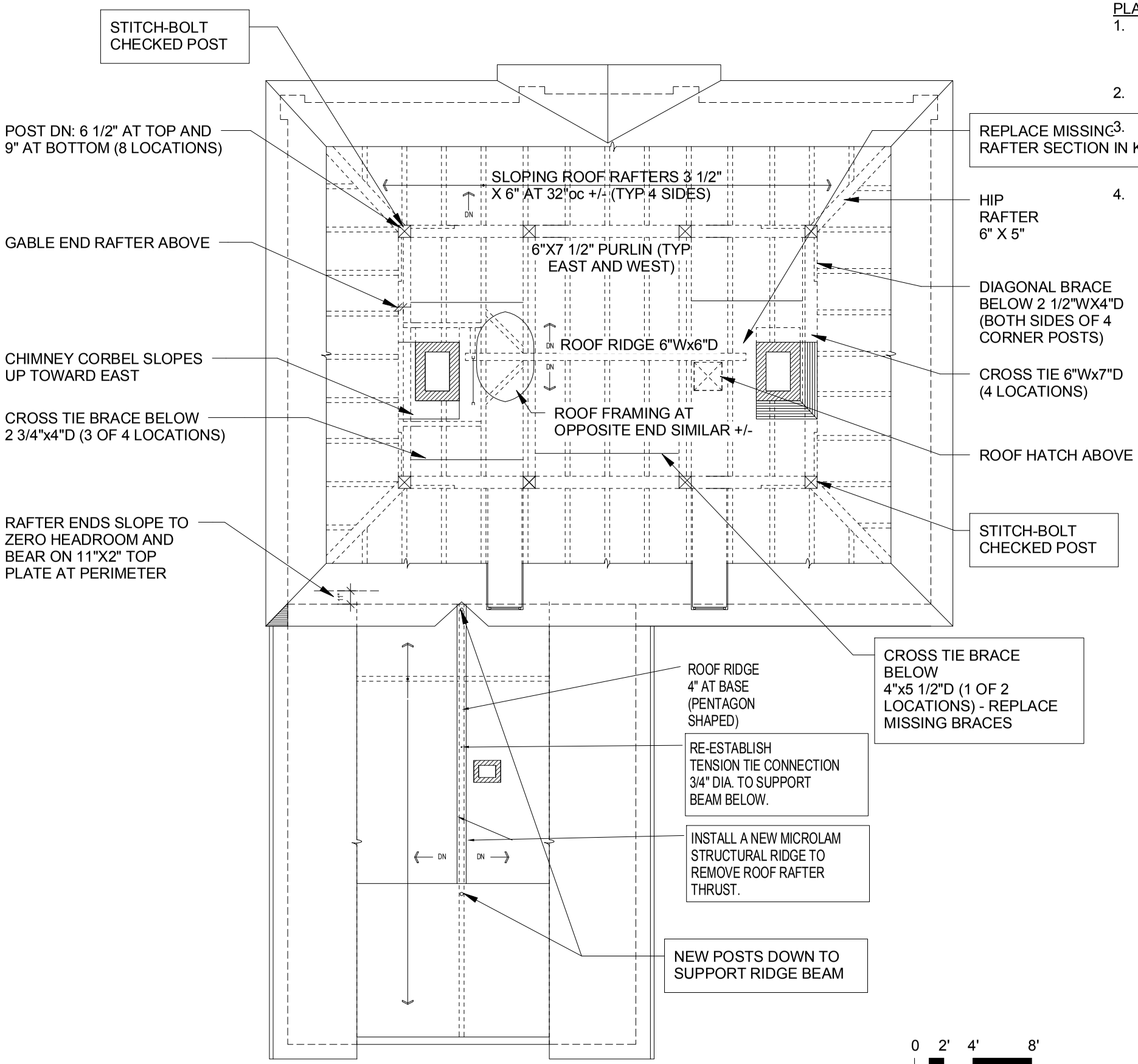

1 Roof Framing Plan
1/8" = 1'-0"

PLAN NOTES:
1. MEASUREMENTS AND DIMENSIONS ARE APPROXIMATE AND ARE BASED ON MEASUREMENTS TAKEN IN THE FIELD BY GNCB IN 2003 WITH A TAPE MEASURE.
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GNCBENGINEERS.COM

No.	DESCRIPTION	DATE

ISSUED DRAWINGS

The Prudence Crandall Museum

1 South Canterbury Rd.
Canterbury, CT

Condition Assessment

Roof Framing Plan

SCALE:	1/8" = 1'-0"
PROJECT NUMBER:	16178
DATE:	03/23/2017
DRAWN BY:	MD/AJ
CHECKED BY:	JFN

S-1.04

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Appendix C: Floor Loading Key Plans

Key-1.01 First Floor Plan

Key-1.02 Second Floor Plan

Key 1.03 Attic Floor Plan

Center Hallway

Live Load Capacity: 40 psf

Max. Occupancy: 18 People

Parlor

Live Load Capacity: 40 psf

Max. Occupancy: 20 People

Dining Room

Live Load Capacity: 35 psf

Max. Occupancy: 13 People

Room

Live Load Capacity: 19 psf

Max. Occupancy: 10 People

Kitchen

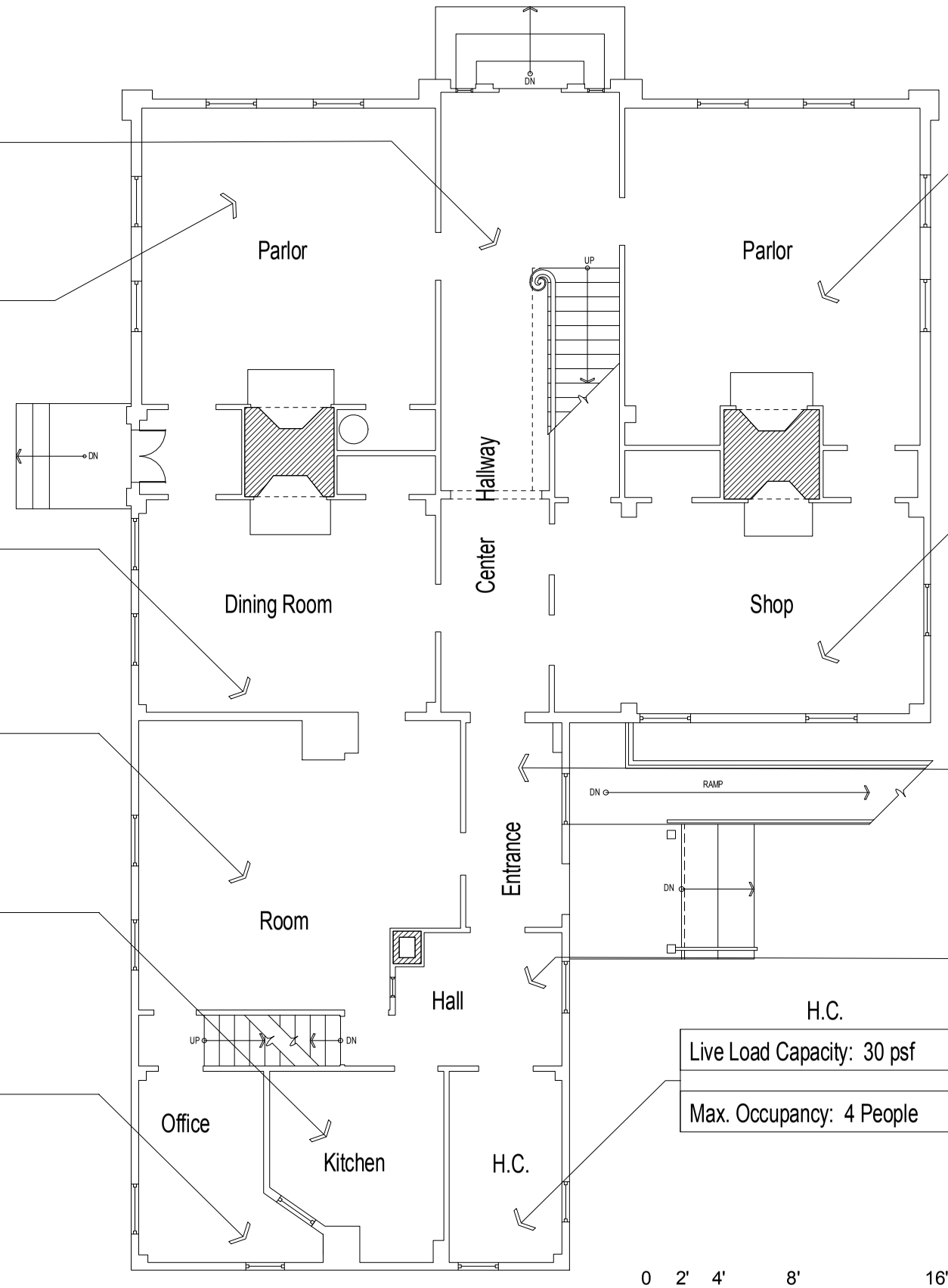
Live Load Capacity: 39 psf

Max. Occupancy: 6 People

Office

Live Load Capacity: 19 psf

Max. Occupancy: 3 People



Parlor

Live Load Capacity: 40 psf

Max. Occupancy: 21 People

Shop

Live Load Capacity: 40 psf

Max. Occupancy: 18 People

Entrance

Live Load Capacity: 52 psf

Max. Occupancy: 5 People

Hall

Live Load Capacity: 30 psf

Max. Occupancy: 4 People

H.C.

Live Load Capacity: 30 psf

Max. Occupancy: 4 People

0 2' 4' 8' 16' 32'

GRAPHIC SCALE: 1/8" = 1'-0"

PROJECT NORTH

1 First Floor Load Key Plan
1/8" = 1'-0"

C:\Users\GNCB032\Documents\16178 S15 Prudence Crandall House_GNCB032.rvt

GNCB Consulting Engineers, P.C.
130 ELM STREET
POST OFFICE BOX 802
OLD SAYBROOK
CONNECTICUT 06475
PHONE: 860 388 1224
FAX: 860 388 4613
GNCBENGINEERS.COM

No.	DESCRIPTION	DATE

ISSUED DRAWINGS

The Prudence Crandall Museum

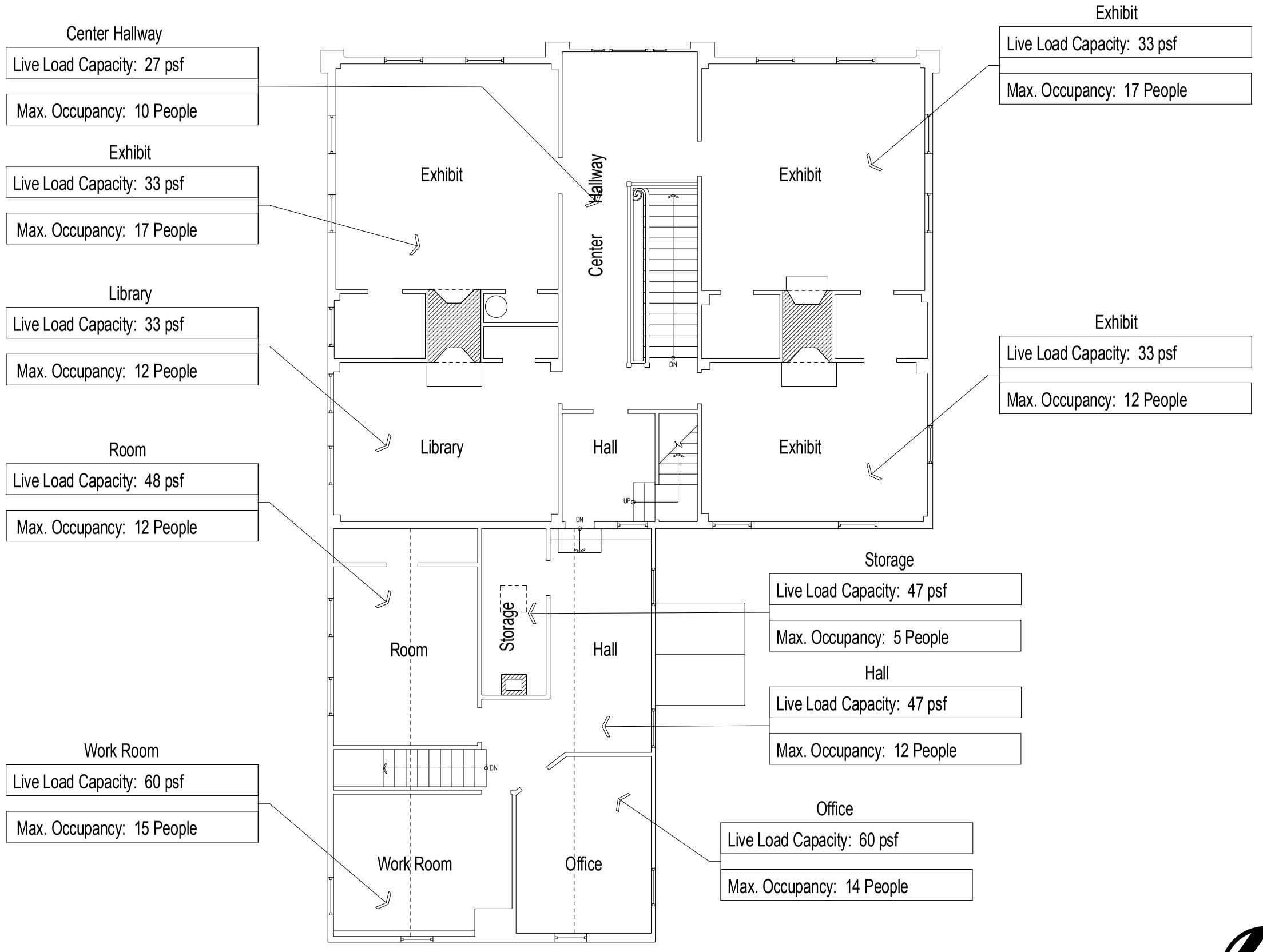
1 South Canterbury Rd.
Canterbury, CT

Condition Assessment

First Floor Load Key Plan

SCALE:	1/8" = 1'-0"
PROJECT NUMBER:	16178
DATE:	03/23/2017
DRAWN BY:	MD
CHECKED BY:	JFN

Key 1.01



1 Second Floor Load Key Plan
1/8" = 1'-0"

GNCB Consulting Engineers, P.C.
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GNCBENGINEERS.COM

No.	DESCRIPTION	DATE

ISSUED DRAWINGS

The Prudence Crandall Museum

1 South Canterbury Rd.
Canterbury, CT

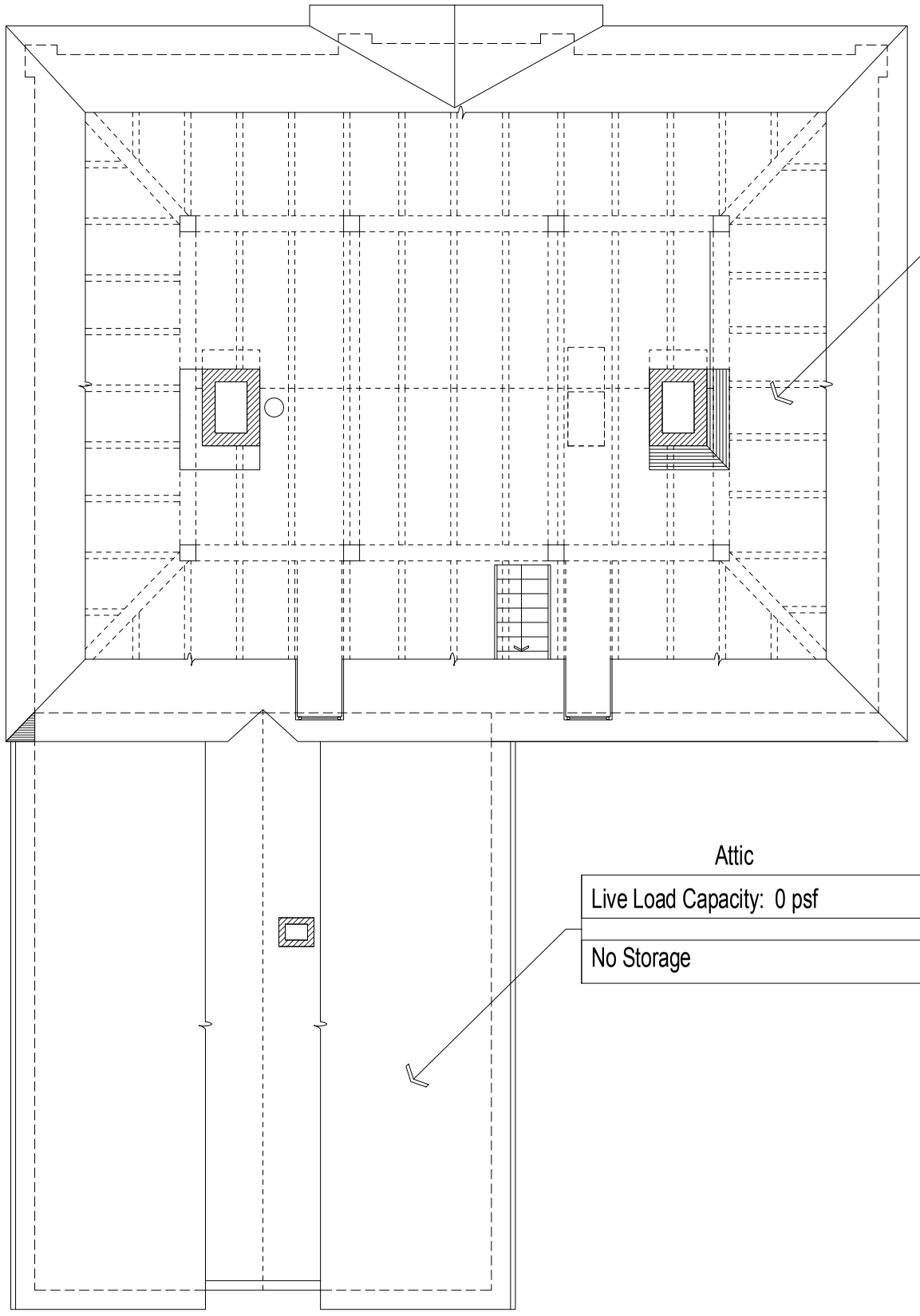
Condition Assessment

Second Floor Load Key Plan

SCALE:	1/8" = 1'-0"
PROJECT NUMBER:	16178
DATE:	03/23/2017
DRAWN BY:	MD
CHECKED BY:	JFN

Key 1.02

C:\Users\GNCB032\Documents\16178 S15 Prudence Crandall House_GNCB032.rvt



Attic

Live Load Capacity: 2 psf

No Storage

Attic

Live Load Capacity: 0 psf

No Storage

0 2' 4' 8' 16' 32'

GRAPHIC SCALE: 1/8" = 1'-0"

PROJECT NORTH

1 Attic Load Key Plan
1/8" = 1'-0"

C:\Users\GNCB032\Documents\16178 S15 Prudence Crandall House_GNCB032.rvt

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No.	DESCRIPTION	DATE

ISSUED DRAWINGS

The Prudence Crandall Museum

1 South Canterbury Rd.
Canterbury, CT

Condition Assessment

Attic Load Key Plan

SCALE:	1/8" = 1'-0"
PROJECT NUMBER:	16178
DATE:	03/23/2017
DRAWN BY:	MD
CHECKED BY:	JFN

Key 1.03

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III. PRUDENCE CRANDALL

A. Elevation Photos for Reference
B. Structural Assessment and Recommendations
C. Mechanical Assessment and Recommendations
D. Architectural Assessment and Recommendations

PRUDENCE CRANDALL HOUSE

CANTERBURY, CT

CONDITION ASSESSMENT AND TREATMENT RECOMMENDATIONS

FOR

MECHANICAL, ELECTRICAL, PLUMBING, AND FIRE SAFETY SYSTEMS

Prepared By:

Landmark Facilities Group, Inc.
252 East Avenue
Norwalk, CT 06855
203-866-4626

Final: March 23, 2017

Contents

INTRODUCTION

The Prudence Crandall House is a 2 story house originally built around 1805, located at the junction of Connecticut Route 14 and 69 in the center of Canterbury, Connecticut. It is notable for having been a school for African American girls which Prudence Crandall ran despite the objections of local residents. The house was designated a National Historic Landmark in 1991.

The objective of this project was to perform an update to a prior assessment of the existing engineered systems in the Prudence Crandall Museum and, from this information, develop a program that would achieve realistic improvements that are in harmony with the historic nature and thermal limitations of the building.

This was accomplished by evaluating the building envelope and the building's mechanical, electrical, plumbing, and fire safety systems. Landmark Facilities Group conducted visual inspections of the existing equipment on November 18, 2016. The analytical findings and improvement recommendations are presented herein.

PHYSICAL DESCRIPTION OF EXISTING CONDITIONS

1. Building Envelope.

The Prudence Crandall House is a 2 story wood structure with a 2 story portion to the west. For the purposes of this report the parts of the house will be referred to as the main block and the portion to the west will be referred to as the ell.

It is a wood frame structure with wood cladding (clapboard) on the exterior walls and plaster on the interior walls. The second floor of the ell is several steps lower than the second floor of the main block.

There is a full basement under both the main block and the ell. The full height of the basement is formed by the foundation walls. There is a polyethylene vapor barrier covered with sand over the floor. The first floor framing consists of unprotected wood joists.

The main block has a walk-up attic while the ell has an attic that is accessible through a hatch in the ceiling.

The main house and the ell have single glazed double-hung windows. All of the heated areas of the building have been retrofit with exterior storm windows.

There are several exterior doors and all are fairly loose-fitting and not tightly sealed.

Insulation has been installed in the attic above the 2nd floor of the ell and below the attic floor in the main house. It is unknown whether insulation was added above the sloped ceilings in the 2nd floor of the ell, but it is seems unlikely.

It is also unlikely that there is any insulation in the exterior walls of the main house, or the ell.

The building is equipped with rain gutters and leaders that discharge at grade. The grade adjacent to the foundation does not provide proper pitch to allow the rain water to flow away from the foundation.

2. Present Use of Space

a. Basement. The basement is used for storage and mechanical space.
b. 1st Floor. The majority of the first floor of the main block is used as period rooms to exhibit various collections. There is a gift shop in one room of the main block. The first floor of the ell is used as administrative space and contains offices, a kitchenette and a restroom for visitors and staff.
c. 2nd floor. The 2nd floor of the main block is used as period rooms to exhibit collections. One room is designated as a library. The 2nd floor of the ell contains rooms to exhibit collections, a staff work space and storage.
d. Attic. The attic of the main house is used for storage of miscellaneous items. The attic of the ell is empty

3. HVAC Systems.

The Prudence Crandall House is heated with "hydro-air" heating system - a forced air heating system with hot water coils in air handlers. Hot water for heating is supplied by two oil-fired boilers located in the basement. The boilers are placed on concrete pads, but are not physically separated from the rest of the basement. The boilers have a new vertical metal flue that runs parallel to the chimney through the first and second floor before it enters the chimney in the attic. (Photo C-1-8) The boilers are both manufactured by the Burnham Company, but each has a different heating capacity. The larger boiler, designated as B-1, (Photo C-1-1, C-2-4) has a rated capacity of 252,000 BTUh and smaller boiler, designated as B-2, (Photo C-2-5) has a rated capacity of 150,000 BTUh.

The boilers were not installed at the same time, which may explain the difference between the two boilers. The boilers are piped in parallel and set up so the larger boiler operates throughout most

of the heating season. If the larger boiler fails or cannot meet the load, the smaller boiler will operate.

There are two air handlers located in the basement. Each air handler is equipped with hot water coils, direct expansion cooling coils, and a filter housing. The air handlers were manufactured by the USA Coil and Air Company. The direct expansion cooling coils were supplied for future air conditioning that has never been implemented. One handler, designated as AHU-1, (Photos C-1-2, C-2-2) serves the first and second floor of the main block while the other air handler, designated AHU-2, (Photo C-1-4, C-2-6) serves the first and second floor of the ell.

An inline circulator pump circulates water through the boilers and distributes hot water to coils in the air handlers. (Photo C-2-7)

The hot water coils are controlled with 3-way motorized valves. It appears the motorized valve valve for AHU-1 is piped incorrectly. (Photo C-2-3)

The air distribution for the first floor runs across the ceiling of the basement to floor grilles along the perimeter walls. There are several vertical risers that feed low sidewall grilles on the second floor. The ductwork is insulated with fiberglass batts covered by a plastic film vapor barrier. The film has become brittle and is cracked and/or torn in numerous locations. (Photo C-2-8)

In order to address visitor comfort, the Museum has acquired several free-standing portable air-conditioning units. (Photo C-2-16) These units are deployed in various rooms during the summer months. These units use a short exhaust duct to window grilles that discharge heat to the exterior.

4. Electrical.

The building is equipped with a 100 amp 120/240 volt, single phase, electrical system. Power is brought to the building via overhead power lines running from a utility pole on Route 14 to a masthead on the side of the house. (Photos C-1-9, C-2-18) A conduit runs from the masthead to the electric meter that is mounted to the side of the house. There is a 100 amp main electric panel located in the basement. (Photos C-1-5, C-2-9) The panel has the following characteristics

Voltage/Phase	120/240 Volt, 1 phase
Rating	125 Amp
Main Breaker Size	100 Amp
# of positions	42
Condition	Good

There is a second panel located on the first floor of the ell (Photo C-2-17) that has the following characteristics:

Voltage/Phase	120/240 Volt, 1 phase
Rating	125 Amp
Main Breaker Size	N/A
# of positions	12
Condition	Good

Several the circuit breakers in the second panel are used as switches for lights in the building. We were unable to determine if the circuit breakers that are installed are rated for use as switches. The wiring is residential-grade cables with a mixture of metallic sheathing (BX) and non-metallic sheathing (Romex). Generally, the wiring appears to be in good condition. However, some of the metallic sheathing on cables in the basement is rusty. (Photo C-2-12) There are also several relatively minor wiring deficiencies such as junction boxes that are not secured (Photo C-2-13), a makeshift fuse box using a light socket (Photo C-2-14), and a light that has separated from its mounting box. (Photo C-2-15)

Much of the lighting in the public areas of the museum are controlled by motion sensors.

The building does not have a lightning protection system.

5. Plumbing.

Domestic water for the building is supplied from a well on the property. The water supply enters the basement through the foundation wall. The well water is treated with a water softener that is located in the basement. (Photos C-1-7, C-2-1)

There is an electric hot water heater located in the basement below the restroom. (Photos C-1-3, C-2-11). The hot water heater appears to be adequately sized and in good condition.

Sanitary waste exits through the foundation wall (Photo C-2-10) and goes to a septic tank and leaching field on the side of the house. The site supervisor has the tank pumped regularly and the contractor reports the tank is in good condition.

6. Fire Protection.

Fire Suppression

There are manually operated fire extinguishers placed throughout the house. The house is not equipped with automatic fire suppression.

Fire Detection

The house is equipped with a conventional fire detection system containing a mixture of heat and smoke detectors. Heat detectors are located in the basement and attic. Smoke detectors are located in the hallways on each floor.

ISSUES TO CONSIDER FOR PLANNING PURPOSES

1. Building-Related Issues

a. Thermal Limitations of the Building Envelope for Humidity Control

The Prudence Crandall House contains moisture-sensitive furniture, fabric, and fine art that require temperature and humidity control for long-term preservation. Based on our experience with similar buildings and the findings from other studies of the building, the following environmental conditions exist:

- There is no equipment for removing heat and moisture from the building in the summer. As a result, the interior spaces become uncomfortably warm and humid. In the evening, as the outside temperature drops, it is likely the relative humidity in the building rises into the 65% - 75% range. Relative humidity in this range poses a threat to collections because it supports mold growth.
- There is no provision for adding moisture to the building in the winter. During cold periods, and depending on the interior temperature, the relative humidity is likely in the 10% - 20% range. At these levels, wooden objects and furniture are at risk of splitting.

Overall, the building envelope lacks adequate thermal and moisture transmission performance to support winter humidification at "normal" room temperatures of 68°F-70°F. Further, the construction of the Prudence Crandall House is fairly loose, which also limits its ability to support precision environmental control. It would be detrimental to the structure, and extremely costly, to attempt to maintain "museum quality" conditions in the building. It would also be difficult to add insulation to the building without basically gutting the interior finishes and/or changing the character of the spaces.

In order to protect both the building and collections, there will have to be a compromise reached that includes trade-offs in occupant comfort for temperature and trade-offs in humidity set points for collections. This is addressed in the HVAC system discussion below.

b. Reuse Potential for existing mechanical equipment

The existing air handling system was installed roughly 12 years ago with the intent to add air conditioning. At this point, it is probably not a worthwhile investment to reuse the existing air handlers because they were provided with coils that were intended to be used with R-22, a refrigerant that has been phased out of production due to its ozone depleting characteristics.

The vapor barrier on the ductwork is failing. It will need to be repaired or replaced if the system is to provide cooling for the house. Without a proper vapor barrier, moisture will condense on the cold sheet metal and soak the insulation, leading to mold.

c. Control Moisture Entry

Controlling the water entry into the building is a prerequisite to any climate control improvements. If there is active water entry, the impact could range from significantly increasing system operating cost to entirely defeating the functionality of a climate control system. The exterior cladding has deteriorated to the point where water penetration is likely causing damage to the structure.

d. Reduce Outside Air Infiltration.

Controlling air leakage into and out of the building is another prerequisite to any climate control improvements. There are several windows and doors in the house that are not tight fitting. This air leakage will make it very difficult to maintain stable conditions and will result in be excessive energy use.

2. Heating, Ventilating, and Air Conditioning (HVAC) Systems

a. HVAC System Design Limitations for Collections Exhibit or Storage Areas.

On average, outside air temperatures in the region typically range from a daytime high of about 90°F in the summer to a nighttime low of about 2°F in winter. Relative humidity can peak in the 80% - 90% range during the summer months.

The lack of insulation and vapor barrier makes the building unsuitable for any use requiring precision climate control. As a result, we recommend compromise temperature and humidity

control techniques to achieve preservation goals by installing a system to limit extremely high or low humidity conditions.

In the summer this would be accomplished with cooling and dehumidification. In the winter, a technique known as humidistatic heating would be used to take advantage of the relationship between temperature and relative humidity to keep the relative humidity at an acceptable level by keeping the space temperature low.

Although there are several techniques for de-humidification, the technique that best suits the needs of the building is cooling with reheat. When warm air is exposed to a cold surface, water is pulled from the air and collects on the colder surface. This is called condensation. For de-humidification, this is typically accomplished with a cooling coil that either has refrigerant or chilled water circulated through it.

Throughout much of the year, the air leaving the cooling coil is too cold to be discharged directly back into the building spaces, so the air passes through a heating coil to reheat the air to a comfortable level. A self-contained dehumidifier works on this principle and uses the waste heat from the cooling cycle to reheat the air. The drawback to self-contained dehumidifier is that it gives off heat and will make a warm space even warmer. The ideal solution is a cooling system that can either direct waste heat indoors as reheat or remove the heat from the building as waste heat to prevent the space from overheating.

The goal of the HVAC improvements is to stabilize the conditions and allow the set points to be gradually adjusted throughout the season to match the building characteristics and outside weather conditions. We envision that the set points for the period rooms in the house would be adjusted between the following limits:

Season	Temperature	Relative Humidity
Summer	75°F	55%
Winter	50°F	30%

b. Sustainability

Any systems proposed for the Prudence Crandall House need to be reliable, easy to maintain and energy efficient. The design of these systems should endeavor to minimize impact on the environment by being energy efficient and, if mechanical cooling is utilized, using refrigerants that do not deplete the ozone.

c. Equipment Placement

There are several challenges related to locating new systems within and around a building such as the Prudence Crandall House. These challenges include:

- Locating equipment so that the risk of fire damage is minimized in the event of a failure.
- Locating equipment so it is not visible. This applies in particular to exterior equipment such as condensing units.
- Locating equipment so it does not create objectionable noise or vibration. This applies to both interior equipment like air handlers as well as exterior equipment like air cooled condensers. Any equipment located adjacent to occupied spaces should be designed with sound and vibration isolation so as not to detract from the visitor's experience in the building.

3. Electrical

There are several issues to consider related to the existing wiring:

- There are several deficiencies that, while they do not pose an immediate threat, should be corrected.
- Some of the metallic wire sheathing in the basement is rusty. This does not pose any immediate risk, but should be included as part of a long-range plan for upgrading the electrical system in the house.
- Some of the existing wiring has an old type of cloth insulation that tends to become dry and brittle. The wiring also does not comply with modern codes regarding grounding.
- Some of the new wiring has a non-metallic sheathing. While this is permissible by code, the non-metallic sheathed cable is more susceptible to physical damage.

- The existing 100 Amp electrical panel is not going to be sufficient to support a central cooling and dehumidification system.

4. Fire Safety

Although there is one layer of gypsum board directly above the boilers, the balance of the basement has exposed wooden joists and posts. The boilers present not only the risk of fire, but also the risk of a puff-back which basically is a fire within the boiler that generates a large quantity of sooty, oily smoke that is spread within the building

5. Fire Detection

The Prudence Crandall House has a basic fire detection system installed. The system is geared more toward life safety than preservation of the building. Conventional fire detection systems like the one in the Prudence Crandall House rely on smoke detectors mounted on the ceiling that utilize either photoelectric or ionization technology to detect particles of combustion. There is a system for smoke detection that draws in air through discreet sampling tubes and analyzes the air for products of combustion. These systems are often referred to as VESDA (Very Early Smoke Detection Apparatus) or aspirating smoke detectors. There are two main advantages to these systems

- They detect the earliest stage of combustion to the point of detecting a wire that is overheating before it ignites
- The smoke analyzer can be located in a remote location and small pipes routed to the rooms being monitored. The sampling tubes can be disguised so there is no obtrusive visual element in a period room.

The main disadvantage is they are very sensitive and consideration must be given to things that might trigger false alarms like candles.

6. Fire Suppression

A fire in a building like the Prudence Crandall House would cause extensive damage that would result in the loss of historic materials and possibly the entire building. The first line of defense is a fire detection system capable of catching a fire in the early stages. The second line of defense is an automatic fire suppression system. The risk of an accidental fire can be greatly mitigated through

careful planning and maintenance and by using a fire detection system. However, there are still unpredictable events like equipment failures, lightning strikes, carelessness, and intentionally-set fires. The only way to protect the building against these events is through the use of a fire suppression system.

A fire suppression system will control and likely extinguish a fire before a fire fighting team arrives. The drawback to a fire suppression system is that it will require significant intervention in the building to properly conceal the piping and locate the heads to minimize their visual impact.

Types of Fire Suppression Systems. If a fire suppression system was to be considered, there are several potential options available for implementing a new water-based fire suppression system. Since parts of the building are unheated in the winter, the feasible options include:

- **Dry Pipe System.** In this system, there is a network of sprinkler piping throughout the building that contains pressurized air at all times. The air pressure holds a valve closed so that water cannot enter the piping network. When a sprinkler head activates, the air pressure is released and the valve opens allowing water to enter the piping. The piping is typically galvanized steel and ranges in size from mains that are 2.5 inches in diameter to branches that are 1 inch in diameter. There are heat-activated sprinkler heads installed at regular intervals in the piping network. Each sprinkler head covers roughly 130 ft^2.

  In the event of a fire, heat activates the nearest sprinkler head or heads and water is discharged from the activated sprinklers. A water supply for a dry-pipe system at the Prudence Crandall House could include water pumped from a water storage tank or water delivered from a pressurized storage tank.

  A conventional dry-pipe sprinkler system requires roughly 150 GPM at a pressure of 75 psi to operate. Since there is no municipal water supply and the well on site has a limited capacity, the dry-pipe sprinkler system would need a source of water stored on site. Typically, a system is designed to operate for a minimum of 30 minutes, so a storage tank would have a water volume of around 5000 gallons. This tank would be about 8 feet in diameter and about 17 feet long. Typically the tank is buried adjacent to the building with

a manhole cover at grade to allow access for inspection. The tank location will have to be carefully vetted and will likely require archeology in the area to be excavated. There are several options for delivering water from a water storage tank to the sprinkler system which is addressed later in this report.

The advantages of a dry-pipe system are:

- Distribution piping can be run in unheated areas.
- Very few components so there is high reliability.
- Fast reaction time.
- Numerous options for sprinkler head configuration (concealed, recessed, sidewall, etc.)

The disadvantages of a dry-pipe system are:

- Water will discharge if a head is accidentally damaged
- A water service and dry-pipe valve have to be kept in a heated area for freeze protection.

- **Mist System.** A mist system operates by discharging a limited quantity of water at a very high pressure through a nozzle which produces extremely fine water droplets. The resulting mist has proven to be very effective at cooling the combustion process. The system uses stainless steel tubing ranging in size from mains that are 2 inches in diameter to branches that are 1/2 inch in diameter. There are heat-activated mist heads installed at regular intervals in the piping network. Each mist head covers roughly 130 ft^2. A powerful pump is used to generate the high water pressure required. A mist system delivers roughly 30 GPM of water at a pressure of about 1000 psi.

  Typically, a system is designed to operate for a minimum of 30 minutes, so a storage tank would have a water volume of around 1000 gallons.

  The advantages of a mist system are:

  - Fire is controlled using significantly less water than conventional suppression systems.
  - Piping and nozzles are small and easily concealed.
  - Piping can be run through unheated areas.

The disadvantages of a mist system are:

- Extremely high initial cost.
- Requires a contractor with special training to install
- Requires vigilant maintenance or system may not operate.

Options for delivering water from a Storage Tank to a Sprinkler System. Assuming that water for a fire suppression system will have to be stored on site, there are a few feasible ways of pressurizing the water to deliver it to the suppression system in the event of a fire which include:

- **Electric Fire Pump**: A pump that is driven by an electric motor fed by utility power.
  Advantages
  - Easy to maintain

  Disadvantages
  - Won't run if there is no power

- **Diesel Engine Fire Pump**: A pump that is driven by a diesel engine with a dedicated fuel tank,
  Advantages
  - Runs if there is no power

  Disadvantages
  - More maintenance and testing

- **Pressurized Storage Tank**. The water storage tank has a volume of air that is compressed to a pressure sufficient to push the water out of the tank. Tank would be roughly 8,000 gallons and would contain roughly 5,000 gallons of water pressurized to about 150 psi.
  Advantages
  - Runs if there is no power
  - Requires a minimum of moving parts.

  Disadvantages
  - Requires a larger storage tank
  - Requires a reinforced tank that can withstand the operating pressure.

RECOMMENDATIONS

Recommendations are provided below using the following categories:

(P1) Priority 1: Address immediately.

(P2) Priority 2: Address within 1-5 years.

(P3) Priority 3: Can be addressed within 5-10 years (maximum).

1. Building-Related Recommendations

a. **(P1)** Priority 1

i. Before any system improvements should be considered, we recommend stabilizing the building envelope. The required improvements are included in the architectural portion of the report.

ii. Correct roof leaders discharging near building foundation by installing underground conductors that would drain away from the foundation.

iii. Improve grading to the greatest extent possible to allow surface water to flow away from the foundation and sill plates. If grading is not feasible, install a French drain tied into the new roof drain underground conductors.

b. **(P1)** Priority 2

i. Build a fire rated enclosure for the boilers. A 1 hour fire rated enclosure is recommended. This can be achieved with 2 layers of gypsum drywall for the walls and ceiling and a fire rated door.

c. **(P3)** Priority 3

i. Reduce air infiltration by installing weather stripping. This weather stripping needs to be carefully detailed to work with the existing doors.

2. HVAC System Recommendations

a. **(P1)** Priority 1

i. Correct the piping to the control valve serving AHU-1.

ii. Install a second circulating pump and lead/lag controls so the second pump would start automatically in the event the primary pump failed.

iii. Install boiler staging controls that would even the wear on the two boilers.

b. **(P2)** Priority 2

i. Install a ducted dehumidification system using the existing ductwork.

i. Replace the existing air handlers with new units with cooling coils and hot water reheat coils.

ii. Install condensing units to provide cooling for dehumidification. The new system would utilize a refrigerant with a zero ozone depletion potential.

iii. Provide the new air handlers with improved air filtration having a MERV rating of 14.

ii. Install digital control system to operate dehumidification in the spring, summer and fall and operate heating system in the winter based on humidistatic control.

c. **(P3)** Priority 3

i. None.

3. Plumbing Recommendations

a. **(P1)** Priority 1

i. Renovate the restroom to correct deficiencies related to ADA accessibility.

b. **(P2)** Priority 2

i. None.

c. **(P3)** Priority 3

i. None.

4. Electrical Recommendations

a. **(P1)** Priority 1

i. Replace any metallic sheathed cable that has corrosion on the sheathing

ii. Correct miscellaneous wiring deficiencies.

iii. Install ceiling fixture in Hall 15

b. **(P2)** Priority 2

i. Upgrade the electric service panel to 200A to support a climate control system.

ii. Install a lightning protection system consisting of air terminals, down conductors and proper grounding.

c. **(P3)** Priority 3

i. Mandate that any new electrical work be performed using metallic sheathed cable.

ii. Replace any non-metallic sheathed wiring with metallic sheathed cable.

iii. Install a lighting contactor panel to operate lighting circuits and eliminate the use of circuit breakers as switches.

iv. Replace any of the older wiring in the house.

v. Remove overhead electrical service from pole to house and install new service to run underground from pole to house.

vi. The incoming electrical service should also be protected with a surge protection system.

5. Fire Protection.

a. **(P1)** Priority 1

i. None.

b. **(P2)** Priority 2

i. Increase the coverage of the fire detection system. The fire detection system is not adequate for the protection of a historic building. If a fire was to start in one of the exhibit rooms, it could be well developed before the current smoke detectors would sense smoke in the hallways. We recommend installing a new addressable fire alarm system with smoke detection in each room of the building. We recommend smoke detectors that integrate photoelectric, ionization, and rate of heat-rise technology into one detector.

ii. Install an aspirating smoke detection system similar to a VESDA system by Xtralis Inc. The detector would be located in the basement and a network of plastic tubing would be run concealed to sample each of the period rooms.

iii. Consider installing an automatic Fire Suppression System. We recommend a dry-pipe system using water stored in a pressurized tank for this location.

1. Design Criteria
    i. Base design on NFPA 13
    ii. Light hazard classification
2. Proposed Approach
    i. Install a water storage tank would be roughly 8000 gallons and would contain roughly 5000 gallons of water pressurized to 120 psi. Most of the tank can be buried outside, but access is required to one end of the tank for service and inspection. This could be accomplished with a service pit adjacent to the tank.
    ii. The dry-valve would have to be located in an area that is kept above freezing, either in the service pit or the basement. Piping would run from the dry-valve to the distribution piping in the building.

c. **(P3)** Priority 3

i. None

APPENDIX C-1 Photographs from 2003 Report

Photo C-1-1: Oil-fired hot water boilers in basement

Photo C-1-2: Air handler serving the Main Block

Photo C-1-3: Electric hot water heater

Photo C-1-4: Air handler serving the Ell

Photo C-1-5: Main electric panel

Photo C-1-6: Sanitary sewer piping exiting through foundation wall

Photo C-1-7: Pressure tank and water softener

Photo C-1-8: Boiler flue connection to chimney in attic

 Photo C-1-9: Electric service meter and telephone feed	

APPENDIX C-2: Photographs from 2016 Survey

Photo C-2-1: Incoming water service and water softener

Photo C-2-2: Air Handler AHU-1

Photo C-2-3: Control valve for AHU-1

Photo C-2-4: Boiler B-1

Photo C-2-5: Boiler B-2

Photo C-2-6: Air Handler AHU-2

Photo C-2-7: Hot water pump

Photo C-2-8: Example of damaged vapor barrier on duct insulation

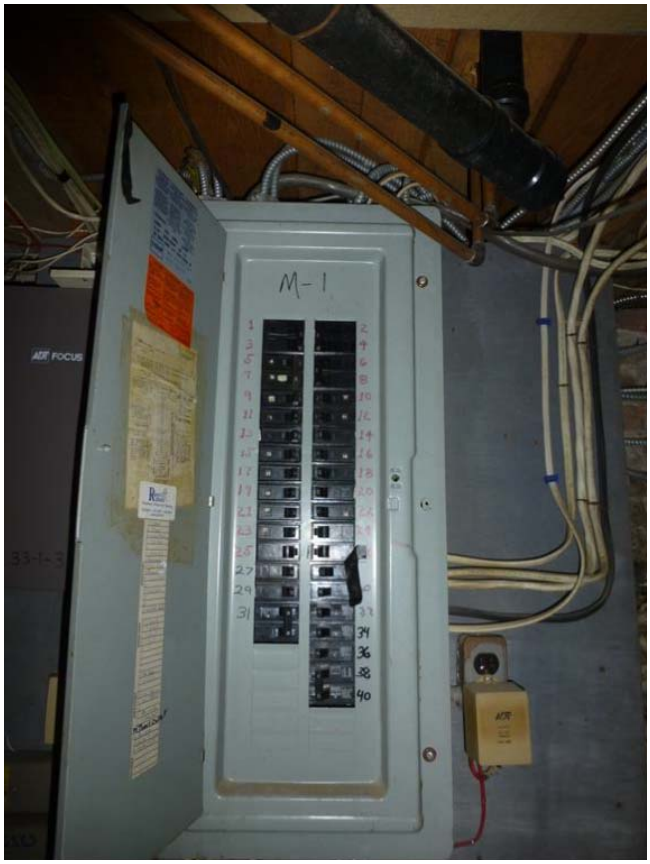


Photo C-2-9: Main Electric Panel

Photo C-2-10: Main Sanitary waste line

Photo C-2-11: Water Heater

Photo C-2-12: Mixture of wiring types. Note corrosion on metallic sheathing

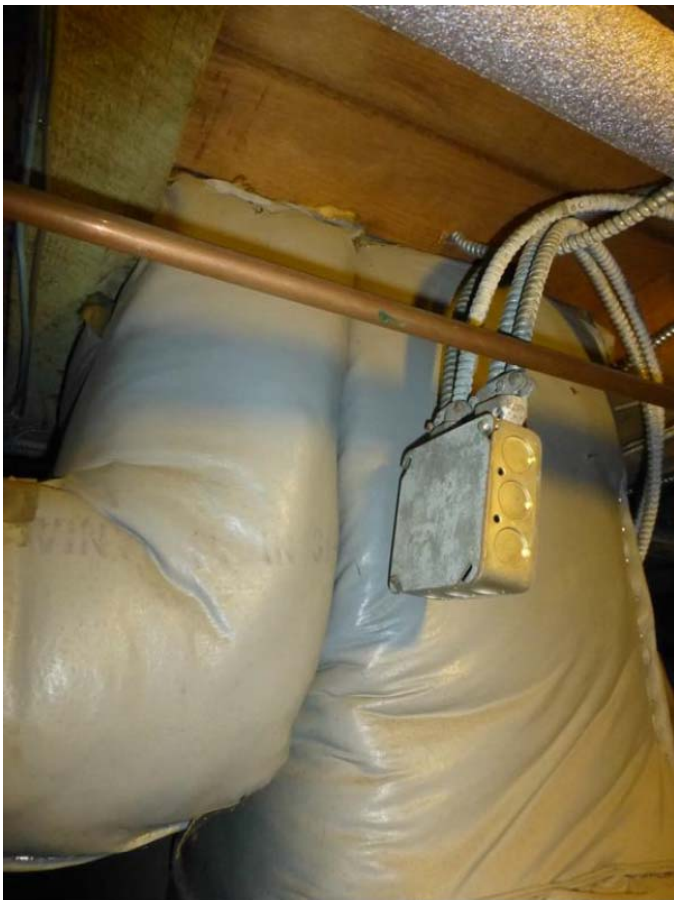
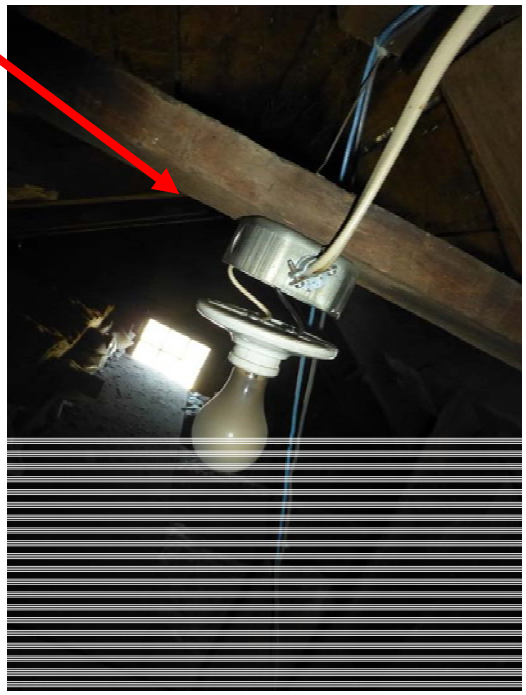


Photo C-2-13: Junction box in basement that is not properly secured

Makeshift fuse-box in basement

Photo C-2-14: Wiring in basement

Photo C-2-15: Attic above Ell



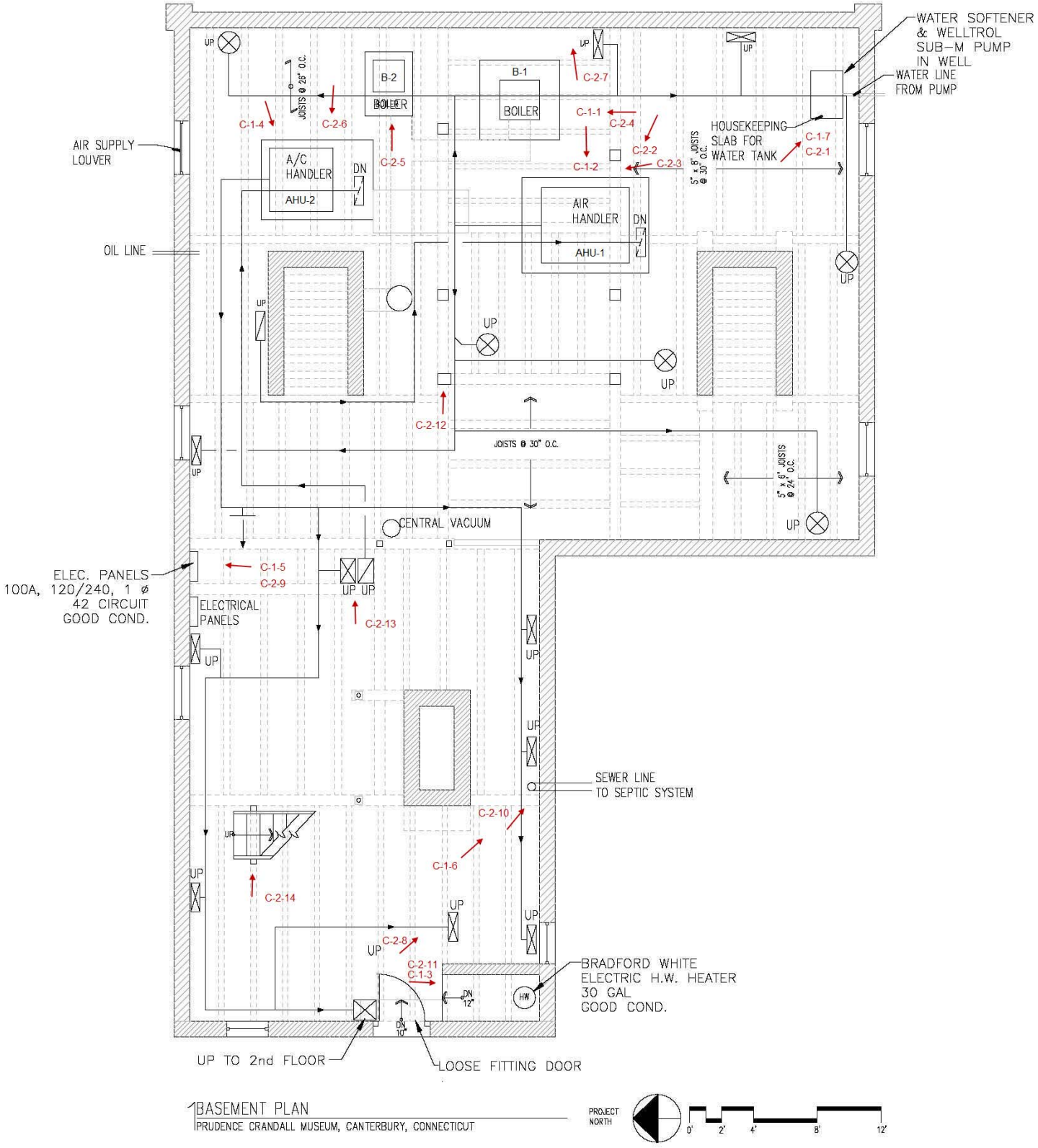
Light socket not properly secured

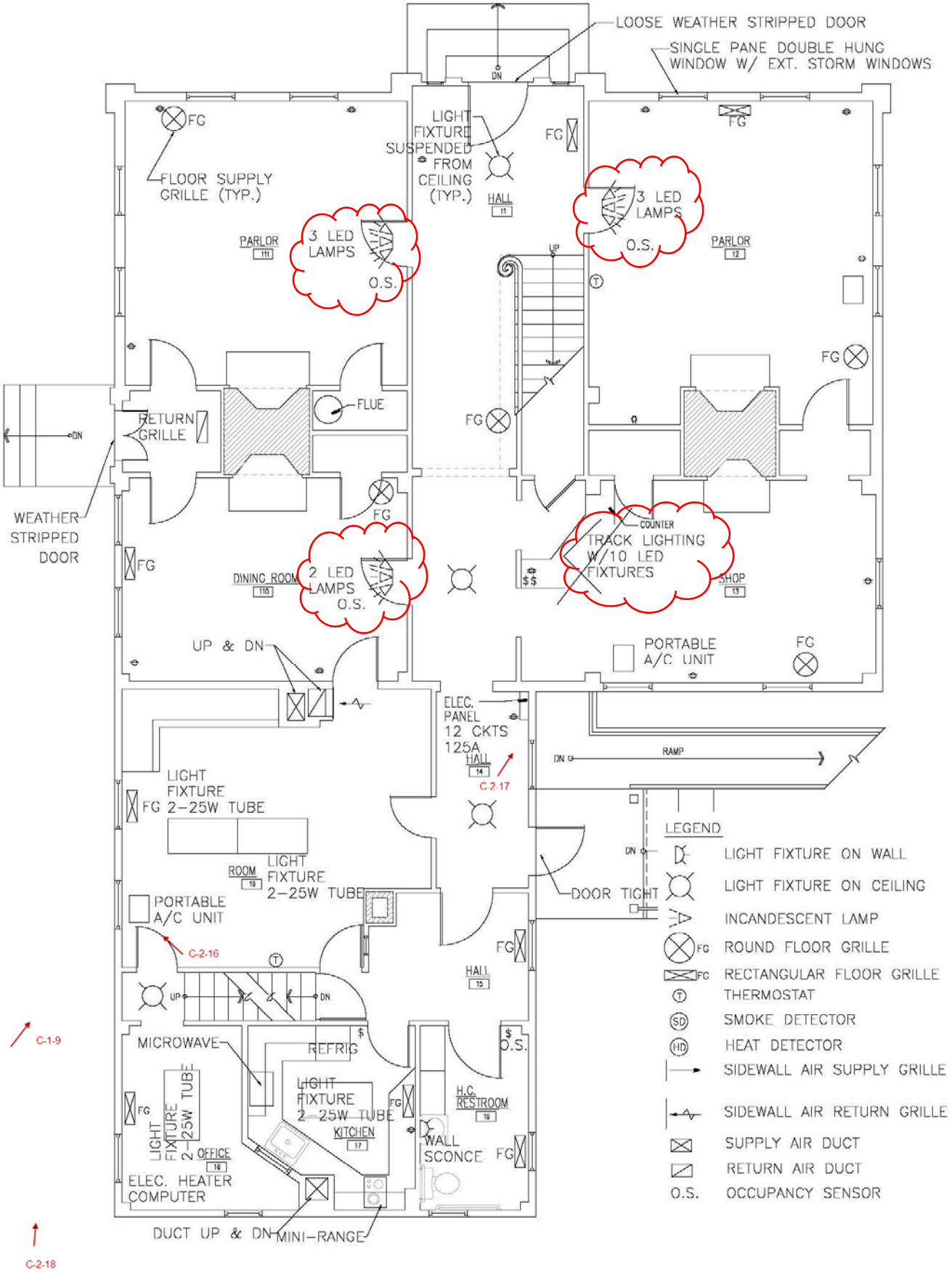
Photo C-2-16: Portable A/C unit (typical)

Photo C-2-17: Circuit breaker panel on 1st floor used as switch box.

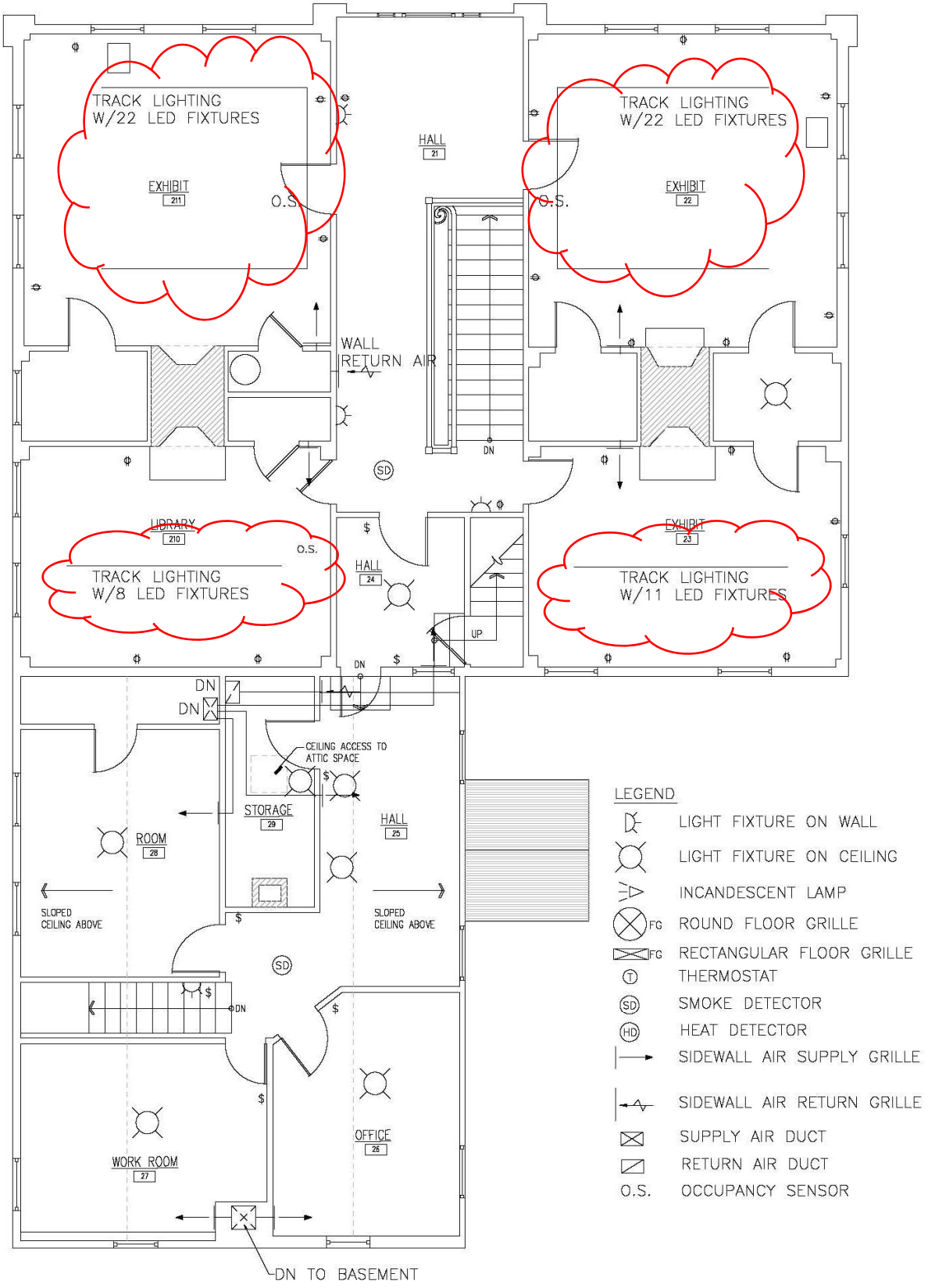
Photo C-2-18: Incoming electrical service

APPENDIX C-3: Existing Condition Plans with 2016 updates


WATER SOFTENER
& WELLTROL
SUB-M PUMP
IN WELL
WATER LINE
FROM PUMP
AIR SUPPLY
LOUVER
OIL LINE
B-2
BOILER
B-1
BOILER
A/C
HANDLER
AHU-2
AIR
HANDLER
AHU-1
HOUSEKEEPING
SLAB FOR
WATER TANK
JOISTS @ 30" O.C.
5" x 8" JOISTS
@ 30" O.C.
5" x 6" JOISTS
@ 24" O.C.
CENTRAL VACUUM
ELEC. PANELS
100A, 120/240, 1 ø
42 CIRCUIT
GOOD COND.
ELECTRICAL
PANELS
SEWER LINE
TO SEPTIC SYSTEM
BRADFORD WHITE
ELECTRIC H.W. HEATER
30 GAL
GOOD COND.
UP TO 2nd FLOOR
LOOSE FITTING DOOR
C-1-1
C-1-2
C-1-3
C-1-4
C-1-5
C-1-6
C-1-7
C-2-1
C-2-2
C-2-3
C-2-4
C-2-5
C-2-6
C-2-7
C-2-8
C-2-9
C-2-10
C-2-11
C-2-12
C-2-13
C-2-14
UP
DN
HW
BASEMENT PLAN
PRUDENCE CRANDALL MUSEUM, CANTERBURY, CONNECTICUT
PROJECT
NORTH
0'
2'
4'
8'
12'



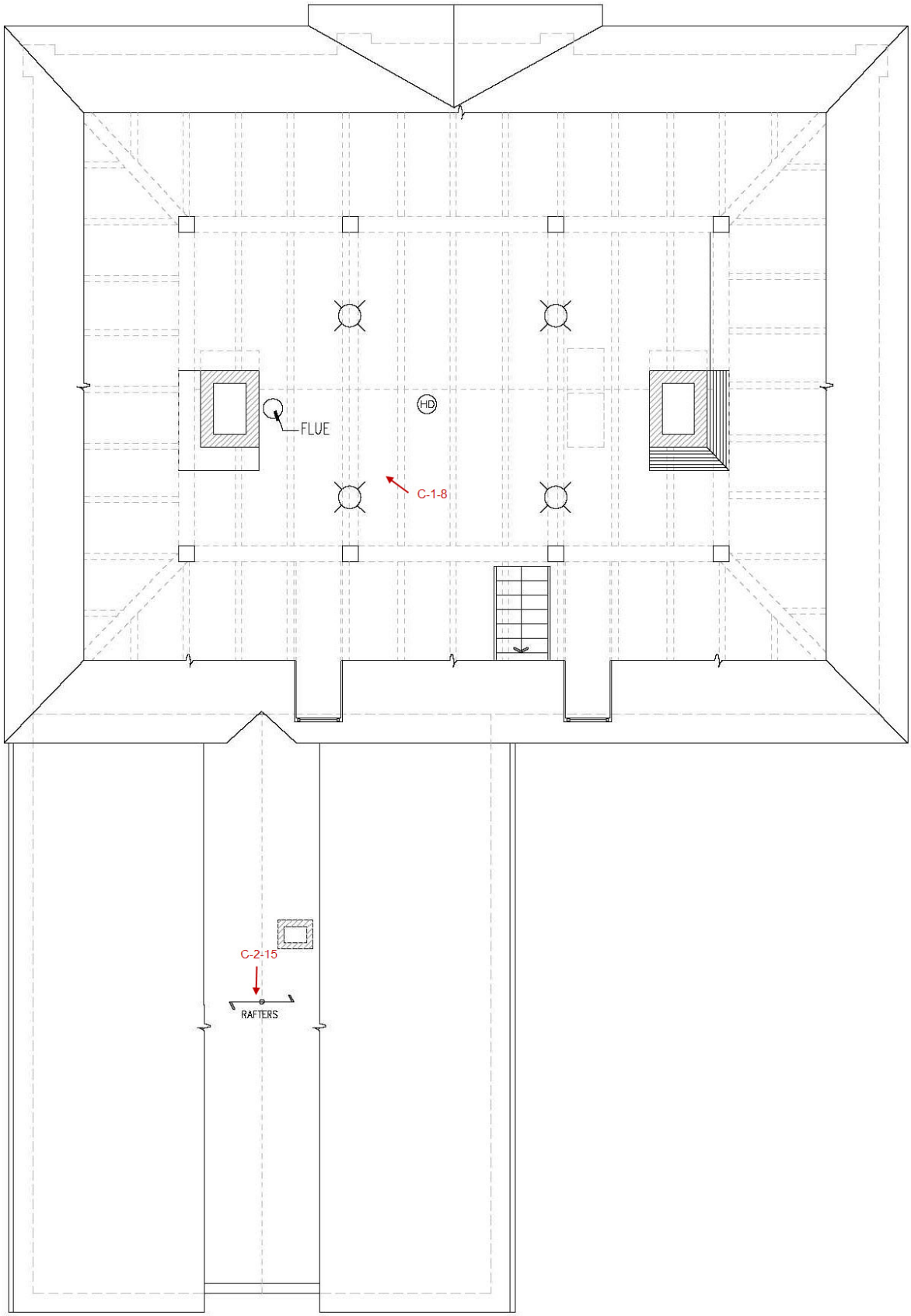
1 FIRST FLOOR PLAN
PRUDENCE CRANDALL MUSEUM, CANTERBURY, CONNECTICUT



2 SECOND FLOOR PLAN
PRUDENCE CRANDALL MUSEUM, CANTERBURY, CONNECTICUT

PROJECT NORTH

0' 2' 4' 8' 12'



2 ATTIC PLAN
PRUDENCE CRANDALL MUSEUM, CANTERBURY, CONNECTICUT

PROJECT NORTH

0' 2' 4' 8' 12'

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III. PRUDENCE CRANDALL

A. Elevation Photos for Reference
B. Structural Assessment and Recommendations
C. Mechanical Assessment and Recommendations
D. Architectural Assessment and Recommendations

EXTERIOR ENVELOPE AND SITE

The March 2004 Paul Bailey Report (PBR) comments on the poor condition of the exterior envelope, citing problems with siding, trim, doors, windows, and the "dire" need for re-painting. A comprehensive renovation and restoration project (#CAT1-MRP-01) was undertaken in 2005 to address these problems. Construction documents were prepared by Bargmann Hendrie &Archetype; the contractor was Gesco Co. Inc. The scope of work documented on the structural drawings has not been done to date. The restoration of exterior doors was to be undertaken in a later phase.

As of this current inspection, 11 years after the completion of the 2005 restoration and renovation work undertaken to address the issues raised in the 2004 PBR, the condition of the paint finish, the extent of deterioration of roofing, siding and trim, as well as the continuing moisture problems in the basement, indicate that a rigorous maintenance regimen would be the cost-effective approach to preserving new renovation efforts.

Roof:

Current cedar shingle roof and copper flashing were installed in 1994 after previous roofing was removed. The PBR notes that the roofing drawings by A. W. Mastronunzio call for white cedar shingles. The specifications provided to TLBA indicate that the specified material was No. 1 Grade Blue Label western red cedar, with an alternate for a pressure preservative-treated red cedar (Certi-Last). A copy of the shingle materials submittal confirm that the installed material is the alternate.

PHOTO 01

Above: Typical condition of red cedar shingles: cracked, cupped, and missing.

Below: Typical prefabricated hip caps are improperly fastened with staples, and have failed.

The cupping of the shingles has worsened significantly since the PBR of 2004. In addition, many shingles are cracked, loose, or missing **(PHOTO 01).** Notably, many shingle hip cap joints have opened up and exposed this vulnerable juncture. Contrary to the project specifications and preservation guidelines (Brief 19), staples were used to fasten shingles. **(PHOTO 02)**

PHOTO 02

The 1x wood roof sheathing does not have the 5" open spacing recommended to facilitate adequate drying of the roof shingles between rains. **(PHOTOS 03)**

PHOTO 03

Shingles on all roof surfaces exhibit the presence of lichens and/or mosses, indicating poor ventilation under the shingles. Moisture trapped under the shingles has accelerated the deterioration of the roof. **(PHOTO 04)**

PHOTO 04

The shingles on the shallow dormer roofs have a 3.75" weather exposure as specified, but overhang the eaves and rakes by less than the recommended 1.5" drip edge. **(PHOTO 05)**

PHOTO 05

Ice damming on the south roof of the ell continues to be problematical, in large part because the lowest third of the roof is directly over the heated sloped ceiling. Insulation of the heated roof in that area will be considered. **(PHOTO 06)**

PHOTO 06

Depending on the installation and the extent of maintenance, the lifespan of cedar shingle roofs can range from 20 years to 40 or 50 years. In this case, the useful life of the roof has expired.

Chimneys:

Per the PBR, the three chimneys were rebuilt at the time the previous roof was removed in 1994. The chimneys, chimney caps, and chimney flashing remain in generally good condition. While some repointing has been done since 2004, some minor additional repointing will be required in the near future. **(PHOTO 07)**

PHOTO 07

Lightning Protection:

Lightning protection as recommended by the PBR has not been installed.

Gutters:

Gutters are installed at the west eave of the main structure and on the north and south eaves of the ell roof. Subsequent to the PBR, the leader draining the gutter at the west eave has been relocated to the southwest corner of the main building, alleviating the overload on the south ell gutter. However, both the south and north ell gutters sag down in the center, spilling most of the rainwater from the center of the runs. **(Photo 08)** Siding and trim below the gutters at these points are deteriorating, and the un-diverted water quickly finds its way into the ell basement.

PHOTO 08

There are no gutters on the north, east, and south sides of the main house, presumably for historical correctness. However, the absence of gutters has hastened the deterioration of the siding and trim by rain water dripping from eaves and splashing up from the ground. As noted in the PBR, the damage is most apparent and destructive at the projecting central entry bay on the east elevation. The worst conditions are at the inside corners on either side of the gable roof. Water from large areas of roof is directed to these corners, and the damage extends from eave to grade, causing the joints to open up and the wood to rot. **(PHOTO 09)**

(NOTE: This concentration of water from the gable valleys quickly finds its way into the basement as well. See further discussion in sections on siding and exterior steps.

Siding:

Corner boards at the shingled cheek walls of the attic dormers would protect the shingle edges from water penetration in driving rain. **(PHOTO 10)**

The bottoms of the wood plank face of the roof gable ends are tight to the flashing of the roof below, and some rot is apparent. **(PHOTO 11)**

PHOTO 09

PHOTO 11

PHOTO 10

In general, the repair and restoration of the clapboard siding completed in 2006 was not always executed to preservation standards. Surfaces were improperly prepared: areas of thick, old, and encrusted paint were not scraped away or feathered by sanding; some damaged clapboards were not repaired or replaced; and some areas do not appear to have been primed. Paint drips suggest inattentive workmanship. In many areas, the paint at the bottommost clapboard has deteriorated more than most. This may be caused by the omission of a spacer commonly installed to align the angle of the clapboard with that of the siding above, and minimize the exposed surface of the skirt board beneath. Paint is blistering and peeling everywhere. Many open joints in the clapboards are evident; some nail heads are protruding and rusting. Mildew can be observed on most surfaces of the building. On the north wall of the ell, new clapboards were insensitively fitted into the original siding, resulting in an unsightly zippered appearance. **(PHOTOS 12—16)**

PHOTO 12 Improperly prepped surfaces.

PHOTO 13 No flashing behind clap above skirt.

PHOTO 14 **Open joints in clapboards.**

PHOTO 15 Exposed nail heads.

PHOTO 16 Zippered clapboard installation.

Trim:

Eleven years after the restoration/renovation project of 2005, the building trim has deteriorated to a similar state as that described in the PBR of 2004. Much of the decorative cornice trim is in reasonable condition, though isolated problem areas are visible, including the eaves where the roof pitches change. **(PHOTOS 17-18)**

The absence of corner boards at the dormer cheek walls exposes the edge of the shingles and leaves them vulnerable to wind-driven rain. **(PHOTO 19)**

The skirt boards consistently show more than average peeling due to moisture. **(PHOTO 20)** Corner boards show mostly normal weathering, though there are some instances of cracks opening up at the bottom. **(PHOTO 22)**

PHOTO 17 Cornice decorative trim in good shape.

PHOTO 18

PHOTO 19

PHOTO 20 Moisture at top of skirt board.

PHOTO 21 Eave at Ell.

PHOTO 22 Dry cracks in trim.

The areas of greatest concern are the decorative trim elements at the east wall corners and the two entry facades at the east and north faces of the building. Here the absence of gutters allows rainwater from the eaves to drip unimpeded on-to the many decorative molding projections, which in some cases are unprotected by cap flashing. **(PHOTOS 23, 24)**

PHOTO 23

Above: Flat and deep shelf of pediment at top of east entry.

Below: Flat shelf seen from attic window. Standing water has begun to rot out wood.

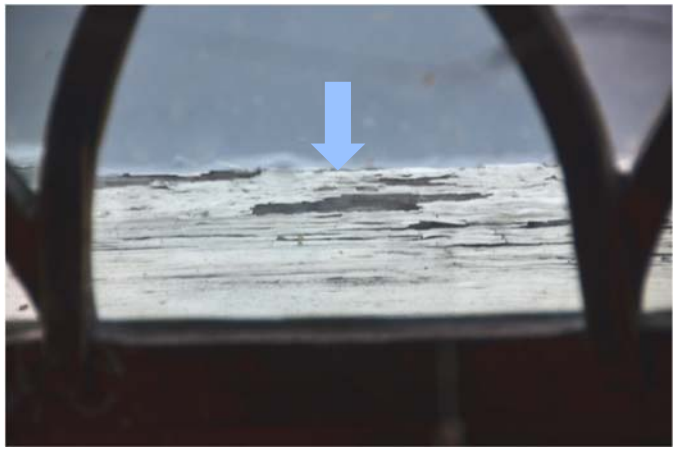

PHOTO 24

The flat and wide wood paneling infill has some large cracks , and some significant areas of rot. **(PHOTOS 25, 26)**

PHOTO 26

PHOTO 25 Water-damaged flat paneling in E. bay.

The worst conditions are at the inside corners on either side of the gable roof over the east entrance. Water from large areas of roof are directed to these corners, and the damage extends from eave to grade, causing the wood to rot and the joints to open up. **(PHOTOS 27-30)**

PHOTO 27 Engaged columns at E. Entry take on a roof-ful of rainwater.

PHOTO 28 Rot at exposed trim, above and below.

PHOTO 29

PHOTO 30

See PHOTOS 31 and 32 for examples of water damage at corner columns of the east elevation.

PHOTO 31

PHOTO 32

Similar concerns for deterioration from rain water dripping on exposed elements of the north entry door. PHOTOS 33 and 34.

PHOTO 33 North Entrance

PHOTO 34 View of deterioration at N. Entry steps.

Note that the wood deck at this entry is unprotected and is heavily mildewed. This deck should be pitched away from the house to shed rain water. **(PHOTOS 35 and 36)**

PHOTO 35

PHOTO 36

PHOTO 37

Windows:

All windows were addressed in the 2005 renovation/restoration project, including the installation of weather stripping at the sash perimeter and meeting rails. However, the outward appearance of the windows appears similar to the conditions described in the 2004 PBR, or, in some cases, have deteriorated from the existing conditions identified in the 2005 construction documents.

All windows excepting the east entry bay have single storm panels. Most of the windows have putty which is cracked or missing, particularly where storm panels have been removed to accommodate portable AC units.
(PHOTOS 37, 38)

PHOTO 38

Exceptions are the sidelights and windows (all three floors) of the east entry bay, which are in good condition. **(PHOTOS 39-41)**

PHOTO 39

PHOTO 40

PHOTO 41

The bottom rails of the basement windows sit right at grade, and are subject to unhindered splash back from rainwater falling from the eaves. In some instances, the window frames are seriously rotted, while all are deteriorating to some extent. **(PHOTOS 42, 43)**

PHOTO 42

PHOTO 43

Doors:
No work has been done on the exterior doors since the 2004 PBR, and further deterioration is evident. Existing weather-stripping is ineffective or non-existent.

The east (single) door and the north (paired) doors are thought to be original. Both have heavy accretions of old, alligatored paint, and the latest coat is failing

The thresholds are particularly vulnerable to water damage and are showing wear, although the original dense wood is likely more durable than any new replacement.

(East Door: PHOTOS 44 and 45)

(North Door: PHOTOS 46–48)

PHOTO 46

Above: Many of the wood stops at the north entry transom window are loose, or in one case, missing.

PHOTO 44

Above: Original east door with accretions of old paint.

Below: Original threshold of east door has been patched but is serviceable.

PHOTO 47

Above: Original north paired door.

Below: Original threshold of north door.

PHOTO 45

PHOTO 48

The 6-panel wood door at the entrance to the ell is protected by the porch roof, and is in acceptable condition. Its screen door is serviceable. **(PHOTO 49)**

PHOTO 49

PHOTO 51

The solid vertical plank door at the entry to the ell basement is in poor condition, and is unprotected from rainwater flowing from the leaders to either side. At some point, the rotted bottom ends of the planks were removed and replaced with short scabs. A new threshold would reduce water flow into the basement and protect the bottom end grain of a replacement door. **(PHOTOS 51, 52)**

PHOTO 52

NOTE: All exterior doors are in-swing doors. Code issues and accessibility are discussed in the summary.

Foundations:

Stone foundations appear to be in good condition on the exterior. Some of the brick foundation at the west side of the ell has been repointed or replaced since the 2004 PBR, but an area of spalled brick can be seen to the north of the basement window, below the section of new brick. **(PHOTO 53)** The spalling is most likely the result of saturation caused by poor drainage of the rainwater leaders to either side.

PHOTO 53

Drainage at Foundations:

Drainage of rainwater around the building foundation is problematical on several counts.

First, the gutter at the southwest corner discharges directly into the foundation wall. **(PHOTO 54)**

PHOTO 54

Secondly, the absence of gutters on the main house results in rain water saturating the foundation around the entire perimeter of the main house and entering the basement. This problem is compounded by the level grade to the east and south of the house, which tends to hold the water rather than allowing it to drain away from the house.

At least two attempts to improve drainage and keep water out of the basement have failed and worsened the situation: During an early phase of the building's restoration (some time before 1981), a concrete bulkhead was poured around the building perimeter, both to shore up the dry-laid foundation below grade and to provide a barrier to address the moisture problem "plaguing" the basement. Direct inspection of the bulkhead has not been attempted, but rain water off the eaves may be channeled towards the basement rather than away from it. Another attempt to correct the problem was to install plastic sheeting below a gravel drip strip. This system has failed, as the plastic has deteriorated and been disturbed sufficiently to be ineffective. **(PHOTOS 55, 56)**

PHOTO 55

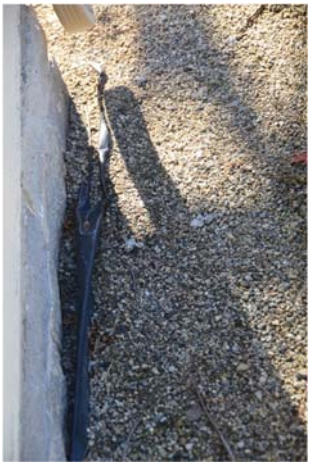

PHOTO 56

Rain water spillage from the sagging gutters of the ell quickly finds its way into the basement.

The leaders from these gutters, as well as the leader from the gutter on the west elevation of the main house, are not properly directed away from the building. Rather, they discharge immediately adjacent to the foundation. **(PHOTOS 57, 58)**

PHOTO 57

PHOTO 58

Exterior Ramp and Stone Steps: The 2004 PBR notes that the ramp and concrete porch were constructed in 1981. The slope of the ramp exceeds the maximum allowable by code. The landing at the ramp at the 90-degree turn and both the guard and hand rails do not meet current code requirements. **(PHOTO 59)**

The stone steps at the main (east) entrance were thought to be improperly pitched, so that water flowed towards the foundation and found its way to the basement. When recently inspected and checked with a level, the steps were shown to pitch away from the house to shed water away from the house. As discussed in the section on trim above, the source of water entering the basement in this area is from the run-off from large areas of the roof. Rainwater is funneled into the valleys on either side of the entrance projection, and this large volume of water is concentrated into a narrow discharge which cannot be quickly dispersed at grade. **(PHOTO 60)**

PHOTO 59

PHOTO 60

Fences: The fences along Westminster Road and South Canterbury Road were completely rebuilt as part of the 2005 Restoration/ Renovation project.

The picket fence requires attention, but is in reasonably good condition, with a few localized areas of separation or rot. **(PHOTOS 61-63)**

PHOTO 61 Picket fence.

PHOTO

PHOTO 63 Open joints, splice, and isolated rot. Replacement may be less costly.

The post and rail fence is failing in multiple locations, and will require a major reconstruction, or even a complete replacement.

From construction photos taken by the museum curator, the built-up posts appear to have been constructed in cedar, but the rails and post caps appear to be pine.

First, many components, and particularly the post caps, are encrusted with lichen and growing mold and mildew. Some of the built-up post caps have opening joints or even rot. **(PHOTOS 64-68)**

PHOTO 64

PHOTO 65 Rotted solid post caps.

PHOTO 66

PHOTO 67

PHOTO 68 Heavy lichen grown.

Many of the post rail pockets have rotted out, possibly because they were not primed **(PHOT0S 69-71)**

The 6x6 posts do not touch the ground, but are supported by steel brackets imbedded in concrete piers. Despite this appropriate detailing, some of the post bases are inexplicably rotted.

This fence may not be salvageable, and its replacement is recommended, using appropriate materials, careful installation and weather protection, and a regular maintenance regimen.

PHOTO 69 Steel brackets embedded in concrete.

PHOTO 70 Rotted rail pockets.

PHOTO 71 Rotted post bases.

INTERIORS
No significant changes have been made to the interiors since the 2004 Paul Bailey Report (PBR). Renovations and restoration to the house interiors is outside of the scope of this report. However, architectural work will be needed in support of the recommended structural and mechanical work.


PHOTO 72

Cellar:
The main floor has several inches of sand and a poly vapor barrier over the original dirt floor. **(PHOTO 72)**

The walls are field stone to grade and brick inside with cut stone outside above grade.
The ell is open to the main cellar, but has a concrete floor slab. The interior walls are brick, with a stone exterior on the north and south walls. The west wall is brick on the outside as well.

Moisture in the basement from rainwater off the roof continues to be a problem. The main source of moisture is from either side of the east entry projection, where water flow from a wide area of the roof is concentrated by the valleys of the entry gable roof and funneled to grade at the inside corners. See the discussion on trim at the east entry above. The stonework at the south wall under one window is heavily stained by water, and there are indications of recent settlement in the stone and mortar infill at the window sill. **(PHOTOS 73, 74)**


PHOTO 73


PHOTO 74

PHOTO 75

Other entry points for moisture are at the north and south sides of the ell, where rain water spills from the sagging gutters. See **PHOTOS 75 and 76**, taken within an hour after the start of a rain storm.

PHOTO 76

First and Second Floors:
Finishes at the main house are in fair to good condition, with wider wood flooring and papered plastered walls. One of the first floor rooms serves as the museum shop, and another provides limited seating for group orientations. **(PHOTOS 77 and 78)**

PHOTO 77

PHOTO 78

The upper floor rooms house exhibits and a library. **(PHOTOS 79, 80)**

PHOTO 79

PHOTO 80

Finishes in the ell are in fair condition, with narrower wood floors, plaster walls and ceilings. The ell is believed to have been built at the same time as the main house, but its second floor is three steps lower than the main house, and its knee walls and low roof restricts headroom at the eaves. The second floor contains an exhibit room, workroom, office and storage. **(PHOTOS 81 and 83)**

PHOTO 81

A widening crack in the center of the ell signals a significant settlement originating at the roof level. **(PHOTO 82)**

PHOTO 82

PHOTO 83 Uninsulated roof contributes to significant ice dams over Ell entrance on south wall.

A kitchen, offices, and a toilet room are located on the first floor of the ell. Note that this is the only toilet for the museum, and it does not meet current ADA clearances

(PHOTOS 85-87)

PHOTO 86 Hall has no source of light.

PHOTO 85 Portable air-conditioners are used.

PHOTO 87 Sink and cabinets encroach on clearances.

Attic:
The attic is unfinished, and neither the roof nor floor is insulated. As noted in a previous section, the roof sheathing is tightly spaced and does not facilitate adequate drying of the cedar shingles. A venting layer should be placed under a new roof, or mechanical ventilation may be considered to compensate for this deficiency to some degree. **(PHOTO 88)**


PHOTO 88

Heavier water stains are visible in the dormer roof sheathing. These are caused by water flowing under the too-narrow drip edge of shingles above. The floor is composed of two layers of wide plank boards. Many are loose and deflect underfoot. The bottom sash of the south dormer window is said to have been repaired, but has yet to be reinstalled. **(PHOTO 89)**


PHOTO 89

Timber frame of gambrel roof with hipped gable ends. **(PHOTO 90)**


PHOTO 90

ARCHITECTURAL RECOMMENDATIONS

Priorities are as Identified in Reports

(P1) Priority 1: Address immediately. *
(P2) Priority 2: Address within 1-5 years.
(P3) Priority 3: Can be addressed within 5-10 years (maximum).

* For Structural Recommendations: To allow for budgeting, final design, and construction the term "immediately" can be taken to mean within the next three years.

Recommendations: Building Maintenance

Site Work

- Improve grading to direct water away from foundation walls. Install a foundation drainage system along entire perimeter of house, with MiraDrain foundation mat. Pipe to discharge point and tie in rainwater leaders. Provide gravel drip edge. **(P1)**
- For wood decking and steps to north entrance: Scrape and sand paint to bare wood; wash with oxygen bleach solution or other mold and mildew remover. Drill patterned drainage holes to eliminate standing water. Apply 1 coat linseed oil, 1 coat oil primer, and 2 coats enamel floor paint. **(P3)**
- For post and rail fence: Remove in entirety and replace in kind, using existing footings and anchors. Redwood or cedar will be considered, but a commitment to an aggressive maintenance schedule is essential to the longevity of a replacement fence.**(P3)**
- For picket fence: Repair rotted or split components, or replace sections; prep and . **(P3)**

Foundations

- Replace area of spalled brick at west foundation of Ell. **(P3)**

Roofs and Gutter Systems

- Replace entire wood shingle roof in kind (pressure preservative-treated red cedar (Certi-Last)). including skip sheathing and all flashing.
- Replace existing gutters and leaders with LCC (half-round section) for proper drainage and for a less modern appearance. **(P1)**

Chimneys

- Repoint (3) brick chimneys. **(P3)**

Wood Trim, Clapboard and Plank Siding

- Repair or replace damaged plank siding at bottom of gable ends of roof. Re-flash intersection with roof. **(P1)**
- Install corner boards and replace sidewall shingles at attic dormers. **(P2)**
- For flat cornice below east entry pediment: Repair, prep, and paint. Install cap flashing. **(P1)**
- For engaged columns on east and north elevations: Repair or replace rotting or damaged trim details. **(P1)**

- For infill panels at east entry bay: Repair or replace rotting or damaged plank. **(P1)**
- Replace "zippered" section of siding at north wall of Ell. **(P1)**
- Install metal drip cap above skirting boards and behind bottom clapboards. **(P1)**
- For all miscellaneous siding and trim: Replace or repair rotted or damaged sections of trim, sills, thresholds, and siding. Set all nails. **(P1)**
- For all exterior siding, thresholds, sills, and trim: scrape and sand to bare wood; wash with mold/mildew remover; apply 1 coat linseed oil, 1 coat oil primer, 2 coats latex. **(P1)**

Windows and Doors

- For basement windows: Replace, prep, and paint. **(P2).** Consider adding window wells to eliminate splash-back on new windows. **(P3)**
- For all windows, with exception of east entry bay, repair damaged or rotted sections. Strip and reglaze as needed. **(P1)**
- For all windows: scrape and sand to bare wood; wash with mold/mildew remover; apply 1 coat linseed oil, 1 coat oil primer, 2 coats latex. **(P1)**
- For north and east exterior doors: Prep, recondition, and refinish, same as windows. **(P1)**
- For Ell entry door, prep and paint. **(P1)**
- For Ell basement door, provide threshold and replace plank door. Prep and paint. **(P3)**
- Install integrated and discrete weather-stripping on 3 exterior doors. **(P2)**

Interiors

- Insulate pitched and flat ceilings at the second floor of the Ell from the exterior, while roof is being replaced. Install batt insulation, ventilation channel, ridge and soffit vents. **(P2)**

Recommendations: Interior Architectural Work in Support of Mechanical Work.

- Construct fire rated enclosure, including ceiling and door, for two furnaces. **(P2)**
- For miscellaneous routing and patching of mechanical piping: a lump sum is provided. **(P2)**

Recommendations: Interior Architectural Work in Support of Structural Work.

- First and Second Floors: Remove 36"+/- lath and plaster ceiling to either side of beam. Replace in kind. Typical of 8.
- Steam section of wall paper to temporarily peel it away from work area. Remove portion of interior wall sufficient to install new HSS column. Maintain wood base and cornice if possible. Restore in kind. Typical of 7.
- Incorporate new HSS column into sales counter in store. Modify counter as required. Patch ceiling.
- Second Floor: Remove sufficient lath and plaster to confirm bearing of beam on chimney at northeast room. Restore.
- First Floor of Ell: Open chase in workroom and temporarily remove ductwork to facilitate installation of new column. Restore enclosure.
- First Floor of Ell: Remove portion of wall as needed to install lally column. Restore wall.
- Second Floor of Ell: Coordinate with installation of lally column. Reconfigure partitions and doors as necessary.

Recommendations: Building Upgrade for Public Use (Accessibility).

Essential for Accessibility

- Remove existing ramp and rail. Develop comprehensive site grading and ramps to permit unhindered accessible pedestrian sidewalk entry to the Ell. **(P2)**
- Reconfigure HC toilet room: Remove all cabinetry on either side of door. Relocate sink. Add pull-down grab bar. Shift door location for required clearance. **(P2)**

Section 50 30 00
Hazardous Building Materials Inspection and Inventory

TRC Hazmat Report – April 11, 2019

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REPORT

PRE-RENOVATION INVESTIGATIVE SURVEY FOR ASBESTOS-CONTAINING MATERIALS AND LEAD BASED PAINT PRUDENCE CRANDALL MUSEUM CANTERBURY, CONNECTICUT

Project No. 19-RR-HAZ-01

Prepared for

State of Connecticut
Department of Administration Services
Division of Construction Services
Hartford, Connecticut

Prepared by

TRC
Windsor, Connecticut

April 11, 2019

PRE-RENOVATION INVESTIGATIVE SURVEY FOR ASBESTOS-CONTAINING MATERIALS AND LEAD BASED PAINT PRUDENCE CRANDALL MUSEUM CANTERBURY, CONNECTICUT

Project No. 19-RR-HAZ-01

Prepared for
State of Connecticut
Department of Administration Services
Division of Construction Services
Hartford, Connecticut

Prepared by
TRC
Windsor, Connecticut

Donald LePage
Project Manager

TRC Project No. 319002-0000-0000
April 11, 2019

TRC
21 Griffin Road North
Windsor, Connecticut 06095
Telephone (860) 298-9692
Facsimile (860) 298-6399

TABLE OF CONTENTS

EXECUTIVE SUMMARY

On December 20, 2018 TRC of Windsor, Connecticut conducted an inspection for suspect asbestos-containing materials (ACM) and lead based paint (LBP) at the Prudence Crandall Museum in Canterbury, Connecticut. The inspection was initiated prior to planned renovation activities in accordance with USEPA Asbestos National Emissions Standard for Hazardous Air Pollutants (NESHAPS) requirements.

The scope of the inspection was limited to the interior/exterior areas at the subject building. A Connecticut licensed asbestos inspector from TRC conducted the inspection in accordance with USEPA AHERA protocols and ASTM Standard E2356-04. Bulk samples of suspect materials were collected and analyzed via polarized light microscopy (PLM) and/or PLM gravimetric analysis methods at a CTDPH/NVLAP accredited laboratory. ACM was identified as exterior grey window glaze. ACM to be impacted by renovation activities must be removed prior to disturbance in accordance with OSHA, USEPA, CTDPH, and CTDEP standards for asbestos abatement/disposal. Detailed results of the asbestos survey can be found in Tables 1-3 and Appendices A through D.

A Connecticut licensed lead inspector from TRC conducted a LBP survey throughout the interior and exterior of the subject building and high levels (>1.0 mg/cm^2) of lead paint were identified on various window/door components, baseboards, fireplace, ceilings, wall panels, crown molding, stairs, ballusters, columns and exterior siding on the structures that are scheduled for impact. Lower levels (<1.0 mg/cm^2) of lead paint were also identified on various door/window components, fireplace, plaster walls and wood flooring in the subject area. Exposure levels for lead in the construction industry are regulated by OSHA 29 CFR 1926.62. Construction activities disturbing surfaces containing lead paint which are likely to be employed, such as grinding, cutting, and demolishing, has been known to expose workers to airborne levels of lead in excess of the permissible exposure limit (PEL). The Contractor shall conduct demolition work in conformance with the OSHA regulations, utilizing engineering controls and personal protective equipment. In addition, disposal of construction waste containing lead paint is subject to regulation under both the CTDEEP Hazardous and Special Waste Management (22a-209-1 through 16; 22a-449(c)-11; 22a-449(c)-13; 22a-449(c)-100 through

110; and 22a-454) and USEPA RCRA Hazardous Waste Management (40 CFR Parts 260 through 274) regulations. However, scrap metal is exempt from regulation under the CTDEEP/USEPA Hazardous Waste Regulations provided it is properly recycled. The Contractor shall recycle any lead painted scrap metal at an approved scrap metal recycling facility.

Building debris waste disposal determination with regards to potentially hazardous lead painted components is regulated by USEPA Resource Conservation Recovery Act (RCRA) Hazardous Waste Regulations (40 CFR Parts 260 through 274), and the CTDEEP Hazardous Waste Regulations (22a-209-1 and 22a-449(c)). A Lead Toxic Characterization Leachate Procedure (TCLP) test was **not** performed on the building structure to determine if the building can be disposed of as regular C&D waste or if it must be deposited in a hazardous landfill based on the amounts of lead. TCLP testing should be performed prior to any renovation/demolition activities. Detailed results of the lead survey can be found in Table 4 and Appendix E.

Additional household hazardous waste items and regulated materials identified at the subject site were categorized according to potential hazard and will be disposed of properly. Details of the household hazardous waste identification and disposal can be found in Table 5.

PROJECT OUTLINE

Project Address:	Prudence Crandall Museum 1 S. Canterbury Road, Canterbury, CT
DAS Contract No.	13PSX0017
DCS Project Manager:	Michael Sanders
DCS Project No.:	19-RR-HAZ-01
TRC Project No.:	319002-0000-0000
TRC Project Manager:	Don LePage
Asbestos Inspector:	Patrick Schaffner (LIC #000263) Carmen Jacko (LIC #000812)
Lead Inspector:	Patrick Schaffner (LIC #001330)
Date of Inspection:	12/19/18-12/20/18
Asbestos Identified:	Yes
Lead Based Paint Identified:	Yes
Gen. Bldg. Mat. Haz Waste:	TCLP testing not performed
Add'l Haz./Reg. Mat./Waste/Items:	Yes (See Table 5)

Additional Notes:
The site investigation was limited to the collection and analysis of suspect asbestos-containing materials, lead based paint and household hazardous materials, wastes and items from the interior/exterior areas of the subject building.

TABLES

TABLE 1
BULK SAMPLE SUMMARY OF SUSPECT ASBESTOS CONTAINING MATERIALS
PRUDENCE CRANDALL MUSEUM
CANTERBURY, CONNECTICUT

Sample No.	Sample Location	Homogeneous Material	% and Type Asbestos
1	Exhibit 2 wall	Skim/base plaster	ND
2	Exhibit 2 wall	Skim/base plaster	ND
3	Exhibit 1 wall	Skim/base plaster	ND
4	Closet between Exhibits 1 & 2	Skim/base plaster	ND
5	Library wall	Skim/base plaster	ND
6	Attic stairs ceiling	Skim coat	ND
		Base plaster	ND
7	Kitchen wall	Skim coat	ND
		Base plaster	ND
8	Hall at Kitchen wall	Skim/base plaster	ND
9	Kitchen ceiling	Skim/base plaster	ND
10	Exhibit 3 wall	Fiberboard with white texture	ND
11	Exhibit 1 wall	Fiberboard with white texture	ND
12	Exhibit 2 wall	Fiberboard with white texture	ND
13	2nd floor Center Hall	Grey wall paper	ND
14	Parlor 2 wall	Grey wall paper	ND
15	Library wall	Blue wall paper	ND
16	Storage Room	Black coating on wall canvas	ND
17	Storage Room	Black coating on wall canvas	ND
18	Top of cellar stairs	Pebble sheet floor	ND
		Yellow/beige adhesive	ND
19	Top of cellar stairs	Pebble sheet floor	ND
		Yellow/beige adhesive	ND
20	Bathroom	4" grey cove base on yellow adhesive	ND
21	Bathroom	4" grey cove base on yellow adhesive	ND
22	Bathroom	12x12 beige/grey marbled floor tile	ND
23	Bathroom	12x12 beige/grey marbled floor tile	ND
24	Basement	Green duct seam sealant	ND

NA/PVA Not analyzed/positive via inseparable association with a confirmed positive ACM
NA/PS Not analyzed/positive stop, homogeneous to sample proven to contain asbestos
ND<1% Non-detected, less than 1%
NAD No asbestos detected
\+ Although found to be negative by analysis, material is homogeneous to a determined ACM and therefore must be considered positive
1 NOB material: result confirmed by TEM analyses
* Quantified by PLM Point Counting techniques

TABLE 1 (...continued)
BULK SAMPLE SUMMARY OF SUSPECT ASBESTOS CONTAINING MATERIALS
PRUDENCE CRANDALL MUSEUM
CANTERBURY, CONNECTICUT

Sample No.	Sample Location	Homogeneous Material	% and Type Asbestos
25	Basement	Green duct seam sealant	ND
26	Gift Shop	Exterior grey window glaze	3% chrysotile
27	Room 1	Exterior grey window glaze	NA/PS
28	Storage	Gypsum ceiling	ND
29	Storage	Gypsum ceiling	ND
30	Storage	Joint compound (ceiling)	ND
31	Storage	Joint compound (ceiling)	ND

NA/PVA	Not analyzed/positive via inseparable association with a confirmed positive ACM
NA/PS	Not analyzed/positive stop, homogeneous to sample proven to contain asbestos
ND<1%	Non-detected, less than 1%
NAD	No asbestos detected
+	Although found to be negative by analysis. material is homogeneous to a determined ACM and therefore must be considered positive
1	NOB material; result confirmed by TEM analyses
*	Quantified by PLM Point Counting techniques

TABLE 2
IDENTIFIED ASBESTOS CONTAINING MATERIALS (>1%)
PRUDENCE CRANDALL MUSEUM
CANTERBURY, CONNECTICUT

Material	Sampled-Assumed (mo/yr)	General Location	NESHAP Category	AHERA Category	Estimated Quantity
Exterior grey window glaze	12/18	Exterior windows	Category II Non-friable	Miscellaneous	44 EA

AHERA Categories = thermal system insulation (TSI), surfacing material or miscellaneous
NESHAP Categories = friable, category I non-friable or category II non-friable
Friable = crumbled, pulverized or reduced to powder by hand pressure when dry
Category I Non-friable = packings, gaskets, resilient floor covering and asphalt roofing
Category II Non-friable = all non-friable that is not Category I

TABLE 3
CONFIRMED NON-ASBESTOS CONTAINING MATERIALS
PRUDENCE CRANDALL MUSEUM
CANTERBURY, CONNECTICUT

Material	General Location
Skim/base plaster	Throughout 1st & 2nd floors
Fiberboard with white texture	Exhibits 1, 2 & 3 walls
Grey wall paper	2nd floor Center Hall, Parlor 2
Blue wall paper	Library
Black coating on wall canvas	2nd floor Storage Room
Pebble sheet floor with yellow/beige adhesive	Top of cellar stairs, Room 1, Office 1, Kitchen
4" grey cove base on yellow adhesive	Bathroom, Kitchen, Room 1
12x12 beige/grey marbled floor tile	Bathroom
Green duct seam sealant	Basement
Gypsum ceiling	2nd floor Storage Room
Joint compound (ceiling)	Storage

TABLE 4
SUMMARY OF LEAD PAINT XRF MEASUREMENTS
PRUDENCE CRANDALL MUSEUM
CANTERBURY, CONNECTICUT

Structure	No. of Measurements	Calibrations	Void	Lead Detected	No Lead Detected via XRF*
Prudence Crandall Museum	121	14	10	73	22

*A XRF cannot determine if paint is "lead free" since it can only detect lead down to 0.1 mg/cm^2. Paint can only be determined as "lead free" by a laboratory using Atomic Absorption Spectrometry (AAS). See Lead Paint XRF Measurement Table in Appendix E.

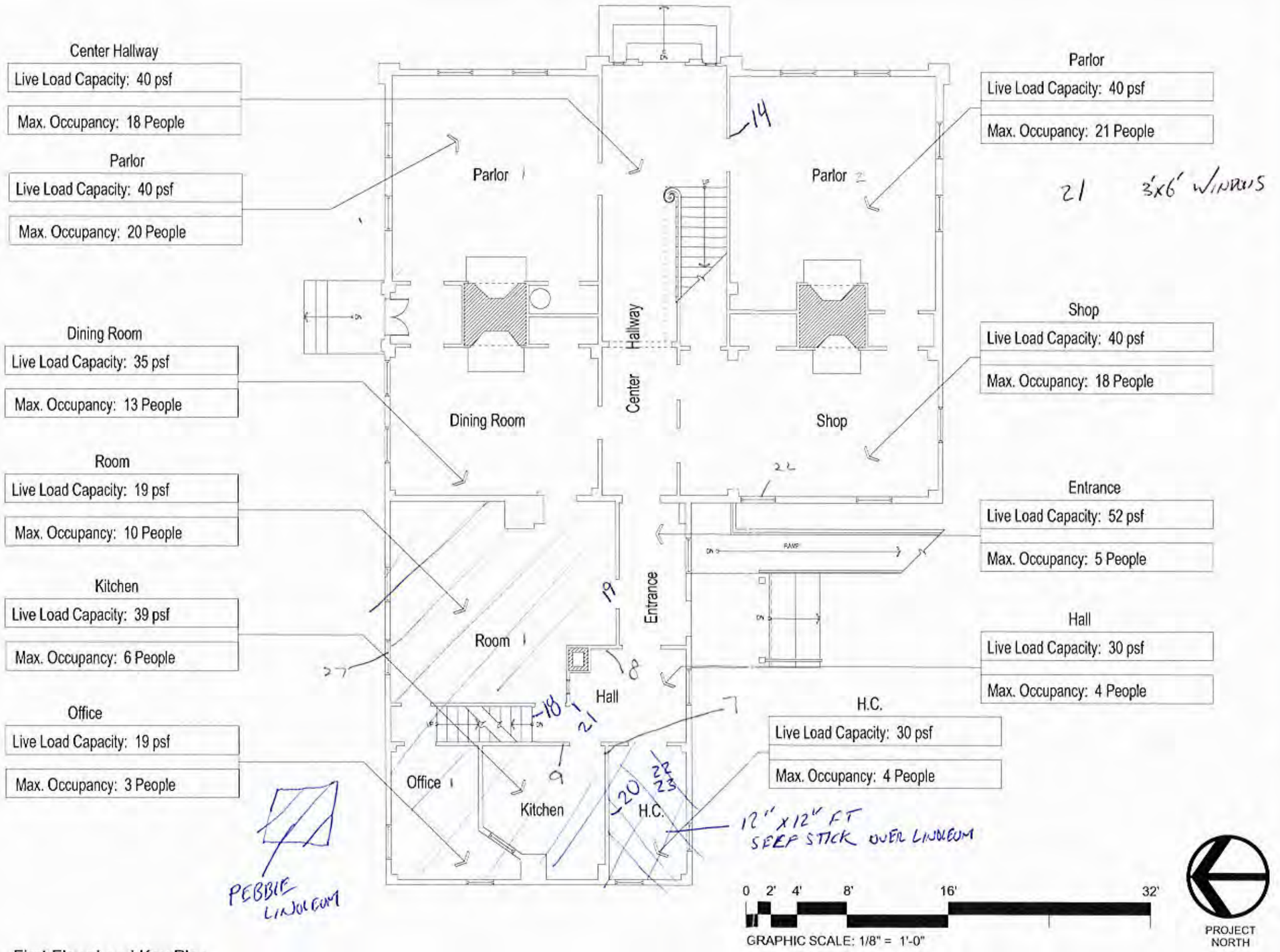
TABLE 5
INVENTORY OF ADDITIONAL HAZARDOUS/REGULATED MATERIALS, WASTES AND ITEMS IDENTIFIED
PRUDENCE CRANDALL MUSEUM
CANTERBURY, CONNECTICUT

Quantity	Size	Material / Item	General Location	Potential Hazard
1	-	Smoke Detector (LLRW)	Attic	Low-level radioactive source
1		Screw-type fluorescent bulb	Attic	Universal Waste (UW)
2		Smoke Detectors (LLRW)	2nd floor	Low-level radioactive source
4		Light switch sensors	2nd floor	Universal Waste (UW)
6		Screw-type fluorescent bulb	2nd floor	Universal Waste (UW)
2		Fire extinguishers	2nd floor	CRW – waste chemical solid
5		Light switch sensors	1st floor	Universal Waste (UW)
2		Thermostats	1st floor	Universal Waste (UW)
1		Electronic security panel	1st floor	Universal Waste (UW)
5		Fluorescent bulbs (4' Lamps)/ballasts	1st floor	Universal Waste (UW)
1		Fluorescent bulbs (2' Lamps)/ballasts	1st floor	Universal Waste (UW)
1		Fire extinguisher	1st floor	CRW – waste chemical solid
1		Fire extinguisher	Basement	CRW – waste chemical solid
2		Smoke Detectors (LLRW)	Basement	Low-level radioactive source
5		Screw-type fluorescent bulb	Basement	Universal Waste (UW)

CRW- Connecticut Regulated Waste – PCBs (CR01), Oils (CR02/CR03), waste chemical liquids - antifreeze, latex & solvent paints, sludges, etc. (CR04), waste chemical solids (CR05)
UW- Universal Waste (batteries, thermostat ampoules, fluorescent lamps, used electronics)
IH- Inhalation hazard (silicas, etc.)
I- Ignitable - may contain ingredients which are ignitable (materials which have a flashpoint <140°F) (D001)
C- Corrosive - may contain ingredients which are alkaline or acidic (materials with a PH<2 or >12.5) (D002)
T- Toxic - may contain ingredients which are harmful if swallowed or which release vapors that can cause irritation
R- Reactive – may contain ingredients which are unstable, react violently with water or are explosive (D003)

APPENDIX A

SITE SKETCHES



1 First Floor Load Key Plan
1/8" = 1'-0"

GNCB Consulting Engineers, P.C.
130 ELM STREET
POST OFFICE BOX 802
OLD SAYBROOK
CONNECTICUT 06475
PHONE: 860 388 1224
FAX: 860 388 4613
GNCBENGINEERS.COM

No.	DESCRIPTION	DATE

ISSUED DRAWINGS

The Prudence Crandall Museum

1 South Canterbury Rd.
Canterbury, CT

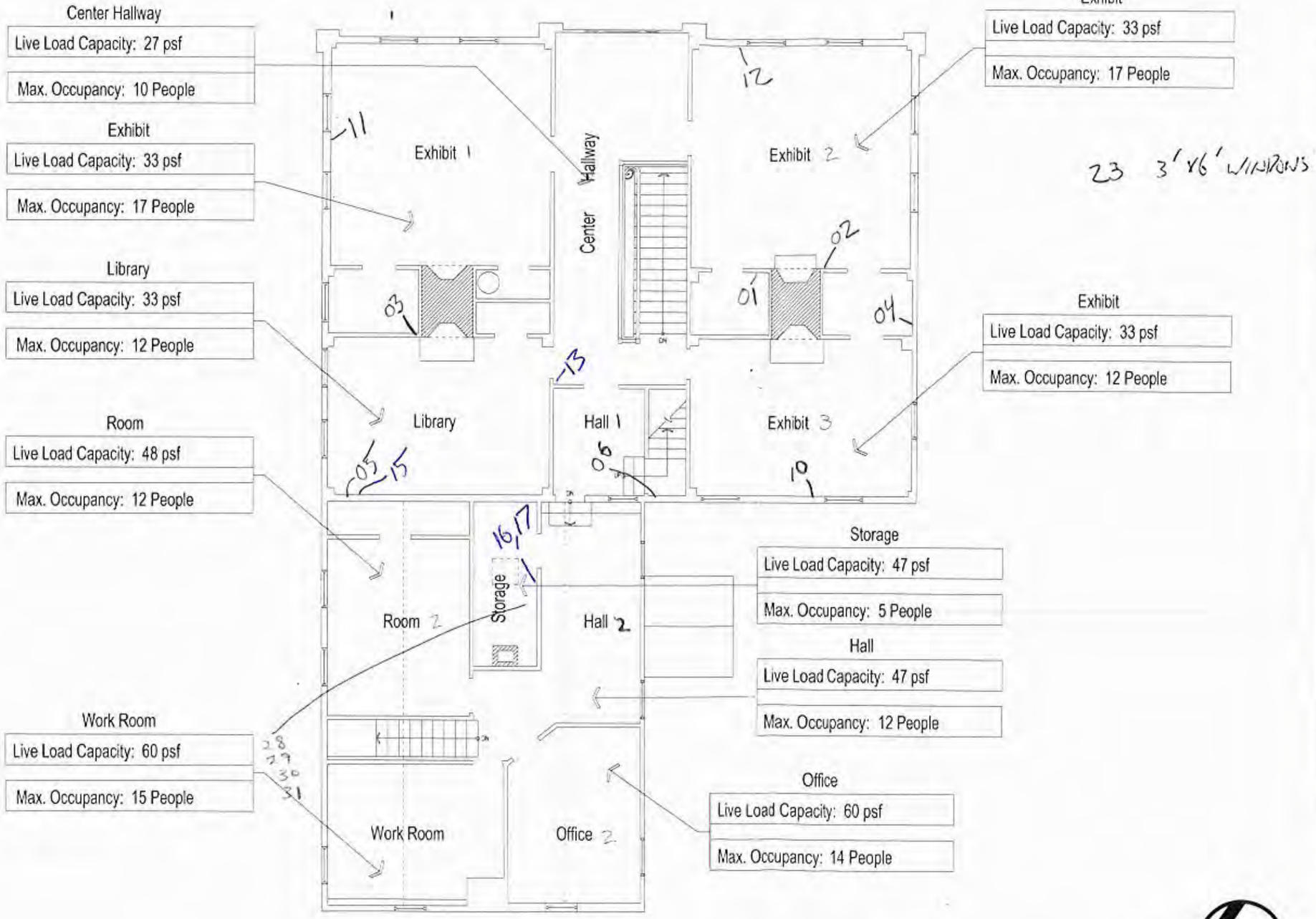
Condition Assessment

First Floor Load Key Plan

ASBESTOS LOCATIONS

SCALE:	1/8" = 1'-0"
PROJECT NUMBER:	16178
DATE:	03/23/2017
DRAWN BY:	MD
CHECKED BY:	JFN

Key 1.01



1 Second Floor Load Key Plan
1/8" = 1'-0"

GNCB Consulting Engineers P.C.
150 ELM STREET
POST OFFICE BOX 802
OLD SAYBROOK
CONNECTICUT 06475
PHONE: 860 388 1224
FAX: 860 388 4613
GNC@ENGINEERS.COM

No.	DESCRIPTION	DATE

ISSUED DRAWINGS

The Prudence Crandall Museum

1 South Canterbury Rd.
Canterbury, CT

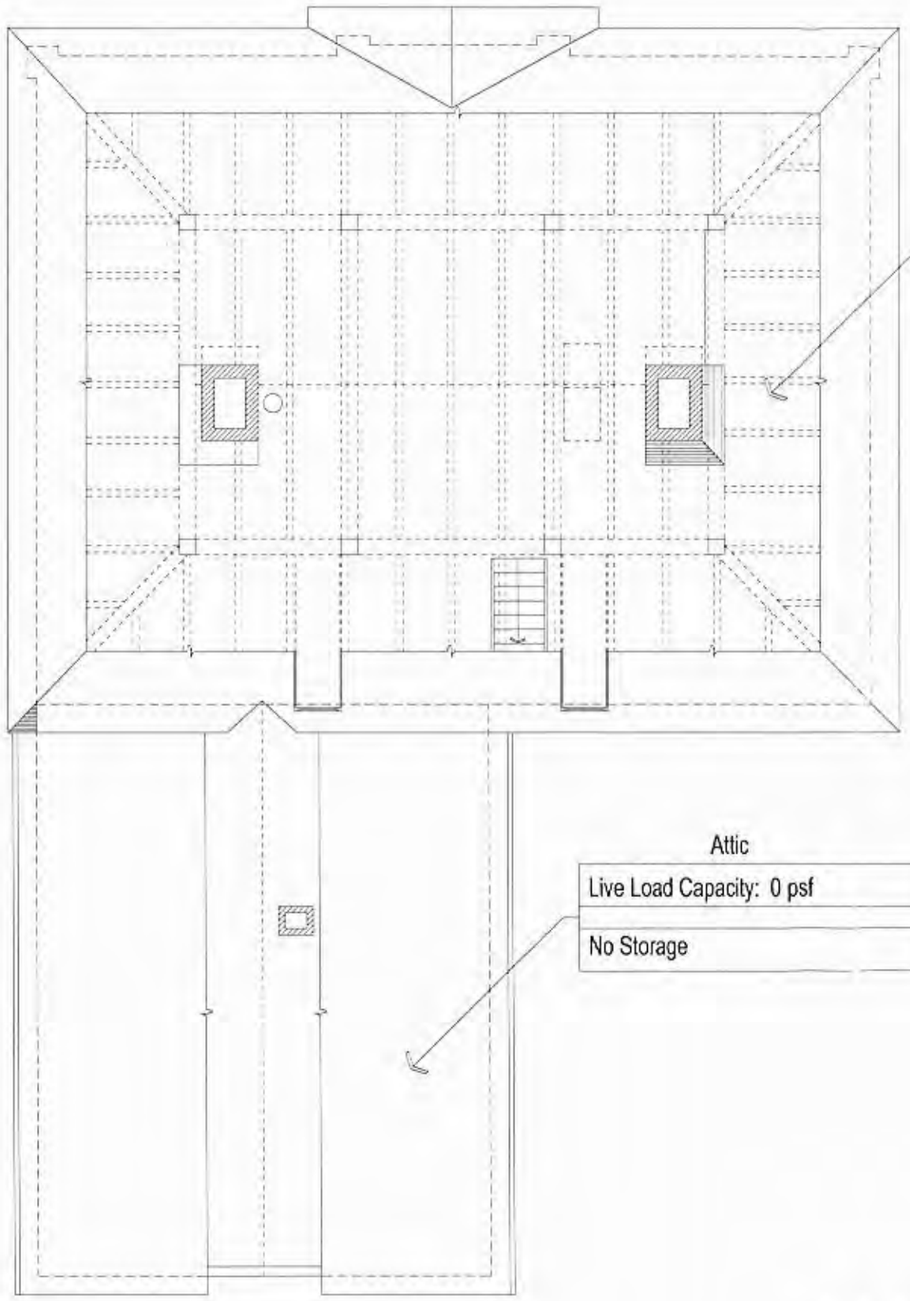
Condition Assessment

Second Floor Load Key Plan

ASBESTOS LOCATIONS

SCALE:	1/8" = 1'-0"
PROJECT NUMBER:	16178
DATE:	03/23/2017
DRAWN BY:	MD
CHECKED BY:	JFS

Key 1.02



Attic

Live Load Capacity: 2 psf

No Storage

Attic

Live Load Capacity: 0 psf

No Storage

0 2' 4' 8' 16' 32'

GRAPHIC SCALE: 1/8" = 1'-0"

PROJECT NORTH

1 Attic Load Key Plan
1/8" = 1'-0"

GNCB Consulting Engineers, P.C.
130 ELM STREET
POST OFFICE BOX 802
OLD SAYBROOK
CONNECTICUT 06475
PHONE: 860 388 1224
FAX: 860 388 4613
GNCBENGINEERS.COM

No.	DESCRIPTION	DATE

ISSUED DRAWINGS

The Prudence Crandall Museum

1 South Canterbury Rd.
Canterbury, CT

Condition Assessment

Attic Load Key Plan

SCALE:	1/8" = 1'-0"
PROJECT NUMBER:	16178
DATE:	03/23/2017
DRAWN BY:	MD
CHECKED BY:	JFN

Key 1.03

SHEET NO. 1 OF
PROJECT NO. 319002.0001
DATE
BY
CHK'D

TRC Results you can rely on

SUBJECT THE PRUDENCE CRANDELL MUSEUM

BASEMENT
WOOD CEILING
STONE WALLS
DIRT/CONCRETE FLOOR
ALL TSI FIBERGLASS
NO SUSPECT MATERIAL

1ST FLOOR
PARLOR 2
PLASTER CEILING (WHITE)
WOOD CROWN MOLDING
PLASTER WALL w/ WALLPAPER - GREY
WOOD BASEBOARD
WOOD FIREPLACE
WOOD FLOOR

SHOP
SAME EXCEPT
NO FIREPLACE
CARPETING - NO ADHESIVE

BATHROOM
PLASTER CEILING
PLASTER WALL w/ WALLPAPER
4' WOOD SIDING
SELF ADHESIVE — 12 x 12 FLOOR TILE (BEIGE/GREY MARBLED) ON TOP OF PEBBLED BEIGE SHEET FLOOR
4" GREY COVE BASE

KITCHEN
PLASTER CEILING
PLASTER WALL w/ WALLPAPER
INTERIOR WINDOW
4" GREY COVE BASE OVER WOOD BASEBOARD
BEIGE PEBBLED SHEET FLOOR

A

TRC Results you can rely on

SUBJECT

SHEET NO. 2 OF
PROJECT NO.
DATE
BY
CHK'D

OFFICE 1
PLASTER CEILING
PLASTER WALL W/ WALLPAPER
6" WOOD BASEBOARD
CARPET NO ADHESIVE

ROOM 1
PLASTER CEILING
PLASTER WALL W/ WALL PAPER
4" WOOD SIDING
4" GRAY CONCRETE
SHEET FLOOR = SAME AS KITCHEN

DINING ROOM
SAME AS PARLOR 2
EXCEPT DIFFERENT WALL PAPER

FOYER
PLASTER CEILING
PLASTER WALL
WOOD FLOOR

PARLOR 1
SAME AS PARLOR 2
DIFFERENT WALL PAPER

CENTER HALL 1ST FLOOR
SAME AS PARLOR 1
NO FIREPLACE
WOOD PANELING AT STAIRS

A

SHEET NO. 3 OF
PROJECT NO.
DATE
BY
CHK'D
SUBJECT

STAIRS
WOOD STAINED BANNISTER
WOOD STRINGER
WOOD STAIRS

2ND FLOOR
EXHIBIT 2
SAME AS PARLOR 2
EXCEPT TEXTURED WALLS

EXHIBIT 3
SAME AS EXHIBIT 2

HALL 1
PLASTER CEILING
PLASTER WALL
6" WOOD BASEBOARD
WOOD FLOOR

HALL 2
SAME AS HALL 1
EXCEPT WOOD PANELING

OFFICE 2
SAME AS HALL 1

WORK ROOM
SAME AS HALL 1

ROOM 2
SAME AS HALL 1

STORAGE
FIBERGLASS PIPE INS
GYPSUM / JOINT COMPOUND CEILING
CANVAS WALL COVER
WOOD FLOOR NO PAINT

A

SHEET NO. 4 OF
PROJECT NO.
DATE
BY
CHK'D
SUBJECT

LIBRARY
SAME AS PARLOR 2

EXHIBIT 1
SAME AS EXHIBIT 2

2ND FLOOR STAIRS
SAME AS 1ST FLOOR

ATTIC AT FRONT SECTION
CLEAN WOOD CEILING (NO PAINT) F.
BRICK CHIMNEYS

WOOD FLOOR (NO PAINT)
MINERAL WOOL UNDER FLOOR
ON WOOD SLATS ON PLASTER

ATTIC 2 (REAR LOWER LEVEL)
CLEAN WOOD
FIBERGLASS INSULATION ON
GYPSUM

A

APPENDIX B

LABORATORY AND INSPECTOR ACCREDITATIONS

State of Connecticut

Lookup Detail View

Name

Name
PATRICK J SCHAFFNER

License Information

lookup

License Type	License Number	Expiration Date	Granted Date	License Name	License Status		Licensure Actions or Pending Charges
Asbestos Consultant-Inspector	263	02/29/2020	04/04/1997	PATRICK SCHAFFNER	ACTIVE	CURRENT	None

Generated on: 1/16/2019 1:42:04 PM

Certificate of Training

Awarded to

PATRICK SCHAFFNER

For successful completion of a 4 Hour, 1/2 Day

Asbestos Building Inspector
Annual Refresher Training

MAY 2, 2018

This training was approved and given in accordance with the Regulations for Connecticut State Agencies RCSA 20 - 440 - 1-9 and RCSA 20 - 441 and meets the requirements of the EPA Revised MAP under TSCA Title II of 4/4/94.

Presented by

Mystic Air Quality Consultants, Inc.
1204 North Road, Groton, CT 06340 (800) 247-7746

Certificate Number: ABIRF26730 **Exam Grade:** 100 **Exam Date:** 05/02/2018 **Expiration Date:** 05/02/2019

Christopher J. Eident, CIH, CSP, RS

George Williamson, Training Director
Richard Haffey, Training Director

State of Connecticut

Lookup Detail View

Name

Name
PATRICK J SCHAFFNER

License Information

lookup

License Type	License Number	Expiration Date	Granted Date	License Name	License Status		Licensure Actions or Pending Charges
Lead Inspector Risk Assessor	1330	02/29/2020	02/07/1997	PATRICK J. SCHAFFNER	ACTIVE	CURRENT	None

Generated on: 1/16/2019 1:41:39 PM

CERT#: L-600-979

CHEMSCOPE TRAINING DIVISION

LEAD INSPECTOR/RISK ASSESSOR REFRESHER

8HOUR TRAINING CERTIFICATE

Patrick Schaffner

293 Bridge Street, Suite 500, Springfield MA

Has attended an 8hour course on the subject discipline on

11/1/2018 and has passed a written examination.

The above individual has successfully completed the above training course approved in accordance with the Department of Public Health Standards established pursuant to Section 20-477 of the Connecticut General Statutes.

Course topics include all required topics of State of Connecticut DPH and EPA.

Under civil and criminal penalties of law for the making or submission of false or fraudulent statements or representations (U.S.C. 1001 and 15 U.S. C. 2615), I certify that this training complies with all applicable requirements of Title IV of TSCA, 40 CFR part 745 and any other applicable Federal, State or local requirements.

Examination Score: 93%
Exam Date: 11/1/2018
Expiration Date: 11/1/2019

Ronald D. Arena
Training Manager

Chem Scope, Inc.
15 Moulthrop Street
North Haven CT 06473
Phone: 203.865.5605
www.chem-scope.com

T004420 01 AB 0.405 **AUTO T9 0 1264 06704-304039 -C01-P04426-I

CARMEN J JACKO
139 PLATT ST
WATERBURY CT 06704-3040

Dear CARMEN J JACKO,

Attached you will find your validated certificate for the coming year. Should you have any questions about your certificate renewal, please do not hesitate to write or call:

Department of Public Health
P.O. Box 340308
M.S.#12MQA
Hartford, CT 06134-0308

(860) 509-7603
oplc.dph@ct.gov
www.ct.gov/dph/license

Sincerely,

RAUL PINO, MD, MPH, COMMISSIONER
DEPARTMENT OF PUBLIC HEALTH

EMPLOYER'S COPY

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

NAME
CARMEN J JACKO

VALIDATION NO.	CERTIFICATE NO.	CURRENT THROUGH
03-690528	000812	09/30/19

PROFESSION
ASBESTOS CONSULTANT-INSPECTOR

SIGNATURE _____ COMMISSIONER Raul Pino

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

PURSUANT TO THE PROVISIONS OF THE GENERAL STATUTES OF CONNECTICUT

THE INDIVIDUAL NAMED BELOW IS CERTIFIED
BY THIS DEPARTMENT AS A
ASBESTOS CONSULTANT-INSPECTOR

CARMEN J JACKO

CERTIFICATE NO.
000812

CURRENT THROUGH
09/30/19

VALIDATION NO.
03-690528

SIGNATURE _____ COMMISSIONER Raul Pino

INSTRUCTIONS:

1. Detach and sign each of the cards on this form.
2. Display the large card in a prominent place in your office or place of business.
3. The wallet card is for you to carry on your person. If you do not wish to carry the wallet card, place it in a secure place.
4. The employer's copy is for persons who must demonstrate current licensure/certification in order to retain employment or privileges. The employer's card is to be presented to the employer and kept by them as a part of your personnel file. Only one copy of this card can be supplied to you.

WALLET CARD

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

NAME
CARMEN J JACKO

VALIDATION NO.	CERTIFICATE NO.	CURRENT THROUGH
03-690528	000812	09/30/19

PROFESSION
ASBESTOS CONSULTANT-INSPECTOR

SIGNATURE _____ COMMISSIONER Raul Pino

CERTIFICATE OF ACHIEVEMENT

This certifies that

Carmen Jacko

has successfully completed the

Asbestos Site Inspector Refresher Training
Asbestos Accreditation Under TSCA Title II
40 CFR Part 763

conducted by

ATC Group Services LLC
73 William Franks Drive
West Springfield, MA 01089
(413) 781-0070

Principal Instructor: Thomas Dion

April 12, 2018
Date of Course

April 12, 2019
Expiration Date

Regional Training Manager: Gregory Morsch

SIAR-6010
Certificate Number

April 12, 2018
Examination Date

State of Connecticut, Department of Public Health

Approved Environmental Laboratory

THIS IS TO CERTIFY THAT THE LABORATORY DESCRIBED BELOW HAS BEEN APPROVED BY THE STATE DEPARTMENT OF PUBLIC HEALTH PURSUANT TO APPLICABLE PROVISIONS OF THE PUBLIC HEALTH CODE AND GENERAL STATUTES OF CONNECTICUT, FOR MAKING THE EXAMINATIONS, DETERMINATIONS OR TESTS SPECIFIED BELOW WHICH HAVE BEEN AUTHORIZED IN WRITING BY THAT DEPARTMENT.

TRC ENVIRONMENTAL CORPORATION

LOCATED AT 21 Griffin Road North IN Windsor, CT 06095

AND REGISTERED IN THE NAME OF Erik Plimpton

THIS CERTIFICATE IS ISSUED IN THE NAME OF Kathleen Williamson WHO HAS BEEN DESIGNATED BY THE REGISTERED OWNER/AUTHORIZED AGENT TO BE IN CHARGE OF THE LABORATORY WORK COVERED BY THIS CERTIFICATE OF APPROVAL AS FOLLOWS:

BUILDING MATERIALS
ASBESTOS FIBERS – PCM
BULK IDENTIFICATION – PLM

SEE COMPUTER PRINT-OUT FOR SPECIFIC TESTS APPROVED

EFFECTIVE RENEWAL DATE JANUARY 1, 2018

THIS CERTIFICATE EXPIRES DECEMBER 31, 2019 AND IS REVOCABLE FOR CAUSE BY THE STATE DEPARTMENT OF PUBLIC HEALTH

DATED AT HARTFORD, CONNECTICUT, THIS 19th DAY OF December, 2017

Registration No.

PH-0426

SUZANNE BLANCAFLOR, MS, MPH
CHIEF, ENVIRONMENTAL HEALTH SECTION

STATE OF CONNECTICUT

DPH

DEPARTMENT OF PUBLIC HEALTH
ENVIRONMENTAL HEALTH SECTION

ENVIRONMENTAL LABORATORY CERTIFICATION PROGRAM

CERTIFIED ANALYTES REPORT FOR ALL MATRICES

TRC-Environmental Corporation

21 GRIFFIN ROAD NORTH
WINDSOR, CT 060951590

CT REGISTRATION NUMBER :	PH-0426
REGISTERED OWNER / AUTHORIZED AGENT :	Erik Plimpton
DIRECTOR :	Kathleen Williamson
CO DIRECTOR(S) :	
PHONE :	(860) 298-9692
LABORATORY REGISTRATION EFFECTIVE DATE :	01/01/2018
LABORATORY REGISTRATION EXPIRATION DATE :	12/31/2019
LABORATORY STATUS :	APPROVED

APPROVED BY

SUZANNE BLANCAFLOR, MS, MPH
CHIEF, ENVIRONMENTAL HEALTH SECTION

REVIEWED BY 12/19/2017 11:00:24 AM

DERMOT JONES

ANY QUESTIONS CONCERNING THIS DOCUMENT SHOULD BE ADDRESSED TO THE ENVIRONMENTAL LABORATORY CERTIFICATION PROGRAM AT (360) 509-7389

CONSTRUCTION, RENOVATION & DEMO BLDG MATERIALS

STATUS REPORTED ON 12/19/2017

ANALYTE NAME

ASBESTOS

ASBESTOS FIBERS (PCM) ASBESTOS IN BULK MATERIALS (PLM)

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 101424-0

TRC Environmental Corporation
Windsor, CT

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2018-07-01 through 2019-06-30
Effective Dates

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA

For the National Voluntary Laboratory Accreditation Program

NVLAP® National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

TRC Environmental Corporation
21 Griffin Road North
Windsor, CT 06095
Ms. Kathleen Williamson
Phone: 860-298-6392 Fax: 860-298-6214
Email: kwilliamson@trcsolutions.com
http://www.trcsolutions.com

ASBESTOS FIBER ANALYSIS

NVLAP LAB CODE 101424-0

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA – 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

For the National Voluntary Laboratory Accreditation Program

Effective 2018-07-01 through 2019-06-30

APPENDIX C

ASBESTOS BULK SAMPLE CHAIN OF CUSTODY FORMS

TRC

21 GRIFFIN ROAD NORTH
WINDSOR, CONNECTICUT 06095
TELEPHONE (860) 298-9692
FAX (860) 298-6380

ASBESTOS BULK SAMPLING CHAIN OF CUSTODY

Edition: October 2009
Supersede Previous Edition

ASK RUN

LAB ID #: 53191

PROJECT NUMBER	PROJECT NAME	PARAMETERS	TURNAROUND TIME
319002.0001	CT DCS THE PRUDENCE CRANDALL MUSEUM		PLM: 8hr 24hr 48hr 3day TEM: 24hr 48hr 3day 5day

SIGNATURE	INSPECTOR
	PAT SCHAFFNER CARMEN JACKO

FIELD SAMPLE NUMBER	DATE	TIME	TYPE: COMP	TYPE: GRAB	SAMPLE LOCATION	PLM EPA 600/R93/116 (POSITIVE STOP)	PLM EPA 600/R93/116 (w/ gravimetric reduction) (POSITIVE STOP)	ANALYZE BY LAYER	POINT COUNT (IF >1% & <10%)	TEM NY NOB 198.4 (IF PLM SERIES NEG)	MATERIAL
1	12/20/18	900		X	EXHIBIT 2 WALL	X		✓			SKIM/BASE PLASTER
2	"	902		X	EXHIBIT 2 WALL	X		✓			"
3	"	905		X	EXHIBIT 1 WALL	X		✓			"
4	"	910		X	CLOSET BETWEEN EXHIBITS 1+2	X		✓			"
5	"	915		X	LIBRARY WALL	X		✓			"
6	"	920		X	ATTIC STAIRS CEILING	X		✓			"
7	"	922		X	KITCHEN WALL	X		✓			"
8	"	925		X	HALL @ KITCHEN WALL	X		✓			"
9	"	930		X	KITCHEN CEILING	X		✓			"
10	"	935		X	EXHIBIT 3 WALL	X		✓			FIBERBOARD WITH WHITE TEXTURE
11	↓	937		X	EXHIBIT 1 WALL	X		✓			"

Relinquished by: (Signature)	Date:	Received by: (Signature)	Relinquished by: (Signature)	Date:	Received by: (Signature)
Patrick Schaffner	12-2018	12/21/18			
(Printed) PATRICK SCHAFFNER	Time:	(Printed) 1100	(Printed)	Time:	(Printed)

Remarks: SEND TO DLAPAGE@TRCSOLUTIONS.COM

Condition of Samples:
Acceptable: Yes ✓ No
Comments:

TRC

21 GRIFFIN ROAD NORTH
WINDSOR, CONNECTICUT 06095
TELEPHONE (860) 298-9692
FAX (860) 298-6380

ASBESTOS BULK SAMPLING CHAIN OF CUSTODY

Edition: October 2009
Supersede Previous Edition

LAB ID #. 53191

PROJECT NUMBER	PROJECT NAME	PARAMETERS	TURNAROUND TIME
319002.0001	THE PRUDENCE CRANDALL MUSEUM		PLM: 8hr 24hr 48hr 3day TEM: 24hr 48hr 3day 5day
SIGNATURE	INSPECTOR PAT SCHAFFNER CARMEN JACKO		

FIELD SAMPLE NUMBER	DATE	TIME	TYPE: COMP	TYPE: GRAB	SAMPLE LOCATION	PLM EPA 600/R93/116 (POSITIVE STOP)	PLM EPA 600/R93/116 (w/ gravimetric reduction) (POSITIVE STOP)	ANALYZE BY LAYER	POINT COUNT (IF >1% & <10%)	TEM NY NOB 198.4 (IF PLM SERIES NEG)	MATERIAL
12	12/20/18	940		X	EXHIBIT 2 WALL	X		✓			FIBERBOARD WITH WHITE TEXTURE
13	"	945		X	2ND FLOOR ENTER HALL	X					GREY WALL PAPER
14		947		X	PARLOR 2 WALL	X					GREEN WALL PAPER
15		950		X	LIBRARY WALL	X					BLUE WALL PAPER
16		955		X	STORAGE ROOM	X					BLACK COATING ON WALL CANVAS
17		956		X	"	X	✓				"
18		1001		X	TOP OF CELLAR STAIRS	X		✓			PEBBLE SHEET FLOOR W/ YELLOW ADHESIVE
19		1003		X	"	X	✓	✓			" / BEIGE
20		1010		X	BATHROOM	X		✓			4" GREY COVE BASE W/ YELLOW ADHESIVE
21		1012		X	"	X	✓	✓			"
22	"	1014		X	BATHROOM	X					12x12 BEIGE/GREY MARBLED FLOOR TILE

Relinquished by: (Signature)	Date:	Received by: (Signature) 12/21/18	Relinquished by: (Signature)	Date:	Received by: (Signature)
(Printed) NATALIE SCHAFFNER	Time:	(Printed) 1100	(Printed)	Time:	(Printed)

Remarks:
SEND TO DLAPAGE@TRCSOLUTIONS.COM

Condition of Samples:
Acceptable: Yes ____ No ____
Comments:

Page 1 of 3

TRC

21 GRIFFIN ROAD NORTH
WINDSOR, CONNECTICUT 06095
TELEPHONE (860) 298-9692
FAX (860) 298-6380

Edition: October 2009
Supersede Previous Edition

ASBESTOS BULK SAMPLING CHAIN OF CUSTODY

LAB ID #. 53191

PROJECT NUMBER	PROJECT NAME	PARAMETERS	TURNAROUND TIME
319002.6001	THE PRUDENCE CRANDALL MUSEUM		PLM: 8hr 24hr 48hr 3day TEM: 24hr 48hr 3day 5day
SIGNATURE	INSPECTOR PAT SCHAFFNER CARMEN JARKO		

FIELD SAMPLE NUMBER	DATE	TIME	TYPE COMP	TYPE GRAB	SAMPLE LOCATION	PLM EPA 600/R93/116 (POSITIVE STOP)	PLM EPA 600/R93/116 (w/ gravimetric reduction) (POSITIVE STOP)	ANALYZE BY LAYER	POINT COUNT (IF >1% & <10%)	TEM NY NOB 198.4 (IF PLM SERIES NEG)	MATERIAL
23	12/20/18	1016		X	BATHROOM	X	✓				12x12 BEIGE/GREY MARBLED FLOOR TILE
24	"	1020		X	BASEMENT	X					GREEN DUCT SEAM SEALANT
25	"	1021		X	"	X	✓				"
26	"	1245		X	GIFT SHOP	X					EXTERIOR WINDOW GLAZE (GREY)
27	"	1250		X	ROOM 1	X	✓				"
28	"	1350		X	STORAGE	X					GYPSUM (~~WALL~~) (CEILING)
29	"	1352		X	"	X					"
30	"	1353		X	"	X					JOINT COMPOUND (CEILING)
31	"	1352		X	"	X					"

Relinquished by: (Signature)	Date:	Received by: (Signature)	Relinquished by: (Signature)	Date:	Received by: (Signature)
	12-20-18	12/21/18			
(Printed) PATRICK SCHAFFNER	Time:	(Printed) 1100	(Printed)	Time:	(Printed)

Remarks:
SEND TO DLAPAGE@TRCSOLUTIONS.COM

Condition of Samples:
Acceptable: Yes ✓ No
Comments:

Page 3 of 3

Date	Analyst	Lab Log #	Sample ID	Crucible ID	g crucible	g crucible plus sample	g after 480°	decimal Residue	% Asb in residue	% Asb total Sample
12/27/2018	KW	53191	17	6	20.8149	20.942	20.8911	0.600	0.00	0.00
			19A	30	19.5552	19.5626	19.5596	0.595	0.00	0.00
			19Lin	32	18.8071	19.0913	18.9795	0.607	0.00	0.00
			21A	49	20.3762	20.4106	20.3926	0.477	0.00	0.00
			23	71	25.2305	25.404	25.3686	0.796	0.00	0.00
			25	82	27.3582	27.4957	27.4259	0.492	0.00	0.00

APPENDIX D

PLM LABORATORY ANALYSIS DATA

Industrial Hygiene Laboratory
21 Griffin Road North
Windsor, CT 06095
(860) 298-6308

TRC
Results you can rely on

BULK ASBESTOS ANALYSIS REPORT

CLIENT: CT Department of Construction Services

Lab Log #: 0053191
Project #: 319002.0001.0000
Date Received: 12/21/2018
Date Analyzed: 12/27/2018

Site: The Prudence Crandall Museum, Canterbury, CT

POLARIZED LIGHT MICROSCOPY by EPA 600/R-93/116

Sample No.	Color	Homogenous	Multi-Layered	Layer No.	Other Matrix Materials		Asbestos %	Asbestos Type
1	Light Grey (base coat)	Yes	No	- -	2%	horse hair	ND	None
2	Light Grey (base coat)	Yes	No	- -		- - -	ND	None
3	Beige (base coat)	Yes	No	- -		- - -	ND	None
4	Light Grey (base coat)	Yes	No	- -	2%	horse hair	ND	None
5	Light Grey (base coat)	Yes	No	- -		- - -	ND	None
6	White (skim coat)	No	Yes	1		- - -	ND	None
6	Light Grey (base coat)	No	Yes	2		- - -	ND	None
7	White (skim coat)	No	Yes	1		- - -	ND	None
7	Light Grey (base coat)	No	Yes	2		- - -	ND	None
8	Light Grey (base coat)	Yes	No	- -	2%	horse hair	ND	None
9	Light Grey (base coat)	Yes	No	- -		- - -	ND	None
10	White/Grey (fiber board)	Yes	No	- -	99%	cellulose	ND	None
11	White/Grey (fiber board)	Yes	No	- -	99%	cellulose	ND	None
12	White/Grey (fiber board)	Yes	No	- -	99%	cellulose	ND	None
13	Grey (wall paper)	Yes	No	- -	99%	cellulose	ND	None
14	Green (wall paper)	Yes	No	- -	99%	cellulose	ND	None
15	Blue (wall paper)	Yes	No	- -	99%	cellulose	ND	None
16	Black-Brown (coating)	Yes	No	- -		- - -	ND	None

Industrial Hygiene Laboratory
21 Griffin Road North
Windsor, CT 06095
(860) 298-6308

TRC
Results you can rely on

POLARIZED LIGHT MICROSCOPY by EPA 600/R-93/116

Sample No.	Color	Homogenous	Multi-Layered	Layer No.	Other Matrix Materials		Asbestos %	Asbestos Type
17♣	Black-Brown (coating)	Yes	No	--		---	ND	None
18	Yellow (adhesive)	No	Yes	1		---	ND	None
18	White/Grey (sheet flooring)	No	Yes	2	30% 10%	cellulose synthetic fiber	ND	None
19♣	Yellow (adhesive)	No	Yes	1		---	ND	None
19♣	White/Grey (sheet flooring)	No	Yes	2		---	ND	None
20	Yellow (adhesive)	Yes	No	--		---	ND	None
21♣	Yellow (adhesive)	Yes	No	--		---	ND	None
22	Beige/Grey (tile)	Yes	No	--		---	ND	None
23♣	Beige/Grey (tile)	Yes	No	--		---	ND	None
24	Green (seam sealant)	Yes	No	--		---	ND	None
25♣	Green (seam sealant)	Yes	No	--		---	ND	None
26	Grey (glaze)	Yes	No	--		---	3%	Chrysotile
27	--	--	--	--		--	NA/PS	--
28	Grey (gypsum board)	Yes	No	--	2%	cellulose	ND	None
29	Grey (gypsum board)	Yes	No	--	2%	cellulose	ND	None
30	White (joint compound)	Yes	No	--		---	ND	None
31	White (joint compound)	Yes	No	--		---	ND	None

Industrial Hygiene Laboratory
21 Griffin Road North
Windsor, CT 06095
(860) 298-6308

TRC
Results you can rely on

POLARIZED LIGHT MICROSCOPY by EPA 600/R-93/116

Sample No.	Color	Homogenous	Multi-Layered	Layer No.	Other Matrix Materials	Asbestos %	Asbestos Type

♠Samples analyzed by EPA/600/R-93/116 with gravimetric reduction

Reporting limit- asbestos present at 1%
ND - asbestos was not detected
Trace - asbestos was observed at level of less than 1%
NA/PS - Not Analyzed / Positive Stop
SNA- Sample Not Analyzed- See Chain of Custody for details

Note: Polarized-light microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. In those cases, EPA recommends, and certain states (e.g. NY) require, that negative results be confirmed by quantitative transmission electron microscopy.

The Laboratory at TRC follows the EPA's Interim Method for the Determination of Asbestos in Bulk Insulation 1982 (EPA 600/M4-82-020) Bulk Analysis Code 18/A01 and the EPA recommended Method for the Determination of Asbestos in Bulk Building Materials July 1993, R.L. Perkins and B.W. Harvey, (EPA/600/R-93/116) Bulk Analysis Code 18/A03, which utilize polarized light microscopy (PLM). Our analysts have completed an accredited course in asbestos identification. TRC's Laboratory is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP), for Bulk Asbestos Fiber Analysis, NVLAP Code 18/A01, effective through June 30, 2019. TRC is accredited by the AIHA Laboratory Accreditation Programs (AIHA-LAP), LLC in the Industrial Hygiene Program (IHLAP) for PLM effective through October 1, 2019. Asbestos content is determined by visual estimate unless otherwise indicated. Quality Control is performed in-house on at least 10% of samples and QC data related to the samples is available upon written request from client.

Analyzed by: K. Williamson — Kathleen Williamson, Laboratory Manager

Reviewed by: Cathryn Lemire — Cathryn Lemire, Approved Signatory

Date Issued 12/27/2018

APPENDIX E

LEAD PAINT XRF MEASUREMENT TABLE

Lead Based Paint Measurement Summary Table

Device(s):	Niton XLP301-A (Serial #24792) X Ray Fluorescence (XRF) Spectrum Analyzer
Site:	Prudence Crandall Museum, Canterbury, Connecticut
Project # :	319002-0000-0000
Date(s):	12/19/18-12/20/18
Inspector:	Patrick Schaffner (CT Lead Inspector Risk Assessor License #001330)

Number	Room	Side	Structure	Feature	Material	Color	Condition	Reading (mg/cm2)	Precision (mg/cm2)	Depth Index	Duration (sec)	Date/Time
1	Shutter calibration							4.1	0.0		77.76	12/19/2018 9:31
2	0.3 calibration							0.5	0.1	1.35	29.29	12/19/2018 9:36
3	0.7 callbration							0.8	0.1	1.2	30	12/19/2018 9:39
4	1.0 calibration							1.0	0.1	1.15	30	12/19/2018 9:40
1st Floor												
5	*VOID*		*VOID*		*VOID*		*VOID*		*VOID*		*VOID*	
6	Parlor 2	A	Window	Frame	Wood	Blue	Intact	**46.5**	1.5	5.67	24.09	12/19/2018 9:49
7	Parlor 2	A	Window	Sill	Wood	Blue	Intact	**46.7**	1.4	4.37	26.7	12/19/2018 9:52
8	Parlor 2	A	Window	Casing	Wood	Blue	Intact	**41.2**	1.2	5.21	30	12/19/2018 9:53
9	Parlor 2	A	Baseboard		Wood	Blue	Intact	**6.6**	0.5	9.89	30	12/19/2018 9:55
10	Parlor 2	A	Floor		Wood	Blue	Intact	**8.0**	0.6	5.16	21.86	12/19/2018 9:57
11	Parlor 2	C	Door	Door	Wood	Blue	Intact	**38.2**	1.4	4.01	21.89	12/19/2018 9:58
12	Parlor 2	C	Door	Frame	Wood	Blue	Intact	**0.8**	0.1	2.28	30	12/19/2018 10:00
13	Parlor 2	C	Door	Jamb	Wood	Blue	Intact	**0.4**	0.1	1.51	25.19	12/19/2018 10:02
14	Parlor 2	C	Fireplace		Wood	Blue	Intact	**42.9**	1.2	5.89	30	12/19/2018 10:04
15	Parlor 2		Ceiling		Plaster	White	Intact	< LOD	0.0	1	6.66	12/19/2018 10:07
16	Parlor 2		Ceiling		Wood	Blue	Intact	**37.5**	1.1	5.2	29.67	12/19/2018 10:09
17	Gift Shop	A	Door	Door	Wood	Tan/Beige	Intact	**29.4**	1.2	6.33	20.75	12/19/2018 10:12
18	Gift Shop	A	Door	Jamb	Wood	Tan/Beige	Intact	**16.0**	0.7	4.2	30	12/19/2018 10:14
19	Gift Shop	A	Door	Frame	Wood	Tan/Beige	Intact	**31.3**	1.0	6.14	29.62	12/19/2018 10:16
20	Gift Shop	B	Window	Frame	Wood	Tan/Beige	Intact	**34.6**	1.2	6.83	25.19	12/19/2018 10:17
21	Gift Shop		Window	Sill	Wood	Tan/Beige	Intact	**21.1**	0.9	7.22	27.07	12/19/2018 10:19
22	Gift Shop		Window	Casing	Wood	Tan/Beige	Intact	< LOD	0.0	2.22	19.6	12/19/2018 10:20
23	*VOID*		*VOID*		*VOID*		*VOID*		*VOID*		*VOID*	
24	Gift Shop	D	Baseboard		Wood	Tan/Beige	Intact	**18.0**	1.1	2.92	14.78	12/19/2018 10:23
25	Gift Shop		Ceiling		Plaster	White	Intact	0.0	0.0	1	12.6	12/19/2018 10:29
26	Bathroom		Ceiling		Plaster	White	Intact	0.0	0.0	1	8.86	12/19/2018 10:32
27	Bathroom	B	Window	Frame	Wood	Grey	Intact	**11.4**	0.8	6.54	19.27	12/19/2018 10:36
28	Bathroom	B	Window	Sill	Wood	Grey	Intact	**9.4**	0.7	4.62	18.14	12/19/2018 10:37
29	Bathroom	B	Window	Casing	Wood	Grey	Intact	**9.4**	0.9	3.55	11.48	12/19/2018 10:38
30	*VOID*		*VOID*		*VOID*		*VOID*		*VOID*		*VOID*	
31	*VOID*		*VOID*		*VOID*		*VOID*		*VOID*		*VOID*	
32	Kitchen		Ceiling		Plaster	White	Intact	0.0	0.0	1	17.35	12/19/2018 10:44

Lead paint includes paint found to contain **any detectable** amount of lead by Atomic Absorption Spectrophotometry (AAS) or X-Ray Fluorescence (XRF).

Side A = Street side; Sides B,C,D follow clockwise

Lead Based Paint Measurement Summary Table

Device(s):	**Niton XLP301-A (Serial #24792) X Ray Fluorescence (XRF) Spectrum Analyzer**
Site:	**Prudence Crandall Museum, Canterbury, Connecticut**
Project # :	**319002-0000-0000**
Date(s):	**12/19/18-12/20/18**
Inspector:	**Patrick Schaffner (CT Lead Inspector Risk Assessor License #001330)**

Number	Room	Side	Structure	Feature	Material	Color	Condition	Reading (mg/cm2)	Precision (mg/cm2)	Depth Index	Duration (sec)	Date/Time
33	Kitchen	C	Interior window	Frame	Wood	Grey	Intact	0.0	0.0	1.71	13.68	12/19/2018 10:46
34	Kitchen	A	Door		Wood	Grey	Intact	**26.1**	1.2	7.33	20.34	12/19/2018 10:48
35	Kitchen	A	Door	Frame	Wood	Grey	Intact	**11.4**	0.7	8.46	23	12/19/2018 10:49
36	Kitchen	A	Door	Jamb	Wood	Grey	Intact	**7.4**	0.5	2.81	27.09	12/19/2018 10:50
37	***VOID***		***VOID***		***VOID***		***VOID***		***VOID***		***VOID***	
38	Office 1		Ceiling		Plaster	White	Intact	0.0	0.0	1	11.09	12/19/2018 10:52
39	Room 1		Ceiling		Plaster	White	Intact	0.0	0.0	1	6.28	12/19/2018 10:54
40	***VOID***		***VOID***		***VOID***		***VOID***		***VOID***		***VOID***	
41	***VOID***		***VOID***		***VOID***		***VOID***		***VOID***		***VOID***	
42	***VOID***		***VOID***		***VOID***		***VOID***		***VOID***		***VOID***	
43	Room 1	D	Wall panel		Wood	Grey	Intact	**17.5**	1.0	5.3	18.95	12/19/2018 10:59
44	***VOID***		***VOID***		***VOID***		***VOID***		***VOID***		***VOID***	
45	Room 1	B	Door		Wood	Grey	Intact	**19.9**	1.0	4.71	21.85	12/19/2018 11:01
46	Room 1	B	Door	Frame	Wood	Grey	Intact	**22.6**	1.1	5.93	19.25	12/19/2018 11:02
47	***VOID***		***VOID***		***VOID***		***VOID***		***VOID***		***VOID***	
48	Room 1	C	Door	Jamb	Wood	Grey	Intact	**23.8**	1.1	4.4	21.86	12/19/2018 11:03
49	Dining Room	A	Fireplace		Wood	Green	Intact	**0.2**	0.0	2.25	18.51	12/19/2018 11:07
50	Dining Room	D	Door		Wood	Tan/Beige	Intact	**2.1**	0.4	1.94	22.66	12/19/2018 11:09
51	Dining Room	D	Door	Frame	Wood	Tan/Beige	Intact	**41.2**	1.5	4.69	21.86	12/19/2018 11:11
52	Dining Room	C	Door	Jamb	Wood	Green	Intact	**26.0**	1.1	3.29	22.59	12/19/2018 11:13
53	Dining Room		Floor		Wood	Grey	Intact	**0.1**	0.0	1.6	21.86	12/19/2018 11:14
54	Dining Room	D	Baseboard		Wood	Grey	Intact	**37.0**	1.5	6	18.87	12/19/2018 11:16
55	North Foyer	D	Door	Door	Wood	White	Intact	**28.0**	1.2	6.12	21.88	12/19/2018 11:19
56	Parlor 1	C	Fireplace		Wood	White	Intact	**43.2**	1.4	5.78	24.12	12/19/2018 11:22
57	Parlor 1	C	Window	Frame	Wood	White	Intact	**48.8**	1.8	5.12	17.88	12/19/2018 11:24
58	Parlor 1		Window	Sill	Wood	White	Intact	**3.4**	0.4	2.37	24.79	12/19/2018 11:25
59	Parlor 1		Window	Casing	Wood	White	Intact	**49.6**	1.7	5.82	20.75	12/19/2018 11:26
60	Center Hall		Ceiling		Wood	White	Intact	0.0	0.0	1	17.02	12/19/2018 11:34
61	Center Hall	B	Crown molding		Wood	Tan/Beige	Intact	**25.2**	1.4	3.65	13.31	12/19/2018 11:35
62	Center Hall	B	Door		Wood	Tan/Beige	Intact	**29.1**	1.2	4.82	20.43	12/19/2018 11:37
63	Center Hall	A	Door	Frame	Wood	Tan/Beige	Intact	**22.8**	1.0	3.84	21.85	12/19/2018 11:39
64	Center Hall	B	Wall paneling at stairs		Wood	Tan/Beige	Intact	**25.6**	2.8	5.39	4.45	12/19/2018 11:41
65	Center Hall	B	Hall arch		Wood	Tan/Beige	Intact	**30.3**	1.4	5.89	16.69	12/19/2018 11:42

Lead paint includes paint found to contain **any detectable** amount of lead
by Atomic Absorption Spectrophotometry (AAS) or X-Ray Fluorescence (XRF).

Side A = Street side; Sides B,C,D follow clockwise

Lead Based Paint Measurement Summary Table

Device(s):	Niton XLP301-A (Serial #24792) X Ray Fluorescence (XRF) Spectrum Analyzer
Site:	Prudence Crandall Museum, Canterbury, Connecticut
Project # :	319002-0000-0000
Date(s):	12/19/18-12/20/18
Inspector:	Patrick Schaffner (CT Lead Inspector Risk Assessor License #001330)

Number	Room	Side	Structure	Feature	Material	Color	Condition	Reading (mg/cm2)	Precision (mg/cm2)	Depth Index	Duration (sec)	Date/Time
66	Center Hall		Floor		Wood	Grey	Intact	0.0	0.0	1.21	25.58	12/19/2018 11:44
67	Center Hall	B	Baseboard		Wood	Tan/Beige	Intact	0.0	0.0	1.38	22.29	12/19/2018 11:46
68	Center Hall	B	Bannister		Wood	Stain	Intact	0.0	0.0	1.07	20.75	12/19/2018 11:48
69	Center Hall	B	Balluster		Wood	Tan/Beige	Intact	**12.9**	0.8	2.68	19.3	12/19/2018 12:00
70	Center Hall	B	Stair	Stringer	--	Tan/Beige	Intact	**25.3**	1.8	5.97	9.25	12/19/2018 12:03
71	Center Hall	B	Stair	Riser	Wood	Grey	Intact	**22.1**	1.0	8.55	24.85	12/19/2018 12:05
72	Center Hall	B	Stair		Wood	Grey	Intact	**3.2**	0.4	3.68	23.32	12/19/2018 12:06
2nd floor												
73	Exhibit 2	A	Wall		Plaster	White	Intact	0.0	0.0	1	20.43	12/19/2018 12:16
74	Exhibit 2	A	Column		Wood	Tan/Beige	Intact	**39.8**	2.4	4.32	9.24	12/19/2018 12:19
75	Exhibit 2	B	Window	Frame	Wood	Tan/Beige	Intact	**38.7**	1.9	4.49	12.94	12/19/2018 12:22
76	Exhibit 2	B	Window	Sill	Wood	Tan/Beige	Intact	**36.7**	2.0	5.42	11.14	12/19/2018 12:24
77	Exhibit 2	B	Window	Sash int	Wood	Tan/Beige	Intact	**8.4**	1.0	9.27	10.03	12/19/2018 12:25
78	Exhibit 3	A	Door	--	Wood	Tan/Beige	Intact	**36.2**	2.1	2.31	10.35	12/19/2018 12:28
79	Exhibit 3	A	Door	Frame	Wood	Tan/Beige	Intact	**20.2**	1.5	4.28	10.75	12/19/2018 12:30
80	Hall 1	A	Door	Frame	Wood	Green	Intact	**8.2**	1.2	10	6.68	12/19/2018 12:33
81	Hall 1	A	Door	--	Wood	Green	Intact	**8.7**	0.9	10	13.34	12/19/2018 12:34
82	Hall 1	D	Wall	--	Plaster	Tan/Beige	Intact	**0.1**	0.0	1.11	10.37	12/19/2018 12:35
83	Hall 2		Ceiling	--	Plaster	Tan/Beige	Intact	0.0	0.0	1	11.48	12/19/2018 12:37
84	Hall 2		Floor	--	Wood	Grey	Intact	**0.1**	0.0	1.73	11.84	12/19/2018 12:39
85	Hall 2	C	Door	Door	Wood	Grey	Intact	**0.1**	0.0	2.67	25.27	12/19/2018 12:42
86	Office 2	--	Ceiling	--	Plaster	White	Intact	0.0	0.0	1	10.4	12/19/2018 12:43
87	Work Room	C	Window	Casing	Wood	White	Intact	**0.1**	0.0	2.47	9.65	12/19/2018 12:45
88	Work Room	D	Column	--	Wood	Tan/Beige	Intact	**21.6**	5.9	3.96	2.23	12/19/2018 12:50
89	Exhibit 1	C	Wall	--	Plaster	Tan/Beige	Intact	0.0	0.0	1	2.95	12/19/2018 12:53
90	Exhibit 1	C	Wall	--	Plaster	Tan/Beige	Intact	0.0	0.0	1	9.58	12/19/2018 12:54
91	Exhibit 1	C	Fireplace	--	Wood	Tan/Beige	Intact	**19.1**	1.7	4.3	8.13	12/19/2018 12:56
92	Center Hall	A	Window	Frame	Wood	Tan/Beige	Intact	**23.0**	2.7	5.6	4.45	12/19/2018 12:59
93	Center Hall	D	Crown molding	--	Wood	Tan/Beige	Intact	**22.4**	2.0	3.99	7.02	12/19/2018 13:01
94	Center Hall	A	Baseboard	--	Wood	Tan/Beige	Intact	**27.1**	1.8	5.64	10.39	12/19/2018 13:04
Exterior												
95	Exterior	A	Fence	Post	Wood	Tan/Beige	Intact	0.0	0.0	1	12.21	12/19/2018 14:07
96	Exterior	A	Fence	Railing	Wood	Tan/Beige	Intact	0.0	0.0	1	5.19	12/19/2018 14:09

Lead paint includes paint found to contain **any detectable** amount of lead by Atomic Absorption Spectrophotometry (AAS) or X-Ray Fluorescence (XRF).

Side A = Street side; Sides B,C,D follow clockwise

Lead Based Paint Measurement Summary Table

Device(s):	**Niton XLP301-A (Serial #24792) X Ray Fluorescence (XRF) Spectrum Analyzer**
Site:	**Prudence Crandall Museum, Canterbury, Connecticut**
Project # :	**319002-0000-0000**
Date(s):	**12/19/18-12/20/18**
Inspector:	**Patrick Schaffner (CT Lead Inspector Risk Assessor License #001330)**

Number	Room	Side	Structure	Feature	Material	Color	Condition	Reading (mg/cm2)	Precision (mg/cm2)	Depth Index	Duration (sec)	Date/Time
97	Exterior	A	Front door	Door	Wood	Brown	Defective	**2.4**	0.2	2.58	9.26	12/19/2018 14:11
98	Exterior	A	Front door	Frame	Wood	Yellow	Defective	**4.9**	0.9	8.92	7.04	12/19/2018 14:12
99	Exterior	A	Window	Frame	Wood	Yellow	Defective	**1.2**	0.1	1.94	19.65	12/19/2018 14:13
100	Exterior	A	Siding	Clapboard	Wood	Yellow	Defective	**3.1**	0.3	3.19	14.1	12/19/2018 14:15
101	Exterior	B	Siding	Column	Wood	Yellow	Defective	**4.8**	0.6	8.53	14.48	12/19/2018 14:17
102	Exterior	B	Siding	Clapboard	Wood	Yellow	Defective	**1.9**	0.2	1.88	8.53	12/19/2018 14:19
103	Exterior	C	Door		Wood	Brown	Defective	**28.2**	1.9	5.28	9.24	12/19/2018 14:21
104	Exterior	C	Door	Casing	Wood	Yellow	Defective	**0.1**	0.0	1.99	30	12/19/2018 14:23
105	Exterior	D	Siding		Wood	Yellow	Defective	**1.6**	0.2	3.35	11.14	12/19/2018 14:25
106	Exterior	D	Door		Wood	Brown	Defective	0.0	0.0	1.27	11.83	12/19/2018 14:26
107	Exterior	D	Door	Frame	Wood	Yellow	Defective	0.0	0.0	1.89	20.06	12/19/2018 14:28
108	Exterior	D		Overhang	Wood	Yellow	Defective	**10.1**	1.3	3.95	7.05	12/19/2018 14:29
109	**3.5 calibration**							3.5	0.3	1.29	4.07	12/19/2018 14:31
110	**0.7 calibration**							0.5	0.1	1.36	7.03	12/19/2018 14:34
111	**1.0 calibration**							0.9	0.1	1.31	7.8	12/19/2018 14:34
112	**Shutter calibration**							4.3	0.0		77.69	12/20/2018 13:13
113	**1.6 calibration**							1.5	0.1	1.09	5.19	12/20/2018 13:23
114	**3.5 calibration**							4.0	0.4	1.4	4.06	12/20/2018 13:24
115	**0.7 calibration**							0.7	0.1	1.12	5.55	12/20/2018 13:24
116	Exterior	C	Railing		Metal	Black		< LOD	0.0	1	20.73	12/20/2018 13:28
117	Exterior	C	Railing bottom		Metal	Black		< LOD	0.0	1	14.79	12/20/2018 13:30
118	Exterior	C	Railing balluster		Metal	Black		< LOD	0.0	1	21.08	12/20/2018 13:31
119	**3.5 calibration**	--	--		--			3.6	0.2	1.31	8.53	12/20/2018 13:34
120	**0.7 calibration**	--	--		--			0.7	0.1	1.11	9.63	12/20/2018 13:35
121	**0.0 calibration**	--	--		--			< LOD	0.0	1	12.23	12/20/2018 13:36

Lead paint includes paint found to contain **any detectable** amount of lead by Atomic Absorption Spectrophotometry (AAS) or X-Ray Fluorescence (XRF).

Side A = Street side; Sides B,C,D follow clockwise

APPENDIX F

RELATED CORRESPONDENCE

CTDAS/DCS, The Prudence Crandall Museum, Windham, , Canterbury, 06331, CT, US, Canterbury Road, 1

Created	2018-12-20 14:11:26 UTC by Carmen Jacko
Updated	2019-01-28 16:01:47 UTC by Patrick Schaffner
Location	41.69823758308, -71.9716923684552
Status	Survey Complete

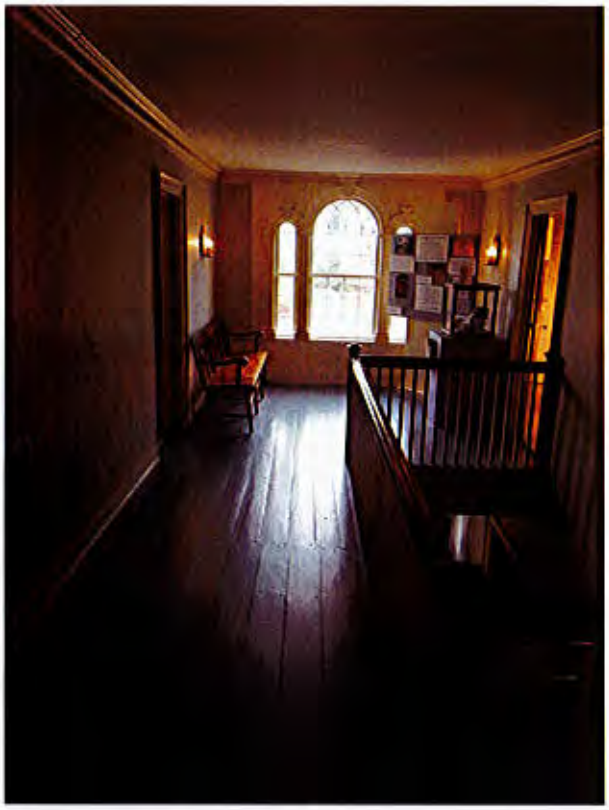
Job Information

Site Name	The Prudence Crandall Museum
Address	1 Canterbury Road Canterbury, CT 06331
TRC Project Number	319002.0001
Project Manager	Donald LePage
Inspector(s)	Carmen Jacko, Pat Schaffner
Client	CTDAS/DCS
Type of Asbestos Survey	Reno/Demo
Additional Testing for NOB Materials	PLM EPA 600/R93/116 (w grav. red.)
Additional Analysis for NOB Materials (Calc)	PLM EPA 600/R93/116 (w grav. red.)
Date	2018-12-20
Overview Photo	

Basement

Front attic

Exhibit 2



2nd floor center hall

Exhibit 3

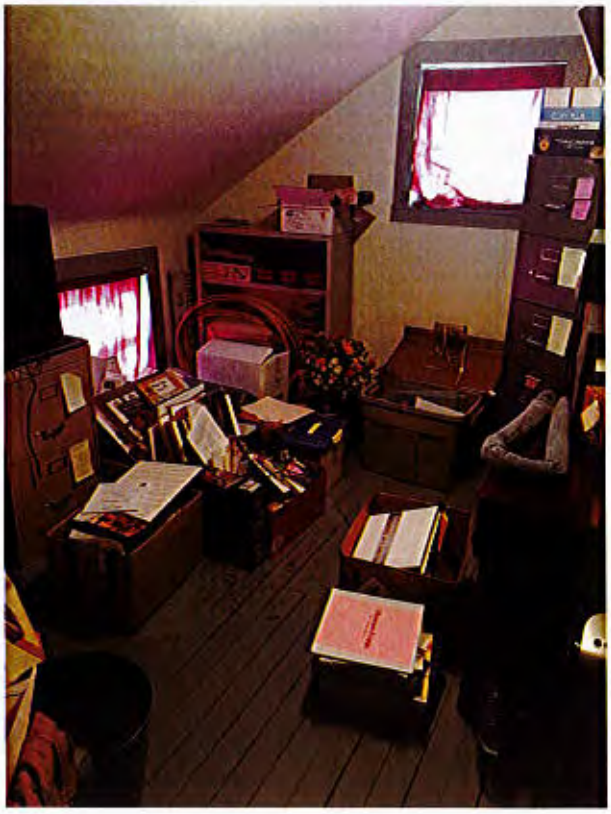
Exhibit 1

Library

Hall 1

Hall 2

Storage



Office 2

Work room

Room 2

Parlor 2

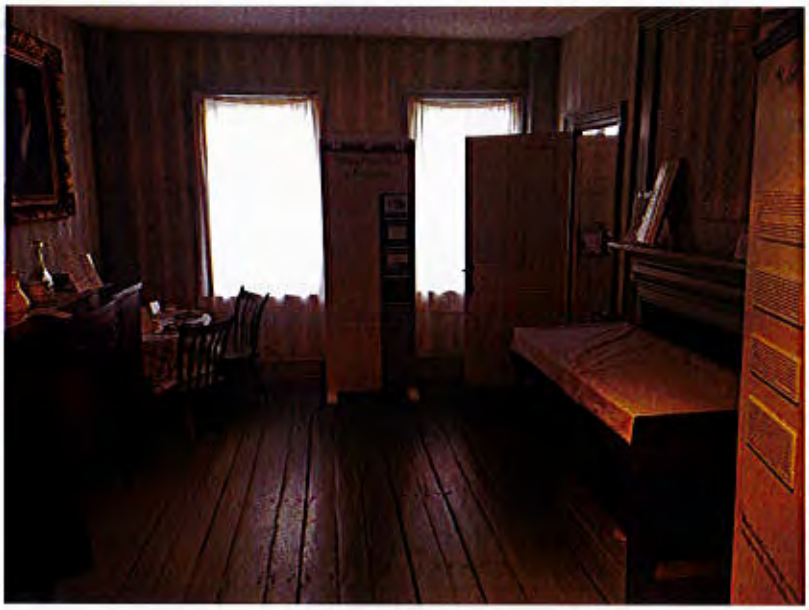
Parlor 1

1st floor center hall

Stairs

Crown molding

Gift shop



Dining room

Foyer

Entrance

Hall at kitchen

Bathroom

Kitchen

Room 1

Office 1

Exterior siding

Exterior window glaze

Clapboard Roof

Building exterior

Exterior window

Test door

Street side door outside of foyer

Front entrance

Surveys Performed	Asbestos, XRF, Hazardous Materials Inventory

XRF Section

Niton XRF Model No.	24792
XRF Survey Completed	Yes
XRF Data Downloaded	Yes
XRF Shots >1.0 on non-metallic building materials	Yes
Date Data Downloaded	2018-12-20

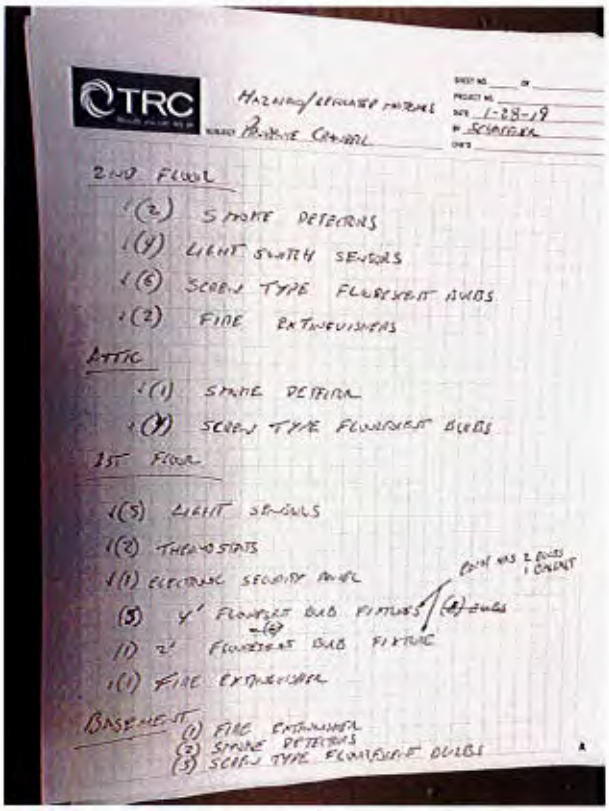
HAZMAT Inventory Section

Fixed inventory hazardous regulated materials

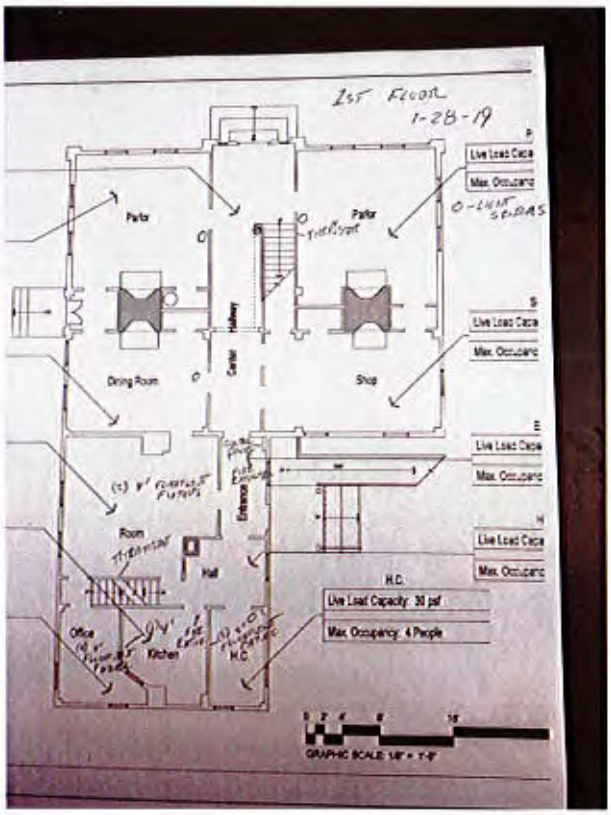
Inventory Area Description	Fixed inventory hazardous regulated materials

Miscellaneous, Smoke Detectors (LLRW)

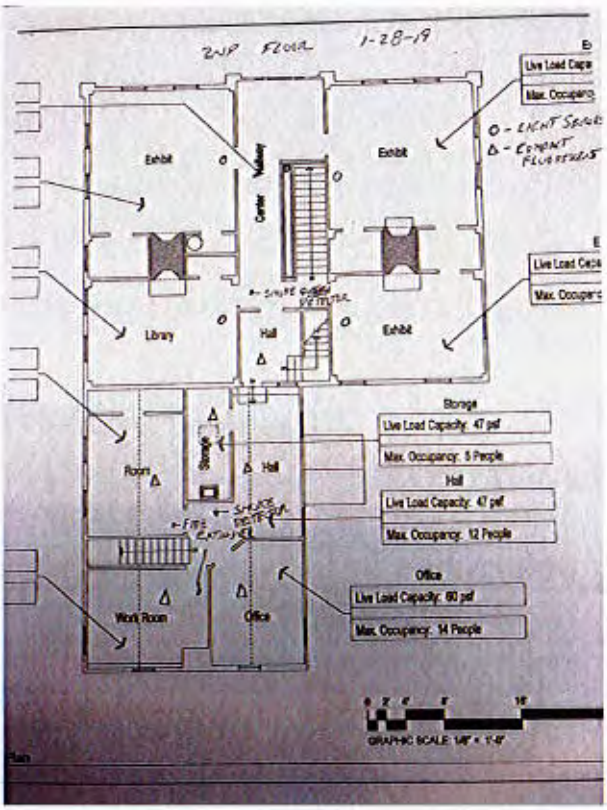
HAZMAT Item Description	Miscellaneous, Smoke Detectors (LLRW/Circuit Boards)
HAZMAT Item Quantity	4
HAZMAT Item Photo	



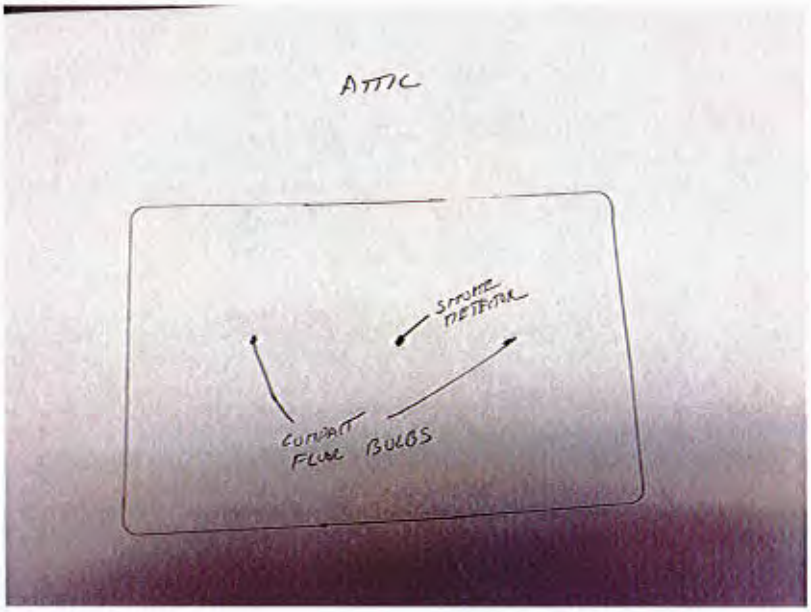
Inventory list

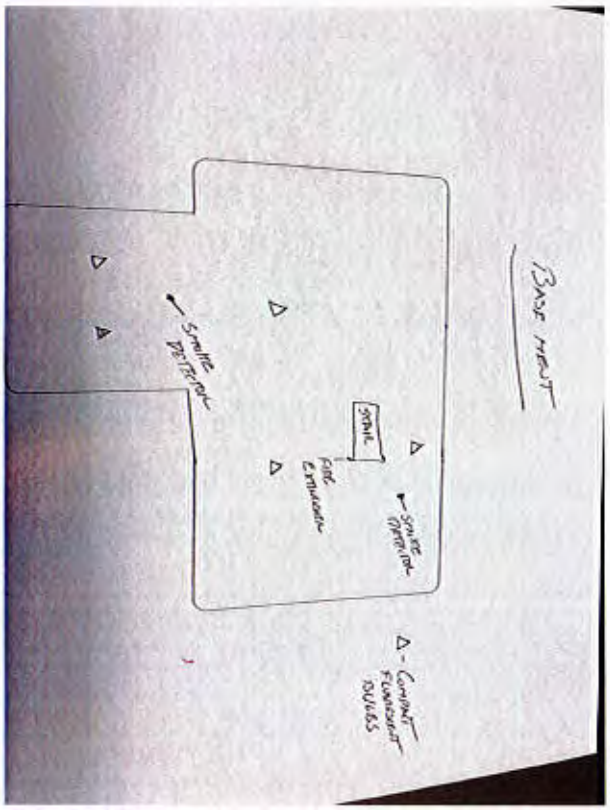


1st floor locations



2nd floor locations





Connecticut Regulated Waste (CRW CR01-CR05), Fire Extinguisher (CR05)

HAZMAT Item Description	Connecticut Regulated Waste (CRW CR01-CR05), Fire Extinguisher (CR05)
HAZMAT Item Quantity	4

HAZMAT Item Photo

Universal Waste (UW), Motion Sensors/Heat Sensors (Circuit boards)

HAZMAT Item Description	Universal Waste (UW), Motion Sensors/Heat Sensors (Circuit boards)
HAZMAT Item Common Name	Light switch sensors
HAZMAT Item Quantity	9

HAZMAT Item Photo

Universal Waste (UW), Compact Fluorescent (Lamps)

HAZMAT Item Description	Universal Waste (UW), Compact Fluorescent (Lamps)
HAZMAT Item Common Name	Screw type fluorescent
HAZMAT Item Quantity	15

HAZMAT Item Photo

Universal Waste (UW), Electronic Thermostats (Circuit boards)

HAZMAT Item Description	Universal Waste (UW), Electronic Thermostats (Circuit boards)
HAZMAT Item Quantity	2

HAZMAT Item Photo

Universal Waste (UW), Security System/Control Panels (Circuit boards/Hg Lamps/Batteries)

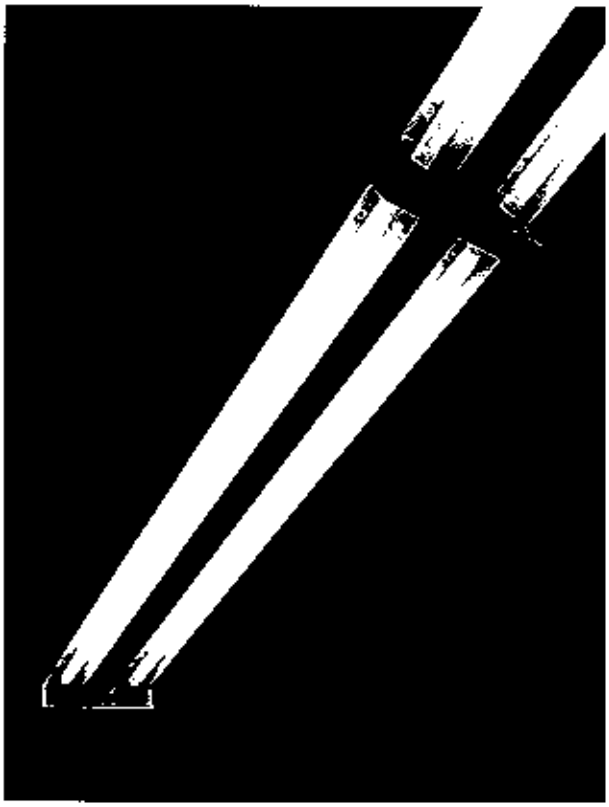
HAZMAT Item Description	Universal Waste (UW), Security System/Control Panels (Circuit boards/Hg Lamps/Batteries)
HAZMAT Item Quantity	1

HAZMAT Item Photo

Universal Waste (UW), Fluorescent bulbs (4' Lamps)

HAZMAT Item Description	Universal Waste (UW), Fluorescent bulbs (4' Lamps)
HAZMAT Item Quantity	4

HAZMAT Item Photo



Universal Waste (UW), Fluorescent bulbs

HAZMAT Item Description	Universal Waste (UW), Fluorescent bulbs
HAZMAT Item Quantity	2

HAZMAT Item Photo

General Information

Asbestos Samples Submitted to TRC Lab	Yes
Date Submitted to Lab	2018-12-20
App Name	WinBSI HBM Survey 1.0

Generate Report Documentation

Cloud-based reporting is still actively being developed, but some features that are at an advanced stage of development may be used with the understanding that unexpected errors may occur occasionally. Please report any difficulties or errors to Justin Coleman.

What documents should be generated?	Asbestos chain-of-custody
Where should the document(s) be sent?	pschaffner@trcsolutions.com
Generate Documents	N/A

Section 50 60 00
FM Global Checklist for Roofing Systems

SAMPLE FM GLOBAL CHECKLIST FOR ROOFING SYSTEMS – page 1

CHECKLIST FOR ROOFING SYSTEM

FM Global

CONTACT INFORMATION: **INDEX NUMBER:**

ROOFING CONTRACTOR (NAME & ADDRESS)	TELEPHONE NO.:	FAX:
	E-MAIL ADDRESS:	CONTACT:
CLIENT (NAME & ADDRESS)	TELEPHONE NO.:	FAX:
	E-MAIL ADDRESS:	CONTACT:

OVERVIEW OF WORK: *(Submit 1 form per roof area)*

Building Name & Number:		
Building Dimensions: Length: *ft/m;*	Width: *ft/m.;*	Height *ft/m.*
Roof Slope:		
Parapet Height ,max *(in./m)*:	Parapet Height ,min *(in./m)*:	
Type of Work: ☐ New Construction ☐ Recover (New roof over existing Roofing System) ☐ Reroof (New cover/remove existing roofing system to deck) ☐ Other		
FM Approved RoofNav Assembly Numbers:		

ROOF SURFACING:

☐ None	
☐ Coating	*(Trade Name/Application Rate)*
☐ Granules	*(Application Rate)*
☐ Gravel/Slag	*(Application Rate)*
☐ Ballast: ☐ Stone Size ☐ Pavers *(Beveled or square edge)*; ☐ Other:	
Ballast Weight (psf): Field: Perimeter: Corners:	

ROOF COVER/MEMBRANE:
(Please provide ALL applicable details including trade name, type, number of plies, thickness, reinforced, adhesive)

☐ Panel: ☐ Through Fastened Metal ☐ Standing Seam metal ☐ Fiber Reinforced Plastic (FRP) ☐ Other:			
☐ Built Up Roofing (BUR)			
☐ Modified Bitumen			
☐ Single Ply:	☐ Adhered	☐ Fastened	☐ Ballasted
☐ Spray Applied			
☐ Other:			

BASE SHEET:
(Please include Trade Name, Type, and Width)

☐ None		
Trade Name:		Width: ☐ 36 In. ☐ 1 meter (39 In.)
☐ Fastened		☐ Adhered
☐ Secured per RoofNav	**OR**	☐ Per FM Global Loss Prevention Data Sheet 1-29
Comments:		
☐ Air Retarder		
☐ Vapor Retarder		

INSULATION

Layer	Trade Name	Thickness (In.)	Fastened	Adhered	Tapered
1. Top			☐	☐	☐
2. Next			☐	☐	☐
3. Next			☐	☐	☐
4. Next			☐	☐	☐

☐ Glass Fiber/Mineral Wool/Batt	☐ Facer Type/Vapor Barrier
☐ Thermal Barrier	

X2688 ENGINEERING (Rev. January 2011)

SAMPLE FM GLOBAL CHECKLIST FOR ROOFING SYSTEMS – page 2

CHECKLIST FOR ROOFING SYSTEM

☐ Other:	
☐ None	

DECK:
(Please include manufacturer, type, yield strength, thickness/gage, etc.)

☐ Steel:	
☐ LWIC (Form Deck):	☐ Cementitious Wood Fiber:
☐ Concrete: ☐ Pre-cast panels or ☐ Cast in Place	
☐ Wood	
☐ Fiber Reinforced Cement	☐ Fiber Reinforced Plastic
☐ Gypsum: ☐ Plank	☐ Poured
☐ Other:	
Comments:	

ROOF STRUCTURE (Include Size, Gage, Etc.):

☐ Purlins ☐ "C" OR ☐ "Z"		
☐ Joists ☐ Wood OR ☐ Steel		
☐ Beams ☐ Wood OR ☐ Steel		
☐ Other:		
Spacing: Field:	Perimeter:	Corners:
Comments:		

FASTENERS USED IN ROOF ASSEMBLY:

Roof Cover Fasteners: Trade Name:		Length:	Diameter:
Stress Plate/Batten:			
Spacing: Field: X	Perimeter: X	Corners: X	
Insulation Fasteners: Trade Name:	Type:		
Size:	Stress Plate:		
Spacing: Field:	Perimeter:	Corners:	
Deck Or Roof Panels Fasteners: Trade Name:	Type:		
Length:	Size Washer:		
If Weld: Size:	Weld:	Washer:	
Deck Side Lap Fasteners: Field: X	Perimeter: X	Corners: X	
Spacing: Field: X	Perimeter: X	Corners: X	
Base Sheet Fasteners Trade Name:	Type:		
Head Diameter:	Length:		
Spacing: (Attached Sketches as necessary) Spacing Along Laps: Field:	Perimeter:	Corners:	
No. Intermediate Rows: Field:	Perimeter:	Corners:	
Spacing Along Intermediate Rows: Field:	Perimeter:	Corners:	

PERIMETER FLASHING:
(Attach a detailed sketch of metal fascia, gravel stop, nailer, coping, etc.)

☐ FM Approved Flashing	☐ Per FM Global Loss Prevention Data Sheet 1-49
☐ Other:	Comments:

DRAINAGE:

For new construction: Has roof drainage been designed by a Qualified Engineer per FM Global Loss Prevention Data Sheet 1-54 and the local building code? ☐ Yes ☐ No (Attach details)
For re-roofing and recovering: will the roof drainage be changed from the original design (for example: drain inserts, drains covered or removed, new expansion joints, blocked or reduced scupper size? ☐ Yes ☐ No If yes, were the changes reviewed by a Qualified Engineer? ☐ Yes ☐ No (Attach details)
Is secondary (emergency) roof drainage provided per FM Global Data Sheet 1-54? ☐ Yes ☐ No (Attach details)

X2688 ENGINEERING (Rev. January 2011)

SAMPLE FM GLOBAL CHECKLIST FOR ROOFING SYSTEMS – page 3

CHECKLIST FOR ROOFING SYSTEM

FM Global OFFICE REVIEW
(Please leave blank for FM Global Office Review)

WIND:

Design Wind Speed: *(mph)*	Ground Terrain: ☐ B ☐ C ☐ D
Uplift Pressure in field: *(psf)*	Uplift Rating Required:
Adequate Uplift Rating Provided:	Adequate? ☐ Yes ☐ No

FIRE:

Internal Assembly Rating:	☐ Class 1	☐ Class 2	☐ Non-Combustible	
External Fire Rating:	☐ Class A	☐ Class B	☐ Class C	☐ None
Concealed Spaces?	☐ Yes	☐ No	Sprinklers below Roof?	☐ Yes ☐ No
Adequate?	☐ Yes	☐ No		

HAIL:

Hail Rating Needed?	☐ SH	☐ MH	☐ None	Hail Rating Provided?	☐ SH ☐ MH ☐ None
Adequate?	☐ Yes	☐ No			

COLLAPSE:

If standing seam, has collapse been reviewed? ☐ Yes ☐ No

COMMENTS:

X2688 ENGINEERING (Rev. January 2011)

End of Section 50 60 00 FM Global Checklist for Roofing Systems

Section 50 70 00
Statement of Special Inspections

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Statement of Special Inspections

Project: *Prudence Crandall Museum Renovations*

Location: *Canterbury, CT*

Owner: *State of Connecticut, Department of Administration Services*

Design Professional in Responsible Charge: *GNCB Consulting Engineers, P.C.*

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

☒ Structural ☐ Mechanical/Electrical/Plumbing

☐ Architectural ☐ Other: _____

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: *Monthly* or ☐ per attached schedule.

Prepared by:

Amy Jagaczewski

(type or print name)

Amy Jagaczewski

Signature

August 30, 2019

Date

Design Professional Seal

Owner's Authorization:

Signature Date

Building Official's Acceptance:

Signature Date

Schedule of Inspection and Testing Agencies

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- ☒ Soils and Foundations
- ☒ Cast-in-Place Concrete
- ☐ Precast Concrete
- ☐ Masonry
- ☒ Structural Steel
- ☐ Cold-Formed Steel Framing
- ☐ Spray Fire Resistant Material
- ☒ Wood Construction
- ☐ Exterior Insulation and Finish System
- ☐ Mechanical & Electrical Systems
- ☐ Architectural Systems
- ☐ Special Cases

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. **Special Inspection Coordinator**	*TBD*	
2. Inspector	*TBD*	
3. Testing Agency	*TBD*	

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official. The credentials of all Inspectors and testing technicians shall be provided if requested.

Key for Minimum Qualifications of Inspection Agents:

When the Registered Design Professional in Responsible Charge deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Agency Number* on the Schedule.

PE/SE	Structural Engineer – a licensed SE or PE specializing in the design of building structures
PE/GE	Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations
EIT	Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination

American Concrete Institute (ACI) Certification

ACI-CFTT	Concrete Field Testing Technician – Grade 1
ACI-CCI	Concrete Construction Inspector
ACI-LTT	Laboratory Testing Technician – Grade 1&2
ACI-STT	Strength Testing Technician

American Welding Society (AWS) Certification

AWS-CWI	Certified Welding Inspector
AWS/AISC-SSI	Certified Structural Steel Inspector

American Society of Non-Destructive Testing (ASNT) Certification

ASNT	Non-Destructive Testing Technician – Level II or III.

International Code Council (ICC) Certification

ICC-SMSI	Structural Masonry Special Inspector
ICC-SWSI	Structural Steel and Welding Special Inspector
ICC-SFSI	Spray-Applied Fireproofing Special Inspector
ICC-PCSI	Prestressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector

National Institute for Certification in Engineering Technologies (NICET)

NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

Exterior Design Institute (EDI) Certification

EDI-EIFS	EIFS Third Party Inspector

Other

Soils and Foundations

Item	Agency # (Qualif.)	Scope
1. Shallow Foundations	*2 (PE/GE)*	*Inspect soils below footings for adequate bearing capacity.* *Inspect removal of unsuitable material and preparation of subgrade prior to placement of controlled fill*
2. Controlled Structural Fill	*3 (PE/GE)*	*Perform sieve tests (ASTM D422 & D1140) and modified Proctor tests (ASTM D1557) of each source of fill material.* *Inspect placement, lift thickness and compaction of controlled fill.* *Test density of each lift of fill by nuclear methods (ASTM D2922)* *Verify extent and slope of fill placement.*

Cast-in-Place Concrete

Item	Agency # (Qualif.)	Scope
1. Mix Design	*2 (ACI-CCI ICC-RCSI)*	*Review concrete batch tickets and verify compliance with approved mix design. Verify that water added at the site does not exceed that allowed by the mix design.*
2. Reinforcement Installation	*2 (ACI-CCI ICC-RCSI)*	*Inspect size, spacing, cover, positioning and grade of reinforcing steel. Verify that reinforcing bars are free of form oil or other deleterious materials. Inspect bar laps and mechanical splices. Verify that bars are adequately tied and supported on chairs or bolsters*
3. Concrete Placement	*2 ACI-CCI ICC-RCSI*	*Inspect placement of concrete. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated.*
4. Sampling and Testing of Concrete	*3 ACI-CFTT ACI-STT*	*Test concrete compressive strength (ASTM C31 & C39), slump (ASTM C143), air-content (ASTM C231 or C173) and temperature (ASTM C1064).*
5. Curing and Protection	*2 ACI-CCI ICC-RCSI*	*Inspect curing, cold weather protection and hot weather protection procedures.*

Structural Steel

Item	Agency # (Qualif.)	Scope
1. Fabricator Certification/ Quality Control Procedures ☐ Fabricator Exempt	*(3) AWS/AISC-SSI ICC-SWSI*	*Review shop fabrication and quality control procedures.*
2. Material Certification	*(3) AWS/AISC-SSI ICC-SWSI*	*Review certified mill test reports and identification markings on wide-flange shapes, high-strength bolts, nuts and welding electrodes*
3. Structural Details	*(2) PE/SE*	*Inspect steel frame for compliance with structural drawings, including bracing, member configuration and connection details.*

Wood Construction

Item	Agency # (Qualif.)	Scope
4. Framing and Details	*(2) PE/SE*	*Inspect all framing for compliance with structural drawings, including bracing, member configuration and connection details.*

Section 50 80 00
Other Information:
Drawings as Referenced in Lead and Asbestos Specifications

ASB-01
ASB-02
ASB-03

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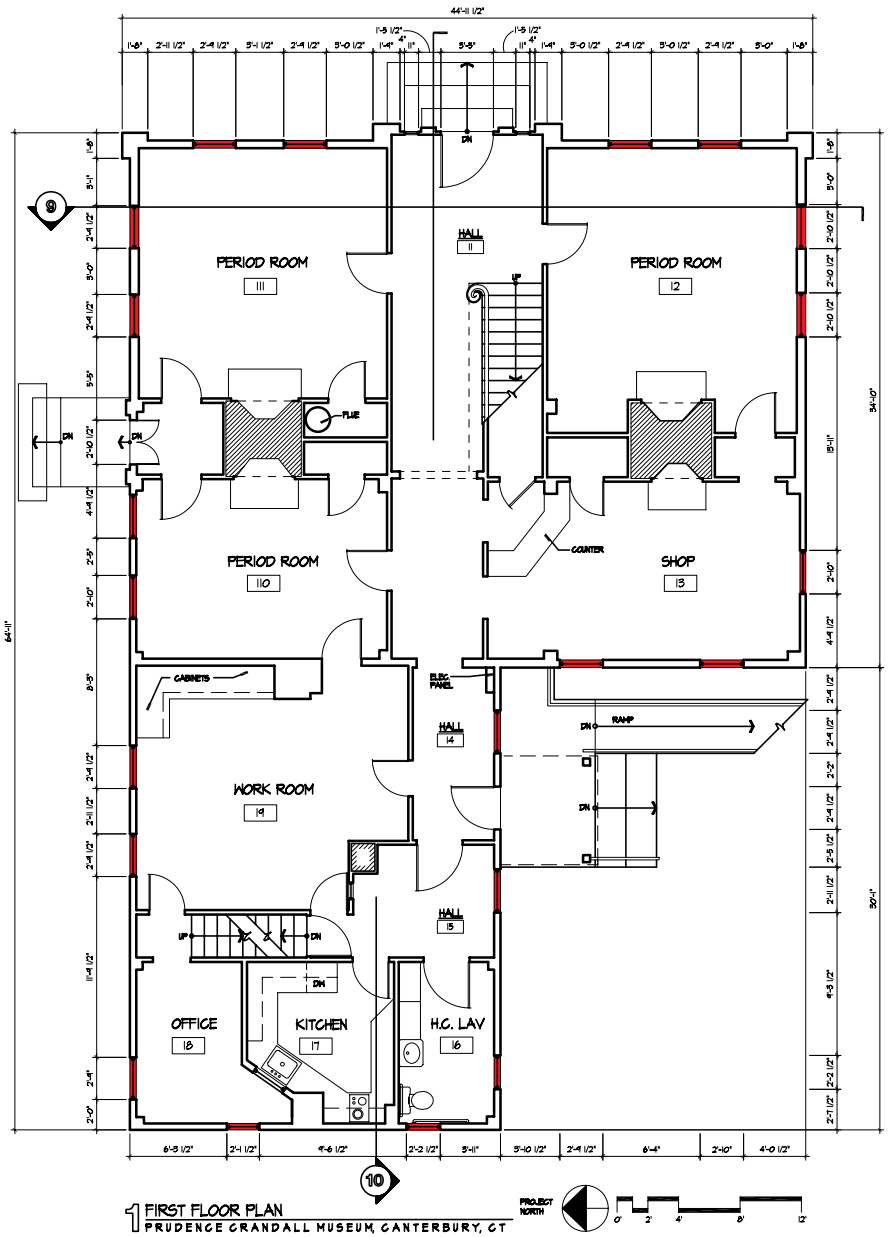
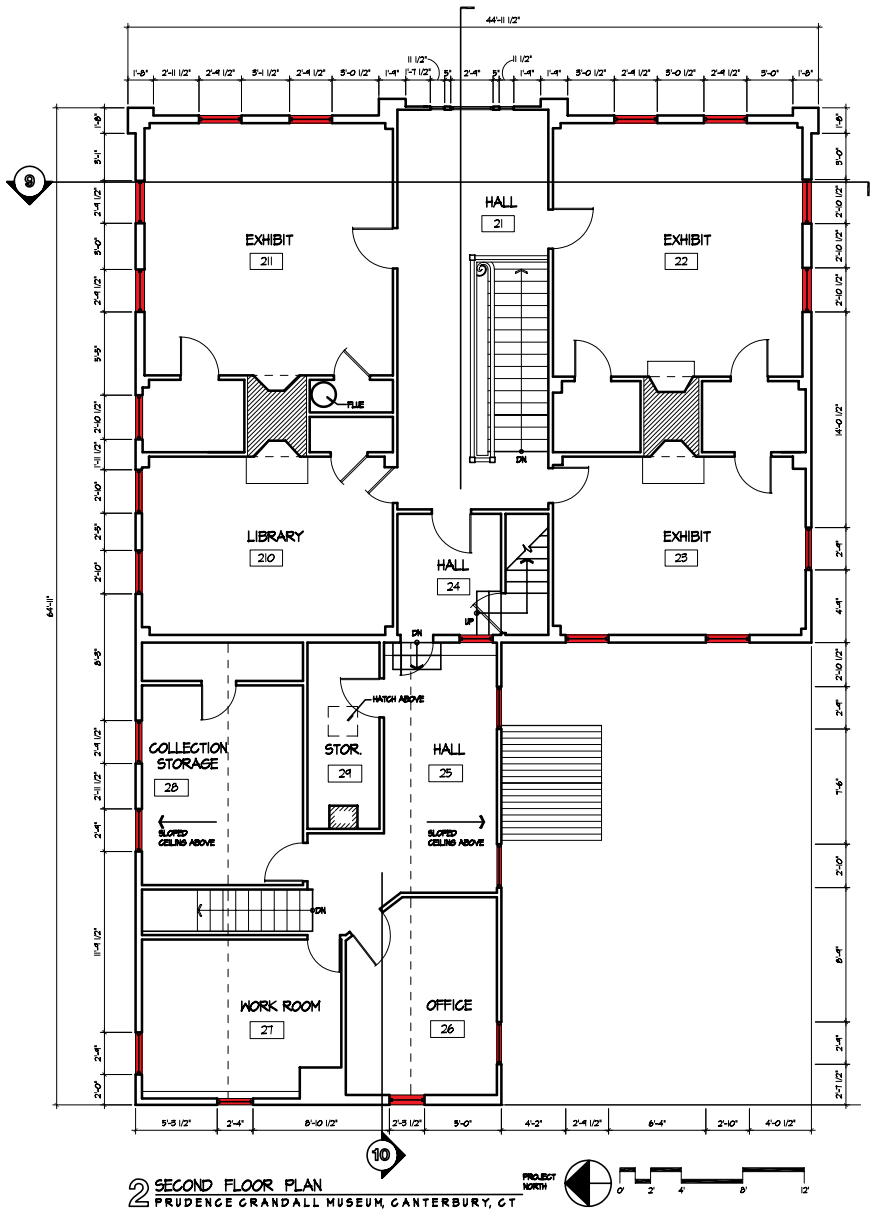


1 FIRST FLOOR PLAN
PRUDENCE GRANDALL MUSEUM, CANTERBURY, CT

PROJECT NORTH



2 SECOND FLOOR PLAN
PRUDENCE GRANDALL MUSEUM, CANTERBURY, CT

PROJECT NORTH

KEY

ACM EXTERIOR WINDOW GLAZE

drawing title
PRUDENCE GRANDALL MUSEUM, CANTERBURY
EXISTING FLOOR PLANS 1 & 2

REVISIONS

mark	date	description

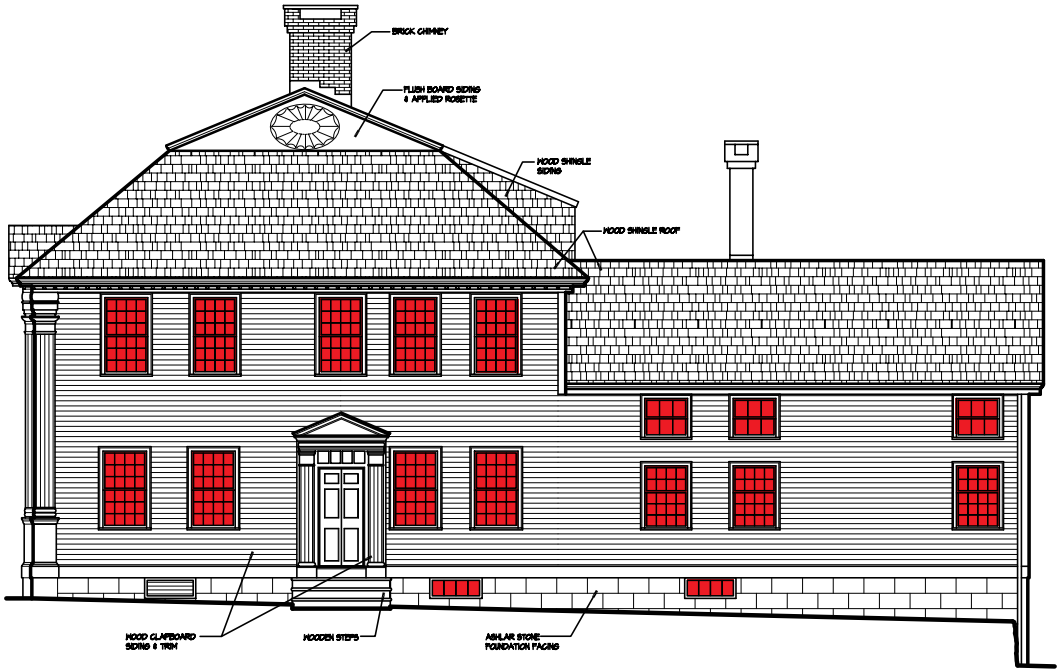
STATE OF CONNECTICUT
DEPARMENT OF PUBLIC WORKS

DRAWING PREPARED BY
TRC
21 Griffin Rd. North
Windsor, CT 06095
T 860.298.9692
TRCcompanies.com

project
FOUR HISTORIC LOCATIONS:
THE CONNECTICUT STATE MUSEUMS
THE CONNECTICUT HISTORICAL COMMISSION

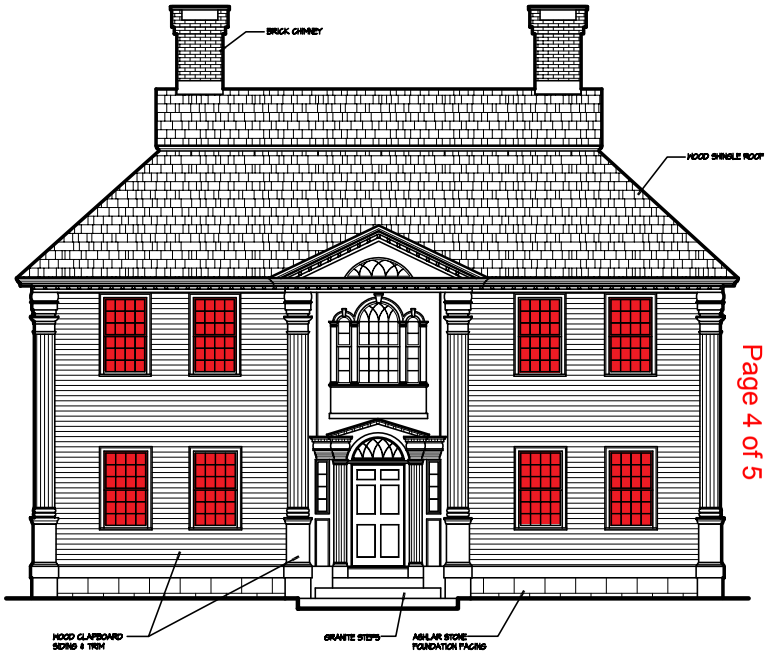
CAD no.
project no. 51-111-025

date 8/8/2019
scale
drawn by
approved by
drawing no. ASB-01



5 NORTH ELEVATION
PRUDENCE GRANDALL MUSEUM, CANTERBURY, CT

0' 2' 4' 8' 12'



6 EAST ELEVATION
PRUDENCE GRANDALL MUSEUM, CANTERBURY, CT

0' 2' 4' 8' 12'

KEY

ACM EXTERIOR WINDOW GLAZE

drawing title
PRUDENCE GRANDALL MUSEUM, CANTERBURY
EXISTING NORTH & EAST ELEVATIONS

REVISIONS

mark	date	description

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC WORKS

DRAWING PREPARED BY
TRC
21 Griffin Rd. North, Windsor, CT 06095
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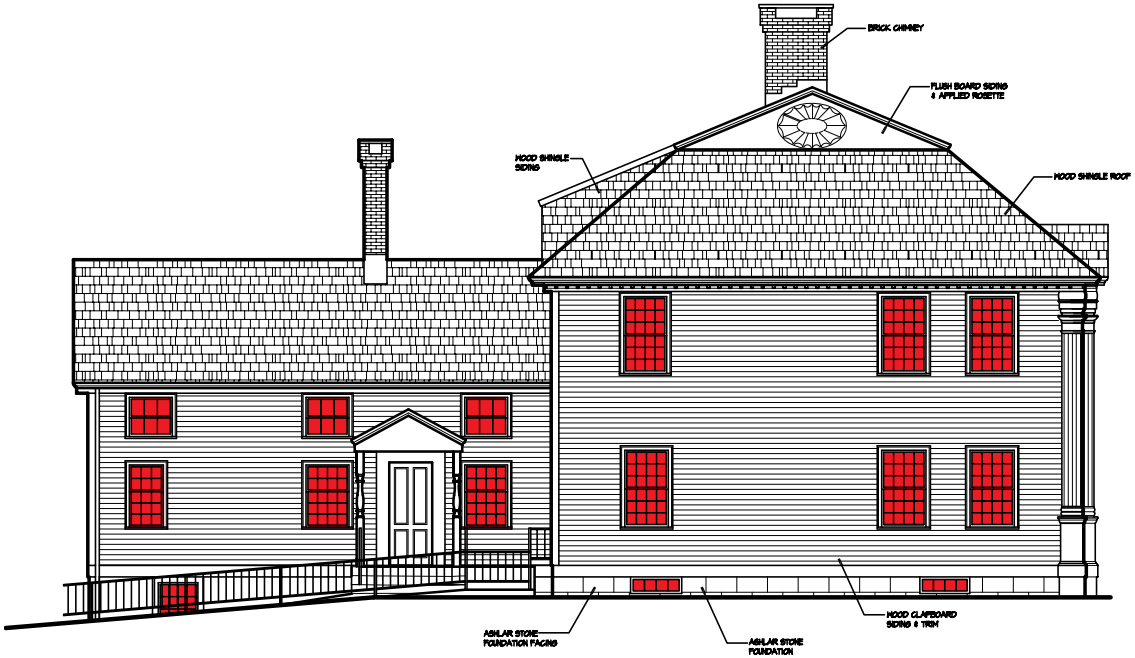
date 8/8/19
scale 1/4"=1'-0"
drawn by
approved by
drawing no. ASB-02

project
THE CONNECTICUT HISTORICAL COMMISSION

CAD no.
project no. 51-HI-025



7 SOUTH ELEVATION
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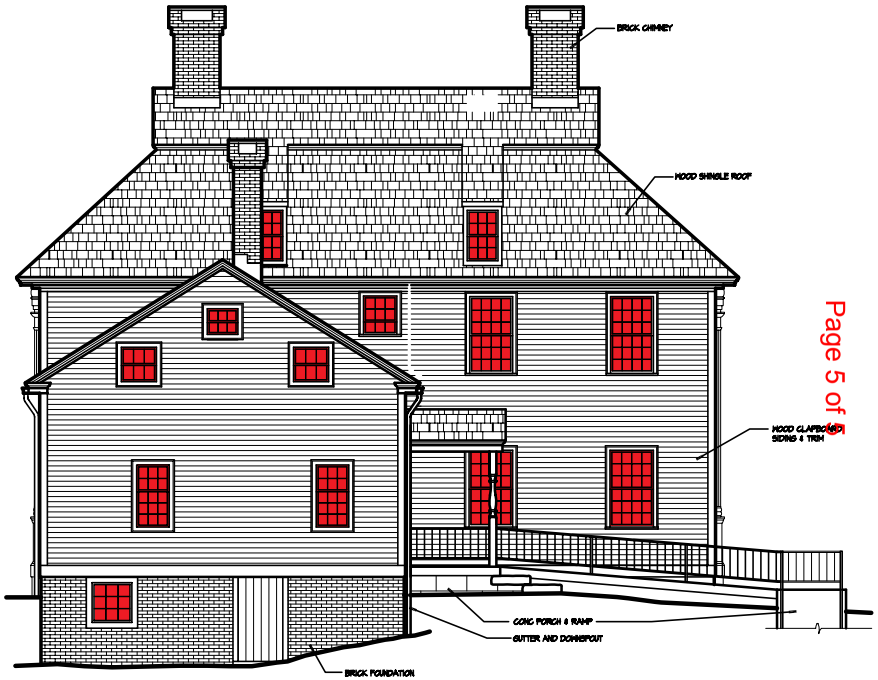

8 WEST ELEVATION
PRUDENCE GRANDALL MUSEUM, CANTERBURY, CT

0' 2' 4' 8' 12'

KEY

ACM EXTERIOR WINDOW GLAZE

drawing title
PRUDENCE GRANDALL MUSEUM, CANTERBURY
EXISTING SOUTH & WEST ELEVATIONS

REVISIONS

mark	date	description

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC WORKS

DRAWING PREPARED BY
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project

CAD no.

project no. 91-HI-023

date 8/8/19
scale 1/4"=1'-0"
drawn by
approved by
drawing no. ASB-03