Windham Senior and Community Center
Addendum #1
10/2/2019

General/Clarifications

Pre Bid Attendance List
(See Attached)

Plan Holders List
(See Attached)

Bid Documents
Plans and specs are dated September 9, 2019. Addendum 1 dated 10/2/19 is the only addendum. All previous versions of this project are obsolete. Current bid documents are available at Advanced Reprographics online planroom.

Owner
Bid Bonds are to list the Town of Windham is to be the Owner

Liquidated damages
Liquidated damages will be $500/day

Project Schedule
The bid opening remains at 2:00 PM on October 9 at the Windham Town Hall.

No additional questions are permitted.

The Town anticipates a contract signing by October 31 and issuing a Notice to Proceed for November 4 2019. The Date of Substantial Completion is projected to be March 27 2021.

No additional time or funds will be granted for working in winter conditions.

Permits
Contractor is responsible for the permit. Fees are waived except for the educational stipend.

Utilities
The fees for water and sewer connection will be waived.

Insurance
See attached insurance requirements and AIA A101 Exhibit A. The Town of Windham be responsible for the Builders Risk Policy. The Contractor will be responsible for reimbursing the Owner for the deductible value of that policy.

CHRO
The Value of the State Grant is $1,343,635.00. This portion of the project is required to comply with CHRO set aside requirements. Exceeding the minimum requirements is highly encouraged.

Adjacent building
Contractor is responsible to take all necessary precautions to not disturb the existing building to the west of the exiting retaining wall. Field verify all conditions

Alternate #4
Alternate #4 is to be a DEDUCT alternate, all work shown as alternate #4 shall be assumed to be a deduct from the Base Bid. See revised Bid Form

Overhead and Profit
Contractor is allowed 6% OH&P markups on work performed by a Subcontractor. Self-performed work may be marked up as follows:

Change order amount	OH&P
$0 - $5,000	20%
$5,001 - $15,000	17%
$15,001 - $25,000	15%
$25,000 and greater	12%

Roof
Replace all references of EPDM with TPO. Assembly to include a mechanically fastened underlayment board, self-adhered vapor retarder, adhered insulation, adhered high density cover board, and TPO.

Gym Equipment
Basketball goals are to be motorized, see specified model. Contractor is to include all necessary power

Mat Hoist
Contractor is to provide (2) wall mounted mat hoist in mezzanine in lieu of previous selection. Basis of design is Porter 91107XXCXX. Contractor is to include all required structural brackets and power. See Mezzanine floor plan and RCP for revisions.

Wall Type C4
Wall to be 10" CMU, meet UL #935 and carry minimum fire rating as indicated on R1.1

Tnemec Paint
All decking and structural components in the pool room and mezzanine ceiling are to be coated w/ tnemec paint including areas with ACT or drop ceiling.

Closed Cell Spray Insulation
Closed Cell spray insulation is to be Encapsulated w/ 5/8" GWB, typ. for all locations. Contractor is to provide all required blocking.

Gym/Pool Ceilings
Tectum Panels are to be 24" x 48" and installed as indicated on RCP and detail 3/A2.12. Contractor to coordinate all ceiling components with truss openings and adjust layout and/or modify panels as needed.

Pocket Door
Wall separating Admin 117 and Act. Coor. 118 is to be 6" mtl stud to accommodate pocket door construction.

Site Benches
Arm rest are to be provided on all site benches

AS Hanging Display System
See 3/A7.6. Note reads "Provide & install picture rail & hooks, refer to notes on finish schedule." 26' total length. Ref spec section 119000.

Heat Trace
All (below slab) interior grease waste piping shall be heat traced.

Control Joints
Control joints on S1.1 are for bidding purposes only. Architect may modify layout prior to installation.

Pool
See revised A1.0 for trench drain, coordinate location of precast tank to avoid conflict. Trench drain to be 4" UV stabilized PVC consisting of 4" wide x 3.5" deep extruded base w/ interlocking grate. Basis of design: Lawson Aquatics Drain the Deck system. Include all outlets and accessories. Assembly to meet all ADA requirements.

The Sequence of Operations (SOO-section 230993) indicates that there are hot water boilers and associated pumps for the lap and recreational pools. See Pool drawings and spec for full list of equipment.

The bearing capacity of the soil will need to be 2,500-3,000lbs/sq.ft. The pool contractor is responsible for pool construction drawings for submittal to the state health department, these would include engineered designed structural details and construction requirements based on site conditions and the project specifications and drawing packages

Pool installer is to coordinate with all associated trades including the provision and/or verification of all required equipotential grounding. All required traps and vents are to be included in Contractors bid price.

Controls and Electrical
See revised spec section 230923 for more information
Equipment is to be provided with BACnet mstp factory controls and only to be integrated by controls contractor
Contractor is to provide a server to collect 60 months of historical data storage per DDC spec
Future expandability is not required as previously referenced in DDC spec.
Controls contractor shall provide all non-factory controls and BACnet interface.
Utility and energy reports will be removed from DDC spec
DDC spec is revised to three days of extended operation test for which a technician is required to man the operator workstation on site for 8 hours per day in lieu of 28 consecutive calendar days.
Electrical plans are updated to show 2x60A for the VRF

FRP
Provide Marlite Standard FRP 4'x9' panel size in lieu of Marlite Artisan FRP.

Glazing film
Glazing film is to be used at Activity Space #149, Lobby #100 glass doors, Waiting #140 glass door, Admin #117 & Waiting #140 interior windows, refer to finish floor plans for clarification
For WFM1 & WFM3, use film #SH2EMOS Oslo. For WFM2 use film #SH2EMWP Weave Pearl

Barn Doors
Basis of Design: Richelieu, Style: Slab, Finish: Burned Yosemite, with "Classic Barn door" system hardware kit

Signage
See attached updated sketches and schedule. Refer to Signage sketch notes on each sign type for Takeform model number indicated. "Full range" referring to full range of laminate color options for backer, laminate color intended to match door finish.
Directional signage (only) to have custom graphic on acrylic backer

Sunshades
Spec for sunshades is included in section 084113

Changes to the Drawings

Replace Sheets S1.1, S1.2, S1.6, S1.7, S3.0, S3.1, S3.6, S3.10, S5.1, A1.1a, A1.1b, A1.1bA, A1.2b, A1.3, A2.1r, A2.2, A2.3, A5.0, A5.4, A5.7 A9.1, FP1.1, P0.1, P0.2, P1.1, P1.2, P1.3, P1.4, P2.1, P2.2, P2.5, P3.1, M1.3, M1.4, EL1.1, EL1.2, EL2.1, EP1.1, EP1.2, EP2.1, EP3.0, E5.0, with the attached sheets.

Changes to the Specs

RREPLACE Sections 087100 Door Hardware, 101400 Signage Schedule and Sketches, 230923 Direct Digital control (DDC) System for HVAC and 275116 Specialized Local Sound System with the attached sections

ADD Section 131500 Swimming Pool filtration, Recirculation, control, Chemical and Components

End of Addendum #1

Colliers INTERNATIONAL

Project Meeting

MEETING SIGN-IN SHEET

September 11, 2019

	Name:	Representing:	Phone #	Email:
1	George Barnes	Colliers	203-215-6573	george.barnes@colliers.com
2	Tom Arcari	QA&M	860-677-4594	tarcari@qamarch.com
3	RICHARD WALSH	ENFIELD BUILDERS, INC	8·627·6870	rwalsh@enfieldbuilders.com
4	Anthony D'Amato	D'Amato Const.	860-583-3489	adamato@damatoconstruction.com
5	Ed. D'Amato, Jr.	D'Amato Const.	860-583-3489	edamatojr@damatoconstr.com
6	TODD D'ELIA	LaCosa Building Group	203-237-1770	VPARETE@LACOSABG.COM
7	BILL COTE	CTC	860-685-1576	BCOTE@CTEMPCONTROLS.COM
8	Gary Broderick	A. Secondino & Son	203-481-3496	gbroderick@asecondinoandson.com
9	Danielle Couture	A. Secondino & Son	203-481-3496	dcouture@asecondinoandson.com
10	Frank Kronenberger	Kronenberger and Sons Rst.	860-347-4600	estimating@kronenbergersons.com
11	Allison Annulli	Orlando Annulli & Sons Inc	860-644-2427	JON@ANNULLI.COM
12	TOM PEREIRA	ZLOTNICK CONSTRUCTION	8604563221	BIDS@ZLOTNICKCONSTRUCTION.COM
13	JOE RUIZ	"	"	"
14	Jonathan Sygrove	Sarazin General Contractors	860-456-4576	jsygrove@sarazin.com
15	Luke Alloway	Carlin Con. Comp.	860-444-2567	lalloway@carlinconstruction.com

Project
Meeting

MEETING SIGN-IN SHEET

September 11, 2019

	Name:	Representing:	Phone #	Email:
16	Bedrich Hajek	Giordano Construction	203-488-7264	beh@giordano,build
17	Rich Mcloughlin	Barton Construction	203 234 2353	soldman@bartonconstruction.com (estimating)
18	MIKE CLIFFORD	BRD BUILDERS	860-706-0359	mikecliffford70@gmail.com
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ADVANCED REPROGRAPHICS

Login

Windham Senior & Community Center

The proposed work consists of the construction of a new 33,000SF single story Senior and Community Center building. The new facility will house a gymnasium, locker rooms, 4-lane natatorium, wrestling room, activity spaces, fitness spaces, classrooms, multi-function room, full commercial kitchen and an administrative suite

Plan Holders

Company	Contact
A. Secondino & Son, Inc. 51 Sherman Hill Road, Suite 204 A Woodbury, CT 06798	**Danielle Couture** Tel: 203-481-3496 Fax: 203-483-8804
Construction Resources, Inc 25 Robert Jackson Way Plainville, CT 06062	**Paulo Ribeiro** Tel: 860-678-0663
D'Amato Construction 400 Middle Street Bristol, CT 06010	**Darian D'Amato** Tel: 8605833489
Enfield Builders 1654 King Street PO Box 1201 Enfield, CT 06083	**Richard Walsh** Tel: 860-627-6870 Fax: 860-627-8017
Kronenberger & Sons Restoration Inc. 175 Industrial Park Road Middletown, CT 06457	**Thomas R Loveless** Tel: 8603474600
LaRosa Building Group, LLC 163 Research Parkway Meriden, CT 06450	**Tiffany Lengyel** Tel: 203-235-1770 Fax: 203-599-6213
Naek Construction Company, Inc. 27 Naek Road Vernon, CT 06066	**Sandra Chuck** Tel: 860-875-1895 Fax: 860-872-3251
Orlando Annulli and Sons, Inc. 147 Hale Road Manchester, CT 06042	**Allison Annulli** Tel: 860-644-2427 Fax: 860-644-6505
PAC Group 126 South Main St Torrington, CT 06790	**Neal Gorneault** Tel: 860-485-9404
Zlotnick Construction Inc 161 Storrs Rd Mansfield Center, CT 06250	**Gregory G.Zlotnick** Tel: 8604563221

FORM OF BID

NEW CONSTRUCTION
WINDHAM SENIOR and COMMUNITY CENTER
WILLIMANTIC, CT

PROPOSAL
OF:_____
(Official name of company and hereinafter called "bidder")

organized and existing under the laws of the state of _____, and doing business as: ☐ a corporation, ☐ a partnership, or ☐ an individual *(check one).*

The Town of Windham, hereinafter called the "Owner".

READERS:

The BIDDER, in compliance with your invitation to bid for **THE NEW WINDHAM COMMUNITY AND SENIOR CENTER,** for the **TOWN OF WINDHAM**, having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the contract documents; within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the contract documents, of which this proposal is a part.

BIDDER hereby agrees to commence work under this contract on **November 4, 2019** and to fully complete the project within **509** consecutive calendar days thereafter as stipulated in the specifications. Bidder further agrees to pay as liquidated damages, the sum of **$500** for each consecutive calendar day thereafter.

BIDDER acknowledges receipt of the following addenda:

1._____

2._____

3._____

PROPOSAL:

The bidder agrees to furnish and install all labor and materials required to fully construct the work in accordance with the contract documents dated **SEPTEMBER 9, 2019**.

BASE BID:

For the sum of: _____
(Indicate the dollar amount of the bid using written words)

$ _____
(Indicate same amount using figures)

In the case of a discrepancy, the bid amount shown in words will prevail.

ADD Alternate #1: Exterior Patio adjacent to Multi-Purpose Rooms on the East:

Alternate price includes all preparatory and incidental work to provide a complete installation in full accordance with ALL drawings and specifications.

Add Alternate #1 **$**_____

_____

ADD Alternate #2: Planting irrigation system:

Alternate price includes all preparatory and incidental work to provide a complete installation in full accordance with ALL drawings and specifications.

Add Alternate #2 **$**_____

_____

ADD Alternate #3: Add 5th lane at Pool:

Alternate price includes all preparatory and incidental work to provide a complete installation in full accordance with ALL drawings and specifications.

Add Alternate #3 **$**_____

_____

DEDUCT Alternate #4 Remove Fitness Room and Adjoining Spaces:

Alternate price includes all preparatory and incidental work to provide a complete installation in full accordance with ALL drawings and specifications.

DEDUCT Alternate #4 **$**_____

_____

ADD Alternate #5: Provide exterior aluminum sunshades in locations indicated:

Alternate price includes all preparatory and incidental work to provide a complete installation in full accordance with ALL drawings and specifications.

Add Alternate #5 **$**_____

_____

ADD Alternate #6: Provide decorative wall panels in Rooms 100 and 200:

Alternate price includes all preparatory and incidental work to provide a complete installation in full accordance with ALL drawings and specifications.

Add Alternate #6 **$**_____

_____

ADD Alternate #7: Provide ceramic tile flooring in Pool in lieu of cementitious coating:

Alternate price includes all preparatory and incidental work to provide a complete installation in full accordance with ALL drawings and specifications.

Add Alternate #7 **$**_____

_____

ADD Alternate #8: Provide cork wall tiles in administrative offices:

Alternate price includes all preparatory and incidental work to provide a complete installation in full accordance with ALL drawings and specifications.

Add Alternate #8 **$**_____

_____

ADD Alternate #9: Provide storage cabinets along the west wall of the main Multi-Purpose space.

Alternate price includes all preparatory and incidental work to provide a complete installation in full accordance with ALL drawings and specifications.

Add Alternate #9 **$**_____

_____

The BIDDER understands that the OWNER reserves the right to reject any or all bids and to waive any informalities in the bidding.

The BIDDER agrees that this bid shall be valid and may not be withdrawn for a period of 60 calendar days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, the BIDDER will execute the OWNER'S formal contract within 10 days and deliver Surety Bonds as required.

The bid security attached in the sum of $_____ is to become the property of the OWNER in the event the contract and bonds are not executed within the time set forth, as liquidated damages for the delay and additional expense to the OWNER caused thereby.

RESPECTFULLY SUBMITTED BY:

_____ _____

(authorized signature of bidder) *(date)*

Company Name: _____

Address: _____

Contact Name: _____

Title: _____

Phone: _____ Email: _____

FEIN or SSN#: _____

If bid is submitted by a corporation, its seal must appear.

NOTE: The penalty for making false statements in offers is prescribed in U.S.C. 1001.

Insurance Requirements

Contractor shall agree to maintain in force at all times during the contract the following minimum coverages and shall name the Town of Windham as an Additional Insured on a primary and non-contributory basis to all policies, except Workers Compensation. All policies should also include a Waiver of Subrogation. Insurance shall be written with Carriers approved in the State of Connecticut and with a minimum AM Best's Rating of "A-" VIII. In addition, all Carriers are subject to approval by the Town of Windham.

		(Minimum Limits)
General Liability	Each Occurrence	$1,000,000
	General Aggregate	$2,000,000
	Products/Completed Operations Aggregate	$2,000,000
Auto Liability-	Combined Single Limit	
Any Auto	Each Accident	$1,000,000
Contractors	Each Claim	$1,000,000
Professional Liability	Aggregate	$1,000,000
Umbrella	Each Occurrence	$10,000,000
(Excess Liability)	Aggregate	$10,000,000

If any policy is written on a "Claims Made" basis, the policy must be continually renewed for a minimum of two (2) years from the completion date of this contract. If the policy is replaced and/or the retroactive date is changed, then the expiring policy must be endorsed to extend the reporting period for claims for the policy in effect during the contract for two (2) years from the completion date.

Workers' Compensation and	WC Statutory Limits	
Employers' Liability	EL Each Accident	$1,000,000
	EL Disease Each Employee	$1,000,000
	EL Disease Policy Limit	$1,000,000

Original, completed Certificates of Insurance must be presented to the Town of Windham prior to contract issuance. Contractor agrees to provide replacement/renewal certificates at least 30 days prior to the expiration date of the policies. Should any of the above described policies be cancelled, limits reduced or coverage altered, 30 days written notice must be given to the Town.

DRAFT AIA® Document A101™ – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

for the following PROJECT:
(Name and location or address)

« »
« »

THE OWNER:
(Name, legal status and address)

« »« »
« »

THE CONTRACTOR:
(Name, legal status and address)

« »« »
« »

TABLE OF ARTICLES

A.1 GENERAL

A.2 OWNER'S INSURANCE

A.3 CONTRACTOR'S INSURANCE AND BONDS

A.4 SPECIAL TERMS AND CONDITIONS

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

§ A.2.3 Required Property Insurance

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A201™–2017, General Conditions of the Contract for Construction. Article 11 of A201™–2017 contains additional insurance provisions.

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User Notes: (1416852310)

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the property insurance requires deductibles, the party initiating the claim shall pay costs not covered because of such deductibles. Notwithstanding, if the cause of any loss payment under such insurance is the fault of the Contractor, then Contractor shall pay such deductible.

~~If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.~~

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures
If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

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User Notes: (1416852310)

§ A.2.4 Optional Extended Property Insurance.

The Owner shall purchase and maintain the insurance selected and described below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

[« »] § A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

« »

[« »] § A.2.4.2 Ordinance or Law Insurance, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

« »

[« »] § A.2.4.3 Expediting Cost Insurance, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

« »

[« »] § A.2.4.4 Extra Expense Insurance, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

« »

[« »] § A.2.4.5 Civil Authority Insurance, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

« »

[« »] § A.2.4.6 Ingress/Egress Insurance, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

« »

[« »] § A.2.4.7 Soft Costs Insurance, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

« »

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

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User Notes: (1416852310)

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[« »] § A.2.5.1 Cyber Security Insurance for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information. *(Indicate applicable limits of coverage or other conditions in the fill point below.)*

« »

[« »] § A.2.5.2 Other Insurance
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits

§ A.2.6 Time Limits on Claims. Claims made by any party must be initiated within 30 calendar days after occurrence of the event giving rise to such Claim or within 30 calendar days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be initiated by written notice to the Owner's Representative and the Surety.

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, ~~the Architect, and the Architect's consultants~~ as additional insured~~s~~ for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.1.3.1 The limits specified in the contract documents are minimum requirements and shall not be construed in any way as limits of liability or as constituting acceptance by Owner of responsibility for losses in excess of such limits. The Contractor shall be responsible for all deductibles applicable to any insurance. No acceptance and/or approval of any insurance by Owner shall be construed as relieving or excusing Contractor from any liability or obligation imposed by the provisions of the Contract Documents.

The Contractor shall provide a Blanket Additional Insured Endorsement and shall provide Owner with evidence of worker's compensation coverage.

§ A.3.1.3.2 The Contractor shall not commence the Work under the Contract nor permit any subcontractor to commence work on a subcontract until all the insurance required is obtained. The Contractor may carry, at its own

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expense, such additional coverage as it may deem necessary. The Contractor shall not be deemed to be relieved of any responsibility by the fact it carries insurance. Should the Contractor at any time neglect or refuse to provide the insurance required herein or should such insurance be cancelled, or should the full annual aggregate or any policy not be available to satisfy the requirements of the Contract, the Owner shall have the right to procure such insurance and the cost thereof shall be deducted from monies then due or thereafter to become due the Contractor.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

« »

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than « » ($ « ») each occurrence, « » ($ « ») general aggregate, and « » ($ « ») aggregate for products-completed operations hazard, providing coverage for claims including

.1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
.2 personal injury and advertising injury;
.3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
.4 bodily injury or property damage arising out of completed operations; and
.5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
.2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
.3 Claims for bodily injury other than to employees of the insured.
.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
.8 Claims related to roofing, if the Work involves roofing.
.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
.10 Claims related to earth subsidence or movement, where the Work involves such hazards.
.11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than « » ($ « ») per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such

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primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than « » ($ « ») each accident, « » ($ « ») each employee, and « » ($ « ») policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

« »

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.
(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[« »] § A.3.3.2.1 Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:

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(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

« »

[« »] § A.3.3.2.2 Railroad Protective Liability Insurance, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate, for Work within fifty (50) feet of railroad property.

[« »] § A.3.3.2.3 Asbestos Abatement Liability Insurance, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

[« »] § A.3.3.2.4 Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[« »] § A.3.3.2.5 Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[« »] § A.3.3.2.6 Other Insurance
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ A.3.3.3 Such coverage shall be maintained for no less than four (4) years following final payment. The Owner shall be named additional insureds. Contractor shall provide a Blanket Additional Insured Endorsement. Contractor shall provide Owner with evidence of workers' compensation coverage.

§ A.3.4 Performance Bond and Payment Bond
The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond	
Performance Bond	

The surety, form and substance of the bond shall be satisfactory to the Owner. Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570, as amended) and be authorized to transact business in the state in which the Project is located.

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS
Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

« »

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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 this Section.

1.2 SECTION INCLUDES

A. Furnish and deliver all finish hardware necessary for all doors, also hardware as specified herein and as enumerated in hardware sets and as indicated and required by actual conditions at the building. The hardware shall include the furnishing of all necessary screws, bolts, expansion shields, drop plates, and all other devices necessary for the proper application of the hardware.

1.3 RELATED SECTIONS

A. Division 06 - Wood, Plastics, and Composites

B. Section 08 11 13 - Hollow Metal Doors and Frames

C. Section 08 14 16 - Flush Wood Doors

D. Section 08 41 13 - Aluminum-Framed Entrances and Storefronts

E. Section 08 42 29 – Automatic Entrances

F. Section 08 80 00 - Glazing

G. Division 26 - Electrical

H. Division 28 - Electronic Safety and Security

I. Specific Omissions: Hardware for the following is specified or indicated elsewhere, unless specifically listed in the hardware sets:
   1. Windows.
   2. Cabinets of all kinds, including open wall shelving and locks.
   3. Signs, except as noted.
   4. Toilet accessories of all kinds including grab bars and coat hooks.
   5. Overhead doors (except cylinders where scheduled).
   6. Electro-magnetic door holders (wall mounted).

1.4 REFERENCES

A. International Code Congress (ICC)/American National Standards Institute (ANSI):
   1. ICC/ANSI A117.1, Accessible and Usable Buildings and Facilities.
   2. ANSI/BHMA A156.1 – A156.24 – Standards for Hardware and Specialties.

B. National Fire Protection Association (NFPA):
   1. NFPA 80 - Standard for Fire Doors and Fire Windows
   2. NFPA 101 - Life Safety Code
   3. NFPA 105 - Smoke and Draft Control Door Assemblies

C. Underwriters Laboratories, Inc. (UL):
   1. UL 10C - Positive Pressure Test of Fire Door Assemblies
   2. UL 1784 - Air Leakage Tests of Door Assemblies
   3. UL 305 - Panic Hardware

D. Applicable state and local building codes.

E. Accessibility
   1. ADA - Americans with Disabilities Act
   2. ICC / ANSI A117.1 - Accessible and Usable Buildings and Facilities

F. Door and Hardware Institute (DHI):
   1. Sequence and Format for the Hardware Schedule.
   2. Recommended Locations for Builders Hardware

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Include manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
   1. Type, style, function, size, and finish of each hardware item.
   2. Name and manufacturer of each item.
   3. Fastenings and other pertinent information.
   4. Location of each hardware set cross-referenced to indications on Drawings.
   5. Explanation of all abbreviations, symbols, and codes contained in schedule.
   6. Mounting locations for hardware.
   7. Mounting type for closers.
   8. Door and frame sizes, materials, degree of opening, handing, and fire/smoke rating.
   9. Name and phone number for the local manufacturer's representative for each product.
   10. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and/or access control components). Operational description should include how the door will operate on egress, ingress, and/or fire/smoke alarm connection.
   11. Riser and point to point wiring diagrams for all openings with electrified hardware.

D. Key Schedule: After a keying meeting between representatives of the Owner, Architect, and the hardware supplier, provide a keying schedule, listing the levels of keying, as well as an explanation of the key system's function, the key symbols used, and the door numbers controlled. This schedule can be submitted as a part of the hardware schedule or as a separate schedule.

E. Samples: If requested by the Architect, submit samples of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule.
   1. Samples will be returned to the supplier in like-new condition. Units that are acceptable may, after final check of operations, be incorporated in the Work, within limitations of key coordination requirements.

F. Templates: After final approval of the hardware schedule, provide templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware.

G. Wiring Diagrams: After final approval of the hardware schedule, submit wiring diagrams as required for the proper installation of all electrical, electro-mechanical, and/or electro-magnetic products.

H. Operations and Maintenance Data: Provide in accordance with Section 01 78 23 and include the following:
   1. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
   2. Catalog pages for each product.
   3. Name, address, and phone number of local representative for each manufacturer.
   4. Parts list for each product.
   5. Copy of final approved hardware schedule, edited to reflect "As installed."
   6. Copy of final keying schedule.
   7. As installed "Wiring Diagrams" for each opening connected to power, both low voltage and 110 volts.
   8. One (1) complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
   9. Copy of warranties including appropriate reference numbers for manufacturers to identify the project.

1.6 QUALITY ASSURANCE

A. Substitutions: Submit substitutions in accordance with Division 01.

B. Supplier Qualifications: A recognized architectural hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an accredited Architectural Hardware Consultant (AHC), who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work for consultation.

C. Product Single Source Responsibility: Obtain each type of hardware (latch and locksets, hinges, closers, etc.) from a single manufacturer.

D. Supplier Single Source Responsibility: Procure hardware for all doors from a single supplier.

E. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Warnock Hersey, Factory Mutual, or other testing and inspecting organization acceptable to the authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

F. Electronic Security Hardware: When electrified hardware is included in the hardware specification, the hardware supplier must employ an individual knowledgeable in electrified components and systems, who is capable of producing wiring diagrams and consulting as needed. Coordinate installation of the electronic security hardware with the Architect and electrical engineers and provide installation and technical data to

the Architect and other related sub-contractor. Upon completion of electronic security hardware installation, verify that all components are working properly, and state in the required guarantee that this inspection has been performed.

1.7 DELIVERY, STORAGE AND HANDLING

A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.

B. Each article of hardware shall be individually packaged in manufacturer's original packaging.

C. Contractor will provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items so that completion of the Work will not be delayed by hardware losses both before and after installation.

D. Items damaged in shipment shall be replaced promptly and with proper material and paid for by whomever did the damage or caused the damage to occur.

E. All the hardware shall be handled at this project in a manner to avoid damage, marring or scratching. Any irregularities that occur to the hardware after it has been delivered to the project shall be corrected, replaced or repaired by the Contractor at their expense. All hardware items shall be protected against malfunction due to paint, solvent, cleanser or any chemical agent.

F. No direct shipments will be allowed unless approved by the Contractor.

1.8 WARRANTY

A. Starting date for warranty periods to be date of manufacture of that hardware item.

B. No liability is to be assumed where damage or faulty operation is due to improper installation, improper usage or abuse.

C. Provide guarantee from hardware supplier as follows:
1. Hinges: Life of the building.
2. Closers: 25 years.
3. ADA Operators: 2 years, mechanical; 2 years, electrical.
4. Locksets: 10 years; except electrified locksets, 2 years.
5. Exit Devices: 10 years; except electrified devices, 2 years.
6. All other Hardware: One (1) year.

D. Products judged to be defective during the warranty period shall be replaced or repaired in accordance with the manufacturer’s warranty, at no additional cost to the Owner.

1.9 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner’s continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approval of manufacturers other than those listed shall be in accordance with Paragraph 1.6A.

B. Note that even though an acceptable substitute manufacturer may be listed, the product must provide all the functions and features of the specified product or it will not be approved.

C. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

D. Where the exact types of hardware specified are not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having as nearly as possible the same operation and quality as the type specified, subject to Architect's approval.

2.2 MATERIALS

A. Fasteners:
1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including “prepared for paint” surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely.
4. All hardware shall be installed with the fasteners provided by the hardware manufacturer.

2.3 HINGES

A. Provide five-knuckle, concealed bearing hinges of type, material, and height as outlined in the following guide for this specification:

B. 1-3/4 inch thick doors, up to and including 36 inches wide:
1. Exterior: standard weight, stainless steel, 4-1/2 inches high
2. Interior: standard weight, steel, 4-1/2 inches high

C. 1-3/4 inch thick doors over 36 inches wide:
1. Exterior: heavy weight, stainless steel, 5 inches high
2. Interior: heavy weight, steel, 5 inches high

D. 2 inches or thicker doors:
1. Exterior: heavy weight, stainless steel, 5 inches high
2. Interior: heavy weight, steel, 5 inches high

E. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.

F. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   1. Steel Hinges: Steel pins
   2. Non-Ferrous Hinges: Stainless steel pins
   3. Out-Swinging Exterior Doors: Non-removable pins
   4. Out-Swinging Interior Lockable Doors: Non-removable pins
   5. Interior Non-lockable Doors: Non-rising pins

G. The width of hinges shall be 4-1/2 inches at 1-3/4 inch thick doors, and 5 inches at 2 inches or thicker doors. Adjust hinge width as required for door, frame, and/or wall conditions to allow proper degree of opening.

H. Provide hinges with electrified option where specified. Provide with sufficient number and gage of concealed wires to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to the electrified locking component.

I. Provide mortar guard for each electrified hinge specified, unless specified in hollow metal frame specification.

J. Acceptable manufacturers and/or products: Stanley CB series, Hager AB series, and McKinney TCA/T4CA series.

2.4 CONTINUOUS HINGES - GEARED

A. Provide aluminum geared continuous hinges conforming to ANSI A156.25, Grade 1.

B. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T5 aluminum.

C. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation. Provide hinge with no less than 32 bearings.

D. Hinges shall be capable of supporting door weights up to 600 pounds, and shall be successfully tested for 1,500,000 cycles.

E. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by a testing agency acceptable to the authority having jurisdiction.

F. Install hinges with fasteners supplied by manufacturer.

G. Acceptable manufacturers and products: Stanley, 661HD series, and Select SL11HD series.

2.5 POCKET DOOR HARDWARE

A. Provide complete sets of pocket door hardware as recommended by the manufacturer for the door type and weight.

B. Include track, hangers, fasteners, guides, and all hardware required for a complete installation.

C. Acceptable manufacturers and/or products: Stanley, Hager, Lawrence.

2.6 SLIDING/BARN DOOR HARDWARE

A. Provide complete sets of sliding door hardware as recommended by the manufacturer for the door type and weight.
   1. Include track, channels, brackets, hangers, fasteners, guides, pulls, and all hardware required for a complete installation.

B. Acceptable manufacturers and/or products: National Guard Products, Hafele, Henderson.

2.7 ELECTRIC POWER TRANSFER

A. Provide power transfer sufficient for number and gage of wires to accommodate electric function of specified hardware.

B. Electric power transfer is to be located per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

C. Acceptable manufacturers and/or products: Dorma, Von Duprin, ABH Manufacturing.

2.8 FLUSH BOLTS

A. Provide automatic and manual flush bolts with forged bronze face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch steel or brass rods at doors up to 90 inches in height. Top rods at manual flush bolts for doors over 90 inches in height shall be increased by 6 inches for each additional 6 inches of door height. Provide dust-proof strikes at each bottom flush bolt.

B. Acceptable manufacturers and/or products: Trimco, Don-Jo Mfg., Burns.

2.9 COORDINATORS

A. Provide a bar-type coordinating device, surface applied to the underside of the stop at the frame head where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors.

B. Provide a filler bar of the correct length for the unit to span the entire width of the opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.

C. Acceptable manufacturers and/or products: Trimco, Don-Jo Mfg., Burns.

2.10 MORTISE LOCKS

A. Provide mortise locks that comply with ANSI A156.13, Series 1000, BHMA Grade 1 Operational and Grade 2 Security and are ULC listed, and appear in BHMA's "Directory of Certified Locks & Latches".

B. Locks shall have stamped steel case with steel or brass parts, and levers constructed of forged or cast brass, bronze or stainless steel construction.

C. Lever design shall be Dorma LCA.

D. Provide function numbers and descriptions indicated at the end of this Section.

E. Lock throw shall comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
   1. Mortise Locks: Minimum 3/4-inch latch bolt throw.
   2. Mortise Locks & Latches shall have an anti-friction, 3/4-inch throw latch bolt with anti-friction piece made of self-lubricated stainless steel. Latch bolt with plastic insert and three-piece latch bolt are unacceptable on this project.
   3. Mortise Locks & Latches shall have levers to be operated with a roller bearing spindle hub mechanism.

F. Acceptable manufacturers and/or products: Dorma M9000 series, Schlage L9000 series, and Sargent 8200 series.

2.11 EXIT DEVICES

A. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit and/or Fire Exit Hardware.

B. Provide touchpad type exit devices, fabricated of stainless steel, plated to the standard architectural finishes to match the balance of the door hardware.

C. Touchpad shall extend a minimum of one half of the door width, but not the full length of the exit device rail.

D. Devices to incorporate a deadlatching feature.

E. Provide manufacturer's standard strikes.

F. Provide exit devices cut to door width and height. Locate exit devices at a height recommended by the exit device manufacturer, allowable by governing building codes, and approved by the Architect.

G. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates.
   1. Lever style will match the lever style of the locksets.

H. Exit devices for fire rated openings shall be UL labeled fire exit hardware.

I. Provide electrical options as scheduled.

J. Acceptable manufacturers and/or products: Dorma 9000 series, Von Duprin 98 series, and Sargent 80 series.

2.12 POWER SUPPLIES

A. Provide power supplies, recommended and approved by the manufacturer of the electrified locking component, for the operation of electrified locks, electrified exit devices, magnetic locks, electric strikes, and other components requiring a power supply.

B. Provide the appropriate quantity of power supplies necessary for the proper operation of the electrified locking component and/or components as recommended by the manufacturer of the electrified locking

components with consideration for each electrified component utilizing the power supply, the location of the power supply, and the approved wiring diagrams. Locate the power supplies as directed by the Architect.

C. Provide a power supply that is regulated and filtered 24 VDC, or as required, and UL class 2 listed.

D. Provide a power supply, where specified, with the internal capability of charging optional sealed backup batteries 24 VDC, or as required, in addition to operating the DC load.

E. Provide a power supply complete requiring only 120VAC to the fused input and shall be supplied in an enclosure.

F. Provide a power supply with emergency release terminals, where required, that allow the release of all devices upon activation of the fire alarm system complete with fire alarm input for initiating "no delay" exiting mode.

G. Acceptable manufacturers and/or products: Dorma PS series, Dynalock 5000 series, Security Door Controls 600 series.

2.13 ELECTRO-MECHANICAL AUTOMATIC OPERATORS

A. Provide low energy automatic operator units that are electro-mechanical design complying with ANSI A156.19 where automatic operators are specified.

B. The operator shall be powered with a DC motor working through reduction gears. Closing shall be spring force. No manual, hydraulic, or chain drive closer will be acceptable. The motor is to be off when the door is in closing mode. The door can be manually operated with the power on or off without damage to the operator. The operator shall include variable adjustments, including opening and closing speed adjustment. Operator shall be mounted in an aluminum cover.

C. Provide units with manual off/auto/hold-open switch, push and go function to activate power operator, vestibule interface delay, electric lock delay, hold-open delay adjustable from 2 to 30 seconds, and logic terminal to interface with accessories, mats, and sensors.

D. Provide drop plates, brackets, or adapters for arms as required to suit details.

E. Provide hard-wired motion sensors and/or actuator switches for operation as specified. Actuators shall be weather-resistant type at exterior applications.

F. Provide key switches, with LED's, recommended and approved by the manufacturer of the automatic operator as required for the function as described in the operation description of the hardware sets.

G. Where automatic operators are scheduled, provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by the manufacturer of the automatic operator for each individual leaf. Locate the actuators, key switches, and other controls as directed by the Architect.

H. Acceptable manufacturers and/or products: Dorma ED900 Series, LCN 4600 Series, and Norton 7100 Series.

2.14 DOOR CLOSERS

A. Provide door closers certified to ANSI/BHMA A156.4 Grade 1 requirements by a BHMA certified independent testing laboratory. Door closers shall have fully hydraulic, full rack and pinion action with a high strength aluminum cylinder. Cylinder body shall be 1-1/2 inch diameter.

B. Provide hydraulic fluid requiring no seasonal closer adjustment. Fluid shall be fireproof and shall pass the requirements of the UL10C "positive pressure" fire test.

C. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force as required by accessibility codes and standards. Closers shall have separate adjustment for latch speed, general speed, and backcheck.

D. Provide closers with heavy-duty forged forearms for parallel arm closers.

E. Closers shall not incorporate Pressure Relief Valve (PRV) technology.

F. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other finish hardware items interfering with closer mounting.

G. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.

H. Acceptable manufacturers and/or products: Dorma 8900 Series, LCN 4040 series, Sargent 350 series

2.15 DOOR TRIM

A. Provide push plates 4 inches wide x 16 inches high x 0.050 inch thick and beveled 4 edges. Where width of door stile prevents use of 4 inches wide plate, adjust width to fit.

B. Provide push bars of solid bar stock, diameter and length as scheduled. Push bars shall be of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.

C. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.

D. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.

E. Provide pull plates 4 inches wide x 16 inches high x 0.050 inch thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches wide plate, adjust width to fit.

F. Acceptable manufacturers and/or products: Trimco, Don-Jo Mfg., Burns.

2.16 PROTECTION PLATES

A. Provide kick plates, and mop plates minimum of 0.050 inch thick as scheduled. Furnish with machine or wood screws, finished to match plates. Sizes of plates shall be as follows:
   1. Kick Plates – 8 inches high x 2 inches less width of door on single doors, 1 inch less width of door on pairs

2. Mop Plates – 4 inches high x 2 inches less width of door on single doors, 1 inch less width of door on pairs

B. Acceptable manufacturers and/or products: Trimco, Don-Jo Mfg, Burns.

2.17 OVERHEAD STOPS

A. Provide heavy duty concealed mounted overhead stop as specified for exterior and interior vestibule single acting doors.

B. Provide medium duty surface mounted overhead stop for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking a wall, open against equipment, casework, sidelights, and/or where conditions do not allow a wall stop or a floor stop presents a tripping hazard.

C. Acceptable manufacturers and/or products: Dorma, ABH Manufacturing, Glynn-Johnson.

2.18 DOOR STOPS

A. Provide door stops for all doors in accordance with the following requirements:
1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where wall stops cannot be used, provide dome type floor stops of the proper height.
3. At any opening where a wall or floor stop cannot be used, a medium duty surface mounted overhead stop shall be used.

B. Acceptable manufacturers and/or products: Trimco, Don-Jo Mfg, Burns.

2.19 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items as closely as possible.

B. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

C. Acceptable manufacturers and/or products: National Guard, Reese, Zero.

2.20 SILENCERS

A. Provide "Push-in" type silencers for each hollow metal or wood frame. Provide three for each single frame and two for each pair frame. Omit where gasketing is specified or required by code.

B. Acceptable manufacturers and/or products: Trimco, Don-Jo Mfg, Burns.

2.21 MAGNETIC HOLDERS

A. Provide wall or floor mounted electromagnetic door release as specified with a minimum of 25 pounds of holding force. Projection of holder and armature must be coordinated with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Where magnetic holders are used on fire-rated doors, they must be wired into the fire control panel for fail-safe operation.

B. Acceptable manufacturers and/or products: ABH Manufacturing, LCN, Rixson.

2.22 FINISHES

A. With the exception of items listed below, the finish of hardware items shall be US26D - satin chrome or US32D - satin stainless steel.

B. Exceptions are as follows:
1. Hinges at Exterior Doors: US32D (BHMA 630).
2. Aluminum Geared Continuous Hinges: US28 (BHMA 628).
3. Push Plates, Pulls: US32D (BHMA 630).
4. Exit Devices: US32D (BHMA 630).
5. Protection Plates: US32D (BHMA 630).
6. Overhead Stops: Powder Coat to Match.
7. Door Closers: Powder Coat to Match.
8. Wall Stops: US32D (BHMA 630).
9. Weatherstipping: Clear Anodized Aluminum.
10. Thresholds: Mill Finish Aluminum.

2.23 CYLINDERS AND KEYING

A. Provide a new key system from the same manufacturer as the locks conforming to the following requirements:
1. Provide restricted patented small formant interchangeable core cylinders at all keyed items. Restriction shall control the access to the products by requiring a signed letter of authorization and/or authorization form from the Owner or authorized agent of the Owner. Patent shall protect against the unauthorized manufacturing and duplication of the products. Restricted patented cores shall not be operable by non-patented key blanks. Restricted patented cores shall incorporate a mechanism to check for the patented features on the keys. Provide construction cores with construction master keying for use during construction. The hardware supplier, accompanied by the Owner or Owner's security agent, shall install permanent keyed cores upon completion of the project. The temporary construction cores are to be returned to the hardware supplier.
2. Provide permanent cores and cylinders keyed by the manufacturer or authorized distributor as directed by the Owner. Provide owner with a copy of the bitting list, return receipt requested.
3. The hardware supplier, accompanied by a qualified factory representative for the manufacturer of the cores and cylinders, shall meet with Owner and Architect to review keying requirements and lock functions prior to ordering finish hardware. Submit a keying schedule to Architect for approval.
4. Provide cores and cylinders, unless noted otherwise, operated by a Grand Master Key System to be established for this project (Do not use the letter "I", "O", or "X" for any of the grand masters). Allow for twenty-four Master Keys under each Grand Master, and sixty-four changes under each master key. All cylinders shall be keyed in alike or different sets as noted by their respective key set number. Do not use the letter "I" or "O" in any of the master key sets.
5. Provide patented restricted keys as follows:
    a. Ten grand master keys for each set.
    b. Ten master keys for each set.

c. Three keys per core and/or cylinder.
d. Two construction core control keys
e. Two permanent core control keys
f. Six construction master keys for each type (Contractor is to provide one set of construction keys to Architect)

6. Visual key control:
   a. Keys shall be stamped with their respective key set number and stamped "DO NOT DUPLICATE".
   b. Grand master and master keys shall be stamped with their respective key set letters.
   c. Do not stamp any keys with the factory key change number.
   d. Do not stamp any cores with key set on face (front) of Core. Stamp on back or side of cores so not to be visible when core is in cylinder.
7. Deliver grand master keys, master keys, change keys, and/or key blanks from the factory or authorized distributor directly to the Owner in sealed containers, return receipt requested. Failure to comply with these requirements may be cause to require replacement of all or any part of the keying system that was compromised at no additional cost to the Owner.
8. Approved products: Best Cormax, Schlage Everest 29T, Sargent Signature.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation of any hardware, examine doors, frames, walls and related items for conditions that would prevent proper installation of finish hardware. Correct defects prior to proceeding with installation.

B. Pre-Installation Conference: Prior to the installation of hardware, manufacturer's representatives for locksets, closers, and exit devices shall arrange and hold a jobsite meeting to instruct the installing contractor's personnel on the proper installation of their respective products. A letter of compliance, indicating when the meeting was held and who was in attendance, shall be sent to Architect and Owner.

3.2 INSTALLATION

A. Hardware shall be installed by qualified tradesmen skilled in application of commercial grade hardware. For technical assistance if necessary, installers may contact manufacturer's representative for the item in question, as listed in the hardware schedule.

B. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.

C. Install each hardware item in compliance with the manufacturer's instructions and recommendations, using only the fasteners provided by the manufacturer.

D. Do not install surface mounted items until finishes have been completed on the substrate. Protect installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

F. Operating parts shall move freely and smoothly without binding, sticking, or excessive clearance.

G. Set thresholds for exterior doors in full bed of butyl rubber or polyisobutylene mastic sealant complying with requirements specified in Section 07 92 00.

3.3 ADJUSTING, CLEANING AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door, to insure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly.

B. Where door hardware is installed more than one (1) month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make a final check and adjustment of hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Clean adjacent surfaces soiled by hardware installation. Remove bulk trash form the building, clean up any dust/debris caused by the installation of hardware.

D. Instruct Owner's personnel in the proper adjustment, lubrication, and maintenance of door hardware and hardware finishes.

3.4 FIELD QUALITY CONTROL

A. At completion of the project, a qualified factory representative for the manufacturers of locksets, closers, and exit devices shall inspect installations of their products. After the inspections, a letter shall be sent to the Architect reporting on conditions, verifying that their respective products have been properly installed and adjusted.

B. Six-Month Adjustment: Approximately six months after the date of Substantial Completion, the installer, accompanied by representatives of the manufacturers of latchsets and locksets, door control devices, and of other major hardware suppliers, shall return to the Project to perform the following work:
   1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
   2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
   3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.
   4. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.5 PROTECTION

A. Provide for the proper protection of items of hardware until Owner accepts the project as complete. Damaged or disfigured hardware shall be replaced or repaired by the responsible party.

3.6 HARDWARE SCHEDULE

A. Provide hardware for each door to comply with requirements of hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.

B. It is intended that the following schedule includes all items of finish hardware necessary to complete the work. If a discrepancy is found in the schedule, such as a missing item, improper hardware for a frame, door or fire codes, the preamble will be the deciding document.

C. Hardware sets:

SET #01 - EXTERIOR ALUM VESTIUBULE - CR/AUTO OP.

2	Continuous Hinge	661HD UL EPT PREP	AL	ST
1	Exit Device	9600AA x ZO03 CD MLR MS	630	DM
1	Exit Device	9600AA CD MLR MS	630	DM
1	Rim Cylinder	AS REQUIRED	626	BE
2	Mortise Cylinder	AS REQUIRED	626	BE
2	Door Pull	1191-4J	630	TR
1	Closer	8916 SPA	689	DM
1	ADA Operator	ED 900 (PUSH SIDE MOUNTED)	689	DM
2	Overhead Stop	CONCEALED HEAVY DUTY 910 S SERIES	689	DM
1	Power Supply	PS532RF		DM
1	Card Reader	PROVIDED/SPECIFIED BY SECURITY VENDOR		
1	Door Position Switch	PROVIDED/SPECIFIED BY SECURITY VENDOR		
2	Power Transfer	ES105		DM
1	Wiring Diagram	ELEVATION & POINT TO POINT		
1	Door Seals	INTEGRAL TO DOOR/FRAME ASSEMBLY		
2	Door Sweep	C627 A (DOOR WIDTH)		NA
1	Threshold	896 V (OPENING WIDTH - PAIR)	AL	NA

NOTE: ALL WIRING AND CONNECTIONS BY DIVISION 26 & 28.
OPERATIONAL DESCRIPTION:
IMMEDIATE EGRESS ALWAYS ALLOWED. DOORS CAN BE MANUALLY OR ONE LEAF AUTOMATICALLY OPERATED. ACCESS CONTROL SYSTEM TO RETRACT AND HOLD EXIT DEVICE LATCHBOLTS AND ENABLE EXTERIOR AUTOMATIC OPERATOR ACTUATOR. DOORS CAN BE MANUALLY PULLED OPEN OR ONE LEAF AUTOMATICALLY OPERATED. INTERIOR ACTUATOR TO SIGNAL AUTOMATIC OPERATOR TO OPEN ONE LEAF. LOCATE ACTUATORS AS DIRECTED BY ARCHITECT.
SECURE OPERATION:
ACCESS CONTROL SYSTEM TO RELEASE EXIT DEVICE LATCHBOLTS AND TAKE CONTROL OF EXTERIOR ACTUATOR TO CONTROL ENTRY. IMMEDIATE EGRESS ALWAYS ALLOWED. AUTOMATIC OPERATION OF ONE LEAF BY PUSHING INTERIOR ACTUATOR. ACCESS BY KEY OR BY CARD READER. CARD READER WILL RETRACT EXIT DEVICE LATCHBOLTS AND ALLOW ACCESS, AND
TEMPORARILY ENABLE EXTERIOR ACTUATOR TO ALLOW AUTOMATIC OPERATION OF ONE LEAF. REQUEST TO EXITS AND DOOR POSITION SWITCHES TO BE CONNECTED TO BUILDING'S SECURITY SYSTEM.

SET #02 - ALUM. VESTIBULE PAIR - AUTO OPERATOR

2	Continuous Hinge	661HD UL	AL	ST
2	Push/Pull Set	1747-1 (DOOR WIDTH LESS 3")	630	TR
1	Closer	8916 SPA	689	DM
1	ADA Operator	ED 900 (PUSH SIDE MOUNTED)	689	DM
2	Overhead Stop	CONCEALED HEAVY DUTY 910 S SERIES	689	DM
2	Wall Switch	WS 1 SQ4	630	DM
1	Wiring Diagram	ELEVATION & POINT TO POINT		
1	Door Seals	INTEGRAL TO DOOR/FRAME ASSEMBLY		

1	Threshold	896 V (OPENING WIDTH - PAIR)	AL	NA

NOTE: ALL WIRING AND CONNECTIONS BY DIVISION 26.
OPERATIONAL DESCRIPTION:
IMMEDIATE EGRESS ALWAYS ALLOWED. DOORS CAN BE MANUALLY OR ONE LEAF AUTOMATICALLY OPERATED. AUTOMATIC OPERATION BY PUSHING ACTUATORS. LOCATE ACTUATORS AS DIRECTED BYARCHITECT.

SET #03 - EXTERIOR ALUM. VESTIBULE - CR/AUTO OP.

1	Continuous Hinge	661HD UL EPT PREP	AL	ST
1	Exit Device	9700AA x ZO03 CD MLR MS	630	DM
1	Rim Cylinder	AS REQUIRED	626	BE
1	Mortise Cylinder	AS REQUIRED	626	BE
1	Door Pull	1191-4J	630	TR
1	ADA Operator	ED 900 (PUSH SIDE MOUNTED)	689	DM
1	Overhead Stop	CONCEALED HEAVY DUTY 910 S SERIES	689	DM
1	Card Reader	PROVIDED/SPECIFIED BY SECURITY VENDOR		
1	Door Position Switch	PROVIDED/SPECIFIED BY SECURITY VENDOR		
2	Wall Switch	WS 1 SQ4	630	DM
1	Power Supply	PS610RF		DM
1	Power Transfer	ES105		DM
1	Wiring Diagram	ELEVATION & POINT TO POINT		
1	Door Seals	INTEGRAL TO DOOR/FRAME ASSEMBLY		
1	Door Sweep	C627 A (DOOR WIDTH)		NA
1	Threshold	896 V (OPENING WIDTH - SINGLE)	AL	NA

NOTE: ALL WIRING AND CONNECTIONS BY DIVISION 26 & 28.
OPERATIONAL DESCRIPTION:
IMMEDIATE EGRESS ALWAYS ALLOWED. DOOR CAN BE MANUALLY OR AUTOMATICALLY OPERATED. ACCESS CONTROL SYSTEM TO RETRACT AND HOLD EXIT DEVICE LATCHBOLT AND ENABLE EXTERIOR AUTOMATIC OPERATOR ACTUATOR. DOOR CAN BE MANUALLY PULLED OPEN OR AUTOMATICALLY OPERATED. INTERIOR ACTUATOR TO SIGNAL AUTOMATIC OPERATOR TO OPEN DOOR. LOCATE ACTUATORS AS DIRECTED BY ARCHITECT.
SECURE OPERATION:
ACCESS CONTROL SYSTEM TO RELEASE EXIT DEVICE LATCHBOLT TO CONTROL ENTRY. IMMEDIATE EGRESS ALWAYS ALLOWED. AUTOMATIC OPERATION BY PUSHING INTERIOR ACTUATOR. ACCESS BY KEY OR BY CARD READER. CARD READER WILL RETRACT EXIT DEVICE LATCHBOLT TO ALLOW ACCESS, AND ENABLE EXTERIOR ACTUATOR. REQUEST TO EXIT AND DOOR POSITION SWITCH TO BE CONNECTED TO BUILDING'S SECURITY SYSTEM.

SET #04 - ALUM. VESTIBULE SINGLE - AUTO OPERATOR

1	Continuous Hinge	661HD UL	AL	ST
1	Push/Pull Set	1747-1 (DOOR WIDTH LESS 3")	630	TR
1	ADA Operator	ED 900 (PUSH SIDE MOUNTED)	689	DM
1	Overhead Stop	CONCEALED HEAVY DUTY 910 S SERIES	689	DM
2	Wall Switch	WS 1 SQ4	630	DM
1	Wiring Diagram	ELEVATION & POINT TO POINT		
1	Door Seals	INTEGRAL TO DOOR/FRAME ASSEMBLY		
1	Threshold	896 V (OPENING WIDTH - SINGLE)	AL	NA

NOTE: ALL WIRING AND CONNECTIONS BY DIVISION 26.
OPERATIONAL DESCRIPTION:

IMMEDIATE EGRESS ALWAYS ALLOWED. DOOR CAN BE MANUALLY OR AUTOMATICALLY OPERATED. AUTOMATIC OPERATION BY PUSHING ACTUATORS. LOCATE ACTUATORS AS DIRECTED BY ARCHITECT.

SET #05 - EXTERIOR ALUM. SINGLE - PANIC HARDWARE

1	Continuous Hinge	661HD UL	AL	ST
1	Exit Device	9700AA x ZO03 CD	630	DM
1	Rim Cylinder	AS REQUIRED	626	BE
1	Mortise Cylinder	AS REQUIRED	626	BE
1	Door Pull	1191-4J	630	TR
1	Closer	8916 SPA	689	DM
1	Overhead Stop	CONCEALED HEAVY DUTY 910 S SERIES	689	DM
1	Door Seals	INTEGRAL TO DOOR/FRAME ASSEMBLY		
1	Door Sweep	C627 A (DOOR WIDTH)		NA
1	Threshold	896 V (OPENING WIDTH - SINGLE)	AL	NA

SET #06 - SINGLE WITH OFFICE LOCK - INSWING

3	Hinges	CB179 SERIES AS SPECIFIED	US26D	ST
1	Office Lock	M9050T LCA	626	DM
1	Cormax Core	AS REQUIRED	626	BE
1	Closer	8616 AF86	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Door Stop	1211/1270CV AS REQUIRED	626	TR
1	Smoke Seal	5020 CL (HEADER ONLY)		NA
2	Smoke Seal	5020 CL (JAMBS ONLY)		NA

SET #07 - EXTERIOR ALUM. SINGLE - CARD READER

1	Continuous Hinge	661HD UL EPT PREP	AL	ST
1	Exit Device	9700AA x ZO03 CD MLR MS	630	DM
1	Rim Cylinder	AS REQUIRED	626	BE
1	Mortise Cylinder	AS REQUIRED	626	BE
1	Door Pull	1191-4J	630	TR
1	Closer	8916 SPA	689	DM
1	Overhead Stop	CONCEALED HEAVY DUTY 910 S SERIES	689	DM
1	Card Reader	PROVIDED/SPECIFIED BY SECURITY VENDOR		
1	Door Position Switch	PROVIDED/SPECIFIED BY SECURITY VENDOR		
1	Power Supply	PS610RF		DM
1	Power Transfer	ES105		DM
1	Wiring Diagram	ELEVATION & POINT TO POINT		
1	Door Seals	INTEGRAL TO DOOR/FRAME ASSEMBLY		
1	Door Sweep	C627 A (DOOR WIDTH)		NA
1	Threshold	896 V (OPENING WIDTH - SINGLE)	AL	NA

NOTE: ALL WIRING AND CONNECTIONS BY DIVISION 26 & 28.
OPERATIONAL DESCRIPTION:
IMMEDIATE EGRESS ALWAYS ALLOWED. ACCESS BY KEY OR BY CARD READER. CARD READER WILL RETRACT EXIT DEVICE LATCHBOLT AND ALLOW ACCESS. REQUEST TO EXIT AND DOOR POSITION SWITCH TO BE CONNECTED TO BUILDING'S SECURITY SYSTEM.

SET #08 - EXTERIOR SINGLE AT GYM - EXIT ONLY

1	Continuous Hinge	661HD UL	AL	ST
1	Exit Device	9300A LD	630	DM
1	Closer	8916 SPA	689	DM

1	Overhead Stop	CONCEALED HEAVY DUTY 910 S SERIES	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Door Seals	INTEGRAL TO DOOR/FRAME ASSEMBLY		
1	Door Sweep	C627 A (DOOR WIDTH)		NA
1	Threshold	896 V (OPENING WIDTH - SINGLE)	AL	NA

SET #09 - EXTERIOR SINGLE AT POOL - PANIC HDW.

3	Hinges	CB199 NRP SERIES AS SPECIFIED	US32D	ST
1	Exit Device	9300A x YC0808 LD	626	DM
1	Rim Cylinder	AS REQUIRED	626	BE
1	Mortise Cylinder	AS REQUIRED	626	BE
1	Closer	8916 SPA	689	DM
1	Overhead Stop	CONCEALED HEAVY DUTY 910 S SERIES	689	DM
1	Door Seals	INTEGRAL TO DOOR/FRAME ASSEMBLY		
1	Door Sweep	C627 A (DOOR WIDTH)		NA
1	Threshold	896 V (OPENING WIDTH - SINGLE)	AL	NA

SET #10 - CORRIDOR SINGLE AT POOL HALLWAY

3	Hinges	CB199 NRP SERIES AS SPECIFIED	US32D	ST
1	Exit Device	F9300A x YC0808	630	DM
1	Mortise Cylinder	AS REQUIRED	626	BE
1	Rim Cylinder	AS REQUIRED	626	BE
1	Closer	8916 SPA	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Door Stop	1211/1270CV AS REQUIRED	626	TR
1	Smoke Seal	5020 CL (HEADER ONLY)		NA
2	Smoke Seal	5020 CL (JAMBS ONLY)		NA

SET #11 - SINGLE AT STAIRWELL - FIRE EXIT HDW.

3	Hinges	CB168 SERIES AS SPECIFIED	US26D	ST
1	Exit Device	F9300A x YC23	630	DM
1	Closer	8616 AF86	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Door Stop	1211/1270CV AS REQUIRED	626	TR
1	Smoke Seal	5020 CL (HEADER ONLY)		NA
2	Smoke Seal	5020 CL (JAMBS ONLY)		NA

SET #12 - PAIR AT GYM, MULTI-PURPOSE ENTRY

2	Continuous Hinge	661HD UL	AL	ST
1	Removable Mullion	F1340 KR-8	600	DM
2	Exit Device	F9300A x YC0808	630	DM
2	Rim Cylinder	AS REQUIRED	626	BE
3	Mortise Cylinder	AS REQUIRED	626	BE
2	Closer	8916 S-DS	689	DM
2	Kick Plate	K0050 8" X 1" LDW B4E CSK	630	TR
1	Smoke Seal	5020 CL (HEADER ONLY)		NA
2	Smoke Seal	5020 CL (JAMBS ONLY)		NA
1	Meeting Stile Seal	5070 CL (DOOR HEIGHT)		NA
1	Mullion Seal	5100N-86 86"		NA

SET #13 - CROSS CORRIDOR PAIR - MAG. HOLD OPEN

6	Hinges	CB168 SERIES AS SPECIFIED	US26D	ST
2	Exit Device	F9400A x YC23 LB	630	DM
2	Magnetic Holder	2100	S1	AB

2	Closer	8616 AF86	689	DM
2	Kick Plate	K0050 8" X 1" LDW B4E CSK	630	TR
2	Door Stop	1211/1270CV AS REQUIRED	626	TR
1	Door Seals	INTEGRAL TO DOOR/FRAME ASSEMBLY		

NOTE: ALL WIRING AND CONNECTIONS BY DIVISION 26.
OPERATIONAL DESCRIPTION:
DOORS NORMALLY HELD OPEN BY MAGNETIC HOLDERS. MAGNETIC HOLDERS TO BE CONNECTED TO BUILDING'S FIRE/SMOKE ALARM SYSTEM TO RELEASE IMMEDIATELY UPON ACTIVATION.

SET #14 - CROSS CORRIDOR INTERIOR PAIR - CR

5	Hinges	CB168 NRP SERIES AS SPECIFIED	US26D	ST
1	Electric Hinge	CECB168-18 SERIES AS SPECIFIED	US26D	ST
1	Exit Device	9400A x YC09C CD LB LFSC MS	630	DM
1	Exit Device	9400A CD LB	630	DM
1	Rim Cylinder	AS REQUIRED	626	BE
2	Mortise Cylinder	AS REQUIRED	626	BE
2	Closer	8616 DS	689	DM
2	Kick Plate	K0050 8" X 1" LDW B4E CSK	630	TR
1	Power Supply	ES100		DM
1	Wiring Diagram	ELEVATION & POINT TO POINT		
1	Door Position Switch	PROVIDED/SPECIFIED BY SECURITY VENDOR		
1	Card Reader	PROVIDED/SPECIFIED BY SECURITY VENDOR		
1	Smoke Seal	5020 CL (HEADER ONLY)		NA
1	Meeting Stile Seal	5070 CL (DOOR HEIGHT)		NA
2	Smoke Seal	5020 CL (JAMBS ONLY)		NA

NOTE: ALL WIRING AND CONNECTIONS BY DIVISION 26 & 28.
OPERATIONAL DESCRIPTION:
IMMEDIATE EGRESS ALWAYS ALLOWED. ACCESS BY KEY OR BY CARD READER. CARD READER WILL UNLOCK TRIM AND ALLOW ACCESS. REQUEST TO EXIT AND DOOR POSITION SWITCH TO BE CONNECTED TO BUILDING'S SECURITY SYSTEM.

SET #15 - SINGLE AT FITNESS/WRESTLING - PANIC HARDWARE

3	Hinges	CB168 NRP SERIES AS SPECIFIED	US26D	ST
1	Exit Device	9300A x YC0808	630	DM
1	Rim Cylinder	AS REQUIRED	626	BE
1	Mortise Cylinder	AS REQUIRED	626	BE
1	Closer	8616 SPA	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Door Stop	1211/1270CV AS REQUIRED	626	TR
3	Door Silencers	1229A	GREY	TR

SET #16 - EXTERIOR SINGLE - ROOF ACCESS DOOR

3	Hinges	CB199 NRP SERIES AS SPECIFIED	US32D	ST
1	Storeroom Lock	M9080T LCA	626	DM
1	Cormax Core	AS REQUIRED	626	BE
1	Closer	8616 SPA	689	DM
1	Overhead Stop	CONCEALED HEAVY DUTY 910 S SERIES	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Perimeter Seal	706 E (HEAD & JAMBS - SINGLE)		NA
1	Door Sweep	C627 A (DOOR WIDTH)		NA

1	Drip Cap	16 A - 4" ODW		NA
1	Threshold	896 V (OPENING WIDTH - SINGLE)	AL	NA

NOTE: **LOCKSET TO BE LOCKED FROM STORAGE ROOM SIDE TO ALLOW EGRESS FROM ROOF**

SET #17 - EXTERIOR SINGLE - ELECTRIC/SOLAR ROOM

1	Continuous Hinge	661HD UL	AL	ST
1	Exit Device	9300A x YC03R	630	DM
1	Rim Cylinder	AS REQUIRED	626	BE
1	Closer	8616 DS	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Perimeter Seal	706 E (HEAD & JAMBS - SINGLE)		NA
1	Door Sweep	C627 A (DOOR WIDTH)		NA
1	Drip Cap	16 A - 4" ODW		NA
1	Threshold	896 V (OPENING WIDTH - SINGLE)	AL	NA

SET #18 - EXTERIOR SINGLE - FIRE/WATER ROOM

1	Continuous Hinge	661HD UL	AL	ST
1	Storeroom Lock	M9080T LCA	626	DM
1	Cormax Core	AS REQUIRED	626	BE
1	Closer	8616 DS	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Perimeter Seal	706 E (HEAD & JAMBS - SINGLE)		NA
1	Door Sweep	C627 A (DOOR WIDTH)		NA
1	Drip Cap	16 A - 4" ODW		NA
1	Threshold	896 V (OPENING WIDTH - SINGLE)	AL	NA

SET #19 - SINGLE WITH OFFICE LOCK

3	Hinges	CB179 SERIES AS SPECIFIED	US26D	ST
1	Office Lock	M9050T LCA	626	DM
1	Cormax Core	AS REQUIRED	626	BE
1	Door Stop	1211/1270CV AS REQUIRED	626	TR
3	Door Silencers	1229A	GREY	TR

SET #20 - SINGLE AT GANG RESTROOM - OUTSWING

3	Hinges	CB168 SERIES AS SPECIFIED	US26D	ST
1	Push Plate	1001-3	630	TR
1	Door Pull	1195-3	630	TR
1	Closer	8916 SPA	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Door Stop	1211/1270CV AS REQUIRED	626	TR
3	Door Silencers	1229A	GREY	TR

SET #21 - SINGLE WITH PRIVACY SET - INSWING

3	Hinges	CB179 SERIES AS SPECIFIED	US26D	ST
1	Privacy Set	M9040 LCA	626	DM
1	Closer	8616 AF86	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Door Stop	1211/1270CV AS REQUIRED	626	TR
3	Door Silencers	1229A	GREY	TR

SET #22 - SINGLE WITH STOREROOM LOCK - INSWING

3	Hinges	CB179 SERIES AS SPECIFIED	US26D	ST
1	Storeroom Lock	M9080T LCA	626	DM

1	Cormax Core	AS REQUIRED	626	BE
1	Closer	8616 AF86	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Door Stop	1211/1270CV AS REQUIRED	626	TR
1	Smoke Seal	5020 CL (HEADER ONLY)		NA
2	Smoke Seal	5020 CL (JAMBS ONLY)		NA

SET #23 - SINGLE WITH STOREROOM LOCK

3	Hinges	CB179 NRP SERIES AS SPECIFIED	US26D	ST
1	Storeroom Lock	M9080T LCA	626	DM
1	Cormax Core	AS REQUIRED	626	BE
1	Overhead Stop	SURFACE MEDIUM DUTY 700 S SERIES	689	DM
3	Door Silencers	1229A	GREY	TR

SET #24 - SINGLE WITH CLASSROOM LOCK - OUTSWING

3	Hinges	CB179 NRP SERIES AS SPECIFIED	US26D	ST
1	Classroom Lock	M9070T LCA	626	DM
1	Cormax Core	AS REQUIRED	626	BE
1	Closer	8616 DS	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Smoke Seal	5020 CL (HEADER ONLY)		NA
2	Smoke Seal	5020 CL (JAMBS ONLY)		NA

SET #25 - SINGLE AT LOCKER ROOM - OUTSWING

3	Hinges	CB199 NRP SERIES AS SPECIFIED	US32D	ST
1	Classroom Lock	M9070T LCA	626	DM
1	Cormax Core	AS REQUIRED	626	BE
1	Closer	8916 SPA	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Door Stop	1211/1270CV AS REQUIRED	626	TR
3	Door Silencers	1229A	GREY	TR

SET #26 - SINGLE WITH CLASSROOM LOCK

3	Hinges	CB179 SERIES AS SPECIFIED	US26D	ST
1	Classroom Lock	M9070T LCA	626	DM
1	Cormax Core	AS REQUIRED	626	BE
1	Door Stop	1211/1270CV AS REQUIRED	626	TR
3	Door Silencers	1229A	GREY	TR

SET #27 - SINGLE WITH CLASSROOM LOCK - OUTSWING

3	Hinges	CB179 NRP SERIES AS SPECIFIED	US26D	ST
1	Classroom Lock	M9070T LCA	626	DM
1	Cormax Core	AS REQUIRED	626	BE
1	Closer	8616 SPA	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Door Stop	1211/1270CV AS REQUIRED	626	TR
1	Smoke Seal	5020 CL (HEADER ONLY)		NA
2	Smoke Seal	5020 CL (JAMBS ONLY)		NA

SET #28 - SINGLE WITH CLASSROOM LOCK - INSWING

3	Hinges	CB179 SERIES AS SPECIFIED	US26D	ST
1	Classroom Lock	M9070T LCA	626	DM
1	Cormax Core	AS REQUIRED	626	BE
1	Closer	8616 AF86	689	DM

1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Door Stop	1211/1270CV AS REQUIRED	626	TR
1	Smoke Seal	5020 CL (HEADER ONLY)		NA
2	Smoke Seal	5020 CL (JAMBS ONLY)		NA

SET #29 - PAIR WITH STOREROOM LOCK - OUTSWING

6	Hinges	CB179 NRP SERIES AS SPECIFIED	US26D	ST
2	Flush Bolt	3917-12	626	TR
1	Storeroom Lock	M9080T LCA 5006-078	626	DM
1	Cormax Core	AS REQUIRED	626	BE
1	Closer	8616 DS	689	DM
1	Overhead Stop	SURFACE MEDIUM DUTY 700 S SERIES	689	DM
2	Kick Plate	K0050 8" X 1" LDW B4E CSK	630	TR
2	Door Silencers	1229A	GREY	TR

NOTE: **PROVIDE CLOSER AT ACTIVE LEAF ONLY. PROVIDE OVERHEAD STOP AT INACTIVE LEAF ONLY**

SET #30 - PAIR AT MULTI-PURPOSE STORAGE - OUTSWING

6	Hinges	CB179 NRP SERIES AS SPECIFIED	US26D	ST
2	Flush Bolt	3917-12	626	TR
1	Storeroom Lock	M9080T LCA 5006-078	626	DM
1	Cormax Core	AS REQUIRED	626	BE
2	Overhead Stop	SURFACE MEDIUM DUTY 700 S SERIES	689	DM
2	Door Silencers	1229A	GREY	TR

SET #31 - SINGLE WITH STOREROOM LOCK - OUTSWING

3	Hinges	CB179 NRP SERIES AS SPECIFIED	US26D	ST
1	Storeroom Lock	M9080T LCA	626	DM
1	Cormax Core	AS REQUIRED	626	BE
1	Closer	8616 SPA	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Door Stop	1211/1270CV AS REQUIRED	626	TR
1	Smoke Seal	5020 CL (HEADER ONLY)		NA
2	Smoke Seal	5020 CL (JAMBS ONLY)		NA

SET #32 - SINGLE AT LOCKER ROOM/POOL - INSWING

3	Hinges	CB199 SERIES AS SPECIFIED	US32D	ST
1	Push Plate	1001-3	630	TR
1	Door Pull	1195-3	630	TR
1	Closer w/Hold Open	8916 FH	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 4" X 1" LDW B4E CSK	630	TR
1	Door Stop	1211/1270CV AS REQUIRED	626	TR
3	Door Silencers	1229A	GREY	TR

SET #33 - PAIR WITH CLASSROOM LOCK- MULTI FUNCTION

6	Hinges	CB179 SERIES AS SPECIFIED	US26D	ST
1	Set Auto Flush Bolts	3815L X 3815L	626	TR
1	Classroom Lock	M9070T LCA 5006-078	626	DM
1	Cormax Core	AS REQUIRED	626	BE
1	Coordinator	3094B2	BLACK	TR
2	Closer	8616 S-IS	689	DM
2	Kick Plate	K0050 8" X 1" LDW B4E CSK	630	TR

2	Door Silencers	1229A	GREY	TR

SET #34 - PAIR AT GYM, MULTI-PURPOSE ENTRY

2	Continuous Hinge	661HD UL	AL	ST
1	Removable Mullion	F1340 KR-8	600	DM
2	Exit Device	9300A x YC0808	630	DM
2	Rim Cylinder	AS REQUIRED	626	BE
3	Mortise Cylinder	AS REQUIRED	626	BE
2	Closer	8916 S-DS	689	DM
2	Kick Plate	K0050 8" X 1" LDW B4E CSK	630	TR
1	Smoke Seal	5020 CL (HEADER ONLY)		NA
2	Smoke Seal	5020 CL (JAMBS ONLY)		NA
1	Meeting Stile Seal	5070 CL (DOOR HEIGHT)		NA
1	Mullion Seal	5100N-86 86"		NA

SET #35 - SINGLE WITH PRIVACY SET - FAMILY BATH

3	Hinges	CB191 SERIES AS SPECIFIED	US32D	ST
1	Privacy Set	M9040 LCA	626	DM
1	Closer	8616 S-IS	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
3	Door Silencers	1229A	GREY	TR

SET #36 - SINGLE WITH OFFICE LOCK - POOL DECK

3	Hinges	CB191 SERIES AS SPECIFIED	US32D	ST
1	Office Lock	M9050T LCA	626AM	DM
1	Cormax Core	AS REQUIRED	626	BE
1	Door Stop	1211/1270CV AS REQUIRED	626	TR
3	Door Silencers	1229A	GREY	TR

SET #37 - PAIR AT EQUIPMENT/STORAGE - POOL DECK

6	Hinges	CB191 NRP SERIES AS SPECIFIED	US32D	ST
2	Flush Bolt	3917-12	626	TR
1	Storeroom Lock	M9080T LCA 5006-078	626AM	DM
1	Cormax Core	AS REQUIRED	626	BE
2	Overhead Stop	SURFACE MEDIUM DUTY 700 S SERIES	689	DM
2	Kick Plate	K0050 8" X 1" LDW B4E CSK	630	TR
2	Door Silencers	1229A	GREY	TR

SET #38 - SINGLE WITH CLASSROOM LOCK

3	Hinges	CB179 SERIES AS SPECIFIED	US26D	ST
1	Classroom Lock	M9070T LCA	626	DM
1	Cormax Core	AS REQUIRED	626	BE
1	Overhead Stop	SURFACE MEDIUM DUTY 700 S SERIES	689	DM
3	Door Silencers	1229A	GREY	TR

SET #39 - SINGLE WITH PRIVACY SET - OUTSWING

3	Hinges	CB179 SERIES AS SPECIFIED	US26D	ST
1	Privacy Set	M9040 LCA	626	DM
1	Closer	8616 DS	689	DM
1	Kick Plate	K0050 8" X 2" LDW B4E CSK	630	TR
3	Door Silencers	1229A	GREY	TR

SET #40 - SINGLE POCKET DOOR AT ADMIN.

1	Pocket Door Set	PDC150N-00-36		ST

1	Pocket Door Pull	1064	626	TR

SET #41 - BIPARTING PAIR AT COORDINATOR CLOSET

2	Sliding Door Hardware Kit	SLSS1-6-SC 78 3/4		NA
2	Cabinet Pull	571-6	630	TR

SET #42 - SPECIALTY SLIDING DOOR AT ACTIVITY

NOTE: **ALL HARDWARE TO BE PROVIDED BY SPECIALTY SLIDING DOOR MANUFACTURER**

END OF SECTION

WINDHAM SENIOR AND
COMMUNITY CENTER
WILLIMANTIC, CT

ROOM ID	ROOM NAME	TEXT	Qty	SIGN TYPE	REMARKS
NOTE: FINAL ROOM ID (ROOM NAME, NUMBER AND SYMBOLS) AND MOUNTING LOCATIONS TO BE COORDINATED WITH CLIENT PRIOR TO SIGN FABRICATION					
COMMON ELEMENTS					
ELEV. #1	ELEVATOR	ELEVATOR	2	POST MOUNTED LETTERS	TO BE MOUNTED ABOVE DOORS
		IN CASE OF FIRE, USE STAIRS	2	FIRE/STAIRS	MOUNTED NEXT TO ELEVATOR
		(EVACUATION ROUTE IMAGE INSERT)	1	EVACUATION ROUTE	MOUNTED NEXT TO ELEVATOR
EXTERIOR ENTRANCES					
100A	VESTIBULE	WINDHAM SENIOR CENTER	1	BUILDING ENTRY	MOUNTED TO EXTERIOR
100B	VESTIBULE	WINDHAM SENIOR CENTER	1	BUILDING ENTRY	MOUNTED TO EXTERIOR
110A	MUTIPURPOSE ROOM 1	ALL VISITORS MUST USE MAIN ENTRANCE	1	BUILDING ENTRY	MOUNTED TO EXTERIOR
110B	MULTIPURPOSE ROOM 2	ALL VISITORS MUST USE MAIN ENTRANCE	1	BUILDING ENTRY	MOUNTED TO EXTERIOR
114	FIRE/WATER	FIRE/WATER ROOM	1	BUILDING ENTRY	MOUNTED TO EXTERIOR
140	WAITING ROOM	HEALTH SCREENING ENTRANCE	1	BUILDING ENTRY	MOUNTED TO EXTERIOR
200A	CORRIDOR 2	WINDHAM PARKS & RECREATION	1	BUILDING ENTRY	MOUNTED TO EXTERIOR
200B	VESTIBULE	WINDHAM PARKS & RECREATION	1	BUILDING ENTRY	MOUNTED TO EXTERIOR
214	GYMNASIUM	ALL VISITORS MUST USE MAIN ENTRANCE	1	BUILDING ENTRY	MOUNTED TO EXTERIOR

ROOM ID	ROOM NAME	TEXT	Qty	SIGN TYPE	REMARKS
NOTE: FINAL ROOM ID (ROOM NAME, NUMBER AND SYMBOLS) AND MOUNTING LOCATIONS TO BE COORDINATED WITH CLIENT PRIOR TO SIGN FABRICATION					
220A	POOL	ALL VISITORS MUST USE MAIN ENTRANCE	2	BUILDING ENTRY	MOUNTED TO EXTERIOR
223	ELECTRIC/ SOLAR	ELECTRIC/ SOLAR	1	BUILDING ENTRY	MOUNTED TO EXTERIOR
112B	DRY STORAGE	DELIVERIES	1	BUILDING ENTRY	MOUNTED TO EXTERIOR
		SENIOR CENTER			
100	LOBBY	MULTIFUNCTION ROOM WOMENS RESTROOM MENS RESTROOM RECEPTION DESK HEALTH CENTER PARKS & REC. STAIR ELEVATOR	2	DIRECTIONAL	
		WOMENS RESTROOM	1	FLAG MOUNTED	
		MENS RESTROOM	1	FLAG MOUNTED	
		WINDHAM SENIOR CENTER	1	RAISED LETTERS	
102	UNISEX BATH	UNISEX BATH	1	RESTROOM	
103	STORAGE	COAT CLOSET	1	ROOM ID	
104	STORAGE	COAT CLOSET	1	ROOM ID	
110A	MULTIPURPOSE 1	MULTIPURPOSE ROOM MAXIMUM OCCUPANCY 275 PERSONS	1	ROOM ID W/ OCCUPANT LOAD	
		MULTIPURPOSE ROOM	1	RAISED LETTERS	ABOVE ENTRANCE

ROOM ID	ROOM NAME	TEXT	Qty	SIGN TYPE	REMARKS
NOTE: FINAL ROOM ID (ROOM NAME, NUMBER AND SYMBOLS) AND MOUNTING LOCATIONS TO BE COORDINATED WITH CLIENT PRIOR TO SIGN FABRICATION					
		(EVACUATION ROUTE IMAGE INSERT)	1	EVACUATION ROUTE	MOUNTED NEAR INTERIOR ENTRANCE DOORS
110B	MULTIPURPOSE 2	MULTIPURPOSE ROOM MAXIMUM OCCUPANCY 275 PERSONS	1	ROOM ID W/ OCCUPANT LOAD	
		MULTIPURPOSE ROOM	1	RAISED LETTERS	ABOVE ENTRANCE
		(EVACUATION ROUTE IMAGE INSERT)	1	EVACUATION ROUTE	MOUNTED NEAR INTERIOR ENTRANCE DOORS
110D	J.C	CUSTODIAN	1	ROOM ID	
111	STORAGE	STORAGE	1	ROOM ID	
112	KITCHEN	KITCHEN	1	ROOM ID	
112A	(KITCHEN) STORAGE	STORAGE ROOM	1	ROOM ID	
112B	(KITCHEN) DRY STORAGE	STORAGE ROOM	1	ROOM ID	
113	(PLATFORM) STORAGE	STORAGE	1	ROOM ID	
114	FIRE/WATER	FIRE/WATER ROOM	1	ROOM ID	
115	WOMENS	WOMENS TOILET	1	RESTROOM	
		WOMEN	1	VINYL DECAL	
116	MENS	MENS TOILET	1	RESTROOM	
		MEN		VINYL DECAL	
117	ADMIN	ADMIN	1	TYPICAL OFFICE ROOM ID	

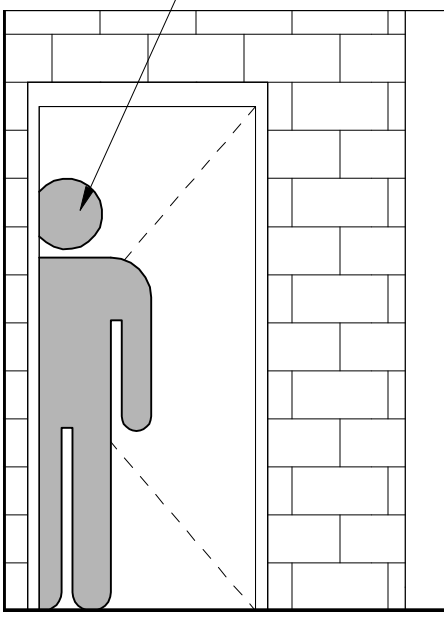
ROOM ID	ROOM NAME	TEXT	Qty	SIGN TYPE	REMARKS
NOTE: FINAL ROOM ID (ROOM NAME, NUMBER AND SYMBOLS) AND MOUNTING LOCATIONS TO BE COORDINATED WITH CLIENT PRIOR TO SIGN FABRICATION					
118	ACTIVITY COORDINATOR	ACTIVITY COORDINATOR	1	TYPICAL OFFICE ROOM ID	
130	LIBRARY	LIBRARY		ROOM ID	
		LIBRARY	2	RAISED LETTERS	ABOVE ENTRANCES
		N/A	1	WALL ORGANIZER	IN LIBRARY
131	ELECTRICAL CLOSET	ELECTRICAL CLOSET		ROOM ID	
132A	DANCE & FITNESS	DANCE & FITNESS MAXIMUM OCCUPANCY 60 PERSONS	1	ROOM ID W/ OCCUPANT LOAD	
		(EVACUATION ROUTE IMAGE INSERT)	1	EVACUATION ROUTE	MOUNTED NEXT TO DOOR ON INSIDE OF ROOM
132B	ACTIVITES	ACTIVITIES MAXIMUM OCCUPANCY 60 PERSONS	1	ROOM ID W/ OCCUPANT LOAD	
		(EVACUATION ROUTE IMAGE INSERT)	1	EVACUATION ROUTE	MOUNTED NEXT TO DOOR ON INSIDE OF ROOM
133	(ACTIVITIES) STORAGE	STORAGE	1	ROOM ID	
134	(ACTIVITIES) STORAGE	STORAGE	1	ROOM ID	
135	(DANCE & FITNESS) STORAGE	STORAGE	1	ROOM ID	
137	(DANCE & FITNESS) STORAGE	STORAGE	1	ROOM ID	
140	WAITING ROOM	SOCIAL SERVICES & HEALTH SCREENING	1	ROOM ID	

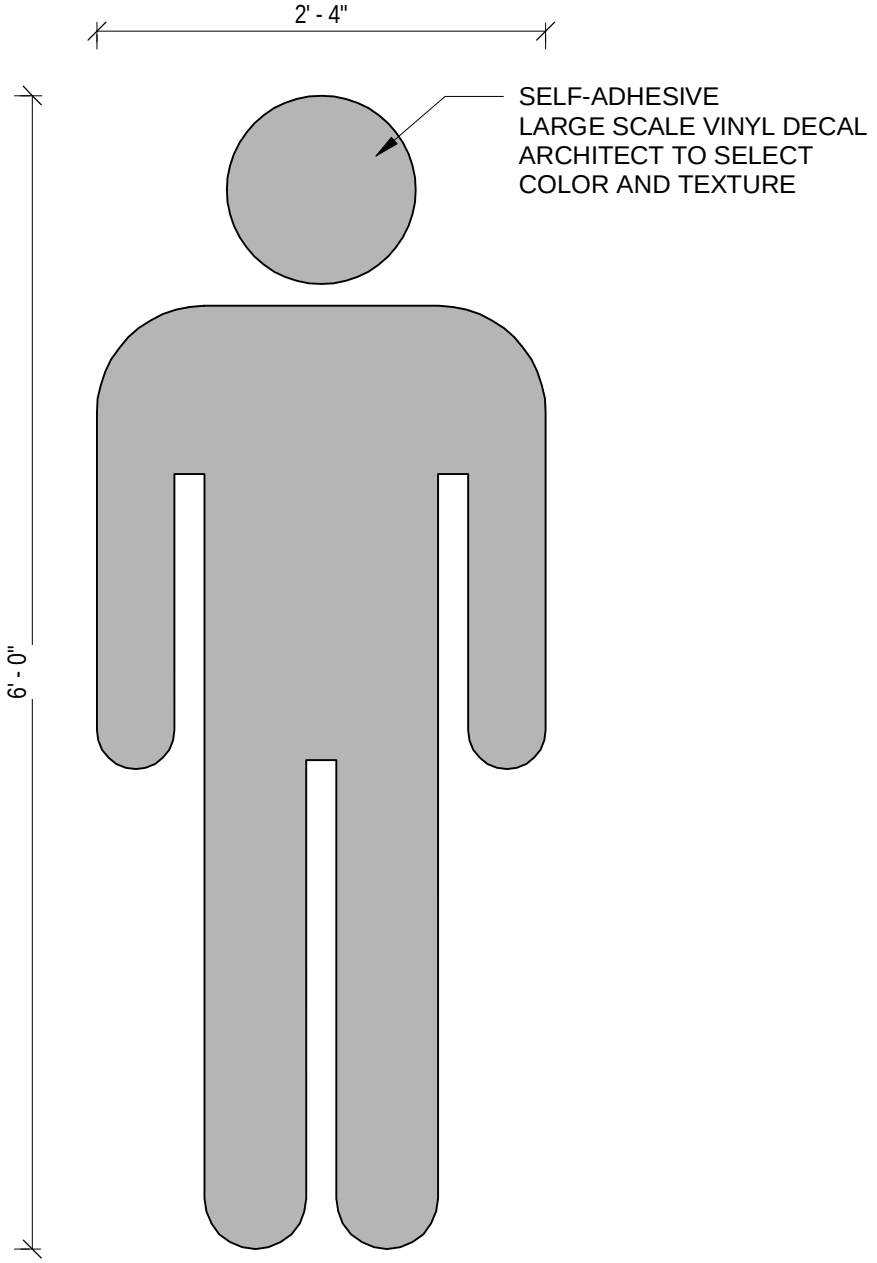
ROOM ID	ROOM NAME	TEXT	Qty	SIGN TYPE	REMARKS
NOTE: FINAL ROOM ID (ROOM NAME, NUMBER AND SYMBOLS) AND MOUNTING LOCATIONS TO BE COORDINATED WITH CLIENT PRIOR TO SIGN FABRICATION					
		N/A	1	WALL ORGANIZER	IN WAITING ROOM
141	H./S. ROOM (HEALTH SCREENING)	HEALTH SCREENING ROOM	1	TYPICAL OFFICE ROOM ID	
142	H./S. BATH	RESTROOM	1	RESTROOM	
143	SOC. OFFICE 1	SOC. OFFICE 1	1	TYPICAL OFFICE ROOM ID	
144	OFFICE 2	OFFICE	1	TYPICAL OFFICE ROOM ID	
145	OFFICE 1	OFFICE	1	TYPICAL OFFICE ROOM ID	
146	SOC. OFFICE 2	OFFICE	1	TYPICAL OFFICE ROOM ID	
147	DIRECTOR OFFICE	OFFICE	1	TYPICAL OFFICE ROOM ID	
148	STORAGE	STORAGE	1	ROOM ID	
149	ACTIVITY SPACE	ACTIVITY SPACE	1	ROOM ID	

ROOM ID	ROOM NAME	TEXT	Qty	SIGN TYPE	REMARKS
NOTE: FINAL ROOM ID (ROOM NAME, NUMBER AND SYMBOLS) AND MOUNTING LOCATIONS TO BE COORDINATED WITH CLIENT PRIOR TO SIGN FABRICATION					
PARKS & RECREATION					
200 + 200C	CORRIDOR + REC LOBBY	GYMNASIUM WRESTLING- 2ND LEVEL STAIR LOCKER ROOMS RESTROOMS FITNESS ROOM POOL ENTRANCE SENIOR CENTER	2	DIRECTIONAL	
		FITNESS	1	FLAG MOUNTED	
		WOMENS RESTROOM	1	FLAG MOUNTED	
201	CORRIDOR 3	RESTROOMS	1	FLAG MOUNTED	
		WRESTLING ROOM	1	FLAG MOUNTED	
210	MULTIFUNCTION/ FITNESS ACTIVITY	MULTIFUNCTION/ FITNESS ACTIVITY ROOM	1	ROOM ID	
		FITNESS	1	VINYL DECAL	
210A	MULTIFUNCTION/ FITNESS ACTIVITY STORAGE	STORAGE	1	ROOM ID	
211	REC OFFICE	REC OFFICE	1	ROOM ID	
211A	I.T	I.T. OFFICE	1	ROOM ID	
212	DIRECTOR OFFICE	DIRECTOR OFFICE	1	TYPICAL OFFICE ROOM ID	
213	ASSISTANT DIRECTOR OFFICE	ASSISTANT DIRECTOR OFFICE	1	TYPICAL OFFICE ROOM ID	

ROOM ID	ROOM NAME	TEXT	Qty	SIGN TYPE	REMARKS
NOTE: FINAL ROOM ID (ROOM NAME, NUMBER AND SYMBOLS) AND MOUNTING LOCATIONS TO BE COORDINATED WITH CLIENT PRIOR TO SIGN FABRICATION					
214	GYMNASIUM	GYMNASIUM MAXIMUM OCCUPANCY 520 PERSONS	2	ROOM ID W/ OCCUPANT LOAD	
		(EVACUATION ROUTE IMAGE INSERT)	1	EVACUATION ROUTE	MOUNTED NEXT TO DOORS ON INTERIOR SIDE
		FITNESS	1	VINYL DECAL	
215	(GYMNASIUM) STORAGE	STORAGE	1	ROOM ID	
216	(GYMNASIUM) STORAGE	STORAGE	1	ROOM ID	
217	WOMENS LOCKER ROOM	WOMENS LOCKER ROOM	1	RESTROOM	
		(IMAGE)	1	VINYL DECAL	
		(EVACUATION ROUTE IMAGE INSERT)	1	EVACUATION ROUTE	MOUNTED NEXT TO DOORS ON INTERIOR SIDE
218	HALL	POOL	1	ROOM ID	
		POOL	1	VINYL DECAL	
218B	FAMILY BATH	RESTROOOM	1	TOILET	
		FAMILY RESTROOM	1	VINYL DECAL	
218A	FAMILY BATH	RESTROOM	1	TOILET	
		FAMILY RESTROOM	1	VINYL DECAL	
219	MENS LOCKER ROOM	MENS LOCKER ROOM	1	RESTROOM	
		(IMAGE)	1	VINYL DECAL	

ROOM ID	ROOM NAME	TEXT	Qty	SIGN TYPE	REMARKS
NOTE: FINAL ROOM ID (ROOM NAME, NUMBER AND SYMBOLS) AND MOUNTING LOCATIONS TO BE COORDINATED WITH CLIENT PRIOR TO SIGN FABRICATION					
220A	POOL	POOL MAXIMUM OCCUPANCY 143 PERSONS	3	ROOM ID W/ OCCUPANT LOAD	
		POOL	1	VINYL DECAL	
		(EVACUATION ROUTE IMAGE INSERT)	2	EVACUATION ROUTE	MOUNTED NEXT TO DOORS ON INTERIOR SIDE
222	LG. OFFICE	LIFEGUARD OFFICE	1	TYPICAL OFFICE ROOM ID	
224	POOL EQUIPMENT & STORAGE	STORAGE	1	ROOM ID	
UPPER LEVEL					
309	BATH 1	UNISEX RESTROOM	1	RESTROOM	
310	BATH 1	UNISEX RESTROOM	1	RESTROOM	
311	LAUNDRY	LAUNDRY	1	ROOM ID	
312	STORAGE	STORAGE	1	ROOM ID	
313	FITNESS/ WRESTLING ROOM	FITNESS/ WRESTLING ROOM MAXIMUM OCCUPANCY 64 PERSONS	2	ROOM ID W/ OCCUPANT LOAD	
		WRESTLING ROOM	1	VINYL DECAL	
		(EVACUATION ROUTE IMAGE INSERT)	2	EVACUATION ROUTE	MOUNTED NEXT TO DOORS & STAIR ON INTERIOR SIDE
314	STORAGE	STORAGE	1	ROOM ID	
315	STORAGE	STORAGE	1	ROOM ID	





NOTES:
SEE SCHEDULE FOR ROOM NAMES.

BASIS OF DESIGN: MFG: TAKEFORM,
STYLE: AMPLIFY WALLCOVERINGS
MATERIAL: VINYL DECAL
ARCHITECT TO SELECT FROM
MFG'S FULL RANGE.

1 SIGN- MEN'S LOCKER ROOM

SIGN 1 1" = 1'-0"

VINYL DECAY - IMAGE - 1

QA+M architecture

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WINDHAM SENIOR & COMMUNITY CENTER

1 JILLSON SQUARE - WILLIMANTIC, CONNECTICUT

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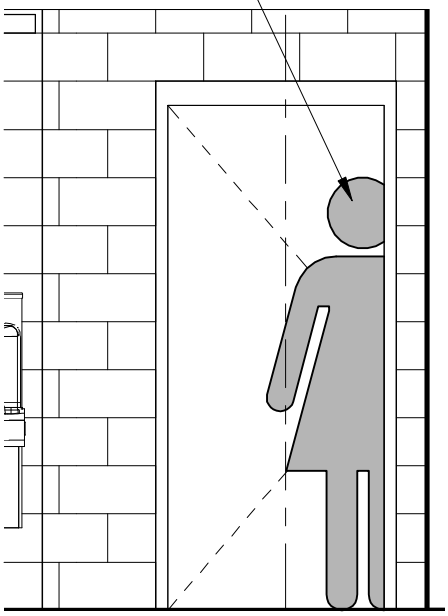

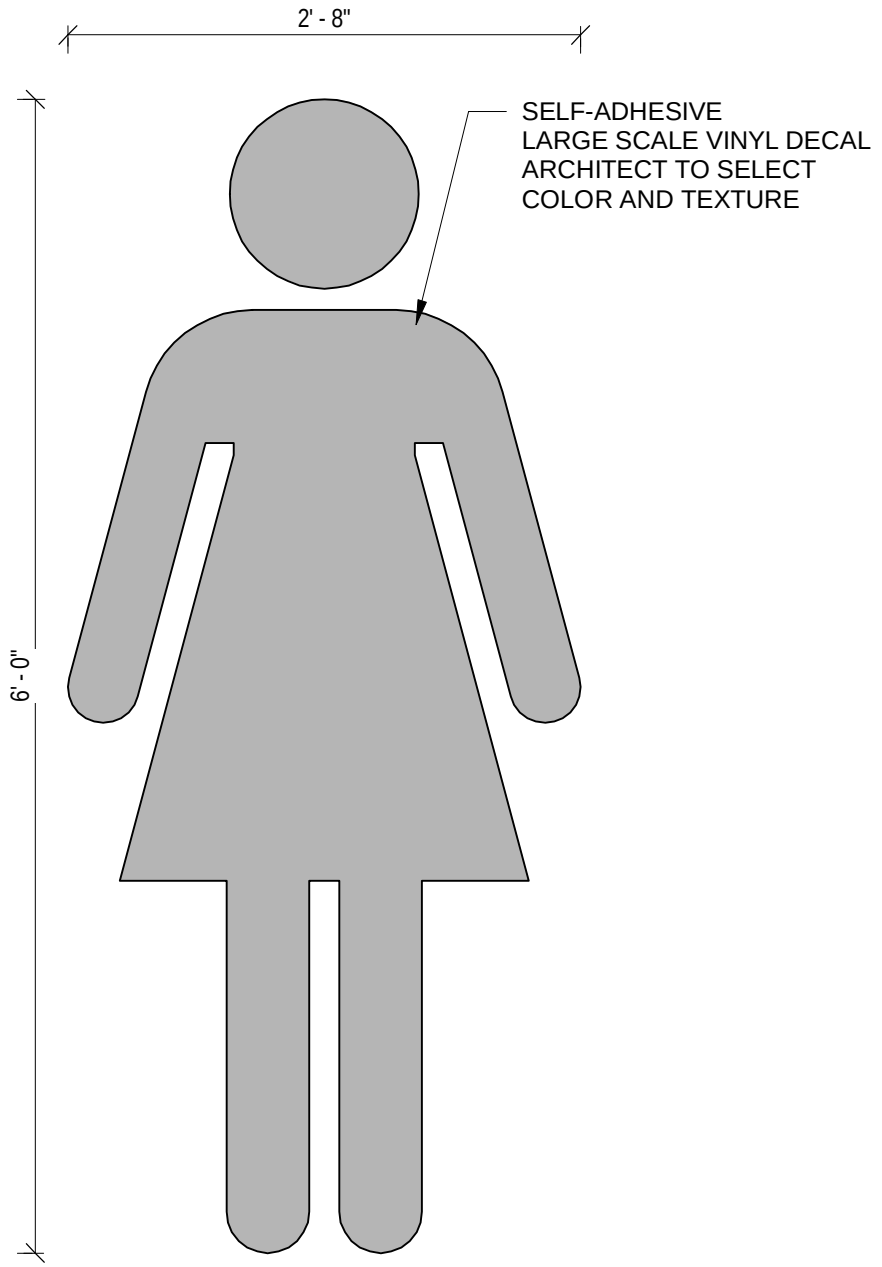

NOTES:
SEE SCHEDULE FOR ROOM NAMES.

BASIS OF DESIGN: MFG: TAKEFORM,
STYLE: AMPLIFY WALLCOVERINGS
MATERIAL: VINYL DECAL
ARCHITECT TO SELECT FROM
MFG'S FULL RANGE.

1
SIGN 2

SIGN- WOMEN'S LOCKER ROOM

1" = 1'-0"

VINYL DECAY - IMAGE - 2

QA+M architecture

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1 JILLSON SQUARE - WILLIMANTIC, CONNECTICUT

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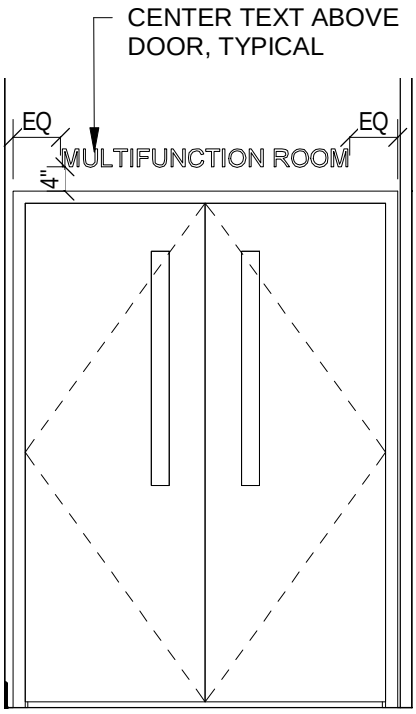

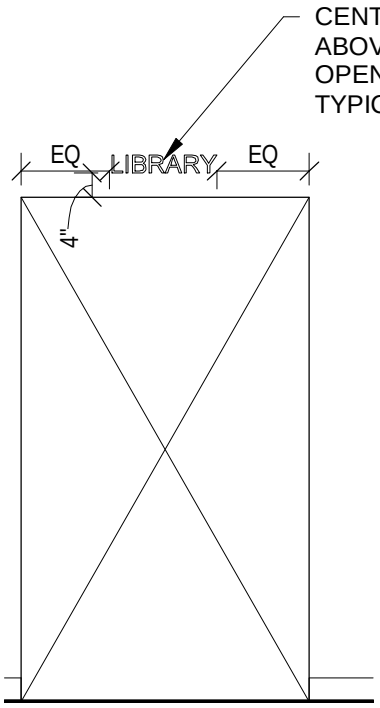

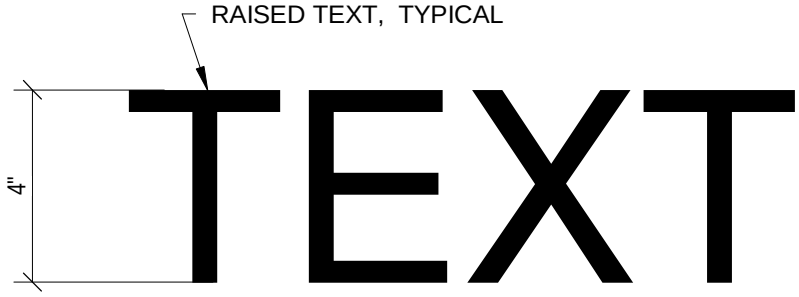

NOTES:
SEE SCHEDULE FOR ROOM NAMES.

BASIS OF DESIGN: MFG: TAKEFORM, STYLE: ETHOS, SOLID ALUMINUM, THICKNESS: 0.25", 0.5" OR 0.75", MOUNTING OPTIONS: STUD FLUSH OR WITH STAND-OFFS, TEXTURE: BRUSHED CLEAR OR NATURAL. ARCHITECT TO SELECT FROM MFG'S FULL RANGE

1 SIGN- RAISED LETTERS

SIGN 3 3" = 1'-0"

RAISED LETTERS

QA+M architecture

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1 JILLSON SQUARE - WILLIMANTIC, CONNECTICUT

Sheet #:

SIGN 3

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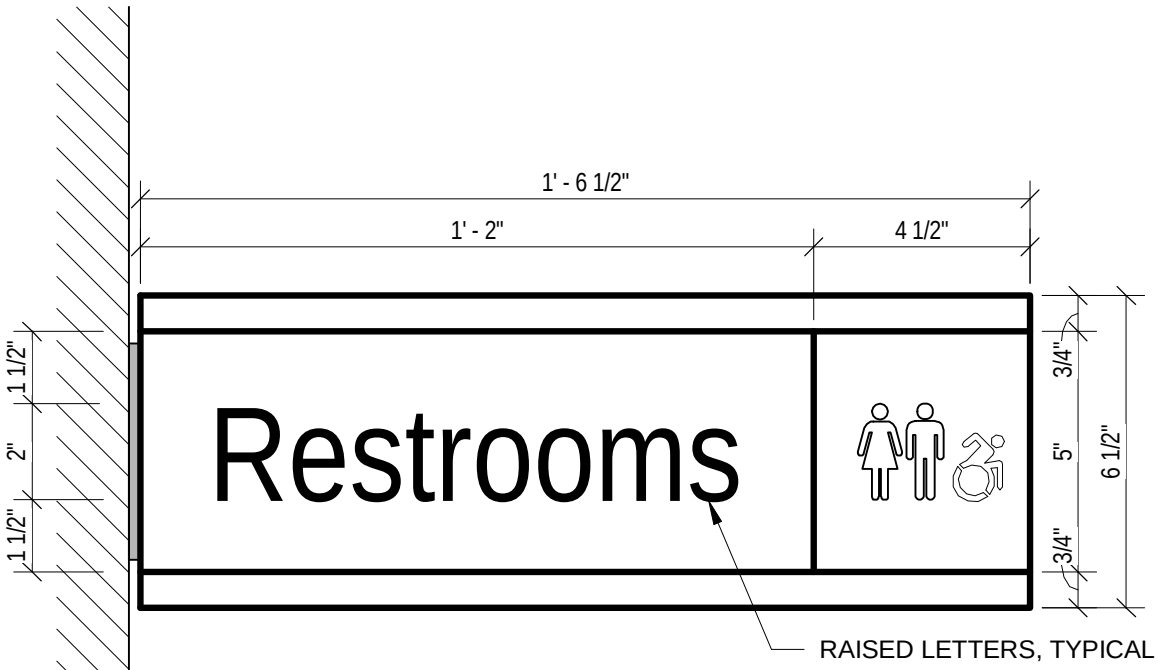

NOTES:
SEE SCHEDULE FOR ROOM NAMES.
SIGN WIDTH MAY BE REDUCED BY 1" IF NOT REQUIRED FOR MULTI-LINE TEXT.

BASIS OF DESIGN: MFG: TAKEFORM, STYLE: FUSION 61 M (F61DB0-F2).
ARCHITECT TO SELECT FROM MFG'S FULL RANGE

1 SIGN- RESTROOMS

SIGN 4 3" = 1'-0"

FLAG MOUNT

QA+M architecture

DEVELOPMENT OF:

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1 JILLSON SQUARE - WILLIMANTIC, CONNECTICUT

Sheet #: **SIGN 4**

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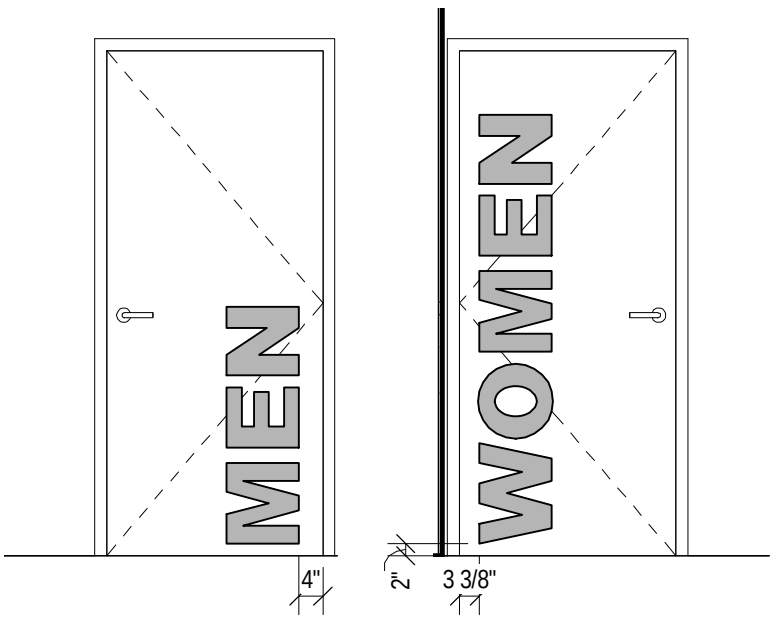
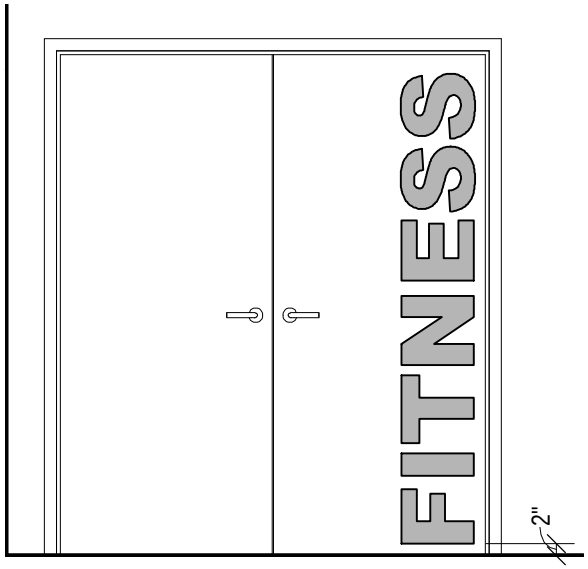
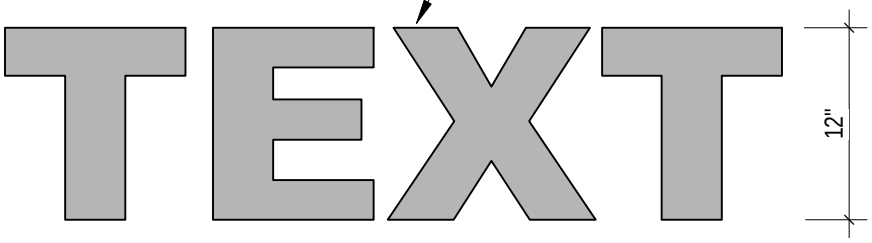
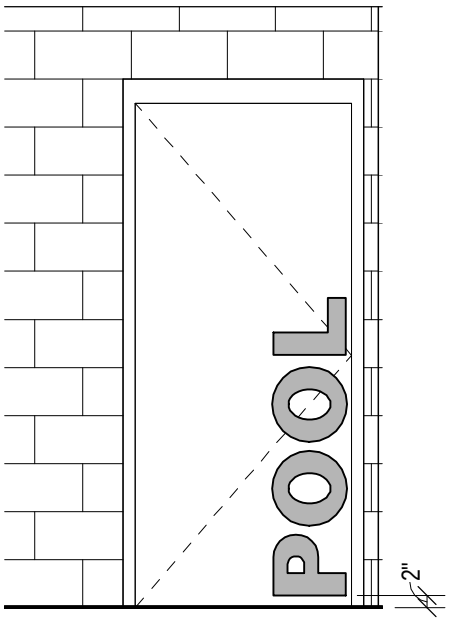




SELF-ADHESIVE VINYL
DECAL TEXT
ARCHITECT TO SELECT
COLOR AND TEXTURE





NOTES:
SEE SCHEDULE FOR ROOM NAMES.

BASIS OF DESIGN: MFG: TAKEFORM, STYLE: AMPLIFY WALLCOVERINGS
MATERIAL: VINYL DECAL.
ARCHITECT TO SELECT FROM MFG'S FULL RANGE

1 SIGN 5

SIGN- VINYL DECAL TEXT

1" = 1'-0"

VINYL DECAL - TEXT

QA+M architecture

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1 JILLSON SQUARE - WILLIMANTIC, CONNECTICUT

Sheet #:
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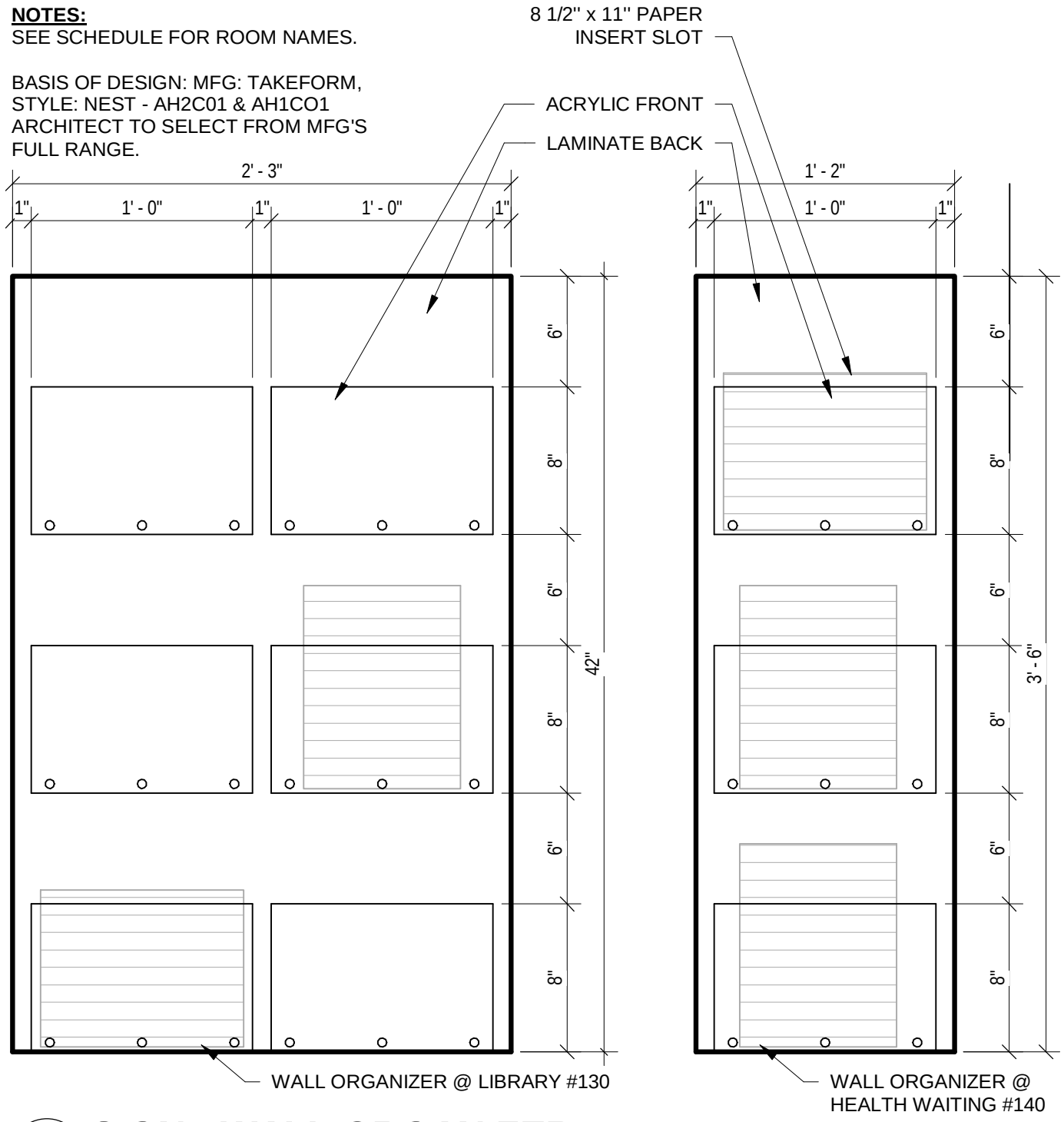
NOTES:
SEE SCHEDULE FOR ROOM NAMES.

BASIS OF DESIGN: MFG: TAKEFORM,
STYLE: NEST - AH2C01 & AH1CO1
ARCHITECT TO SELECT FROM MFG'S
FULL RANGE.



1 **SIGN - WALL ORGANIZER**
SIGN 6 1 1/2" = 1'-0"

WALL ORGANIZER

QA+M architecture

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WINDHAM SENIOR & COMMUNITY CENTER

1 JILLSON SQUARE - **WILLIMANTIC, CONNECTICUT**

Sheet #:
SIGN 6

Project #:	Drawn By:
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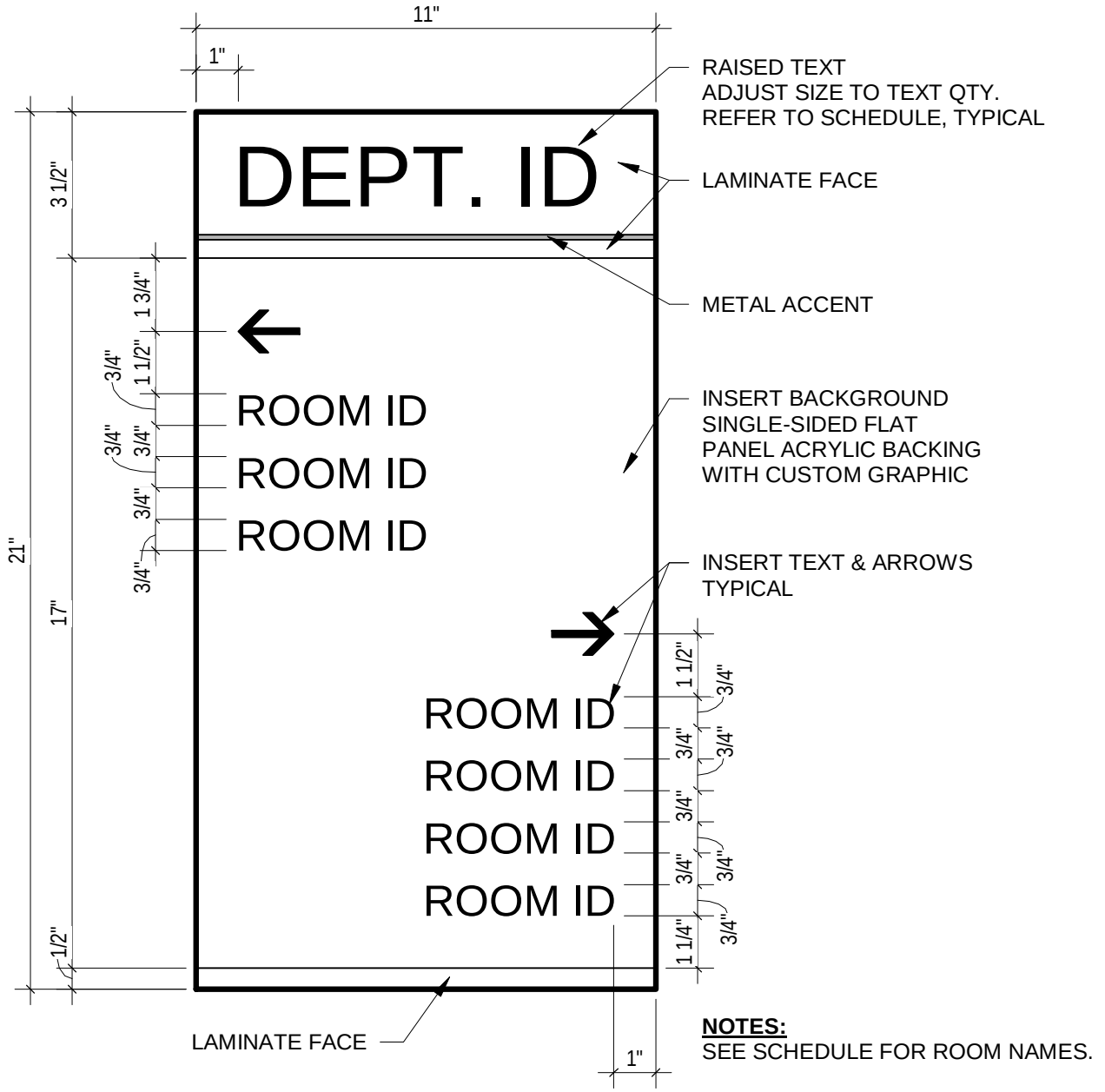

NOTES:
SEE SCHEDULE FOR ROOM NAMES.

BASIS OF DESIGN: MFG: TAKEFORM, STYLE: FUSION - 01B (F01C-W1). ARCHITECT TO SELECT FROM MFG'S FULL RANGE

1 SIGN- DIRECTIONAL SIGNAGE

SIGN 7 3" = 1'-0"

DIRECTIONAL SIGNAGE

QA+M architecture

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WINDHAM SENIOR & COMMUNITY CENTER

1 JILLSON SQUARE - WILLIMANTIC, CONNECTICUT

Sheet #:
SIGN 7

Project #:	Drawn By:
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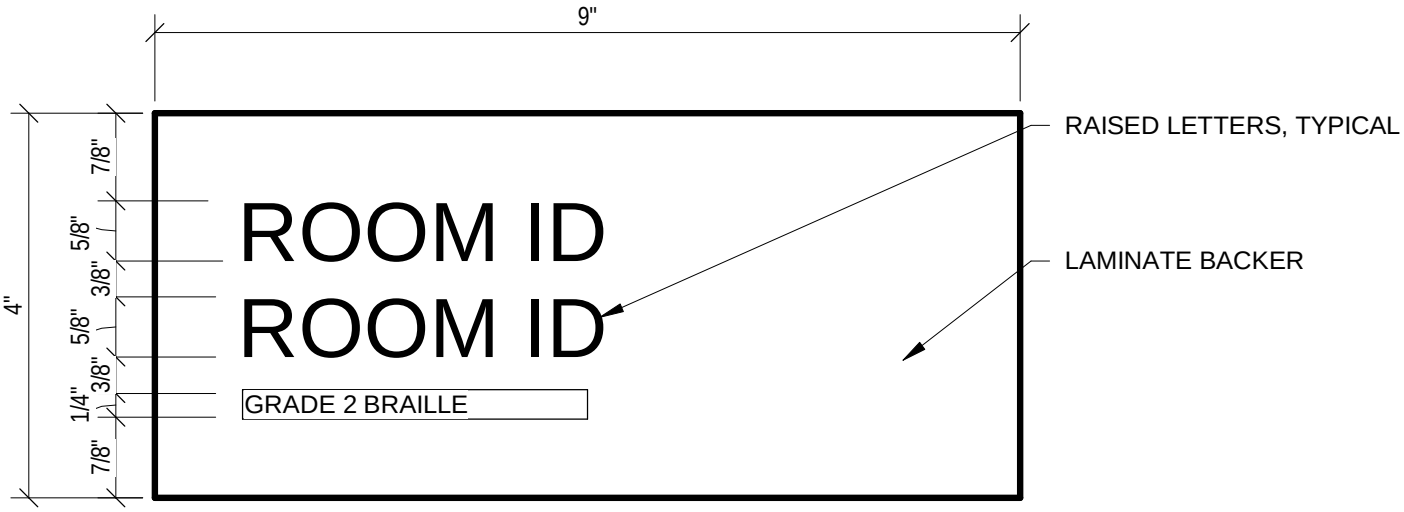

NOTES:
SEE SCHEDULE FOR ROOM NAMES.
SIGN WIDTH MAY BE REDUCED BY 1" IF NOT REQUIRED FOR MULTI-LINE TEXT.

BASIS OF DESIGN: MFG: TAKEFORM, STYLE: FUSION, ARCHITECT TO SELECT FROM FULL RANGE OF LAMINATE COLORS

1 SIGN- ROOM ID (MULTI-LINE)

SIGN 8 6" = 1'-0"

ROOM ID

QA+M architecture

DEVELOPMENT OF:

WINDHAM SENIOR & COMMUNITY CENTER

1 JILLSON SQUARE - WILLIMANTIC, CONNECTICUT

Sheet #:
SIGN 8

Project #:	Drawn By:
1762	ESR

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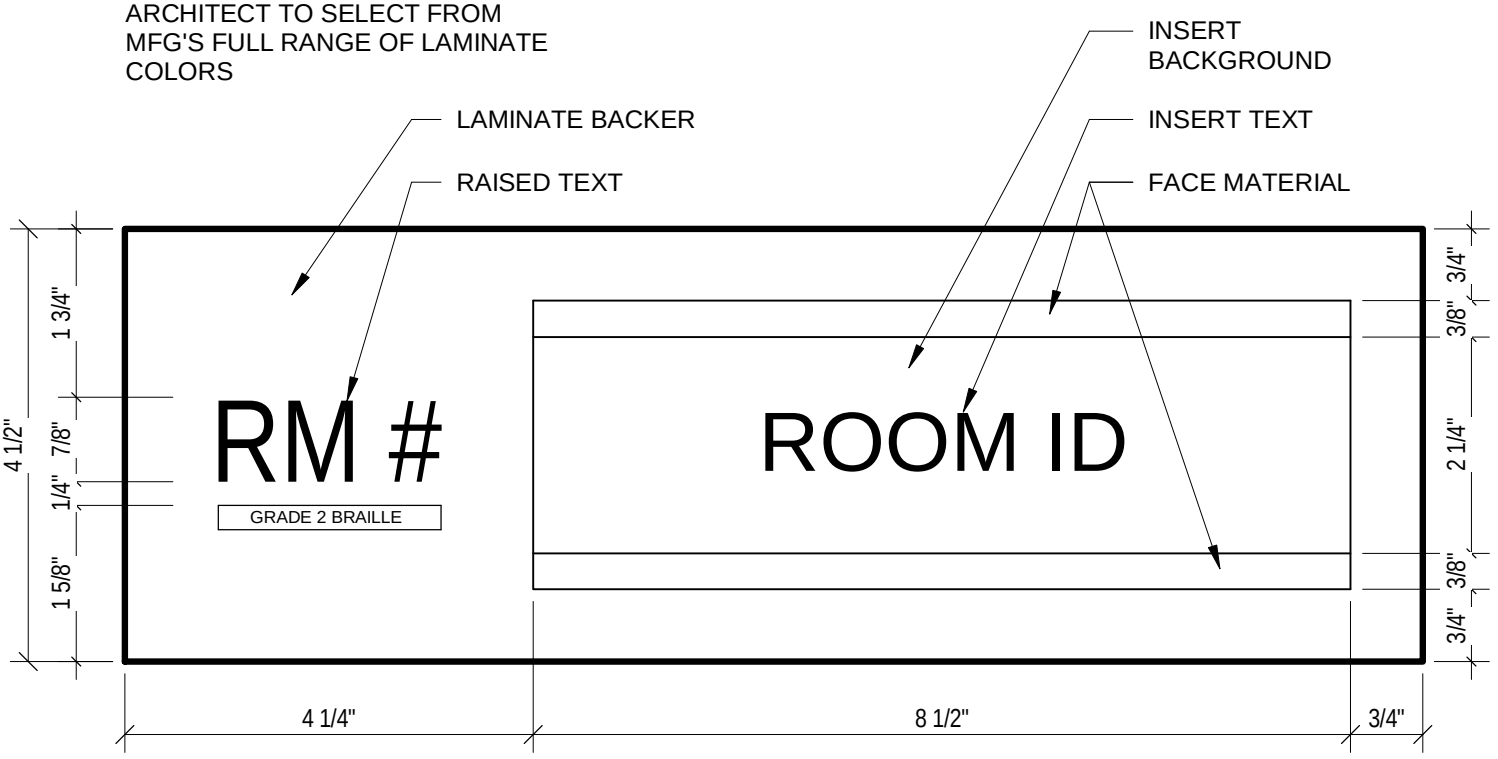
NOTES:
SEE SCHEDULE FOR ROOM NAMES.

BASIS OF DESIGN: MFG: TAKEFORM, STYLE: FUSION - 61H(F61BB0-D1). ARCHITECT TO SELECT FROM MFG'S FULL RANGE OF LAMINATE COLORS



1 SIGN 9 **SIGN- TYPICAL OFFICE ROOM ID**
6" = 1'-0"

TYPICAL OFFICE ROOM ID

QA+M architecture

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WINDHAM SENIOR & COMMUNITY CENTER

1 JILLSON SQUARE - WILLIMANTIC, CONNECTICUT

Sheet #:
SIGN 9

Project #:	Drawn By:
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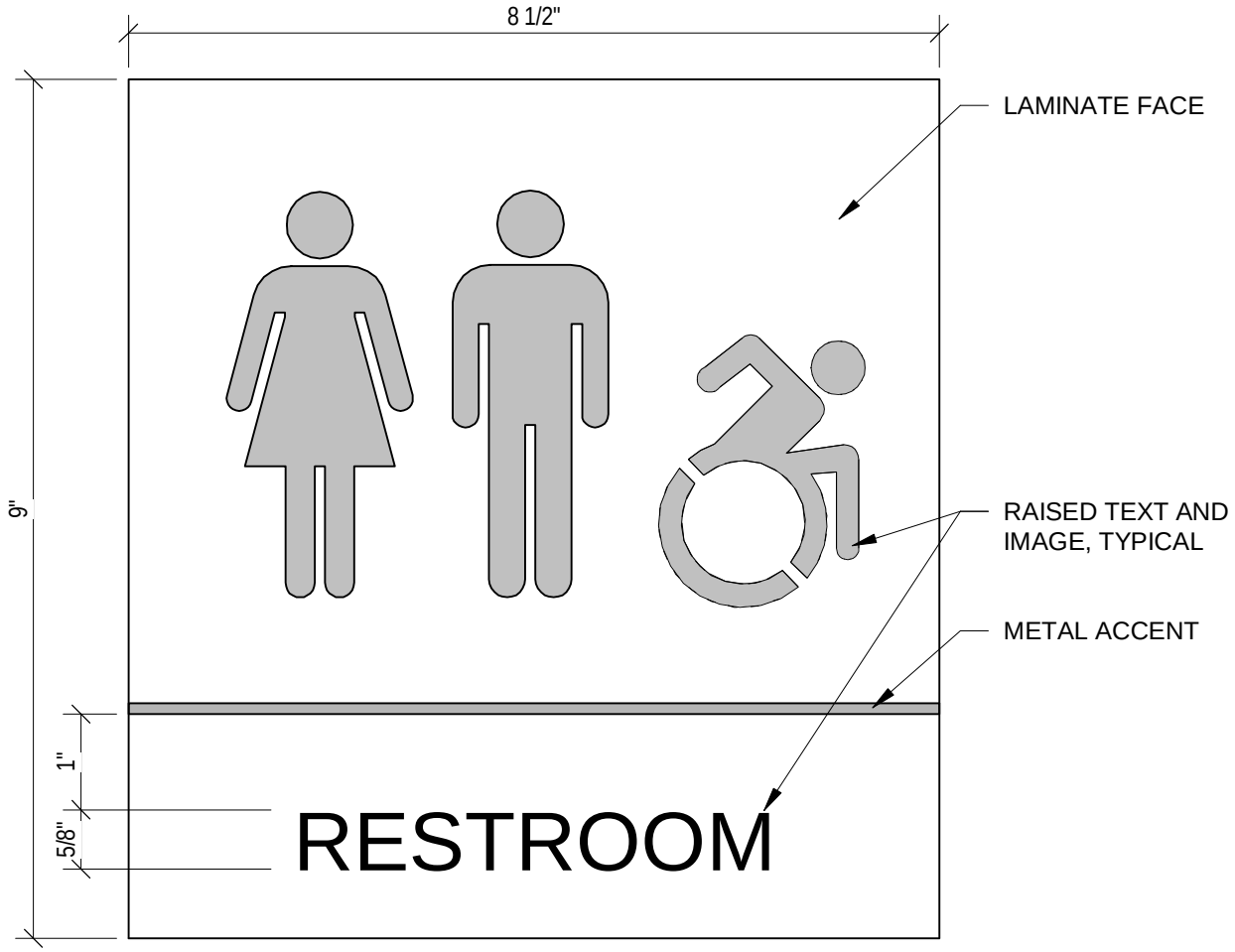
NOTES:
SEE SCHEDULE FOR ROOM NAMES.
SIGN WIDTH MAY BE REDUCED BY 1" IF NOT REQUIRED FOR MULTI-LINE TEXT.

BASIS OF DESIGN: MFG: TAKEFORM, STYLE: FUSION - 01 E.2 (F01B-G2-BC). ARCHITECT TO SELECT FROM MFG'S FULL RANGE



1 **SIGN- RESTROOM**
SIGN 10 6" = 1'-0"

RESTROOM SIGNAGE

QA+M architecture

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WINDHAM SENIOR & COMMUNITY CENTER

1 JILLSON SQUARE - WILLIMANTIC, CONNECTICUT

Sheet #:
SIGN 10

Project #:	Drawn By:
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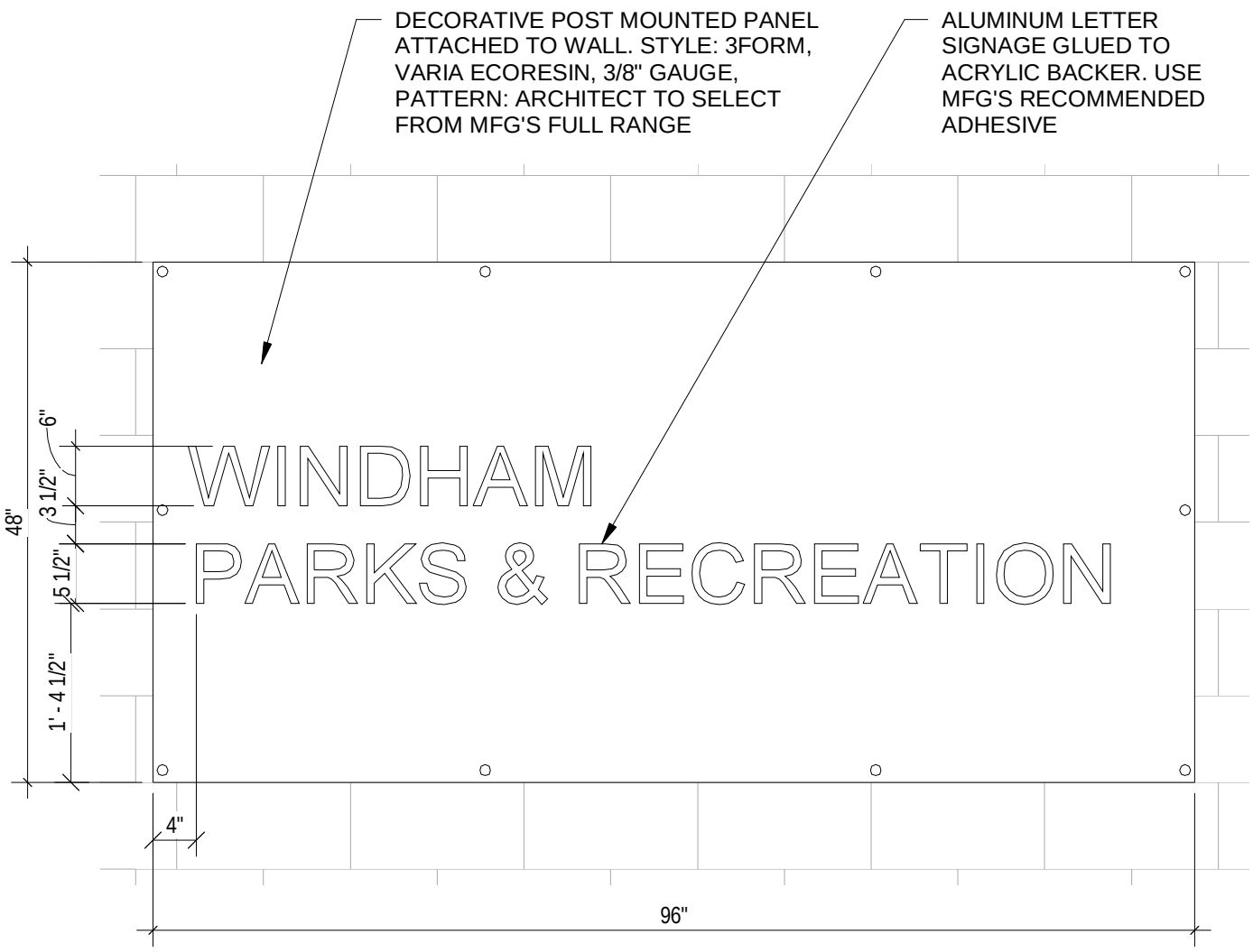

2 SIGN - ACRYLIC

SIGN 11 3/4" = 1'-0"

ACRYLIC SIGNAGE

QA+M architecture

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WINDHAM SENIOR & COMMUNITY CENTER

1 JILLSON SQUARE - WILLIMANTIC, CONNECTICUT

Sheet #:

SIGN 11

Project #:	Drawn By:
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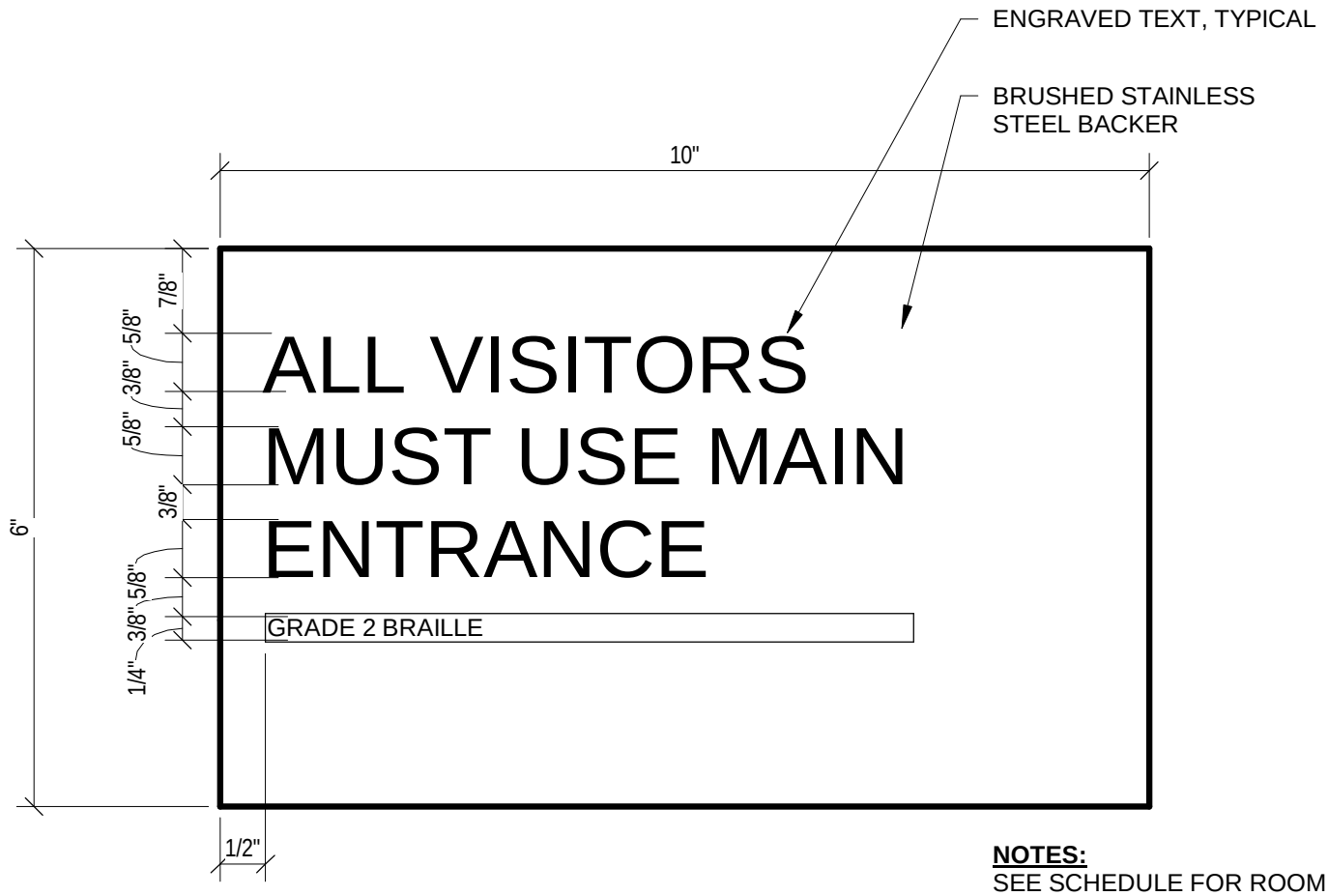

NOTES:
SEE SCHEDULE FOR ROOM NAMES.
SIGN WIDTH MAY BE REDUCED BY 1" IF NOT REQUIRED FOR MULTI-LINE TEXT.

1 SIGN - BUILDING ENTRY

SIGN 12 6" = 1'-0"

BUILDING ENTRY

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1 JILLSON SQUARE - WILLIMANTIC, CONNECTICUT

Sheet #:
SIGN 12

Project #:	Drawn By:
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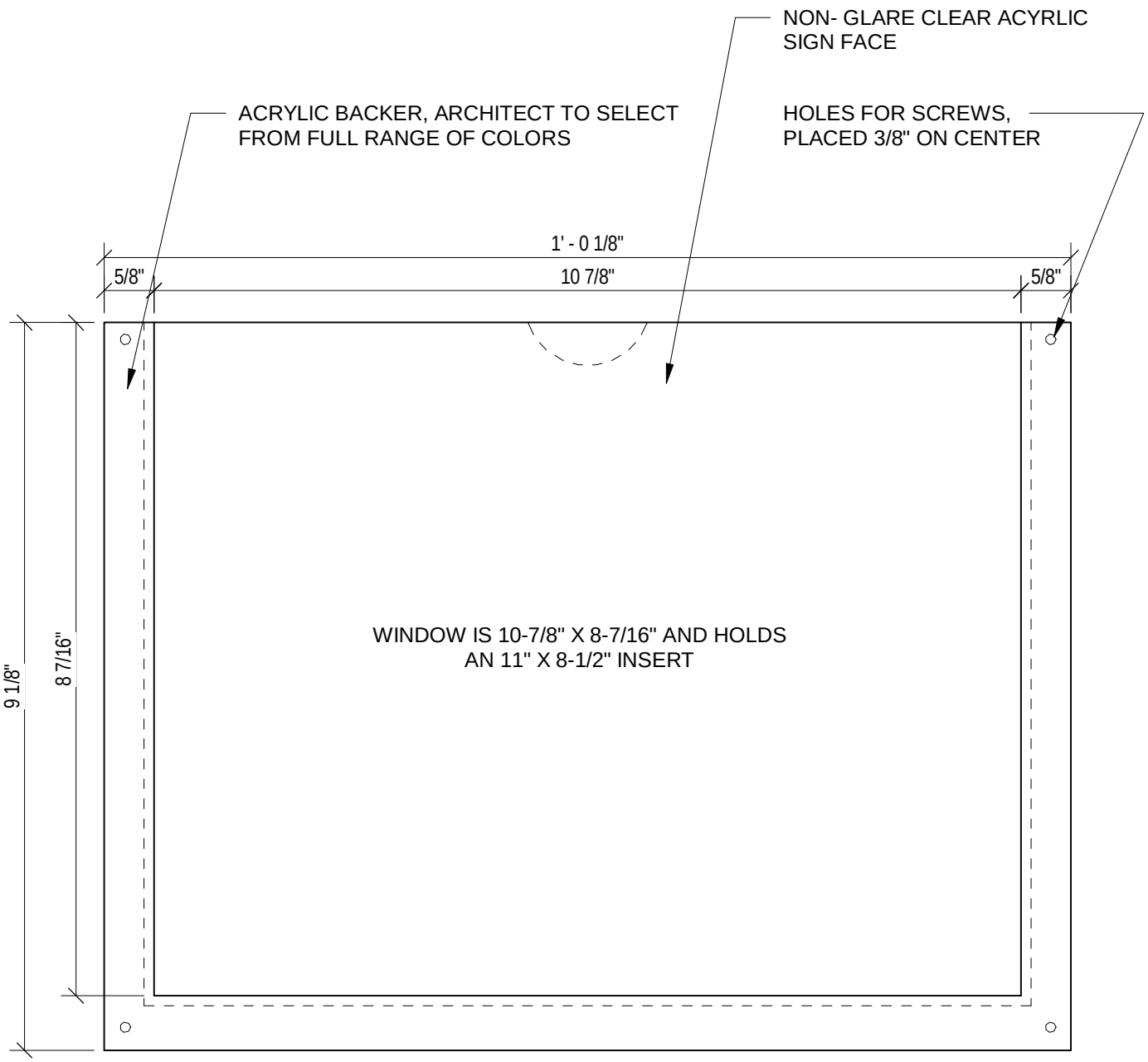

1 SIGN 13

SIGN- EVACUATION ROUTE

6" = 1'-0"

EVACUATION ROUTE

QA+M architecture

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1 JILLSON SQUARE - WILLIMANTIC, CONNECTICUT

Sheet #:

SIGN 13

Project #:	Drawn By:
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NOTES:

BASIS OF DESIGN:
TAKEFORM, STYLE: FUSION,
ARCHITECT TO SELECT
FROM FULL RANGE OF
LAMINATE COLORS

FIRE/STAIRS

QA+M architecture

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1 JILLSON SQUARE - WILLIMANTIC, CONNECTICUT

Sheet #:

SIGN 14

Project #:	Drawn By:
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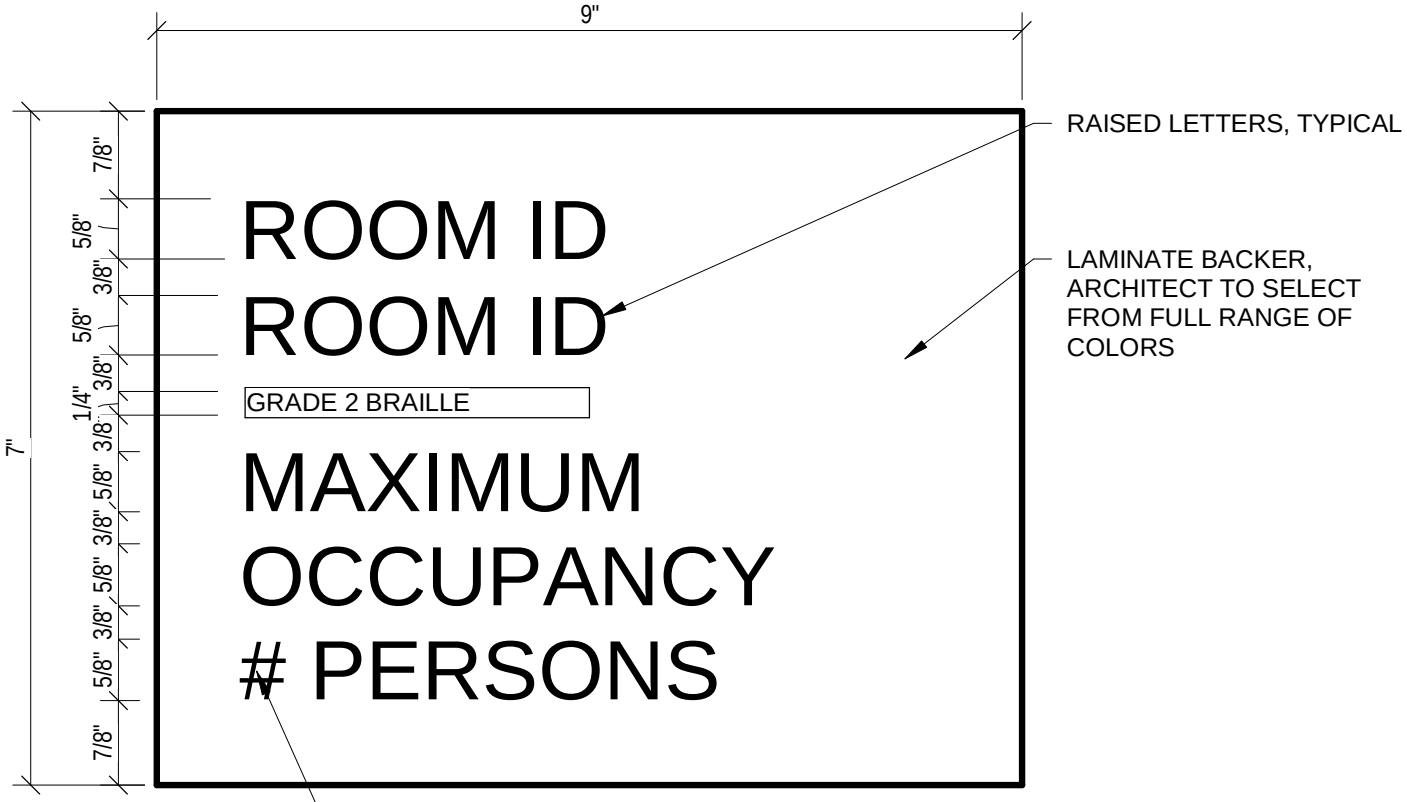

NOTES:
SEE SCHEDULE FOR ROOM NAMES.
SIGN WIDTH MAY BE REDUCED BY 1" IF NOT REQUIRED FOR MULTI-LINE TEXT.

BASIS OF DESIGN: MFG: TAKEFORM, STYLE: FUSION, ARCHITECT TO SELECT FROM FULL RANGE OF LAMINATE COLORS

1 SIGN- ROOM ID W/ OCCUPANT LOAD

SIGN 15 6" = 1'-0"

ROOM ID W/ OCCUPANT LOAD

QA+M architecture

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1 JILLSON SQUARE - WILLIMANTIC, CONNECTICUT

Sheet #:
SIGN 15

Project #:	Drawn By:
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SECTION 131500 - SWIMMING POOL FILTRATION, RECIRCULATION, CONTROL, CHEMICAL and COMPONENTS

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

A. Provide all swimming pool replacement filtration, re-circulation, chemical control and necessary work to completely install the specified replacement equipment components and materials as indicated on the drawings and specified herein, including:

- Assembly and installation
- Piping and valves
- Filter recirculation components
- Heater
- System accessories
- Surge tank, including valving and accessories
- Automatic water level control system
- Santinizing chemical feed system
- VFD Controller for Recirculation pump motor
- Specialty start-up chemicals
- Start-up service

1.1 INTENT

A. Purpose of the bid is to purchase and have installed a complete recirculation, filtration, re-circulation and chemical control systems for a new swimming pool. It is intended to provide products that have a proven history and record of performance.

1.2 PROPRIETARY NAMES

A. Due to the specialized nature of certain components required for this project, these specifications, in some instances, refer to various components by trade or manufacturers name.

B. Whenever a proprietary (trade) name is used within this Specification Section, it is used for informational purposes to describe a standard of required function, dimension, appearance and quality. All bidders are required to bid on any named manufacturer in the BASE BID. The Contractor may at his option, elect to bid using the products and/or services of alternate manufacturers as ALTERNATES on the bid form. Any alternates must be accompanied with detailed shop drawings as required per State Of Connecticut Public Swimming Pool Design Guide.

1.3 SUBSTITUTIONS

A. No substitutions will be considered unless the specified product becomes unavailable due to no fault of the Contractor.

1.4 QUALITY ASSURANCE

A. Due to the specialized nature of the specified work and products, all bidders shall be required to have a minimum of five (5) years of operating history. The equipment described herein shall be products of a manufacturer regularly engaged in the fabrication of specified systems for at least Seven (7) years.

B. The bidder shall include a list of five (5) projects, which have been in operation for at least five (5) Years. List shall include contact names, addresses, telephone numbers and year of installation.

1.5 GUARANTEE

A. The "COMPONENT EQUIPMENT SUPPLIER" shall guarantee that the equipment to be furnished is of the correct capacity, that the various parts are designed to operate correctly and in conjunction with each other, that if the installation is made in accordance with the project drawings and operated in accordance with the suppliers' instructions, the system will perform the prescribed functions correctly, the water entering the pool will be clear, bright, free from suspended matter visible to the unaided eye, and will be sanitary to the satisfaction of all authorities having jurisdiction.

1.6 SUBMITTALS

A. Provide detailed shop drawings of the items of equipment being provided, indicating the dimensions, materials of construction and warranty.

B. Provide a complete set of operating instructions, embracing the operational functions and recurring maintenance processes involved in connection with the complete filtration and chemical treatment system.

1.7 WARRANTIES

- Piping, valves and accessories shall include a three (3) year warranty unless otherwise noted.
- Unless otherwise specified, workmanship is to be guaranteed first class and carry a one (1) year warranty.

PART 2 – RECIRCULATION COMPONENTS

2.00 FILTER RECIRCULATION PUMP

Pentair C-Series commercial bronze pump with 6" Hair and Lint Strainer. Bronze volute and pot, coated cast iron foot, flanged connections, 6 in. suction, 4 in. discharge

Includes:

- Heavy-gauge stainless steel strainer basket (one spare basket to be included).
- Model: CM-75, Item #348001 (Verify with Pool Consultant)

- 208v, 1 Phase, 39.6 amp, 7.5 H.P., Service Factor: 1.15
- NSF Listed
- Capable of 300 GPM @ 78' TDH

2.01 FILTER SYSTEM

General Notes:
•Prior to ordering filter system, the pool contractor is to verify tank access into building, including access to final design installation location.
•The filter system under this section shall be a Defender Model as detailed on the drawings.
•It is the intent of these specifications to describe a filter system complete with all accessory items supplied and warranted by one manufacturer.
•The primary components of the system consist of the main filter tank, flex tube filter elements, element assembly, bump mechanism, vacuum transfer system, sight glass, pressure gauge panel, inspection (viewing) window, valves and automatic filter controller.
•All components and related subassemblies shall be factory assembled and tested prior to shipment.
•The filter system under this section shall be a Defender Model as detailed on the drawings.

2.02 FILTER SYSTEM CAPACITY

- The filter system shall have a capacity of filtering 108,000 gallons in 6 hours at a rate of 300 gallons per minute (GPM).
- The system shall consist of (1) Defender filter tank(s) with a total effective filter surface area of 381 square feet and operate at a rate of 0.79 gallons per minute per square foot of filter area.
- The filter area shall be provided as specified and as listed in NSF-Standard 50 to provide the specific filter rate. No modification, manipulation or interpretation of these values shall be permitted.
- Filter system shall be designed to maximize sq. ft. of filter area while minimizing operating weight. Systems that operate in excess of 11 lbs. per sq. ft. of filter area shall not be considered.

2.03 FILTER TANKS

A. The filter tank shall not be less than 27” in diameter with a 60” side shell, suitable for 50 psi working pressure and hydrostatically tested to 75 psi. Tank shell shall be not less than ¼” thick. Bottom dished head shall be not less than ¼” thick. Top flat head shall be not less than 1 1/4” thick. All material shall be Type A-36 carbon steel.

NOTE: Tanks constructed of alternate materials shall not be considered.

B. All welding shall be performed by qualified operators. Joints shall be butt or fillet welded inside and out by manual or automatic process. Welded joints shall have complete penetration and fusion with little or no reduction of the thickness of the base metal. Welds shall be free of coarse ripples, grooves, overlaps, abrupt ridges or valleys. All welded surfaces shall be chipped and brushed clean, when necessary, leaving no slag or splatter.

C. Tank legs shall be constructed of 6” x 2 ½” channel legs ¼” thick. 24”, 27” and 33" filters shall have (3) legs. 41”, 49” and 55” filters shall have (4) legs. The material shall be Type A-36 carbon steel. Bearing plates shall be 10” x 5” x 1/4” type 304L stainless steel. Each bearing plate shall have (2) 5/8" drilled holes to secure to the floor with the ½" x 4 ½" stainless steel concrete anchors provided. The legs shall be designed with bolted connections to minimize overall tank height for shipping and access into the mechanical room.

- The tank head shall be bolted to the shell with 7/8” diameter T304 stainless steel threaded rods and nuts, 9” on center around the tank perimeter.
- Tank shall be equipped with a UL listed grounding lug.
- Tank shall incorporate connections for 6“filter influent,6" effluent, 3" drain; 1-1/2" vacuum transfer piping, 6” viewing window, and lift shaft gland.
- Tank shall include brackets for mounting of RMF System controller, gauge panel, filter / regulator, vacuum transfer blower, and vacuum hose rack.
- Tank shall include a integrally mounted hydraulic lifting device (davit). The davit assembly shall be designed to lift the filter head and include a pivot mechanism allowing the head to rotate 180°, for access to the tube sheet.

NOTE: Systems requiring additional devices for filter head removal will not be considered.

2.04 FLEXSOL 3000 INTERIOR LINING

•All interior surfaces shall be grit blasted to white metal condition with a 3-4 mil profile. Blasted surfaces shall be cleaned of all dust or blast residue. Lining shall be applied as soon as is practical on the same day blasting is done.

•Flexsol 3000® shall be a urethane, 100% solid plural component lining. Hardness shall be 75 durometer on the shore D scale. Break tensile strength shall be 4000 psi with elongation of less than 10%. Adhesion shall be greater than 2500 psi.

•Application of Flexsol 3000® lining shall be done by experienced applicators using a high pressure, high temperature plural component system. All wetted surfaces including flange faces, manway rings and manway covers shall be lined to 100 mils +/- 10 mils WFT.

•Hardness shall be verified after curing to ASTM D 2240 standard.

•Manufacturer shall submit for approval a sample piece of coated steel to determine flexibility, abrasion tolerance and adhesion integrity.

•Flexsol 3000® lining shall meet the NSF toxicity standard unconditionally and shall be approved for use with the NSF approved filter.

•Flexsol 3000® lined vessels shall carry a ten (10) year limited non-prorated warranty.

•The filter manufacturer shall bear the responsibility for suitability of lining and shall be the sole source for the specified warranty.

2.05 EXTERIOR COATINGS

- All exterior surfaces shall be grit blasted to white metal condition with a 2-3 mil profile. Blasted surfaces shall be cleaned of all dust or blast residue and primed as soon as is practical on the same day blasting is done.

- When priming has dried the coating process will begin. If prime has sat for over twenty-four hours, a refresher coat will be applied.

- Two coats of high solids enamel shall be applied for a total developed film thickness of 5-8 mils.

- Manufacturer is to supply min.16 oz of high solids enamel touch-up paint.

2.06 INTERNAL COMPONENTS

- The filter shall consist of flex tube elements, filter tube sheet, stainless steel lift shaft and internal flow diversion assembly.

- The filter elements shall be flexible tubes that provide the support structure for the media. The outer wall of each element shall be fabricated of multi-filament high strength polyester braid. Each element shall have an internal T304 stainless steel spring, which acts a support structure for the braided filament.

- The filter element tube sheet shall be fabricated of T304 stainless steel and provide both support for the top of the element assembly as well as water tight seal to prevent media from escaping the filter tank.

- The lift shaft shall be fabricated from T304 stainless steel and provide the internal connection between the filter element tube sheet and the external bump mechanism.

- The filter influent connection shall be fitted with a T304 stainless steel flow diversion assembly to eliminate disturbance to the filter elements during operation.

- All stainless steel wetted fasteners shall be Type 304.

  NOTE: Systems utilizing rigid elements with replaceable filter septum shall not be considered.

2.07 BUMP MECHANISM

The bump mechanism shall include a pneumatically operated tire mounted externally on the filter tank head. The tire is alternately pressurized then depressurized causing the connected filter element assembly to move in a downward then upward fashion. This movement shall provide the means of dislodging the media and accumulated solids, which then recoat the filter element.

NOTE: Systems that do not incorporate a pneumatic bump mechanism shall not be considered.

2.08 VACUUM TRANSFER SYSTEM

- The vacuum transfer system shall be provided to allow the recharging of media into the filter for either bag or bulk media.

- The vacuum shall include a 5 peak HP 115V single phase motor 60 Hz, cULus listed.

- Vacuum shall be supplied with mating electrical connections pre-wired into RMF System controller for field final connection in a pre-assembled junction box.

- Provide three (3) 1-1/2" SCH 80 PVC ball valves: for the vacuum drain line, the blower inlet and the vacuum hose.

- The Manufacturer shall provide all necessary pipe, fittings and hardware for field plumbing of the vacuum transfer system.

- Provide 1-1/2" vacuum hose with required fittings.

  NOTE: Systems requiring external precoat mixing tanks, slurry feed, or other wet media transfer devices shall not be considered.

2.09 RMF SYSTEM CONTROLLER

- The automatic controller shall provide total control of the system's filtration and regeneration cycles, and provide all necessary equipment interlocks and timing mechanisms to execute the filter program.
- The controller shall contain at least two microprocessors that will monitor all functions of the system.

- The controller shall contain also control the operation of the following functions:

Standard Features

- Bump cycle / manual or automatic; with or without security interlock for data logging
- Precoating of the filter elements
- Stopping and starting of the main recirculation pump
- Opening and closing of pneumatically operated valving
- Vacuum transfer system
- Heater cool down delay
- Auxiliary contacts to interlock UV lamps, chemical control, or other equipment
- 7 inch Hi-Res LCD Screen with Tactile Feedback Membrane
- Last Bump™ and Bump-n-Go™ Features
- Remote Operation via browser or phone
- Off Site Real-Time Status
- Email on change of condition
- Data logging of process
- Differential Pressure Monitoring and Bump Control
- Automatic maintenance reminders
- Exporting of process data logs to .csv Excel™ files
- Modbus Communications for PLC connectivity

The controller panel shall display the following functions:

- Filter status
- Precoat status
- Last Bump
- Recirculating pump status

- Vacuum transfer pump status
- System power
- Low Pressure Alarm
- Recirculating Pump Off Alarm
- Pressure Differential
- Flow Rate (when interlocked with VFD)
- Step by step animated graphics

- The controller enclosure shall be NEMA 4x/IP66 approved system.

- The RMF controller will provide signal power to the main recirculating pump motor starter. The unit is required to be a variable frequency drive (VFD) and is to be installed with control wiring by the electrical contractor.

- The RMF shall be 120V/230V, 1 phase, 20 amp rated and shall be UL labeled.

- NOTE: Systems without programmable, automatic bump/regeneration/filter modes shall not be considered.

2.10 VFD

- A Variable Frequency Drive (VFD) shall be provided with each Defender (one per filter pump) for control of the filter pump motor.
- The Variable Frequency Drives (VFDs) shall be solid state, with a Pulse Width Modulated (PWM) output. The VFD package as specified herein shall be enclosed in a NEMA 12 enclosure, completely assembled, programmed and tested by the manufacturer. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC induction motors. The VFD shall be a six-pulse input design. The VFD shall be of a PWM output design utilizing current IGBT inverter technology and voltage vector control of the output PWM waveform and shall output a waveform that closely approximates a sine wave.

- Option for Single Phase input: The VFD shall convert incoming fixed frequency single-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC induction motors. The VFD shall be UL-listed for Single Phase operation. De-rating the VFD for operation on other than UL-labeled voltages shall not be acceptable. The VFD shall be a six-pulse input design. The VFD shall be of a PWM output design utilizing current IGBT inverter technology and voltage vector control of the output PWM waveform and shall output a waveform that closely approximates a sine wave.

- The VFD shall utilize VVC^{PLUS}, an output voltage-vector switching algorithm, or equivalent, in both variable and constant torque modes. VVC^{PLUS} provides rated RMS fundamental voltage from the VFD. This allows the motor to operate at a lower temperature rise, extending its thermal life. VFD's that cannot produce rated RMS fundamental output voltage or require the input voltage to be increased above motor nameplate value to achieve rated RMS fundamental output voltage are not acceptable. VFD's that utilize Sine-Coded PWM or Look-up tables shall not be acceptable.

- An Automatic Energy Optimization (AEO) selection feature shall be provided in the VFD to minimize energy consumption in variable torque applications. This feature shall optimize motor magnetization voltage and shall dynamically adjust output voltage in response to load, independent of speed. Output voltage adjustment based on frequency alone is not acceptable for single motor VT configurations.

- An Automatic Motor Adaptation (AMA) function shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to spin the motor shaft or de-couple the motor from the load to accomplish this optimization. Additionally, the parameters for motor resistance and motor reactance shall be user-programmable.

- Run permissive circuit shall be provided to accept a "system ready" signal to ensure that the VFD does not start until isolation valves, seal water pumps or other types of auxiliary equipment are in the proper state for VFD operation. The run permissive circuit shall also be capable of sending an output signal as a start command to actuate external equipment before allowing the VFD to start.

- All Green Drive VFDs shall be factory programmed per the unique requirements of each job per Neptune Benson specifications. Programming shall include but shall not be limited to filter pump, remote start/stop requirements, run confirm requirements and PID loop requirements.

- VFDs and options shall be UL, CUL, and CE labeled as a component.

Harmonic Distortion Control:

•The VFD shall provide internal DC link reactors to minimize power line harmonics and to provide near unity power factor. DC Link reactor shall be installed so that power fluctuations to the DC Capacitors shall be reduced to increase Capacitor life. VFDs without a DC link reactor shall provide a 5% impedance line side reactor and provide spare capacitors.

Specifications:

•Input voltage 200-240, 380-480, 575-600 VAC +/- 10%, 3 phase, 48-63 Hz.

•Voltage tolerance + 10% or – 15% of specified line voltage.

•Output Frequency 0 to 300 Hz. Operation above 60 Hz shall require programming changes to prevent inadvertent high-speed operation.

•Environmental operating conditions: -10 to 500°C, 0 to 1000 meters above sea level, less than 90% humidity, non-condensing.

- Enclosure shall be rated NEMA 12 or as specifically mentioned elsewhere.

- The VFD shall be wired into the RMF system controller to provide remote for on/off and run confirm functions. Wiring shall be by electrical contractor.

- The VFD shall be a Green Drive series.

- The VFD shall be equipped with a bypass. Bypass option shall send the motor to bypass mode based on an easily accessible door-mounted selector or based on the drive's programmable relay. A bypass pilot light shall provide indication of the bypass mode. The bypass mode shall provide overload protection. Contactors shall be electrically and mechanically interlocked. An essential services mode shall send the motor to bypass regardless of the selected mode.

- The bypass enclosure shall be equipped with a circuit breaker/disconnect switch.

2.11 FLOWMETER

A. A digital flowmeter shall be included with a 4-20mA 0-10 VDC analog output.

B. The flowmeter shall be wired into the VFD to provide automatic speed control of the filter pump motor.

C. The VFD shall compensate for varying filter head losses by maintaining the specified flowrate with the 4-20mA output signal of the flowmeter.

2.12 FILTER / REGULATOR

Each filter shall include a combination filter / regulator. The regulator shall be adjustable from 0 – 120 p.s.i. 1/2" F.P.T. connections shall be provided for field installation of air lines.

2.13 WATER SEPARATOR

One water separator with automatic drain shall be included for each air compressor supplied. 1/2" F.P.T. connections shall be provided for field installation of air lines.

2.14 AIR COMPRESSOR

The system will require (1) air compressor per mechanical room. The following is the minimum requirement:
20 gallon tank, 2 HP 115v, 1 phase, 15 amp, 5.2 CFM @ 90 psi, air pressure gauge, pressure relief valve, belt guard, pressure switch, air filter, tank drain.

2.15 PNEUMATIC ACTUATORS

A. Each filter shall include pneumatic actuators for (1) effluent valve and (1) precoat valve.

- The actuators shall be double acting with valve mounted drilling to ISO 5211.
- The actuators shall include (2) 1/4" FPT ports for open / close connections. Flow control valves with quick connect fittings shall be provided at each port to allow speed control adjustment for the open / close function of the actuators.

Materials of Construction

Body: aluminum alloy, extruded acc. to ASTM 6063, anodized acc. to UNI 4522

- Ends: Die-cast in aluminum alloy acc. To ASTM B179, epoxy-polyester coated
- Pistons: Die-cast in aluminum alloy acc. To ASTM B179
- Pinion: Nickel-plated steel
- Slideways: Acetal resin (LAT LUB 731320T)
- Fasteners: AISI 304 Stainless steel
- Springs: Zinc phosphate coated steel, pre-compressed
- Seals: NBR Nitrile rubber
- Lubricant: MoS2

- The actuators shall be factory lubricated to allow for 1,000,000 maneuvers.
- The actuators shall have adjustable travel stops for both directions.
- Working temperature limits: 4ºF to 186ºF. NOTE: Systems utilizing manually operated valves shall not be considered.

H. A tool kit for adjustment of pneumatic actuators shall be provided by the filter manufacturer.

2.16 SOLENOID VALVES

A. Each filter shall include three (3) single solenoid, 4-way valves mounted on a multi-station manifold for operation of the pneumatic actuators and bump mechanism.

- The solenoids valves shall include lighted DIN connectors.
- The solenoid valves shall be factory lubricated and shall not require any field lubrication.
- The solenoid valves with multi-station manifold shall be located on the bottom of the automatic controller, factory wired and include quick connect fittings for attachment to the pneumatic actuators and bump mechanism.
- The solenoid valves shall be SMC Series SY 7000.

2.17 VALVES

- All valves 3" – 12" shall be constructed with cast aluminum ASTM B179S12C housing and fully coated with Rilsan on all interior and exterior surfaces. Internal components include EPDM resilient lining, Rilsan coated ductile iron disc and T304 stainless steel shaft. Valves 14" and larger shall be constructed with cast iron housing epoxy coated and with nylon coated ductile iron disc.

B. Valves shall be butterfly valves and shall be provided for the influent, effluent and precoat lines.

2.18 SYSTEM VALVES

A. Each defender filter shall include Five (5) system valves to facilitate system fill after media recharge, precoat/regeneration, influent & effluent for filtering and media dump/drain valve.

- The precoat/regeneration and effluent valves shall be butterfly type with pneumatic actuators per 2.15.
- The system fill valve shall be butterfly type with lever operator and shall be the same size as the precoat/regeneration valve.
- The influent valve shall be a wafer type check valve, ductile iron body w/double disc, SS type 304.
- The dump/rinse valve shall be butterfly type, lever operated with SS extension to facilitate operation.

2.18a DRAIN REQUIREMENTS (BY OTHERS)

A. A sump pit, stand pipe or similiar drain is required for dumping spent media and rinsing tube elements.

B. To prevent overflow the sump or stand pipe drain piping should be sized for 300 gpm(min) capacity.

2.20 PACKAGING

A. For loading and unloading, filter tank diameters 24" – 41" shall be bolted to individual wooden pallets. Filter tank diameters 49" and 55" shall be equipped with temporary lifting legs. All tanks shall be shrink wrapped to prevent damage during transport.

B. The components shall be carefully packaged in a totally enclosed wooden crate to prevent damage during transport.

2.21 MEDIA

- Media shall be expanded perlite with a median particle size of 37 microns. Percentage retained on a +150 Tyler Mesh shall not be less than 8% or more than 25%. Darcy permeability shall be between 1.2-1.85.

B. The media shall contain no more than 1 tenth of one percent (.001) of crystalline silicate.

C. The media shall be certified by the Manufacturer for use in the Defender Filter. The media shall be NSF Std. 50 listed.

D. The media shall be Aquaperl/Harborlite.

E. Each Defender filter shall be furnished with six (6) charges of perlite media.

2.22 FILTER CLEANER

- Each Defender filter shall be furnished with one (1) charge of chemicals for cleaning and degreasing of filter tube elements.

2.23 WARRANTIES

A. Defender filter tanks with Flexsol 3000 shall carry a 10 year limited fully rated warranty as regularly offered by the tank manufacturer.

B. Internal components, including tube elements, shall carry a fully rated 10 year warranty.

C. Valve bodies shall carry a 5 year fully rated warranty.

D. Valve operators and system accessories including the RMF controller, quick exhaust valve, solenoid valve and bump mechanisms shall carry one year warranty as provided by the product manufacturer.

E. Unless otherwise specified, workmanship is to be guaranteed first class and carry a one (1) year warranty.

2.24 SURGE TANK (PRE-FAB CONCRETE)

Prior to ordering surge tank, the pool contractor is to verify tank access into building, including access to final design installation location, including headroom requirements.

- Surge tank shall be maximum outside dimensions of 7'W x 15'L x 8'-8"H.
- MEETS CURRENT ASTM C 1227
- CONCRETE STRENGTH 5000 PSI MIN. AT 28 DAYS
- REBAR: ASTM A-615 GRADE 60
- Tank pipe connections will be field located and coredrilled with installation of Link Seals.
- Theroseal to be applied to all interior surfaces of tank. Two coats applied as directed by manufacturer.

  Color: White

Tank to be 4,000 gallon, single chamber H20 as manufactured by Jolley Precast. Top of tank is to be supplied with rough opening for installation of 30"x30" Bilco Hatch - Allow 3-4 weeks for delivery of this custom tank. Contact Dennis Jolley (860) 774-9066 - coordinate with Aquatic Consultant: Jim Muise (401) 212-0412.

2.24a SURGE TANK ACCESS LADDER

- Access ladder shall be a Neptune-Benson stainless steel ladder and shall be mounted inside the surge tank. Ladder shall be 18" wide with 2½" x 1/4" side rails. Length per plan.

- Ladder rungs shall be ¾", diameter stainless steel rod spaced at 12" centers. 2½" x 1/4", stainless steel, angle clips shall be provided for mounting ladder to surge tank wall.

2.24b SURGE TANK ANTI-VORTEX PLATE

6” PVC Anti-Vortext plate assembly as manufactured by Neptune-Benson, Model: AVPLATE6PVCKIT

Kits to include:

(4) ¾” SS Threaded Rods
(8) ¾” SS Nuts
(8) ¾” SS Flat Washers

Plate Designed To Limit Velocity To 1.5 F.P.S Maximum.

2.24c SURGE TANK PVC YMCA STYLE BALL FLOAT VALVE

- 6” Float operated modulating valve shall be designed for submerged service.
- The housing body shall be fabricated using Sch. 80 PVC pipe with Sch. 80 PVC van stone flanges.

- The internal wafer shall be 12 gauge T304L material and positioned with 1/8" (± 1/16") clearance around the perimeter. The body shall also incorporate an interior stop plate constructed of PVC to define the allowable range of arm motion. Close fitting Delrin bushings shall be included on the shaft penetrations of the body to provide a seal against water loss and air entrance.
- The valve shaft shall be T304L material 1" in diameter. Float arms shall securely fasten to shaft using T316SS nuts with washers to provide adjustability. Arms shall be ½" diameter all thread rod T316SS with length as required.
- Ball floats shall be constructed of T304L stainless steel and be 7" in diameter with internal weighting. Floats shall also be adjustable using T316SS nuts with washers as previously described. Provide one two (2) float arms as shown on the drawings.
- Unit shall be as supplied with connections as indicated on drawing manufactured by Neptune-Benson.
- One Required: DVYMCAPVC06D

2.24d SURGE TANK BILCO ACCESS HATCH

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide factory-fabricated floor access doors.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data.

B. Shop Drawings: Submit shop drawings including profiles, accessories, location, adjacent construction interface, and dimensions.

C. Warranty: Submit executed copy of manufacturer's standard warranty.

1.3 QUALITY ASSURANCE

A. Manufacturer: A minimum of 5 years experience manufacturing similar products.

B. Installer: A minimum of 2 years experience installing similar products.

C. Manufacturer's Quality System: Registered to ISO 9001:2008 Quality Standards including in-house engineering for product design activities.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original packaging. Store materials in a dry, protected, well-vented area. Inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.

1.5 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard warranty. Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Manufacturer: Type TER Floor Access Door by The Bilco Company, P.O. Box 1203, New Haven, CT 06505, 1-203-934-6363, Fax: 1-203-933-8478, Web: www.bilco.com.

2.2 ACCESS DOOR

A. Furnish and install where indicated on plans vault access door TER, size width 30" x length 30". Length denotes hinge side. The floor access door shall be single leaf and pre-assembled from the manufacturer.

B. Performance characteristics:

1. Cover: Shall be reinforced to support a minimum live load of 150 psf (732kg/m^2) with a maximum deflection of 1/150th of the span.

2. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.

3. Operation of the cover shall not be affected by temperature.

C. Cover shall have a 1" (25mm) fillable pan to receive concrete or a combination of concrete and floor tile. All fill material to be furnished and installed by others in the field.

D. Frame: Shall be extruded aluminum with full anchor flange around the perimeter.

E. Lifting mechanisms: Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4" (6mm) gusset support plate.

F. A removable exterior turn/lift handle with a spring loaded ball detent shall be provided to open the and the latch release shall be protected by a flush, gasketed, removable screw plug.

G. Hardware:

1. Hinges: Shall be a continuous heavy duty Type 316 stainless steel hinge that is accessible only when the cover is in the open position.

2. Cover shall be equipped with an aluminum hold open arm that automatically locks the cover in the open position.

3. Cover shall be fitted with the required number and size of compression spring operators.

4. A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover.

5. Hardware: Compression spring tubes shall be an anti-corrosive composite, all fasteners shall be Type 316 stainless steel material, and all other hardware shall be zinc plated and chromate sealed.

H. Finishes: Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install products in strict accordance with manufacturer's instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work.

1. Test units for proper function and adjust until proper operation is achieved.

2. Repair finishes damaged during installation.

3. Restore finishes so no evidence remains of corrective work.

3.3 ADJUSTING AND CLEANING

A. Clean exposed surfaces using methods acceptable to the manufacturer which will not damage finish.

2.24e SURGE TANK VALVE EXTENSIONS

- Valves shall be furnished with stainless steel extension rods to deck surface.Stainless steel deck access sockets with drop-in covers shall be provided for each valve extension. Sockets shall be furnished to deck work contractor for installation in concrete stab over surge tank.
- Stainless steel T-Handle operator shall be provided.
- Valve Sizes and quantity as indicated on drawing.

2.25 GAUGES

A. Compound Gauges: 30"Hg-0-30psi, 4-1/2" dial

- (One) shall be mounted before H&L Strainer

B. Pressure Gauge 0-60psi, 4-1/2" dial

- (One) shall be mounted at pump discharge (before throttling valve).

Each gauge to be Glycerin filled, have stainless steel case and ¼"mpt bottom connection. Each gauge to be supplied with one (1) ¼" brass petcock and snubber.

2.26 THERMOMETERS

A. Thermometers: Two (2) Lincoln Aquatics #21-115 In-Line Thermometer Scale: 30-240 degrees F.

- (One) shall be mounted upstream of heater supply connection (2"HS1)
- (One) shall be mounted downstream of heater return connection (2"HR1)

2.27 VALVES

A. Valves shall be Dominion butterfly valves and shall be provided for strainer isolation, backwash throttling, filtered water return and balance tank connections and as noted on drawings.

B. Valves shall be suitable for freshwater, saltwater and submerged applications.

2.28 LEVER OPERATORS

A. Valves shall be provided with 6 position latch lock handles.

B. Latch lock handles shall be constructed of epoxy coated cast aluminum and shall include a spring loaded lever for position lock.

C. Lever shall be capable of holding the disc in any of the locking positions with no movement up to the full pressure rating of the valve.

2.29 AUTOMATIC WATER LEVEL SENSING AND MAKE-UP WATER CONTROL SYSTEM

General: New automatic fill system with manual override is to be installed. Fill water to be introduced into pool via surge tank. See drawings for piping and location details.

A. Pool water level shall be maintained by an automatic make-up level controller Model WLC-100.

B. Controller package shall consist of a PVC chamber to house stainless steel probes, a liquid level relay and delay timer, 110v 24-hour timer and terminal board.

C. Water level shall be controlled by the use of a three-probe electrode system, one for high level, one for low level and one ground. Electrodes shall be T316 stainless steel connected to a UL approved probe holder. A mechanical linkage or float operated system will not be acceptable.

D. Probes and holders shall be housed in a PVC chamber consisting of an 8", schedule 80 PVC pipe. Chamber shall be sized to accommodate desired range of water level variation and shall be complete with removable cover and adjustable collar suitable for deck level installation. A 1 ½", equalizing line shall be connected from the bottom of the chamber to the pool wall.

E. Probes shall be mounted on a readily removable plastic disk within the chamber. Probe connectors shall be protected with 90º molded plastic holders. Probe holders allow for +/- ½" of elevation adjustment.

F. Wiring from the probes shall be connected to a UL approved relay mounted within the Control Panel.

G. A 24 hour, 110v time clock shall be provided to allow for variable time settings of operation for the WLC system. Clock shall be provided with a manual override.

H. Solenoid valve shall be Parker-Hannifin, Gold Ring Model 1" N.C., 120v, slow closing.

- Supply and Install: One (1) S.R. Smith 1.5” Quickfill Fillspout (consult deck installation with proj.mgr)
- Supply and Install: One (1) Waterway Plastics Equalizer fitting for sensing line at pool wall: #640-825x V

2.30 Swimming Pool Water Chemistry Controller

PART 1 GENERAL

1.01 SECTION INCLUDES

Aquatic/pool disinfection process controller

1.02 RELATED DOCUMENTS

Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.

1.03 REFERENCES

A. The following latest edition reference specifications, guides and standards shall become part of this Specification as if herein written. If provisions conflict, the more stringent provisions shall apply.

1. NSF – National Sanitary Foundation

2. MET – Met Laboratories, Inc.

3. CSA – Canadian Standards Association

4. UL – Underwriters Laboratory

5. NEMA – National Electrical Manufacturers’ Association

6. ANSI – American National Standards Institute

DIN- German Institute of Standardization

IP- International Electrotechnical Commission

1.04 SUBMITTALS

Drawings and Instructions

1. Provide detailed Shop Drawings of the items of equipment being provided, indicating the dimensions, material and characteristics.

2. Provide a detailed Operations Manual, embracing the operation functions and recurring maintenance processes

1.05 SUBSTITUTIONS

Refer to General Requirements and Division 01.

1.06 DELEVERY, STORAGE, AND HANDLING

Refer to General Requirements and Division 01.

PART 2 PRODUCT

2.01 WATER CHEMISTRY MONITORING AND CONTROL SYSTEMS

A. General

Provide an integrated microprocessor- based electronic water treatment control system for each body of water for continuous control of pH, disinfectant via either chlorine residual or alternatively ORP value and temperature. Installation of the system shall be specified by the manufacturer and no exceptions shall be allowed. Requests for substitutions for the specified make and model will not be considered unless equal to the specified system in every respect and must be submitted to the specifying agent not less than 10 calendar days prior to bid date.

The specified controller is a **Blu-Sentinel SE** as manufactured by Evoqua Water Technologies. A request for approval must include a sample controller with all specified features; manufactures' sales literature and reference list, engineering drawings, installation, operation and maintenance manuals. Failure to provide these or any other information necessary to confirm that all specified features are provided will be cause for rejection of substitution request.

Any deviation/exception must be provided in writing to and approved by the designer prior to the bid date.

B. Controller

1. Supply power: 100 – 240 V AC, 50 – 60 Hz

2. The controller shall have a 4.3" graphic color display and capacitive touchscreen. The resolution of the display shall be 480 x 272 pixels

3. The controller shall display all measured values and their four assigned limit values on a single home screen.

4. Each measured value shall have the capability of having two minimum and two maximum limit values assigned.

5. The controller shall display on the main screen if the controller is set in manual, automatic, stop or adaption mode.

6. The controller shall operate in one of the following disinfectant control modes: 1) as an ORP controller with an ORP setpoint while providing a Cl_2 measurement in the display without control function or the controller can operate as Cl_2 controller with Cl_2 setpoint while providing an ORP measurement in display without ORP control. The pH measurement and its control to a setpoint shall also be included.

7. The controller shall be supplied with a fully integrated flowcell for precise sample flow regulation. The flow cell shall be equipped with temperature probe, flow switch, water ground and sample water shut-off valve.

8. The flow cell assembly shall have continuous hydro-mechanical cleaning of the free available chlorine sensor.

9. The flow cell shall be equipped with an LED light stick capable of changing colors to indicate normal operation, pre-alarm condition and alarm condition.

10. The controller shall have 6 relay outputs that shall allow assignment of each alarm output depending on customer preference and needs as well as assignment to feed devices.

The relays that are assigned alarm functionality shall be able to be configured as normally open or normally closed, latch or unlatched contact.

12. The controller shall be furnished with five digital inputs that can be assigned to sample water stop, controller stop, controller standby and alarm assignments.

13. The controller shall incorporate an auto tuning control algorithm for the disinfectant metering equipment. This adaption program shall analyze pool hydraulics, feed equipment capability and automatically set up feed proportioning accordingly. The adaption feature is an integral part of the controller and therefore controllers that do not utilize the adaption program shall not be considered equal.

14. The free chlorine sensor shall be based on potentiostatic 3-electrode amperometric system with a measuring range from 0 to 10 mg/l with selectable ranges: 1.00 mg/l, 2.00 mg/l, 3.00 mg/l, 5.00 mg/l and 10.0 mg/l with a resolution of 0.01 for up to the 5.00 mg/l range and 0.1 mg/l resolution for the 10.0 mg/l measurement range. The measurement is temperature compensated from 0 to 122 degrees Fahrenheit.

15. The pH and ORP sensors shall be the proprietary Strantrol pH and Strantrol HRR sensors respectively.

16. The controller shall be capable of having on site software updates by connecting an USB stick to an internally mounted USB port.

17. The controller shall include an Ethernet interface to allow visualization of the displayed measurements on a PC, tablet and smart phone with a standard browser like Internet Explorer, Firefox or Apple's Safari. The Ethernet interface also supports Modbus TCP communication for external data access with other PLC based visualization systems.

18. The controller shall provide a link to three additional IP addresses for easy visualization of additional equipment that is Ethernet capable and allows visualization of its data via a standard browser.

19. The controller shall be provided with an illustrated installation, operating and maintenance manual. Drawing and detailed written description of features and operating phases of the control system shall be a part of the operating and maintenance manual.

20. The controller shall carry an eighteen (18) month limited warranty against defects in material and workmanship for all components including electronics and flow cell assembly.

21. The controller shall include an RS485 interface to communicate with an optional Process Monitoring System capable of connecting up to 32 controllers to a single unit via a proprietary RS 485 communications network. The Process Monitoring System will communicate outside its network of controllers via an Ethernet connection and/or via a digital modem.

PART 3 EXECUTION

3.01 INSTALLATION

A. The equipment shall be installed per the contract documents and manufacturer's recommendations.

3.02 WARRANTY

A. The equipment/system warranty, unless otherwise stated, shall be one year from start-up or 18 months after shipment.

2.31 CHLORINE FEED (Sanitizer) SYSTEM

Pulsar Model 140

- Chlorinator height - 35" [88.9cm]
- Chlorinator weight (full) - 150 lbs [68.0kg]
- Chlorinator weight (empty) - 50 lbs [22.7kg]
- Capacity: 100 lbs [45.4kg] Pulsar® Briquettes (equivalent to 68 lbs [30.8kg] available chlorine).
- Feed Rate: Pulsar® Plus Dry Chlorinator Briquettes: 5-140 lbs [2.3-63.5kg] of Available Chlorine per day
- Booster Pump: 1 H.P. pump is to be wired for 115V single-phase

2.32 pH FEED SYSTEM

The ProMinent Carbon Dioxide System for pH control to consist of the following:

- CO_2 dosing control panel containing rotameter and solenoid valve.
- Injection assembly, (contains injection lance, check valve and ball valve), is withdrawable for servicing without the need to drain the pipe work of water.
- Gas bottle kit containing wall mounting, auto changeover and all accessories for either 2 bottle installations.

2.33 AUXILIARY SANITIZER (Ultraviolet UV) SYSTEM

1. GENERAL

1.01 SECTION INCLUDES

A. Pool ultraviolet disinfection equipment = Model: ECF-210-4

1.02 REFERENCES

A. The following latest edition reference specifications, guides and standards shall become part of this Specification as if herein written. If provisions conflict, the more stringent provisions shall apply.

1. NSF – National Sanitary Foundation

2. MET – Met Laboratories, Inc.

3. CSA – Canadian Standards Association

4. UL – Underwriters Laboratory

5. NEMA – National Electrical Manufacturers' Association

6. ANSI – American National Standards Institute

7. USEPA UVDGM- U.S. Environmental Protection Agency Ultraviolet Guidance Manual

8. Din- German Institute of Standardization

9. IP- International Electrotechnical Commission

1.03 SUBMITTALS

A. Drawings and Instructions

1. Provide detailed Shop Drawings of the items of equipment being provided, indicating the dimensions, material and characteristics.

2. Provide a detailed Operations Manual, embracing the operation functions and recurring maintenance processes

1.04 WARRANTY

A. A factory trained representative of the manufacturer shall perform all warranty work. Manufacturer to warranty Ultraviolet chamber and Spectra Touch Control panel for a period of 5 years(see requirements) excluding lamps, quartz and seals. Medium pressure Ultraviolet bulbs shall be warranted for a period of 8,000 hours. Intermittently operated lamps (³ 1 on/off cycles per day) will be replaced free of charge should failure occur prior to 4,000 hours and replacement will be prorated between 4,000 and 8,000 hours.

B. Manufacturer must maintain spare or replacement parts in the USA for same day or no longer than next day delivery in North America, other areas based on expedited delivery available.

C. A Service Agreement (twice per year maintenance) from a qualified factory certified distributor shall be provided to initiate the service in order to maintain the five year warranty.

2. PRODUCTS

2.01 GENERAL

A. Ultraviolet Disinfection Equipment: Shall operate within the UVC electromagnetic spectrum emitting wavelengths in the range of 200nm to 400nm. This required wavelength will provide constant disinfection/inactivation of bacteria, algae, molds, viruses and destruction of Monochloramines, Trichloramines, and Dichloramines. Ultraviolet Lamp/Chamber and Spectra Touch Control Panel by ETS UV by Neptune Benson (Telephone 920-885-4628, Fax 920-885-4386) or Architect/Engineer approved equal. Any deviation/exception must be provided in writing to and approved by the designer prior to the bid date.

B. The UV System shall have an MET or equivalent (ETL, CSA, or UL) listing, be NSF-50 2016 certified including Section 14.18 (crypto inactivation) and 3rd party validated to the USEPA UVDGM 2006 Guidelines.

1. Equipment General Description

a. The Ultraviolet System shall be provided in a complete package to include: 316L Schedule 10 Stainless Steel Chamber, Spectra Touch Control System located in a NEMA 12 (IP52) rated panel, Medium Pressure Bulb(s) designed to emit wavelengths within the UVC electromagnetic spectrum, UV EZ Clean strainer, automatic wiper system, and Project Commissioning by a Certified ETS Ultraviolet Technician.

2.02 UNIT

ECF Unit: Ultraviolet manufacturer to offer unit capability of a horizontal OR vertical installation application using state of art design and direct flow through characteristics. Direct flow will be required in order to reduce total head loss through the system. Unit shall be a Multiple Lamp medium pressure system with a bulb range of (2) 1.0 kW – (4) 3.0 kW power range. Multiple lamp system is required in order to maintain quality disinfection in the event of a single bulb failure. ANSI or PN (as specified) flange range of 4”/100MM – 12”/300MM and flow pattern of 350 to 3700 GPM (79 m3/hr to 840 m3/hr). @ 94% UVT. Any systems validated or designed for flows based on 98 % UVT are not acceptable. Chamber and Control Cabinet shall be as indicated on the drawings. Electrical requirements to include either of the following 208, 240,315,400,415, 480 or 575 volt 3-phase 50/60 HZ (as specified) with a (XX) amp external breaker recommended by ETS based on the appropriate supply voltage. The electrical contractor is to take into account plus/minus 3% for external breaker. All required electrical work to be performed by licensed electrician.

2.03 ULTRAVIOLET CHAMBER

A. Pressure rated for 100 psi/8 Bar (tested to 150 psi/11 Bar), and pressure drop across the unit will be minimal. The unit shall be constructed of 316L stainless steel, schedule 10 pipe, passivated to prevent corrosion within the harsh pool environment. The Ultraviolet chamber shall come complete with the following equipment:

B. Ultraviolet intensity monitor factory calibrated to provide intensity in mw/cm2, monitors providing percentage of lamp output not acceptable. It must include a built-in alarm system to notify operator when output level drops below required level of 60 mj/cm2 for indoor pools or 40mj/cm2 for outdoor pools (or operator set dosing levels).

C. Ultraviolet temperature control system shall be provided to maintain system integrity in the event of flow interruptions to the chamber.

D. Ultraviolet chamber shall come complete with annealed quartz sleeve with “O” ring seals for water tightness.

E. Chambers shall be complete with ANSI or DN flanges (as specified) and all ports or vents shall be threaded NPT. The Ultraviolet chamber must be capable of installation in the system so that it remains full under all conditions.

F. The ultraviolet unit must be complete with integrated brackets or feet for ease of installation in either vertical or horizontal mounting.

G. The Chamber shall have a sacrificial anode attached to the chamber, extending inside the

chamber and be bonded to the installation bond loop.

2.04 ULTRAVIOLET LAMP

A. Ultraviolet lamp shall be medium pressure high intensity. Lamp shall be designed to emit continuous Ultraviolet wavelengths in the range of 200nm to 400nm. This will provide optimal disinfection benefits and destruction of the Monochloramine, Dichloramine, and Trichloramine compounds. Lamp must remain unaffected by temperature variance of 0 degrees F (-17 C) to 200 degrees Fahrenheit (93 degrees Celsius).

B. The lamp system must provide a constant dose of not less than 60 mj/cm2 until the end of the lamp life for indoor applications and not less than 40 mj/cm2 for outdoor disinfection and this must be based on constantly monitoring the full recirculating flow rate, not on a side stream treatment. The system must be equipped with variable power control to control the intensity & dose of the lamp in 1% increments. Power stepping not acceptable.

C. The lamp(s) must be powered by chokes. Electronic ballasts are not acceptable since they limit the distance between the chamber and the power supply to 13 feet (4M) to operate effectively and must be replaced every two –three years.

2.05 AUTOMATIC WIPER SYSTEM

A. An automatic cleaning system shall be provided for cleaning of quartz sleeve and Ultraviolet monitor probe. The system shall travel the entire length of the quartz sleeve twice per desired cleaning cycle. Precision molded wiper rings shall be provided to ensure thorough quartz tube cleaning and quartz tube protection. Wiper cycle shall be user selectable and adjustable within a range of 5 minutes to 24 hours depending on anticipated application and

deposit build-up. At a minimum the Automatic Wiper system shall have the following characteristics:

1. System shall utilize direct Belt Drive with square machined pulleys and acme threaded shaft to prevent slippage and pin shearing. Systems utilizing shear pins or complicated gear boxes will be unacceptable.

2. Wiper power supply shall be 24 volt DC for improved safety. Higher voltage not acceptable.

3. System shall incorporate Direct Shaft Encoding for positional location. Systems relying on external limit switches or internally located magnets will be unacceptable.

4. Wiper interval shall be operator selectable with optional override switch.

5. Wiper faults are to be indicated on the control system display.

6. Wiper System to utilize “Intelligent Operation” for automatic start-up commissioning.

a. Records wiper position at chamber ends. Position must be fixed and not dependent on a timed interval or component striking end of chamber.

b. Establish a travel run without setting limit adjustments to ensure system integrity and longevity.

2.06 UV STRAINER

A. The UV system must be provided with a downstream strainer to protect against the remote possibility of lamp /quartz breakage traveling downstream.

B. The strainer must be cleanable without removal from the piping system.

C. The strainer must be operable either manually, electrically or pneumatically to clean it.

D. The electrical or pneumatic operation must be able to be integrated with the filtration control system and/or the UV control system

2.07 ULTRAVIOLET CONTROL SYSTEM

A. Control cabinet shall be an ETS SPECTRA Touch control unit and or pre-approved equal. The cabinet shall be an epoxy coated NEMA 12 / IP52 rated cabinet. If mounted outdoors it must be a NEMA4X /IP56 rated cabinet with an integral A/C unit to protect the components from the environment. The power must be controllable to provide full power, half power and infinite variable power based on real time interface with changes in UVT, Flow Rate or Combined Chloramines. The power panel must house the chokes required to ignite the lamps. Three levels of operation shall be provided to meet the needs of the operator and pool environment: Simple Control (start, stop and reset), Full Parameter Display, and Customized Operator Configuration. Modes of operation shall be password protected to secure system critical setup functions. Touch Control system shall have clearly identifiable start, stop, and reset icons (suitable for gloved operation) with Running and Fault LCD indicators.

1. The main Touch screen shall display the following: Ultraviolet calculated dose (derived from flow and intensity inputs), Ultraviolet intensity (as a % and mw/cm2), Lamp Current, Flow rate (accepts signal from optional flow meter – displayed as gallons per minute or m3/hour), Chamber temperature (displayed as deg. F or deg. C), Operation hour meter, and fault indicators to include Lamp fault, low Ultraviolet & temperature alarm, Ground fault trip, Wiper fault. All alarm functions shall have simple text message display to assist in fault finding.

2. Touch Control system shall have a minimum of the following system interface control: Remote operation, Process interrupt features (from valves, flow meters), Low UV dose (configurable to shutdown or alarm only), Flow meter input, Auto-Restrike, Half to full power Ultraviolet setting with 24 hour/7 day settable timer. Variable power/Dose pacing interface.

3. Touch Control system shall have built in data-logging capabilities to record the following information: Ultraviolet intensity required, Ultraviolet intensity measured, Lamp current, Chamber temperature, Flow rate (if flow meter is connected), Time and date stamp, All alarms generated.

4. Touch Control system must be able to be interfaced with a Chemistry Controller that can

measure Total or Combined Chloramines in order to maintain the proper dosage

required during the life of the lamp.

5. Touch Control System must be able to interface with the Defender filtration controller.

6. Touch Control System must be capable of operating through Ethernet or Wi Fi.

7. Touch Control System must be capable of interfacing with a SCADA system including

both Profibus and Modbus.

3. EXECUTION

3.01 SYSTEM STARTUP

A. Install in accordance with contract documents and manufacturer’s instructions.

B. Commissioning

1. Ultraviolet Chamber and Control Panel shall be commissioned by a qualified factory trained technician to institute the warranty.

2. Final electrical and control cabling will be connected from the Touch control cabinet to the Ultraviolet disinfection chamber during the commissioning process.

3. Daily operation and simple maintenance instructions shall be provided during the commissioning process.

4. SOT shall be conducted only by a factory trained technician.

2.34 TEST KIT

A. Provide one (1) Taylor No. 1741STR tester for measuring chlorine residuals and pH. Furnish in carrying case with separate slides for pH and chlorine (low: 0-3ppm and high: 1-10ppm) and with tests for Total Alkalinity and Calcium Hardness. Provide two (2) Dalite slide-viewers.

2.35 SPECIALTY START-UP CHEMICALS

A. The contractor is responsible to supply and dose the pool with all necessary chemicals to balance the water to the following levels:

1. pH 7.5 - 7.6
2. Total Alkalinity 60-90 ppm
3. Calcium Hardness 250 - 350 ppm

B. All chemicals shall be USP listed and mineral free.

C. Initial shock treatment shall be performed with a non-chlorine oxidant and shall be administered prior to balancing.

D. Chemicals necessary to prevent staining and discoloration (sequestering agents) shall be introduced prior to shock treatment.

- All chemical tests must meet owner satisfaction and filter manufacturer's standards. Contractor shall obtain owner approval prior to any chemical dosage.
- Contractor to provide and install (1) One wall mounted eyewash station as shown on the plans.

2.36 POOL HEATER WITH D-2 POWER VENT

•The heater shall be Raypak Model **P-514** with 511,500 BTU input, 419,400 BTU output. The heater shall be design certified, ASME inspected and stamped for 160 PSI working pressure, complete with manufacturer's data report. The heater shall be equipped with 125 PSI, ASME pressure relief valve. The water tube heat exchanger shall be of single level horizontal grid design constructed with nine tubes, 1"x.065" wall integral cupro nickel fin tubes with fins spaced at seven per inch, and extra heavy galvanized steel gull baffles secured tightly to the tubes above the point of tangency of the fins. Each end of the tubes shall be rolled into an ASME fire box steel tube sheet and sealed to bronze headers with silicone "O" rings with a temperature rating over 500°F. The headers shall be precision machined for easy removal and the "O" rings seals shall positively prevent boiler water from reaching the steel tube sheets. They shall be of high pressure bronze with integral bronze baffling to direct water through the heat exchanger in two passes.

•The heat exchanger shall be capable of withstanding a 1000 PSI hydrostatic pressure. The heaters shall be secured to the tube sheets by properly spaced stud bolts and flange nuts. The heat exchanger shall be readily cleanable from either the right side or the left side of the heater, and cleanable on the right side without removing external piping.

•The heat exchanger shall be explosion proof on the waterside. It shall have 100% copper and bronze waterways to positively protect the heater from galvanic action (electrolysis).

•The heater shall be equipped with a 24V main electric gas valve, a factory calibrated pressure switch, a pool thermostat, and a high limit switch. Electronic Intermittent Pilot Ignition is standard.

•The heater shall be equipped with stainless or aluminized steel burners mounted in an easily removable burner drawer. The burners shall be capable of quiet ignition and extinction, and equipped with fixed primary air ports for atmospheric gas firing and capable of complete combustion.

•The heater shall be equipped with a Unitherm Governor Bypass Valve to automatically control the internal water temperature between 105° and 115°F.

•The heater shall be rated at least 82% thermal efficiency by a recognized independent gas appliance test laboratory, independent of the manufacturer.

•Heater is to be supplied with D-2 Power Vent.

PART 3 - EXECUTION

3.01 INSTALLATION AND CLEANUP

- The installation contractor shall assemble an install all filtration system equipment, accessories and piping in accordance with the intent of these Specifications and as indicated on the Drawings and Shop Drawings of the Equipment Manufacturer and as recommended by the Equipment Manufacturer.

- Remove from the Project Site all excess materials, debris and rubbish resulting from the operations of this Section. The installation contractor shall at all times be responsible for daily good housekeeping and never leave the site in a messy or unsafe condition. The installation contractor will be required to pick-up and dispose of properly, all refuse and demolition materials into appropriate containers.

- At the close of each work day, the installation contractor shall not leave the job site until the work area is left in a safe and secured condition with proper signage, perimeter caution tape and any required barriers in place.

3.02 PIPING AND VALVES

A. The Contractor shall furnish and install all piping beginning at the main drain sumps, through the balancing tank to the pump suction line, gutter drain line to the balancing tank, filter effluent to pool return inlets and filter backwash to waste. All required piping and materials for chemical treatment and automatic fill systems. Refer to drawings for all connection and piping locations.

B. In addition to the material indicated to be furnished by the "COMPONENT EQUIPMENT SUPPLIER", the Contractor shall furnish all other material and parts necessary to complete the installation.

C. All new pipes and fittings shall be Schedule 80 PVC. All piping is to bear the NSF seal.

D. All new and existing piping and systems as part of the new recirculation system, including but not limited to: recirculation, backwash and chemical treatment piping and systems are to be pressure tested at 15psi for not less than 45 minutes. Piping and system pressure test is to be witnessed by pool consultant and owner representative with pressure test certificate indicating such.

E. All hardware in all areas, including but not limited to: filtration equipment room and Natatorium area shall be T304 stainless steel or better. Plated or coated hardware of any type will not be considered equal. Any existing hardware, if not s.s., is to be replaced as required.

- Piping arrangement shall be in accordance with equipment manufacturer's recommendations. Piping shall be supported at uniform centers. Adjustable clevis, ring, riser clamps, or pipe clamps with broad support surfaces shall be used. Maximum spans shall be:

Pipe Size	**Support Spacing (Maximum)**
1/2”,3/4”	4-1/2’
1”	5’
1-1/4”,1-1/2”	5-1/2’
2”	6’
2-1/2”	6-1/2’
3”	7’
4”	7-1/2’
6”	9’
8”	9-1/2’
10”,12”	10’

G. All chemical feed equipment, tubing, piping and chemical control sample streams shall be installed in strict accordance to the manufacturers’ installation instructions. All chemical feed materials are to be replaced with new, including tubing and valves for flowcell.

3.03 START UP AND ENGINEERING SERVICES

A. An authorized representative of the "COMPONET EQUIPMENT SUPPLIER" shall provide the supervisory services of an installation engineer for at least one day to fully instruct designated personnel in the operation, care and maintenance of the entire purifying, sterilizing and re-circulating system.

B. Technician shall be based within a reasonable distance from the pool site and shall be available to service the equipment if required by Owner.

END OF SECTION

SECTION 13151
STAINLESS STEEL RECIRCULATING OGRS GUTTER SPECIFICATIONS

PART 1 - GENERAL

DESCRIPTION OF WORK

- The work under this section shall include the furnishing and installation of a stainless steel perimeter recirculating gutter system. The system shall consist of an overflow channel filtered water supply channel, finished edge, drain converter, supply converter and other accessories as listed.

- The manufacturer shall guarantee the gutter system for a period of 5 years for materials and workmanship if the system is operated in accordance with written instructions. The fiberglass grating included with the system shall carry the original manufacturer's warranty is for a period of one (1) year.

BASE BID REQUIREMENT

- The method of water recirculating specified and shown on the drawings is intended as the basis for receiving bids. The base bid proposal shall include the gutter system as specified by Neptune-Benson, Inc. of Coventry, Rhode Island.

PERFORMANCE REQUIREMENTS

- It is the intent of the specifications that the swimming pool perimeter gutter system channel flow and surface cleaning be maintained under all conditions of operation and that no water be discharged to waste except when backwashing the filters or emptying the pool.

- The gutter system shall be sized to accommodate a flow capacity equal to 100% of the pool system recirculation rate.

- The system shall include a handhold at the overflow lip and required anchors for racing and/or safety lines.

SUBMITTALS

- Provide detailed shop drawings for the gutter system installation including; anchor details and layout, section layout, corner details, line anchor detail and layout, grating detail and grate support layout, converter details and converter locations, converter concrete blockout dimensions and requirements.

- Upon request, provide detailed hydraulic calculations showing the gutter channel flow capacity.

FINISHED EDGE

•The bottom front edge of the gutter shall incorporate a flange extending 1" below the bottom of the gutter channel and form a second “V” notch. It shall be flush with the face of the gutter and pool wall finish as shown on the drawings. Systems not incorporating a finished edge on the gutter shall not be acceptable.

PART 2 - PRODUCTS

MATERIALS

•The exposed surface of all stainless steel shall be fabricated of type 304L, with a number 3 polished finish. The anchor angles and stiffeners shall be type 304 stainless steel. All components of the system shall be no less than 12 gauge in thickness.

CHANNEL

•The OGRS gutter channel shall be fabricated according to the dimensions detailed on the drawings.

•There shall not be any horizontal welding distortion noticeable on the face of the gutter. Systems not incorporating a “V” notch on the gutter face shall not be acceptable.

•The gutter system shall be sized to accommodate a flow capacity equal to 100% of the pool system recirculation rate.

SUPPLY TUBE/FILTERED WATER INLETS

•The filtered water supply shall be TIG welded stainless steel, with inlet nozzles spaced not more than 42" on center around the perimeter of the pool. The quantity of inlets shall be determined to deliver the required flowrate. The inlets shall be spaced so as to not interfere with wall areas, electronic touch pads or competitive racing lanes.

SURFACE SKIMMING

•Surface skimming shall be continuous around the entire pool perimeter. The water level of the pool shall be maintained at ±1/16" above the overflow lip of the gutter. Dynamic surge action shall be quelled by the gutter channel to reduce repelling back onto the swimming surface.

GRATING

•The gutter channel shall be covered with a pultruded glass fiber composite grating. The grating shall be white, non-skid and UV coated. The style shall be T bars at 2" centers with cross rods at 12" centers.

•The grating shall be fastened to the support angles with non-corrosive hardware.

•The grating support angles shall be T304L stainless steel and shall be spaced not more than 36" on center around the entire pool perimeter.

CONVERTERS

•Gutter drain and supply/return converters shall be sized according to the system requirements and installed in the system where indicated on the drawings.

•The drain converter shall be fabricated of T304L stainless steel no less than 12 ga in thickness. The supply (pressure) converter shall be fabricated of T304L stainless steel no less than 10 ga thickness. A 1" x 1" x 1/8" angle shall be welded around the converter to increase rigidity.

NOTE: For buried applications the supply converter must be completely encased in 4" minimum of concrete or grout.

•All converters shall be fitted with slotted flanged connections. Other means of connection to perimeter piping shall not be acceptable.

NON-SKID SURFACES

•The horizontal surfaces of the gutter are to have a skid resistant surface.

EXPANSION ANCHORS

•The entire gutter channel shall be anchored to the pool walls with non-corrosive anchors drilled into the pool beam at no less than 48" on center around the pool perimeter.

•The anchors shall be zinc plated expansion type with stainless steel threaded rods. 1.5" x 1.5" 10 gauge stainless steel slotted angles shall be secured to the threaded rods with fasteners to provide accurate leveling.

•The rear top gutter edge shall be aligned and secured to the pool beam with 12 gauge stainless steel support angles. The angles shall be welded to anchor pins installed in the pool beam at no less than 48" on center around the entire pool perimeter.

DEPTH MARKERS

•The contractor shall provide self-adhesive black vinyl depth markers as detailed on the plans and the contractor shall apply these after all concrete work is complete.

RECESSED ANCHORS

•All racing lane and safety line anchors shall be included as detailed on the drawings. Anchors shall be integral to the gutter system and recessed not to protrude above any finish face of the gutter

STEP COVER

•A stainless steel step cover shall be installed at each step location as detailed in the drawings

PART 3 - EXECUTION

INSTALLATION

- All components of the system including anchor plates, gutter channel, supply tube, converters, grating and line anchors; shall be installed by personnel approved by the manufacturer.

- Welding shall be performed by a welder with at least five (5) years experience in the welding of stainless steel gutters.

- Expansion anchors shall be installed by the gutter installer and shall be spaced no more than 48" on center and at the elevation shown on the drawings.

- The fabricated gutter components shall be delivered to the jobsite, unloaded by the pool construction contractor and stored in the shallow end of the pool.

- All other installation work and required installation materials, including scaffold brackets and scaffolding, shall be provided and performed by the gutter manufacturer's installation crew. All scaffolding shall conform to OSHA requirements where applicable.

- The gutter system shall be installed level within a tolerance of ±1/16".

WELDS

- All seams shall be welded by the TIG process and shall result in a uniform appearance. Welds shall not be ground. All welds shall be brushed after cooling to approximately 300 degrees. Filler metal shall be added to present a flush appearance to finished seams.

- All horizontal welds shall be fully accessible for inspection.

TESTING VERIFICATION

- After the gutter system has been fully welded, anchored and secured, the supply tube shall be air pressure tested at 12 psi for 2 hours.

- After the test has been satisfactorily completed, the inlets shall be drilled.

- Factory drilled inlets or factory tested supply tubes shall not be acceptable.

- Final gutter installation is to be approved by a factory authorized engineer.

GROUTING

- After the gutter system has been installed, the contractor shall place a non-metallic, non-shrink grout underneath and behind the gutter to completely encase the channel.

- The grout material shall include Sika Interplast-N as manufactured by Sika Corp. Mixing proportions shall be in accordance with Sika Corp. guidelines.

CAULKING – SEALANT

- After the gutter system has been installed, the contractor shall place a sealant under the finished edge and behind the deck strip as shown on the drawings.

- The sealant shall be a two part Elastomeric Polysulfide based joint seal. P/G primer is required for joints subjected to hydrostatic pressure or submersion.

CLEANING/PASSIVATION

- The stainless steel components shall be cleaned as required to present a uniform appearance.

- Blending of the surface shall be done with a 3M pad #7447, or 100 grit abrasive.

- The strength of the welds shall not be reduced by grinding.

- At the completion of the gutter system installation, the gutter installer shall clean and passivate all accessible gutter and welds, including below the grating, with a nitric acid solution per manufacturer's cleaning instructions.

CERTIFICATION

- Final gutter installation is to be certified by a factory authorized licensed engineer.

WARRANTIES

- The manufacturer shall guarantee the gutter system for a period of (5) years for materials and workmanship if the system is operated in accordance with written instructions. The fiberglass grating include with the system shall carry the original manufacturer's warranty for a period of one (1) year.

END OF SECTION

SECTION 230923 - DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC

Addendum #1
10/2/19

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section Includes:

1. DDC system for monitoring and controlling of HVAC systems.
2. Delivery of selected control devices to equipment and systems manufacturers for factory installation and to HVAC systems installers for field installation.

B. Related Requirements:

1. Section 230923.13 "Energy Meters" for thermal and electric power energy meters that connect to DDC systems.
2. Section 230923.17 "Level Instruments" for liquid-level switches, sensors, and transmitters that connect to DDC systems.
3. Section 230923.22 "Position Instruments" for limit switches that connect to DDC systems.
4. Section 230923.33 "Vibration Instruments" for vibration instruments that connect to DDC systems.
5. Section 230923.43 "Weather Stations" for weather stations that connect to DDC systems.
6. Section 230993 "Sequence of Operations for HVAC Controls" for control sequences in DDC systems.

1.3 DEFINITIONS

A. Algorithm: A logical procedure for solving a recurrent mathematical problem. A prescribed set of well-defined rules or processes for solving a problem in a finite number of steps.

B. Analog: A continuously varying signal value, such as current, flow, pressure, or temperature.

C. BACnet Specific Definitions:

1. BACnet: Building Automation Control Network Protocol, ASHRAE 135. A communications protocol allowing devices to communicate data over and services over a network.
2. BACnet Interoperability Building Blocks (BIBBs): BIBB defines a small portion of BACnet functionality that is needed to perform a particular task. BIBBs are combined to build the BACnet functional requirements for a device.
3. BACnet/IP: Defines and allows using a reserved UDP socket to transmit BACnet messages over IP networks. A BACnet/IP network is a collection of one or more IP subnetworks that share the same BACnet network number.

4. BACnet Testing Laboratories (BTL): Organization responsible for testing products for compliance with ASHRAE 135, operated under direction of BACnet International.
5. PICS (Protocol Implementation Conformance Statement): Written document that identifies the particular options specified by BACnet that are implemented in a device.

D. Binary: Two-state signal where a high signal level represents ON" or "OPEN" condition and a low signal level represents "OFF" or "CLOSED" condition. "Digital" is sometimes used interchangeably with "Binary" to indicate a two-state signal.

E. Controller: Generic term for any standalone, microprocessor-based, digital controller residing on a network, used for local or global control. Three types of controllers are indicated: Network Controller, Programmable Application Controller, and Application-Specific Controller.

F. Control System Integrator: An entity that assists in expansion of existing enterprise system and support of additional operator interfaces to I/O being added to existing enterprise system.

G. COV: Changes of value.

H. DDC System Provider: Authorized representative of, and trained by, DDC system manufacturer and responsible for execution of DDC system Work indicated.

I. Distributed Control: Processing of system data is decentralized and control decisions are made at subsystem level. System operational programs and information are provided to remote subsystems and status is reported back. On loss of communication, subsystems shall be capable of operating in a standalone mode using the last best available data.

J. DOCSIS: Data-Over Cable Service Interface Specifications.

K. E/P: Voltage to pneumatic.

L. Gateway: Bidirectional protocol translator that connects control systems that use different communication protocols.

M. HLC: Heavy load conditions.

N. I/O: System through which information is received and transmitted. I/O refers to analog input (AI), binary input (BI), analog output (AO) and binary output (BO). Analog signals are continuous and represent control influences such as flow, level, moisture, pressure, and temperature. Binary signals convert electronic signals to digital pulses (values) and generally represent two-position operating and alarm status. "Digital," (DI and (DO), is sometimes used interchangeably with "Binary," (BI) and (BO), respectively.

O. I/P: Current to pneumatic.

P. LAN: Local area network.

Q. LNS: LonWorks Network Services.

R. LON Specific Definitions:

1. FTT-10: Echelon Transmitter-Free Topology Transceiver.
2. LonMark: Association comprising suppliers and installers of LonTalk products. Association provides guidelines for implementing LonTalk protocol to ensure interoperability through a standard or consistent implementation.

3. LonTalk: An open standard protocol developed by the Echelon Corporation that uses a "Neuron Chip" for communication. LonTalk is a register trademark of Echelon.
4. LonWorks: Network technology developed by Echelon.
5. Node: Device that communicates using CEA-709.1-C protocol and that is connected to a CEA-709.1-C network.
6. Node Address: The logical address of a node on the network, consisting of a Domain number, Subnet number, and Node number. "Node number" portion of an address is a number assigned to device during installation, is unique within a subnet, and is not a factory-set unique Node ID.
7. Node ID: A unique 48-bit identifier assigned at factory to each CEA-709.1-C device. Sometimes called a "Neuron ID."
8. Program ID: An identifier (number) stored in a device (usually EEPROM) that identifies node manufacturer, functionality of device (application and sequence), transceiver used, and intended device usage.
9. Standard Configuration Property Type (SCPT): Pronounced "skip-it." A standard format type maintained by LonMark International for configuration properties.
10. Standard Network Variable Type (SNVT): Pronounced "snivet." A standard format type maintained by LonMark used to define data information transmitted and received by individual nodes. "SNVT" is used in two ways. It is an acronym for "Standard Network Variable Type" and is often used to indicate a network variable itself (i.e., it can mean "a network variable of a standard network variable type").
11. Subnet: Consists of a logical grouping of up to 127 nodes, where logical grouping is defined by node addressing. Each subnet is assigned a number, which is unique within a Domain. See "Node Address."
12. TP/FT-10: Free Topology Twisted Pair network defined by CEA-709.3 and is most common media type for a CEA-709.1-C control network.
13. TP/XF-1250: High-speed, 1.25-Mbps, twisted-pair, doubly terminated bus network defined by "LonMark Interoperability Guidelines" typically used only to connect multiple TP/FT-10 networks.
14. User-Defined Configuration Property Type (UCPT): Pronounced "U-Keep-It." A Configuration Property format type that is defined by device manufacturer.
15. User-Defined Network Variable Type (UNVT): Network variable format defined by device manufacturer. UNVTs create non-standard communications that other vendors' devices may not correctly interpret and may negatively impact system operation. UNVTs are not allowed.

S. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

T. Modbus TCP/IP: An open protocol for exchange of process data.

U. MS/TP: Master-slave/token-passing, IEE 8802-3. Datalink protocol LAN option that uses twisted-pair wire for low-speed communication.

V. MTBF: Mean time between failures.

W. Network Controller: Digital controller, which supports a family of programmable application controllers and application-specific controllers, that communicates on peer-to-peer network for transmission of global data.

X. Network Repeater: Device that receives data packet from one network and rebroadcasts it to another network. No routing information is added to protocol.

Y. PDA: Personal digital assistant.

Z. Peer to Peer: Networking architecture that treats all network stations as equal partners.

AA. POT: Portable operator's terminal.

BB. PUE: Performance usage effectiveness.

CC. RAM: Random access memory.

DD. RF: Radio frequency.

EE. Router: Device connecting two or more networks at network layer.

FF. Server: Computer used to maintain system configuration, historical and programming database.

GG. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.

HH. UPS: Uninterruptible power supply.

II. USB: Universal Serial Bus.

JJ. User Datagram Protocol (UDP): This protocol assumes that the IP is used as the underlying protocol.

KK. VAV: Variable air volume.

LL. WLED: White light emitting diode.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Multiple Submissions:

1. If multiple submissions are required to execute work within schedule, first submit a coordinated schedule clearly defining intent of multiple submissions. Include a proposed date of each submission with a detailed description of submittal content to be included in each submission.
2. Clearly identify each submittal requirement indicated and in which submission the information will be provided.
3. Include an updated schedule in each subsequent submission with changes highlighted to easily track the changes made to previous submitted schedule.

B. Product Data: For each type of product include the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical

power requirements, and limitations of ambient operating environment, including temperature and humidity.

3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation, operation and maintenance instructions including factors effecting performance.
5. Bill of materials of indicating quantity, manufacturer, and extended model number for each unique product.

    a. Operator workstations.
    b. Servers.
    c. Printers.
    d. Gateways.
    e. Routers.
    f. Protocol analyzers.
    g. DDC controllers.
    h. Enclosures.
    i. Electrical power devices.
    j. UPS units.
    k. Accessories.
    l. Instruments.
    m. Control dampers and actuators.
    n. Control valves and actuators.

6. When manufacturer's product datasheets apply to a product series rather than a specific product model, clearly indicate and highlight only applicable information.
7. Each submitted piece of product literature shall clearly cross reference specification and drawings that submittal is to cover.

C. Software Submittal:

1. Cross-referenced listing of software to be loaded on each operator workstation, server, gateway, and DDC controller.
2. Description and technical data of all software provided, and cross-referenced to products in which software will be installed.
3. Operating system software, operator interface and programming software, color graphic software, DDC controller software, maintenance management software, and third-party software.
4. Include a flow diagram and an outline of each subroutine that indicates each program variable name and units of measure.
5. Listing and description of each engineering equation used with reference source.
6. Listing and description of each constant used in engineering equations and a reference source to prove origin of each constant.
7. Description of operator interface to alphanumeric and graphic programming.
8. Description of each network communication protocol.
9. Description of system database, including all data included in database, database capacity and limitations to expand database.
10. Description of each application program and device drivers to be generated, including specific information on data acquisition and control strategies showing their relationship to system timing, speed, processing burden and system throughout.
11. 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.

D. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

E. Shop Drawings:

1. General Requirements:

   a. Include cover drawing with Project name, location, Owner, Architect, Contractor and issue date with each Shop Drawings submission.
   b. Include a drawing index sheet listing each drawing number and title that matches information in each title block.
   c. Prepare Drawings using CAD.
   d. Drawings Size: 11 inches by 17 inches.

2. Include plans, elevations, sections, and mounting details where applicable.
3. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
4. Detail means of vibration isolation and show attachments to rotating equipment.
5. Plan Drawings indicating the following:

   a. Screened backgrounds of walls, structural grid lines, HVAC equipment, ductwork and piping.
   b. Room names and numbers with coordinated placement to avoid interference with control products indicated.
   c. Each desktop operator workstation, server, gateway, router, DDC controller, control panel instrument connecting to DDC controller, and damper and valve connecting to DDC controller, if included in Project.
   d. Exact placement of products in rooms, ducts, and piping to reflect proposed installed condition.
   e. Network communication cable and raceway routing.
   f. Information, drawn to scale.
   g. Proposed routing of wiring, cabling, conduit, and tubing, coordinated with building services for review before installation.

6. Schematic drawings for each controlled HVAC system indicating the following:

   a. I/O points labeled with point names shown. Indicate instrument range, normal operating set points, and alarm set points. Indicate fail position of each damper and valve, if included in Project.
   b. I/O listed in table format showing point name, type of device, manufacturer, model number, and cross-reference to product data sheet number.
   c. A graphic showing location of control I/O in proper relationship to HVAC system.
   d. Wiring diagram with each I/O point having a unique identification and indicating labels for all wiring terminals.
   e. Unique identification of each I/O that shall be consistently used between different drawings showing same point.
   f. Elementary wiring diagrams of controls for HVAC equipment motor circuits including interlocks, switches, relays and interface to DDC controllers.
   g. Narrative sequence of operation.
   h. Graphic sequence of operation, showing all inputs and output logical blocks.

7. Control panel drawings indicating the following:

    a. Panel dimensions, materials, size, and location of field cable, raceways, and tubing connections.
    b. Interior subpanel layout, drawn to scale and showing all internal components, cabling and wiring raceways, nameplates and allocated spare space.
    c. Front, rear, and side elevations and nameplate legend.
    d. Unique drawing for each panel.

8. DDC system network riser diagram indicating the following:

    a. Each device connected to network with unique identification for each.
    b. Interconnection of each different network in DDC system.
    c. For each network, indicate communication protocol, speed and physical means of interconnecting network devices, such as copper cable type, or fiber-optic cable type. Indicate raceway type and size for each.
    d. Each network port for connection of an operator workstation or other type of operator interface with unique identification for each.

9. DDC system electrical power riser diagram indicating the following:

    a. Each point of connection to field power with requirements (volts/phase//hertz/amperes/connection type) listed for each.
    b. Each control power supply including, as applicable, transformers, power-line conditioners, transient voltage suppression and high filter noise units, DC power supplies, and UPS units with unique identification for each.
    c. Each product requiring power with requirements (volts/phase//hertz/amperes/connection type) listed for each.
    d. Power wiring type and size, race type, and size for each.

10. Monitoring and control signal diagrams indicating the following:

    a. Control signal cable and wiring between controllers and I/O.
    b. Point-to-point schematic wiring diagrams for each product.
    c. Control signal tubing to sensors, switches and transmitters.
    d. Process signal tubing to sensors, switches and transmitters.

11. Color graphics indicating the following:

    a. Itemized list of color graphic displays to be provided.
    b. For each display screen to be provided, a true color copy showing layout of pictures, graphics and data displayed.
    c. Intended operator access between related hierarchical display screens.

F. System Description:

1. Full description of DDC system architecture, network configuration, operator interfaces and peripherals, servers, controller types and applications, gateways, routers and other network devices, and power supplies.
2. Complete listing and description of each report, log and trend for format and timing and events which initiate generation.
3. System and product operation under each potential failure condition including, but not limited to, the following:

a. Loss of power.
b. Loss of network communication signal.
c. Loss of controller signals to inputs and outpoints.
d. Operator workstation failure.
e. Server failure.
f. Gateway failure.
g. Network failure
h. Controller failure.
i. Instrument failure.
j. Control damper and valve actuator failure.

4. Complete bibliography of documentation and media to be delivered to Owner.
5. Description of testing plans and procedures.
6. Description of Owner training.

G. Samples:

1. For each of the following exposed product, installed in finished space for approval of selection of aesthetic characteristics:

a. Gas instruments specified in Section 230923.16 "Gas Instruments."
b. Moisture instruments specified in Section 230923.19 "Moisture Instruments."
c. Motion instruments specified in Section 230923.21 "Motion Instruments."
d. Pressure instruments specified in Section 230923.23 "Pressure Instruments."
e. Temperature instruments specified in Section 230923.27 "Temperature Instruments."

H. Delegated-Design Submittal: For DDC system products and installation indicated as being delegated.

1. Supporting documentation showing DDC system design complies with performance requirements indicated, including calculations and other documentation necessary to prove compliance.
2. Schedule and design calculations for control dampers and actuators.

a. Flow at Project design and minimum flow conditions.
b. Face velocity at Project design and minimum airflow conditions.
c. Pressure drop across damper at Project design and minimum airflow conditions.
d. AMCA 500-D damper installation arrangement used to calculate and schedule pressure drop, as applicable to installation.
e. Maximum close-off pressure.
f. Leakage airflow at maximum system pressure differential (fan close-off pressure).
g. Torque required at worst case condition for sizing actuator.
h. Actuator selection indicating torque provided.
i. Actuator signal to control damper (on, close or modulate).
j. Actuator position on loss of power.
k. Actuator position on loss of control signal.

3. Schedule and design calculations for control valves and actuators.

a. Flow at Project design and minimum flow conditions.
b. Pressure-differential drop across valve at Project design flow condition.
c. Maximum system pressure-differential drop (pump close-off pressure) across valve at Project minimum flow condition.

d. Design and minimum control valve coefficient with corresponding valve position.
e. Maximum close-off pressure.
f. Leakage flow at maximum system pressure differential.
g. Torque required at worst case condition for sizing actuator.
h. Actuator selection indicating torque provided.
i. Actuator signal to control damper (on, close or modulate).
j. Actuator position on loss of power.
k. Actuator position on loss of control signal.

4. Schedule and design calculations for selecting flow instruments.

a. Instrument flow range.
b. Project design and minimum flow conditions with corresponding accuracy, control signal to transmitter and output signal for remote control.
c. Extreme points of extended flow range with corresponding accuracy, control signal to transmitter and output signal for remote control.
d. Pressure-differential loss across instrument at Project design flow conditions.
e. Where flow sensors are mated with pressure transmitters, provide information for each instrument separately and as an operating pair.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Plan drawings and corresponding product installation details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

a. Product installation location shown in relationship to room, duct, pipe and equipment.
b. Structural members to which products will be attached.
c. Wall-mounted instruments located in finished space showing relationship to light switches, fire-alarm devices and other installed devices.
d. Size and location of wall access panels for products installed behind walls and requiring access.

2. Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

a. Ceiling components.
b. Size and location of access panels for products installed above inaccessible ceiling assemblies and requiring access.
c. Items penetrating finished ceiling including the following:

1) Lighting fixtures.
2) Air outlets and inlets.
3) Speakers.
4) Sprinklers.
5) Access panels.
6) Motion sensors.
7) Pressure sensors.
8) Temperature sensors and other DDC control system instruments.

B. Qualification Data:

1. Systems Provider Qualification Data:

a. Resume of project manager assigned to Project.
b. Resumes of application engineering staff assigned to Project.
c. Resumes of installation and programming technicians assigned to Project.
d. Resumes of service technicians assigned to Project.
e. Brief description of past project including physical address, floor area, number of floors, building system cooling and heating capacity and building's primary function.
f. Description of past project DDC system, noting similarities to Project scope and complexity indicated.
g. Names of staff assigned to past project that will also be assigned to execute work of this Project.
h. Owner contact information for past project including name, phone number, and e-mail address.
i. Contractor contact information for past project including name, phone number, and e-mail address.
j. Architect and Engineer contact information for past project including name, phone number, and e-mail address.

2. Manufacturer's qualification data.
3. Testing agency's qualifications data.

C. Welding certificates.

D. Product Certificates:

1. Data Communications Protocol Certificates: Certifying that each proposed DDC system component complies with ASHRAE 135.
2. Data Communications Protocol Certificates: Certifying that each proposed DDC system component complies with LonWorks.

E. Product Test Reports: For each product that requires testing to be performed by manufacturer and witnessed by a qualified testing agency, or a qualified testing agency.

F. Preconstruction Test Reports: For each separate test performed.

G. Source quality-control reports.

H. Field quality-control reports.

I. Sample Warranty: For manufacturer's warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For DDC system to include in emergency, operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Project Record Drawings of as-built versions of submittal Shop Drawings provided in electronic PDF format.
b. Testing and commissioning reports and checklists of completed final versions of reports, checklists, and trend logs.
c. As-built versions of submittal Product Data.
d. Names, addresses, e-mail addresses and 24-hour telephone numbers of Installer and service representatives for DDC system and products.
e. Operator's manual with procedures for operating control systems including logging on and off, handling alarms, producing point reports, trending data, overriding computer control and changing set points and variables.
f. Programming manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
g. Engineering, installation, and maintenance manuals that explain how to:

    1) Design and install new points, panels, and other hardware.
    2) Perform preventive maintenance and calibration.
    3) Debug hardware problems.
    4) Repair or replace hardware.

h. Documentation of all programs created using custom programming language including set points, tuning parameters, and object database.
i. Backup copy of graphic files, programs, and database on electronic media such as DVDs.
j. List of recommended spare parts with part numbers and suppliers.
k. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.
l. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.
m. Licenses, guarantees, and warranty documents.
n. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.
o. Owner training materials.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials and parts that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Include product manufacturers' recommended parts lists for proper product operation over four-year period following warranty period. Parts list shall be indicated for each year.

C. Furnish parts, as indicated by manufacturer's recommended parts list, for product operation during two-year period following warranty period.

D. Furnish quantity indicated of matching product(s) in Project inventory for each unique size and type of following:

1. Network Controller: One.
2. Programmable Application Controller: One.
3. Application-Specific Controller: One.

4. Carbon Dioxide Sensor and Transmitter: One.
5. Moisture Sensor and Transmitter: One.
6. Pressure Sensor and Transmitter: One.
7. Temperature Sensor and Transmitter: One.
8. General-Purpose Relay: One.
9. Multifunction Time-Delay Relay: One.
10. Latching Relay: One.
11. Current-Sensing Relay: One.
12. Combination On-Off Status Sensor and On-Off Relay: One.
13. Transformer: One.
14. DC Power Supply: One.
15. Supply of 20 percent spare fiber-optic cable splice organizer cabinets for several re-terminations.

1.9 QUALITY ASSURANCE

A. DDC System Manufacturer Qualifications:

1. Nationally recognized manufacturer of DDC systems and products.
2. DDC systems with similar requirements to those indicated for a continuous period of 10 years within time of bid.
3. DDC systems and products that have been successfully tested and in use on at least one hundred past projects.
4. Having complete published catalog literature, installation, operation and maintenance manuals for all products intended for use.
5. Having full-time in-house employees for the following:

    a. Product research and development.
    b. Product and application engineering.
    c. Product manufacturing, testing and quality control.
    d. Technical support for DDC system installation training, commissioning and troubleshooting of installations.
    e. Owner operator training.

B. DDC System Provider Qualifications:

1. Authorized representative of, and trained by, DDC system manufacturer.
2. In-place facility located within 50 miles of Project.
3. Demonstrated past experience with installation of DDC system products being installed for period within five consecutive years before time of bid.
4. Demonstrated past experience on twenty projects of similar complexity, scope and value.
5. Each person assigned to Project shall have demonstrated past experience.
6. Staffing resources of competent and experienced full-time employees that are assigned to execute work according to schedule.
7. Service and maintenance staff assigned to support Project during warranty period.
8. Product parts inventory to support on-going DDC system operation for a period of not less than 5 years after Substantial Completion.
9. DDC system manufacturer's backing to take over execution of Work if necessary to comply with requirements indicated. Include Project-specific written letter, signed by manufacturer's corporate officer, if requested.

C. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
4. AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

E. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

1.10 PRECONSTRUCTION TESTING

A. Preconstruction Testing: Performed by a qualified testing agency on manufacturer's standard assemblies.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace products that fail in materials or workmanship within specified warranty period.

1. Failures shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner.
2. Include updates or upgrades to software and firmware if necessary to resolve deficiencies.

a. Install updates only after receiving Owner's written authorization.

3. Warranty service shall occur during normal business hours and commence within **24** hours of Owner's warranty service request.
4. Warranty Period: Two year(s) from date of Substantial Completion.

a. For Gateway: Three-year parts and labor warranty for each.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alerton Inc.
2. American Auto-Matrix.
3. Automated Logic Corporation.
4. Distech Controls.
5. Honeywell International Inc.
6. Invensys Building Systems.
7. Johnson Controls, Inc.
8. Schneider Electric USA, Inc.

9. Siemens Building Technologies, Inc.

2.2 DDC SYSTEM DESCRIPTION

A. Microprocessor-based monitoring and control including analog/digital conversion and program logic. A control loop or subsystem in which digital and analog information is received and processed by a microprocessor, and digital control signals are generated based on control algorithms and transmitted to field devices to achieve a set of predefined conditions.

1. DDC system shall consist of a high-speed, peer-to-peer network of distributed DDC controllers, other network devices, operator interfaces, and software.

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.

2.3 WEB ACCESS

A. DDC system shall be Web based or Web compatible.

1. Web-Based Access to DDC System:

a. DDC system software shall be based on server thin-client architecture, designed around open standards of Web technology. DDC system server shall be accessed using a Web browser over DDC system network, using Owner's LAN, and remotely over Internet.
b. Intent of thin-client architecture is to provide operators complete access to DDC system via a Web browser. No special software other than a Web browser shall be required to access graphics, point displays, and trends; to configure trends, points, and controllers; and to edit programming.
c. Web access shall be password protected.

2. Web-Compatible Access to DDC System:

a. Operator workstation and shall perform overall system supervision and configuration, graphical user interface, management report generation, and alarm annunciation.
b. DDC system shall support Web browser access to building data. Operator using a standard Web browser shall be able to access control graphics and change adjustable set points.
c. Web access shall be password protected.

2.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design DDC system to satisfy requirements indicated.

B. Delegated Design: Engage a qualified professional to design DDC system to satisfy requirements indicated.

1. System Performance Objectives:

a. DDC system shall manage HVAC systems.
b. DDC system control shall operate HVAC systems to achieve optimum operating costs while using least possible energy and maintaining specified performance.
c. DDC system shall respond to power failures, HVAC equipment failures, and adverse and emergency conditions encountered through connected I/O points.
d. DDC system shall operate while unattended by an operator and through operator interaction.
e. DDC system shall record trends and transaction of events and produce report information such as performance, energy, occupancies, and equipment operation.

C. Surface-Burning Characteristics: Products installed in ducts, equipment, and return-air paths shall comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

D. DDC System Speed:

1. Response Time of Connected I/O:

a. AI point values connected to DDC system shall be updated at least every five seconds for use by DDC controllers. Points used globally shall also comply with this requirement.
b. BI point values connected to DDC system shall be updated at least every five seconds for use by DDC controllers. Points used globally shall also comply with this requirement.
c. AO points connected to DDC system shall begin to respond to controller output commands within two seconds. Global commands shall also comply with this requirement.
d. BO point values connected to DDC system shall respond to controller output commands within two seconds. Global commands shall also comply with this requirement.

2. Display of Connected I/O:

a. Analog point COV connected to DDC system shall be updated and displayed at least every 10 seconds for use by operator.
b. Binary point COV connected to DDC system shall be updated and displayed at least every 10 seconds for use by operator.
c. Alarms of analog and digital points connected to DDC system shall be displayed within 30 seconds of activation or change of state.
d. Graphic display refresh shall update within eight seconds.
e. Point change of values and alarms displayed from workstation to workstation when multiple operators are viewing from multiple workstations shall not exceed graphic refresh rate indicated.

E. Network Bandwidth: Design each network of DDC system to include at least **30** percent available spare bandwidth with DDC system operating under normal and heavy load conditions indicated. Calculate bandwidth usage, and apply a safety factor to ensure that requirement is satisfied when subjected to testing under worst case conditions.

F. DDC System Data Storage:

1. Include server(s) with disk drive data storage to archive not less than 60 consecutive months of historical data for all I/O points connected to system, including alarms, event histories, transaction logs, trends and other information indicated.
2. When logged onto a server, operator shall be able to also interact with any DDC controller connected to DDC system as required for functional operation of DDC system.
3. Server(s) shall be used for application configuration; for archiving, reporting and trending of data; for operator transaction archiving and reporting; for network information management; for alarm annunciation; and for operator interface tasks and controls application management.
4. Server(s) shall use IT industry-standard database platforms such as Microsoft SQL Server and Microsoft Data Engine (MSDE).

G. Input Point Displayed Accuracy: Input point displayed values shall meet following end-to-end overall system accuracy, including errors associated with meter, sensor, transmitter, lead wire or cable, and analog to digital conversion.

1. Energy:

    a. Thermal: Within 3 percent of reading.
    b. Electric Power: Within 1 percent of reading.
    c. Requirements indicated on Drawings for meters not supplied by enre.

2. Flow:

    a. Air: Within 2 percent of design flow rate.
    b. Air (Terminal Units): Within 5 percent of design flow rate.
    c. Water: Within 2 percent of design flow rate.
    d. Steam: Within 5 percent of design flow rate.

3. Gas:

    a. Carbon Dioxide: Within 50 ppm.
    b. Carbon Monoxide: Within 5 percent of reading.
    c. Oxygen: Within 5 percent of reading.
    d. Refrigerant: Within 50 ppm.

4. Moisture (Relative Humidity):

    a. Air: Within 2 percent RH.
    b. Space: Within 2 percent RH.
    c. Outdoor: Within 2 percent RH.

5. Level: Within 2 percent of reading.
6. Pressure:

    a. Air, Ducts and Equipment: 0.5 percent of instrument range.
    b. Space: Within 0.5 percent of instrument range.
    c. Water: Within 0.5 percent of instrument range.
    d. Steam: Within 0.5 percent of instrument range.

7. Speed: Within 5 percent of reading.
8. Temperature, Dew Point:

    a. Air: Within 1 deg F.

b. Space: Within 1 deg F.
c. Outdoor: Within 2 deg F.

9. Temperature, Dry Bulb:

a. Air: Within 1 deg F.
b. Space: Within 1 deg F.
c. Outdoor: Within 1 deg F.
d. Chilled Water: Within 1 deg F.
e. Condenser Water: Within 1 deg F.
f. Heating Hot Water: Within 1 deg F.
g. Energy Recovery Runaround Liquid: Within 1 deg F.
h. Steam: Within 2 deg F.
i. Temperature Difference: Within 0.25 deg F.
j. Other Temperatures Not Indicated: Within 1 deg F.

10. Temperature, Wet Bulb:

a. Air: Within 1 deg F.
b. Space: Within 1 deg F.
c. Outdoor: Within 1 deg F.

11. Vibration: Within **5** percent of reading.

H. Precision of I/O Reported Values: Values reported in database and displayed shall have following precision:

1. Current:

a. Milliamperes: Nearest 1/100th of a milliampere.
b. Amperes: Nearest 1/10th of an ampere up to 100 A; nearest ampere for 100 A and more.

2. Energy:

a. Electric Power:

1) Rate (Watts): Nearest 1/10th of a watt through 1000 W.
2) Rate (Kilowatts): Nearest 1/10th of a kilowatt through 1000 kW; nearest kilowatt above 1000 kW.
3) Usage (Kilowatt-Hours): Nearest kilowatt through 10,000 kW; nearest 10 kW between 10,000 and 100,000 kW; nearest 100 kW for above 100,000 kW.

b. Thermal, Rate:

1) Heating: For Btu/h, nearest Btu/h up to 1000 Btu/h; nearest 10 Btu/h between 1000 and 10,000 Btu/h; nearest 100 Btu/h for above 10,000 Btu/h. For Mbh, round to nearest Mbh up to 1000 Mbh; nearest 10 Mbh between 1000 and 10,000 Mbh; nearest 100 Mbh above 10,000 Mbh.
2) Cooling: For tons, nearest ton up to 1000 tons; nearest 10 tons between 1000 and 10,000 tons; nearest 100 tons above 10,000 tons.

c. Thermal, Usage:

1) Heating: For Btu, nearest Btu up to 1000 Btu; nearest 10 Btu between 1000 and 10,000 Btu; nearest 100 Btu for above 10,000 Btu. For Mbtu, round to nearest Mbtu up to 1000 Mbtu; nearest 10 Mbtu between 1000 and 10,000 Mbtu; nearest 100 Mbtu above 10,000 Mbtu.
2) Cooling: For ton-hours, nearest ton-hours up to 1000 ton-hours; nearest 10 ton-hours between 1000 and 10,000 ton-hours; nearest 100 tons above 10,000 tons.

3. Flow:

a. Air: Nearest 1/10th of a cfm through 100 cfm; nearest cfm between 100 and 1000 cfm; nearest 10 cfm between 1000 and 10,000 cfm; nearest 100 cfm above 10,000 cfm.
b. Water: Nearest 1/10th gpm through 100 gpm; nearest gpm between 100 and 1000 gpm; nearest 10 gpm between 1000 and 10,000 gpm; nearest 100 gpm above 10,000 gpm.
c. Steam: Nearest 1/10th lb/hr through 100 lbs/hr; nearest lbs/hr between 100 and 1000 lbs/hr; nearest 10 lbs/hr above 1000 lbs/hr.

4. Gas:

a. Carbon Dioxide (ppm): Nearest ppm.
b. Carbon Monoxide (ppm): Nearest ppm.
c. Oxygen (Percentage): Nearest 1/10th of 1 percent.
d. Refrigerant (ppm): Nearest ppm.

5. Moisture (Relative Humidity):

a. Relative Humidity (Percentage): Nearest 1 percent.

6. Level: Nearest 1/100th of an inch through 10 inches; nearest 1/10 of an inch between 10 and 100 inches; nearest inch above 100 inches.
7. Speed:

a. Rotation (rpm): Nearest 1 rpm.
b. Velocity: Nearest 1/10th fpm through 100 fpm; nearest fpm between 100 and 1000 fpm; nearest 10 fpm above 1000 fpm.

8. Position, Dampers and Valves (Percentage Open): Nearest 1 percent.
9. Pressure:

a. Air, Ducts and Equipment: Nearest 1/10th in. w.c..
b. Space: Nearest 1/100th in. w.c..
c. Steam: Nearest 1/10th psig through 100 psig; nearest psig above 100 psig.
d. Water: Nearest 1/10 psig through 100 psig; nearest psig above 100 psig.

10. Temperature:

a. Air, Ducts and Equipment: Nearest 1/10th of a degree.
b. Outdoor: Nearest degree.
c. Space: Nearest 1/10th of a degree.
d. Chilled Water: Nearest 1/10th of a degree.
e. Condenser Water: Nearest 1/10th of a degree.
f. Heating Hot Water: Nearest degree.

g. Heat Recovery Runaround: Nearest 1/10th of a degree.
h. Steam: Nearest degree.

11. Vibration: Nearest 1/10th in/s.
12. Voltage: Nearest 1/10 volt up to 100 V; nearest volt above 100 V.

I. Control Stability: Control variables indicated within the following limits:

1. Flow:

a. Air, Ducts and Equipment, except Terminal Units: Within 2 percent of design flow rate.
b. Air, Terminal Units: Within 5 percent of design flow rate.
c. Water: Within 2 percent of design flow rate.
d. Steam: Within 5 percent of design flow rate.

2. Gas:

a. Carbon Dioxide: Within 50 ppm.
b. Carbon Monoxide: Within 5 percent of reading.
c. Oxygen: Within 5 percent of reading.

3. Moisture (Relative Humidity):

a. Air: Within 2 percent RH.
b. Space: Within 2 percent RH.
c. Outdoor: Within 2 percent RH.

4. Level: Within 2 percent of reading.
5. Pressure:

a. Air, Ducts and Equipment: 0.5 percent of instrument range.
b. Space: Within 0.5 percent of instrument range.
c. Water: Within 0.5 percent of instrument range.
d. Steam: Within 0.5 percent of instrument range.

6. Temperature, Dew Point:

a. Air: Within 1 deg F.
b. Space: Within 1 deg F.

7. Temperature, Dry Bulb:

a. Air: Within 1 deg F.
b. Space: Within 1 deg F.
c. Chilled Water: Within 1 deg F.
d. Condenser Water: Within 1 deg F.
e. Heating Hot Water: Within 1 deg F.
f. Energy Recovery Runaround Liquid: Within 1 deg F.

8. Temperature, Wet Bulb:

a. Air: Within 1 deg F.
b. Space: Within 1 deg F.

J. Environmental Conditions for Controllers, Gateways, and Routers:

1. Products shall operate without performance degradation under ambient environmental temperature, pressure and humidity conditions encountered for installed location.

    a. If product alone cannot comply with requirement, install product in a protective enclosure that is isolated and protected from conditions impacting performance. Enclosure shall be internally insulated, electrically heated, cooled and ventilated as required by product and application.

2. Products shall be protected with enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Products not available with integral enclosures complying with requirements indicated shall be housed in protective secondary enclosures. Installed location shall dictate the following NEMA 250 enclosure requirements:

    a. Outdoors, Protected: Type 2.
    b. Outdoors, Unprotected: Type 4.
    c. Indoors, Heated with Filtered Ventilation: Type 1.
    d. Indoors, Heated with Non-Filtered Ventilation: Type 2.
    e. Indoors, Heated and Air Conditioned: Type 1.
    f. Mechanical Equipment Rooms:

        1) Chiller and Boiler Rooms: Type 12.
        2) Air-Moving Equipment Rooms: Type 1.

    g. Localized Areas Exposed to Washdown: Type 4.
    h. Within Duct Systems and Air-Moving Equipment Not Exposed to Possible Condensation: Type 2.
    i. Within Duct Systems and Air-Moving Equipment Exposed to Possible Condensation: Type 4.
    j. Hazardous Locations: Explosion-proof rating for condition.

K. Environmental Conditions for Instruments and Actuators:

1. Instruments and actuators shall operate without performance degradation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified and encountered for installed location.

    a. If instruments and actuators alone cannot comply with requirement, install instruments and actuators in protective enclosures that are isolated and protected from conditions impacting performance. Enclosure shall be internally insulated, electrically heated**, cooled** and ventilated as required by instrument and application.

2. Instruments, actuators and accessories shall be protected with enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Instruments and actuators not available with integral enclosures complying with requirements indicated shall be housed in protective secondary enclosures. Installed location shall dictate the following NEMA 250 enclosure requirements:

    a. Outdoors, Protected: Type 2.
    b. Outdoors, Unprotected: Type 4.
    c. Indoors, Heated with Filtered Ventilation: Type 1.

d. Indoors, Heated with Non-Filtered Ventilation: Type 2.
e. Indoors, Heated and Air-conditioned: Type 1.
f. Mechanical Equipment Rooms:

1) Chiller and Boiler Rooms: Type 12.
2) Air-Moving Equipment Rooms: Type 1.

g. Localized Areas Exposed to Washdown: Type 4.
h. Within Duct Systems and Air-Moving Equipment Not Exposed to Possible Condensation: Type 2.
i. Within Duct Systems and Air-Moving Equipment Exposed to Possible Condensation: Type 4.
j. Hazardous Locations: Explosion-proof rating for condition.

L. DDC System Reliability:

1. Design, install and configure DDC controllers, gateways, and routers to yield a MTBF of at least 40,000hours, based on a confidence level of at least 90 percent. MTBF value shall include any failure for any reason to any part of products indicated.
2. If required to comply with MTBF indicated, include DDC system and product redundancy to maintain DCC system, and associated systems and equipment that are being controlled, operational and under automatic control.
3. Critical systems and equipment that require a higher degree of DDC system redundancy than MTBF indicated shall be indicated on Drawings.

M. Electric Power Quality:

1. Power-Line Surges:

a. Protect susceptible DDC system products connected to ac power circuits from power-line surges to comply with requirements of IEEE C62.41.
b. Do not use fuses for surge protection.
c. Test protection in the normal mode and in the common mode, using the following two waveforms:

1) 10-by-1000-mic.sec. waveform with a peak voltage of 1500 V and a peak current of 60 A.
2) 8-by-20-mic.sec. waveform with a peak voltage of 1000 V and a peak current of 500 A.

2. Power Conditioning:

a. Protect susceptible DDC system products connected to ac power circuits from irregularities and noise rejection. Characteristics of power-line conditioner shall be as follows:

1) At 85 percent load, output voltage shall not deviate by more than plus or minus 1 percent of nominal when input voltage fluctuates between minus 20 percent to plus 10 percent of nominal.
2) During load changes from zero to full load, output voltage shall not deviate by more than plus or minus 3 percent of nominal.
3) Accomplish full correction of load switching disturbances within five cycles, and 95 percent correction within two cycles of onset of disturbance.
4) Total harmonic distortion shall not exceed 3-1/2 percent at full load.

3. Ground Fault: Protect products from ground fault by providing suitable grounding. Products shall not fail due to ground fault condition.

N. Backup Power Source:

1. HVAC systems and equipment served by a backup power source shall have associated DDC system products that control such systems and equipment also served from a backup power source.

A. UPS:

1. DDC system products powered by UPS units shall include the following:

a. Desktop operator workstations.
b. Printers.
c. Servers.
d. Gateways.
e. DDC controllers.

2. DDC system instruments and actuators powered by UPS units shall include the following:

a. Instruments associated with the following systems controlled by DDC system:

1) All HVAC systems.

b. Dampers and actuators associated with the following systems controlled by DDC system:

1) All HVAC systems.

c. Valves and actuators associated with the following systems controlled by DDC system:

1) All HVAC systems.

B. Continuity of Operation after Electric Power Interruption:

1. Equipment and associated factory-installed controls, field-installed controls, electrical equipment, and power supply connected to building normal and backup power systems shall automatically return equipment and associated controls to operating state occurring immediately before loss of normal power, without need for manual intervention by operator when power is restored either through backup power source or through normal power if restored before backup power is brought online.

2.5 PANEL-MOUNTED, MANUAL OVERRIDE SWITCHES

A. Manual Override of Control Dampers:

1. Include panel-mounted, two-position, selector switch for each automatic control damper being controlled by DDC controller.
2. Label each switch with damper designation served by switch.
3. Label switch positions to indicate either "Manual" or "Auto" control signal to damper.

4. With switch in "Auto" position signal to control damper actuator shall be control loop output signal from DDC controller.
5. With switch in "Manual" position, signal to damper actuator shall be controlled at panel with either an integral or separate switch to include local control.

    a. For Binary Control Dampers: Manual two-position switch shall have "Close" and "Open" switch positions indicated. With switch in "Close" position, damper shall close. With switch in "Open" position, damper shall open.
    b. For Analog Control Dampers: A gradual switch shall have "Close" and "Open" switch limits indicated. Operator shall be able to rotate switch knob to adjust damper to any position from close to open.

6. DDC controller shall monitor and report position of each manual override selector switch. With switch placed in "manual" position, DDC controller shall signal an override condition to alert operator that damper is under manual, not automatic, control.
7. Terminal equipment including VAV units, fan-coil units, and unit heaters do not require manual override unless otherwise indicated by sequence of operation.

B. Manual Override of Control Valves:

1. Include panel-mounted, two-position, selector switch for each automatic control valve being controlled by a DDC controller.
2. Label each switch with valve designation served by switch.
3. Label switch positions to indicate either "Manual" or "Auto" control signal to valve.
4. With switch in "Auto" position, signal to control-valve actuator shall be a control loop output signal from DDC controller.
5. With switch in "Manual" position, signal to valve actuator shall be controlled at panel with either an integral or a separate switch to include local control.

    a. For Binary Control Dampers: Manual two-position switch shall have "Close" and "Open" switch positions indicated. With switch in "Close" position, damper shall close. With switch in "Open" position, damper shall open.
    b. For Analog Control Dampers: A gradual switch shall have "Open" and "Close" switch limits indicated. Operator shall be able to rotate switch knob to adjust damper to any position from close to open.

6. DDC controller shall monitor and report position of each manual override selector switch. With switch placed in "manual" position, DDC controller shall signal an override condition to alert operator that valve is under manual, not automatic, control.
7. Configure manual override switches to allow operator to manually operate valve while at panel without DDC controller installed and operational.
8. Terminal equipment including VAV units, fan-coil units, and unit heaters do not require manual override unless otherwise indicated by sequence of operation.

2.6 SYSTEM ARCHITECTURE

A. System architecture shall consist of no more than two or three levels of LANs.

1. Level one LAN shall connect network controllers and operator workstations.
2. Level one or Level two LAN shall connect programmable application controllers to other programmable application controllers, and to network controllers.
3. Level two or Level three LAN shall connect application-specific controllers to programmable application controllers and network controllers.

4. Level two or Level three LAN shall connect application-specific controllers to application-specific controllers.

B. Minimum Data Transfer and Communication Speed:

1. LAN Connecting Operator Workstations and Network Controllers: 100 Mbps for Ethernet networks, and 1.25 Mbps for CEA-709.1-C networks.
2. LAN Connecting Programmable Application Controllers: 1000 kbps.
3. LAN Connecting Application-Specific Controllers: 115,000 bps.

C. DDC system shall consist of dedicated and separated LANs that are not shared with other building systems and tenant data and communication networks.

D. System architecture shall be modular and have inherent ability to expand to not less than two times system size indicated with no impact to performance indicated.

E. System architecture shall perform modifications without having to remove and replace existing network equipment.

F. Number of LANs and associated communication shall be transparent to operator. All I/O points residing on any LAN shall be capable of global sharing between all system LANs.

G. System design shall eliminate dependence on any single device for system alarm reporting and control execution. Each controller shall operate independently by performing its' own control, alarm management and historical data collection.

H. Special Network Architecture Requirements:

1. Air-Handling Systems: For control applications of an air-handling system that consists of air-handling unit(s) and VAV terminal units, include a dedicated LAN of application-specific controllers serving VAV terminal units connected directly to controller that is controlling air-handling system air-handling unit(s). Basically, create a DDC system LAN that aligns with air-handling system being controlled.

2.7 DDC SYSTEM OPERATOR INTERFACES

A. Operator Means of System Access: Operator shall be able to access entire DDC system through any of multiple means, including, but not limited to, the following:

1. Desktop and portable operator workstation with hardwired connection through LAN port.
2. Portable operator terminal with hardwired connection through LAN port.
3. Portable operator workstation with wireless connection through LAN router.
4. PDA with wireless connection through LAN router.
5. Remote connection using outside of system personal computer or PDA through Web access.
6. Remote connection using portable operator workstation and telephone dial-up modem.

B. Access to system, regardless of operator means used, shall be transparent to operator.

C. Network Ports: For hardwired connection of desktop or portable operator workstation. Network port shall be easily accessible, properly protected, clearly labeled, and installed at the following locations:

1. Each mechanical equipment room.
2. Each boiler room.
3. Each chiller room or outdoor chiller yard.
4. Each cooling tower location.
5. Each different roof level with roof-mounted air-handling units or rooftop units.
6. Security system command center.
7. Fire-alarm system command center.

D. Desktop Workstations:

1. Connect to DDC system Level one LAN through a communications port directly on LAN or through a communications port on a DDC controller.
2. Able to communicate with any device located on any DDC system LAN.
3. Able to communicate, with modems, remotely with any device connected to any DDC system LAN.
4. Communication via a modem shall not interfere with LAN activity and LAN activity shall not prevent workstation from handling incoming calls.

E. Portable Workstations:

1. Connect to DDC system Level one LAN through a communications port directly on LAN or through a communications port on a DDC controller.
2. Able to communicate with any device located on any DDC system LAN.
3. Connect to DDC system Level two or Level three LAN through a communications port on an application-specific controller, or a room temperature sensor connected to an application-specific controller.
4. Connect to system through a wireless router connected to Level one LAN.
5. Portable workstation shall be able to communicate with any device connected to any system LAN regardless of point of physical connection to system.
6. Monitor, program, schedule, adjust set points, and report capabilities of I/O connected anywhere in system.
7. Have dynamic graphic displays that are identical to desktop workstations.

F. POT:

1. Connect DDC controller through a communications port local to controller.
2. Able to communicate with any DDC system controller that is directly connected, or with LAN, or connected to DDC system.

G. Personal Digital Assistant:

1. Connect to system through a wireless router connected to LAN.
2. Able to communicate with any DDC controller connected to DDC system.

H. Telephone Communications:

1. Through use of a standard modem, operator shall be able to communicate with any device connected to any system LAN.
2. Have auto-dial and auto-answer communications to allow desktop and portable workstations and DDC controllers to communicate with remote workstations and remote DDC controllers via telephone lines.

    a. Desktop and Portable Operator Workstation Computers with Modems:

1) Operators shall be able to perform all control functions, report functions, and database generation and modification functions as if directly connected to system LAN.
2) Have routines to automatically answer calls, and either file or display information sent remotely.
3) Communications taking place over telephone lines shall be completely transparent to operator.
4) Dial-up program shall maintain a user-definable cross-reference and associated telephone numbers so it is not required to remember or manually dial telephone numbers.

b. DDC Controllers:

1) Not have modems unless specifically indicated for a unique controller.
2) Controllers with modems shall automatically place calls to report critical alarms, or to upload trend and historical information for archiving.
3) Analyze and prioritize alarms to minimize initiation of calls.
4) Buffer noncritical alarms in memory and report them as a group of alarms, or until an operator manually requests an upload.
5) Make provisions for handling busy signals, no-answers, and incomplete data transfers.
6) Call default devices when communications cannot be established with primary devices.

I. Critical Alarm Reporting:

1. Operator-selected critical alarms shall be sent by DDC system to notify operator of critical alarms that require immediate attention.
2. DDC system shall send alarm notification to multiple recipients that are assigned for each alarm.
3. DDC system shall notify recipients by any or all means, including e-mail, text message and prerecorded phone message to mobile and landline phone numbers.

J. Simultaneous Operator Use: Capable of accommodating up to 10 simultaneous operators that are accessing DDC system through any one of operator interfaces indicated.

2.8 NETWORKS

A. Acceptable networks for connecting operator workstations and network controllers include the following:

1. CEA-709.1-C.
2. IP.
3. IEEE 8802-3, Ethernet.

B. Acceptable networks for connecting programmable application controllers include the following:

1. CEA-709.1-C.
2. IP.
3. IEEE 8802-3, Ethernet.

C. Acceptable networks for connecting application-specific controllers include the following:

1. CEA-709.1-C.
2. IP.
3. IEEE 8802-3, Ethernet.

2.9 NETWORK COMMUNICATION PROTOCOL

A. Network communication protocol(s) used throughout entire DDC system shall be open to public and available to other companies for use in making future modifications to DDC system.

B. ASHRAE 135 Protocol:

1. ASHRAE 135 communication protocol shall be sole and native protocol used throughout entire DDC system.
2. DDC system shall not require use of gateways except to integrate HVAC equipment and other building systems and equipment, not required to use ASHRAE 135 communication protocol.
3. If used, gateways shall connect to DDC system using ASHRAE 135 communication protocol and Project object properties and read/write services indicated by interoperability schedule.
4. Operator workstations, controllers and other network devices shall be tested and listed by BACnet Testing Laboratories.

C. CEA-709.1-C Protocol:

1. DDC system shall be an open implementation of LonWorks technology using CEA 709.1-C communication protocol and using LonMark SNVTs as defined in LonMark SNVT list exclusively for communication throughout DDC system.
2. LNS shall be used for all network management including addressing and binding of network variables.

    a. Final LNS database shall be submitted with Project closeout submittals.
    b. All devices shall be online and commissioned into LNS database.

3. All devices connected to DDC system network(s) shall use CEA-709.1-C protocol and be installed so SCPT output from any node on network can be bound to any other node in the domain.

D. Industry Standard Protocols:

1. DDC system shall use any one or a combination of the following industry standard protocols for network communication while complying with other DDC system requirements indicated:

    a. ASHRAE 135.
    b. CEA-709.1-C.
    c. Modbus Application Protocol Specification V1.1b.

2. Operator workstations and network controllers shall communicate through ASHRAE 135 or CEA-709.1-C protocol.
3. Portions of DDC system networks using ASHRAE 135 communication protocol shall be an open implementation of network devices complying with ASHRAE 135. Network devices shall be tested and listed by BACnet Testing Laboratories.

4. Portions of DDC system networks using CEA-709.1-C communication protocol shall be an open implementation of LonWorks technology using CEA-709.1-C communication protocol and using LonMark SNVTs as defined in LonMark SNVT list exclusively for DDC system.
5. Portions of DDC system networks using Modbus Application Protocol Specification V1.1b communication protocol shall be an open implementation of network devices and technology complying with Modbus Application Protocol Specification V1.1b.
6. Gateways shall be used to connect networks and network devices using different protocols.

2.10 DDC SYSTEM WIRELESS NETWORKS

A. Use Zigbee or an open industry standard and technology used by multiple DDC system manufacturers technology to create a wireless mesh network to provide wireless connectivity for network devices at multiple system levels including communications from programmable application controllers and application-specific controllers to temperature sensors and from network controllers to programmable application controllers and application-specific controllers.

B. Installer shall design wireless networks to comply with DDC system performance requirements indicated. Wireless network devices shall co-exist on same network with hardwired devices.

C. Hardwired controllers shall be capable of retrofit to wireless devices with no special software.

D. A wireless coordinator shall provide a wireless interface between programmable application controllers, application-specific controllers, and network controllers.

E. Wireless Coordinators:

1. Each wireless mesh network shall use wireless coordinator(s) for initiation and formation of network.
2. Use direct sequence spread spectrum RF technology.
3. Operate on the 2.4-GHz ISM Band.
4. Comply with IEEE 802.15.4 for low-power, low duty-cycle RF transmitting systems.
5. FCC compliant to 47 CFR 15, Subpart B, Class A.
6. Operate as a bidirectional transceiver with sensors and routers to confirm and synchronize data transmission.
7. Capable of communication with sensors and routers up to a maximum distance of 250 feet in line of sight.
8. Include visual indicators to provide diagnostic information required for operator verification of operation.

F. Wireless Routers:

1. Each wireless mesh network shall use wireless routers with any controller to provide a wireless interface to a network controller, through a wireless coordinator.
2. Use direct sequence spread spectrum RF technology.
3. Operate on the 2.4-GHz ISM Band.
4. Comply with IEEE 802.15.4 for low-power, low duty-cycle RF transmitting systems.
5. FCC compliant to 47 CFR 15, Subpart B, Class A.
6. Operate as a bidirectional transceiver with other mesh network devices to ensure network integrity.
7. Capable of communication with other mesh network devices at a maximum distance of 250 feet in line of sight.

8. Include indication for use in commissioning and troubleshooting.

G. Wireless Temperature Sensors:

1. Wireless temperature sensors shall sense and transmit room temperatures, temperature set point, room occupancy notification and low battery condition to an associated router.
2. Use direct sequence spread spectrum RF technology.
3. Operate on the 2.4-GHz ISM Band.
4. Comply with IEEE 802.15.4 for low-power, low duty-cycle RF transmitting systems.
5. FCC compliant to CFR 15, Subpart B, Class A.
6. Include set point adjustment between 55 to 85 deg F.
7. Multiple sensors shall be able to report to a router connected to a DDC controller for averaging or high and low selection.

H. One-to-One Wireless Network Receivers:

1. One-to-one wireless receivers shall receive wireless RF signals containing temperature data from multiple wireless room temperature sensors and communicate information to programmable application controllers or application-specific controllers.

a. Use direct sequence spread spectrum RF technology.
b. Operate on the 2.4-GHz ISM Band.
c. Comply with IEEE 802.15.4 for low-power, low duty-cycle RF transmitting systems.
d. FCC compliant to 47 CFR 15, Subpart B, Class A.
e. Operate as a bidirectional transceiver with the sensors to confirm and synchronize data transmission.
f. Capable of communication up to a distance of 200 feet.
g. Include visual indication of the following:

1) Power.
2) Receiver activity.
3) Wireless RF transmission from wireless sensors.
4) No transmission, weak signal, adequate signal or excellent signal.

I. One-to-One Wireless Network Sensors:

1. One-to-one wireless sensors shall sense and report room temperatures to one-to-one receiver.

a. Use direct sequence spread spectrum RF technology.
b. Operate on the 2.4-GHz ISM Band.
c. Comply with IEEE 802.15.4 for low-power, low duty-cycle RF transmitting systems.
d. FCC compliant to CFR 15, Subpart B, Class A.
e. Include set point adjustment between 55 to 85 deg F.

2.11 DESKTOP OPERATOR WORKSTATIONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dell Inc.
2. HP.
3. Lenovo.

B. Performance Requirements:

1. Performance requirements may dictate equipment exceeding minimum requirements indicated.
2. Energy Star compliant.

C. Personal Computer:

1. Minimum Processor Speed: 4.00 GHz., I7 or similar.
2. RAM:

    a. Capacity: 24 GB.
    b. Speed and Type: 1333 MHz.
    c. Expandable Capacity: 24 GB.

3. Hard Drive:

    a. Number of Hard Drives: Two with RAID1.
    b. Capacity: 200 GB.

4. Second Hard Drive:

    a. Capacity: 200 GB.

5. Optical Read and Write Drive:

    a. Include with at least 2 MB of data buffer.
    b. Type: DVD Burner.

6. At least four expansion slots of 64 bit.
7. On-Board Video Card:

    a. Resolution: 1920 by 1200 pixels.

8. On-Board Sound Card:

    a. At least 128 voice wavetable synthesis.
    b. Capable of delivering three-dimensional sound effects.
    c. High-resolution 16-bit stereo digital audio recording and playback with user-selectable sample rates up to 48,000 Hz.

9. On-Board Network Interface Card: Include card with connection, as applicable.

    a. 10-100-1000 base TX Ethernet with RJ45 connector port.
    b. 100 base FX Ethernet with SC or ST port.

10. I/O Ports:

    a. Two second-generation USB 3.0 ports on front panel, six on back panel, and three internal on motherboard.
    b. One RJ-45.
    c. One stereo line-in and headphone line-out on back panel.
    d. One microphone and headphone connector on front panel.

11. Battery: Life of at least three years to maintain system clock/calendar and ROM, as a minimum.

D. Keyboard:

1. 101 enhanced keyboard.
2. Full upper- and lowercase ASCII keyset, numeric keypad, dedicated cursor control keypad, and 12 programmable function keys.
3. Wireless operation within up to 72 inches in front of workstation.

E. Pointing Device:

1. Either a two- or three-button mouse.
2. Wireless operation within up to 72 inches in front of workstation.

F. Flat Panel Display Monitor:

1. Display:

a. Color display with 24 inch diagonal viewable area.
b. Digital or analog input signal.
c. Aspect Ratio: 16 to 9.
d. Antiglare display.
e. Dynamic Contrast Ratio: 50000 to 1.
f. Brightness: 250 cd/sq. m.
g. Tilt adjustable base.
h. Energy Star compliant.
i. Resolution: 1920 by 1080 pixels at 60 Hz with pixel size of 0.277 mm or smaller.
j. Number of Displays: One.

G. Speakers:

1. Two, with individual controls for volume, bass and treble.
2. Signal to Noise Ratio: At least 65 dB.
3. Power: At least 4 W per speaker/channel.
4. Magnetic shielding to prevent distortion on the video monitor.

H. I/O Cabling: Include applicable cabling to connect I/O devices.

2.12 PORTABLE OPERATOR WORKSTATIONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dell Inc.
2. HP.
3. Lenovo.

B. Performance Requirements:

1. Performance requirements may dictate equipment exceeding minimum requirements indicated.
2. Energy Star compliant.

3. Hardware and software shall support local down-loading to DDC controllers.
4. Data transfer rate to DDC controller shall be at network speed.

C. Processor:

1. Minimum Processor Speed: 4.00 GHz., I7 or similar.
2. RAM:

    a. Capacity: 24 GB.
    b. Speed and Type: 1333 MHz.
    c. Expandable Capacity: 24 GB.

3. Hard Drive:

    a. Number of Hard Drives: Two.
    b. Capacity: 200 GB.

D. Input and Output Ports:

1. Shared port for external keyboard or mouse.
2. Four USB 3.0 ports.
3. Ethernet port.

E. Battery:

1. 9-cell, 81 Wh lithium ion battery and ac adapter.
2. Battery life of at least three years.
3. Battery charge time of less than three hours.
4. Spare Battery(ies). One.

F. Keyboard:

1. 85-key backlit keyboard.
2. Full upper- and lowercase ASCII keyset.

G. Integral Pointing Device: Touchpad with two buttons or equivalent pointing device.

H. Display:

1. 17 inch diagonal or larger high-definition WLED color display.
2. Antiglare screen.
3. 1920 by 1080 pixel resolution.
4. Brightness: 300 nits.

I. Network Interface Card: Include card with connection, as application.

1. 10-100-1000 base TX Ethernet with RJ45 connector port.
2. 100 base FX Ethernet with SC or ST port.

J. Digital Video Disc Rewrite Recorder (DVD+/-RW):

1. Compatible with DVD disks and data, audio, recordable and rewritable compact disks.
2. 160-ms access time.

K. Accessories:

1. Leather carrying case.
2. Docking station.
3. Wireless-N communication card.
4. Bluetooth module with 2.1 standard technologies.
5. Mobile broadband card.
6. Wireless optical mouse.
7. 1 TB portable hard drive.
8. Light-sensitive Web cam and noise-cancelling digital array microphone.
9. Cable with network jackets on each end. Minimum cable length shall be.

2.13 POT

A. Description: Handheld device with integral keypad or touch screen operator interface.

B. Display: Multiple lines of text display for use in operator interaction with DDC system.

C. Cable: Flexible coiling cable, at least 36 inches long, with a plug-in jack for connection to DDC controllers, network ports or instruments with an integral LAN port. As an alternative to hardwired connection, POT shall be accessible to DDC controllers through a wireless network connection.

D. POT shall be powered through network connection.

E. Connection of POT to DDC system shall not interrupt or interfere with normal network operation in any way, prevent alarms from being transmitted, or preclude central initiated commands and system modification.

F. POT shall give operator the ability to do the following:

1. Display and monitor BI point status.
2. Change BO point set point (on or off, open or closed).
3. Display and monitor analog point values.
4. Change analog control set points.
5. Command a setting of AO point.
6. Display and monitor I/O point in alarm.
7. Add a new or delete an existing I/O point.
8. Enable and disable I/O points, initiators, and programs.
9. Display and change time and date.
10. Display and change time schedules.
11. Display and change run-time counters and run-time limits.
12. Display and change time and event initiation.
13. Display and change control application and DDC parameters.
14. Display and change programmable offset values.
15. Access DDC controller initialization routines and diagnostics.

2.14 PRINTERS

A. Color Laser Printer:

1. 1200 by 1200 dots per inch resolution black and white, 1200 by 1200 dots per inch resolution black and white and color.
2. First sheet printed within 10 seconds.
3. 10 page per minute rated print speed at best quality mode.
4. Print buffer with at least 512 MB of RAM, expandable to at least one GB.
5. Complies with Energy Star requirements.
6. Capable of handling letter- and legal-size paper and overhead transparencies.
7. Two paper trays; one tray with 100 sheet capacity, and one tray with 500 sheet capacity.
8. Two-sided printing.

B. Color Inkjet Printer:

1. Inkjet technology with true four-color printing (black, cyan, magenta, and yellow).
2. Print quality of 1200 by 600 dots per inch with black on inkjet paper and 4800 by 1200 dots per inch color printing on premium photo paper.
3. Rated speed of 10 pages per minute printing black and white in normal mode and 10pages per minute printing color in normal mode.
4. Two paper trays; one tray with 50 sheet capacity, and one tray with 100 sheet capacity.
5. Capable of handling letter- and legal-size paper and overhead transparencies.
6. 512 MB of RAM.
7. Duplex printing (printing on both sides of paper).

2.15 SYSTEM SOFTWARE

A. System Software Minimum Requirements:

1. Real-time multitasking and multiuser 64-bit operating system that allows concurrent multiple operator workstations operating and concurrent execution of multiple real-time programs and custom program development.
2. Operating system shall be capable of operating DOS and Microsoft Windows applications.
3. Database management software shall manage all data on an integrated and non-redundant basis. Additions and deletions to database shall be without detriment to existing data. Include cross linkages so no data required by a program can be deleted by an operator until that data have been deleted from respective programs.
4. Network communications software shall manage and control multiple network communications to provide exchange of global information and execution of global programs.
5. Operator interface software shall include day-to-day operator transaction processing, alarm and report handling, operator privilege level and data segregation control, custom programming, and online data modification capability.
6. Scheduling software shall schedule centrally based time and event, temporary, and exception day programs.

B. Operator Interface Software:

1. Minimize operator training through use of English language prorating and English language point identification.
2. Minimize use of a typewriter-style keyboard through use of a pointing device similar to a mouse.
3. Operator sign-off shall be a manual operation or, if no keyboard or mouse activity takes place, an automatic sign-off.

4. Automatic sign-off period shall be programmable from one to 60 minutes in one-minute increments on a per operator basis.
5. Operator sign-on and sign-off activity shall be recorded and sent to printer.
6. Security Access:

    a. Operator access to DDC system shall be under password control.
    b. An alphanumeric password shall be field assignable to each operator.
    c. Operators shall be able to access DDC system by entry of proper password.
    d. Operator password shall be same regardless of which computer or other interface means is used.
    e. Additions or changes made to passwords shall be updated automatically.
    f. Each operator shall be assigned an access level to restrict access to data and functions the operator is cable of performing.
    g. Software shall have at least five access levels.
    h. Each menu item shall be assigned an access level so that a one-for-one correspondence between operator assigned access level(s) and menu item access level(s) is required to gain access to menu item.
    i. Display menu items to operator with those capable of access highlighted. Menu and operator access level assignments shall be online programmable and under password control.

7. Data Segregation:

    a. Include data segregation for control of specific data routed to a workstation, to an operator or to a specific output device, such as a printer.
    b. Include at least 32 segregation groups.
    c. Segregation groups shall be selectable such as "fire points," "fire points on second floor," "space temperature points," "HVAC points," and so on.
    d. Points shall be assignable to multiple segregation groups. Display and output of data to printer or monitor shall occur where there is a match of operator or peripheral segregation group assignment and point segregations.
    e. Alarms shall be displayed and printed at each peripheral to which segregation allows, but only those operators assigned to peripheral and having proper authorization level will be allowed to acknowledge alarms.
    f. Operators and peripherals shall be assignable to multiple segregation groups and all assignments are to be online programmable and under password control.

8. Operators shall be able to perform commands including, but not limited to, the following:

    a. Start or stop selected equipment.
    b. Adjust set points.
    c. Add, modify, and delete time programming.
    d. Enable and disable process execution.
    e. Lock and unlock alarm reporting for each point.
    f. Enable and disable totalization for each point.
    g. Enable and disable trending for each point.
    h. Override control loop set points.
    i. Enter temporary override schedules.
    j. Define holiday schedules.
    k. Change time and date.
    l. Enter and modify analog alarm limits.
    m. Enter and modify analog warning limits.
    n. View limits.
    o. Enable and disable demand limiting.

p. Enable and disable duty cycle.
q. Display logic programming for each control sequence.

9. Reporting:

a. Generated automatically and manually.
b. Sent to displays, printers and disk files.
c. Types of Reporting:

1) General listing of points.
2) List points currently in alarm.
3) List of off-line points.
4) List points currently in override status.
5) List of disabled points.
6) List points currently locked out.
7) List of items defined in a "Follow-Up" file.
8) List weekly schedules.
9) List holiday programming.
10) List of limits and deadbands.

10. Summaries: For specific points, for a logical point group, for an operator selected group(s), or for entire system without restriction due to hardware configuration.

C. Graphic Interface Software:

1. Include a full interactive graphical selection means of accessing and displaying system data to operator. Include at least five levels with the penetration path operator assignable (for example, site, building, floor, air-handling unit, and supply temperature loop). Native language descriptors assigned to menu items are to be operator defined and modifiable under password control.
2. Include a hierarchical-linked dynamic graphic operator interface for accessing and displaying system data and commanding and modifying equipment operation. Interface shall use a pointing device with pull-down or penetrating menus, color and animation to facilitate operator understanding of system.
3. Include at least 10 levels of graphic penetration with the hierarchy operator assignable.
4. Descriptors for graphics, points, alarms and such shall be modified through operator's workstation under password control.
5. Graphic displays shall be online user definable and modifiable using the hardware and software provided.
6. Data to be displayed within a graphic shall be assignable regardless of physical hardware address, communication or point type.
7. Graphics are to be online programmable and under password control.
8. Points may be assignable to multiple graphics where necessary to facilitate operator understanding of system operation.
9. Graphics shall also contain software points.
10. Penetration within a graphic hierarchy shall display each graphic name as graphics are selected to facilitate operator understanding.
11. Back-trace feature shall permit operator to move upward in the hierarchy using a pointing device. Back trace shall show all previous penetration levels. Include operator with option of showing each graphic full screen size with back trace as horizontal header or by showing a "stack" of graphics, each with a back trace.
12. Display operator accessed data on the monitor.

13. Operator shall select further penetration using pointing device to click on a site, building, floor, area, equipment, and so on. Defined and linked graphic below that selection shall then be displayed.
14. Include operator with means to directly access graphics without going through penetration path.
15. Dynamic data shall be assignable to graphics.
16. Display points (physical and software) with dynamic data provided by DDC system with appropriate text descriptors, status or value, and engineering unit.
17. Use color, rotation, or other highly visible means, to denote status and alarm states. Color shall be variable for each class of points, as chosen by operator.
18. Points shall be dynamic with operator adjustable update rates on a per point basis from one second to over a minute.
19. For operators with appropriate privilege, points shall be commanded directly from display using pointing device.

    a. For an analog command point such as set point, current conditions and limits shall be displayed and operator can position new set point using pointing device.
    b. For a digital command point such as valve position, valve shall show its current state such as open or closed and operator could select alternative position using pointing device.
    c. Keyboard equivalent shall be available for those operators with that preference.

20. Operator shall be able to split or resize viewing screen into quadrants to show one graphic on one quadrant of screen and other graphics or spreadsheet, bar chart, word processing, curve plot and other information on other quadrants on screen. This feature shall allow real-time monitoring of one part of system while displaying other parts of system or data to better facilitate overall system operation.
21. Help Features:

    a. On-line context-sensitive help utility to facilitate operator training and understanding.
    b. Bridge to further explanation of selected keywords. Document shall contain text and graphics to clarify system operation.

        1) If help feature does not have ability to bridge on keywords for more information, a complete set of user manuals shall be provided in an indexed word-processing program, which shall run concurrently with operating system software.

    c. Available for Every Menu Item:

        1) Index items for each system menu item.

22. Graphic generation software shall allow operator to add, modify, or delete system graphic displays.

    a. Include libraries of symbols depicting HVAC symbols such as fans, coils, filters, dampers, valves pumps, and electrical symbols similar to those indicated.
    b. Graphic development package shall use a pointing device in conjunction with a drawing program to allow operator to perform the following:

        1) Define background screens.
        2) Define connecting lines and curves.
        3) Locate, orient and size descriptive text.

4) Define and display colors for all elements.
5) Establish correlation between symbols or text and associated system points or other displays.

D. Project-Specific Graphics: Graphics documentation including, but not limited to, the following:

1. Site plan showing each building, and additional site elements, which are being controlled or monitored by DDC system.
2. Plan for each building floor, including interstitial floors, and each roof level of each building, showing the following:

   a. Room layouts with room identification and name.
   b. Locations and identification of all monitored and controlled HVAC equipment and other equipment being monitored and controlled by DDC system.
   c. Location and identification of each hardware point being controlled or monitored by DDC system.

3. Control schematic for each of following, including a graphic system schematic representation with point identification, set point and dynamic value indication, sequence of operation, and control logic diagram.
4. Graphic display for each piece of equipment connected to DDC system through a data communications link. Include dynamic indication of all points associated with equipment.
5. DDC system network riser diagram that shows schematic layout for entire system including all networks and all controllers, gateways, operator workstations, and other network devices.

E. Customizing Software:

1. Software to modify and tailor DDC system to specific and unique requirements of equipment installed, to programs implemented and to staffing and operational practices planned.
2. Online modification of DDC system configuration, program parameters, and database using menu selection and keyboard entry of data into preformatted display templates.
3. As a minimum, include the following modification capability:

   a. Operator assignment shall include designation of operator passwords, access levels, point segregation and auto sign-off.
   b. Peripheral assignment capability shall include assignment of segregation groups and operators to consoles and printers, designation of backup workstations and printers, designation of workstation header points and enabling and disabling of print-out of operator changes.
   c. System configuration and diagnostic capability shall include communications and peripheral port assignments, DDC controller assignments to network, DDC controller enable and disable, assignment of command trace to points and application programs and initiation of diagnostics.
   d. System text addition and change capability shall include English or native language descriptors for points, segregation groups and access levels and action messages for alarms, run time and trouble condition.
   e. Time and schedule change capability shall include time and date set, time and occupancy schedules, exception and holiday schedules and daylight savings time schedules.
   f. Point related change capability shall include the following:

      1) System and point enable and disable.

2) Run-time enable and disable.
3) Assignment of points to segregation groups, calibration tables, lockout, and run time and to a fixed I/O value.
4) Assignment of alarm and warning limits.

g. Application program change capability shall include the following:

1) Enable and disable of software programs.
2) Programming changes.
3) Assignment of comfort limits, global points, time and event initiators, time and event schedules and enable and disable time and event programs.

4. Software shall allow operator to add points, or groups of points, to DDC system and to link them to energy optimization and management programs. Additions and modifications shall be online programmable using operator workstation, downloaded to other network devices and entered into their databases. After verification of point additions and associated program operation, database shall be uploaded and recorded on hard drive and disk for archived record.
5. Include high-level language programming software capability for implementation of custom DDC programs. Software shall include a compiler, linker, and up- and down-load capability.
6. Include a library of DDC algorithms, intrinsic control operators, arithmetic, logic and relational operators for implementation of control sequences. Also include, as a minimum, the following:

a. Proportional control (P).
b. Proportional plus integral (PI).
c. Proportional plus integral plus derivative (PID).
d. Adaptive and intelligent self-learning control.

1) Algorithm shall monitor loop response to output corrections and adjust loop response characteristics according to time constant changes imposed.
2) Algorithm shall operate in a continuous self-learning manner and shall retain in memory a stored record of system dynamics so that on system shut down and restart, learning process starts from where it left off.

7. Fully implemented intrinsic control operators including sequence, reversing, ratio, time delay, time of day, highest select AO, lowest select AO, analog controlled digital output, analog control AO, and digitally controlled AO.
8. Logic operators such as "And," "Or," "Not," and others that are part of a standard set available with a high-level language.
9. Arithmetic operators such as "Add," "Subtract," "Multiply," "Divide," and others that are part of a standard set available with a high-level language.
10. Relational operators such as "Equal To," "Not Equal To," "Less Than," "Greater Than," and others that are part of a standard set available with a high-level language.

F. Alarm Handling Software:

1. Include alarm handling software to report all alarm conditions monitored and transmitted through DDC controllers**,** gateways, and other network devices.
2. Include first in, first out handling of alarms according to alarm priority ranking, with most critical alarms first, and with buffer storage in case of simultaneous and multiple alarms.
3. Alarm handling shall be active at all times to ensure that alarms are processed even if an operator is not currently signed on to DDC system.

4. Alarms display shall include the following:

    a. Indication of alarm condition such as "Abnormal Off," "Hi Alarm," and "Low Alarm."
    b. "Analog Value" or "Status" group and point identification with native language point descriptor such as "Space Temperature, Building 110, 2nd Floor, Room 212."
    c. Discrete per point alarm action message, such as "Call Maintenance Dept. Ext-5561."
    d. Include extended message capability to allow assignment and printing of extended action messages. Capability shall be operator programmable and assignable on a per point basis.

5. Alarms shall be directed to appropriate operator workstations, printers, and individual operators by privilege level and segregation assignments.
6. Send e-mail alarm messages to designated operators.
7. Send e-mail, page, text and voice messages to designated operators for critical alarms.
8. Alarms shall be categorized and processed by class.

    a. Class 1:

        1) Associated with fire, security and other extremely critical equipment monitoring functions; have alarm, trouble, return to normal, and acknowledge conditions printed and displayed.
        2) Unacknowledged alarms to be placed in unacknowledged alarm buffer.
        3) All conditions shall cause an audible sound and shall require individual acknowledgment to silence audible sound.

    b. Class 2:

        1) Critical, but not life-safety related, and processed same as Class 1 alarms, except do not require individual acknowledgment.
        2) Acknowledgement may be through a multiple alarm acknowledgment.

    c. Class 3:

        1) General alarms; printed, displayed and placed in unacknowledged alarm buffer queues.
        2) Each new alarm received shall cause an audible sound. Audible sound shall be silenced by "acknowledging" alarm or by pressing a "silence" key.
        3) Acknowledgement of queued alarms shall be either on an individual basis or through a multiple alarm acknowledgement.
        4) Alarms returning to normal condition shall be printed and not cause an audible sound or require acknowledgment.

    d. Class 4:

        1) Routine maintenance or other types of warning alarms.
        2) Alarms to be printed only, with no display, no audible sound and no acknowledgment required.

9. Include an unacknowledged alarm indicator on display to alert operator that there are unacknowledged alarms in system. Operator shall be able to acknowledge alarms on an individual basis or through a multiple alarm acknowledge key, depending on alarm class.
10. To ensure that no alarm records are lost, it shall be possible to assign a backup printer to accept alarms in case of failure of primary printer.

G. Reports and Logs:

1. Include reporting software package that allows operator to select, modify, or create reports using DDC system I/O point data available.
2. Each report shall be definable as to data content, format, interval and date.
3. Report data shall be sampled and stored on DDC controller, within storage limits of DDC controller, and then uploaded to archive on workstation and server for historical reporting.
4. Operator shall be able to obtain real-time logs of all I/O points by type or status, such as alarm, point lockout, or normal.
5. Reports and logs shall be stored on workstation and server hard drives in a format that is readily accessible by other standard software applications, including spreadsheets and word processing.
6. Reports and logs shall be readily printed and set to be printed either on operator command or at a specific time each day.

H. Standard Reports: Standard DDC system reports shall be provided and operator shall be able to customize reports later.

1. All I/O: With current status and values.
2. Alarm: All current alarms, except those in alarm lockout.
3. Disabled I/O: All I/O points that are disabled.
4. Alarm Lockout I/O: All I/O points in alarm lockout, whether manual or automatic.
5. Alarm Lockout I/O in Alarm: All I/O in alarm lockout that are currently in alarm.
6. Logs:

    a. Alarm history.
    b. System messages.
    c. System events.
    d. Trends.

I. Custom Reports: Operator shall be able to easily define any system data into a daily, weekly, monthly, or annual report. Reports shall be time and date stamped and shall contain a report title.

J. Tenant Override Reports: Prepare Project-specific reports.

1. Weekly report showing daily total time in hours that each tenant has requested after-hours HVAC.
2. Monthly report showing daily total time in hours that each tenant has requested after-hours HVAC.
3. Annual summary report that shows after-hours HVAC usage on a monthly basis.

K. HVAC Equipment Reports: Prepare Project-specific reports.

1. Chiller Report: Daily report showing operating conditions of each chiller according to ASHRAE 147, including, but not limited to, the following:

    a. Chilled-water entering temperature.
    b. Chilled-water leaving temperature.
    c. Chilled-water flow rate.
    d. Chilled-water inlet and outlet pressures.
    e. Evaporator refrigerant pressure and temperature.
    f. Condenser refrigerant pressure and liquid temperature.
    g. Condenser-water entering temperature.

h. Condenser-water leaving temperature.
i. Condenser-water flow rate.
j. Refrigerant levels.
k. Oil pressure and temperature.
l. Oil level.
m. Compressor refrigerant discharge temperature.
n. Compressor refrigerant suction temperature.
o. Addition of refrigerant.
p. Addition of oil.
q. Vibration levels or observation that vibration is not excessive.
r. Motor amperes per phase.
s. Motor volts per phase.
t. Refrigerant monitor level (PPM).
u. Purge exhaust time or discharge count.
v. Ambient temperature (dry bulb and wet bulb).
w. Date and time logged.

L. Utility Reports: Prepare Project-specific reports.

1. Electric Report:

a. Include weekly report showing daily electrical consumption and peak electrical demand with time and date stamp for each meter.
b. Include monthly report showing the daily electrical consumption and peak electrical demand with time and date stamp for each meter.
c. Include annual report showing the monthly electrical consumption and peak electrical demand with time and date stamp for each meter.
d. For each weekly, monthly and annual report, include sum total of submeters combined by load type, such as lighting, receptacles and HVAC equipment showing daily electrical consumption and peak electrical demand.
e. For each weekly, monthly and annual report, include sum total of all submeters in building showing electrical consumption and peak electrical demand.

2. Natural Gas Report:

a. Include weekly report showing daily natural gas consumption and peak natural gas demand with time and date stamp for each meter.
b. Include monthly report showing the daily natural gas consumption and peak natural gas demand with time and date stamp for each meter.
c. Include annual report showing the monthly natural gas consumption and peak natural gas demand with time and date stamp for each meter.
d. For each weekly, monthly and annual report, include sum total of submeters combined by load type, such as boilers and service water heaters showing daily natural gas consumption and peak natural gas demand.
e. For each weekly, monthly and annual report, include sum total of all submeters in building showing natural gas consumption and peak natural gas demand.

3. Service Water Report:

a. Include weekly report showing daily service water consumption and peak service water demand with time and date stamp for each meter.
b. Include monthly report showing the daily service water consumption and peak service water demand with time and date stamp for each meter.

c. Include annual report showing the monthly service water consumption and peak service water demand with time and date stamp for each meter.
d. For each weekly, monthly and annual report, include sum total of submeters combined by load type, such as cooling tower makeup and irrigation showing daily service water consumption and peak service water demand.
e. For each weekly, monthly and annual report, include sum total of all submeters in building showing service water consumption and peak service water demand.

M. Standard Trends:

1. Trend all I/O point present values, set points, and other parameters indicated for trending.
2. Trends shall be associated into groups, and a trend report shall be set up for each group.
3. Trends shall be stored within DDC controller and uploaded to hard drives automatically on reaching **75** of DDC controller buffer limit, or by operator request, or by archiving time schedule.
4. Preset trend intervals for each I/O point after review with Owner.
5. Trend intervals shall be operator selectable from 10 seconds up to 60 minutes. Minimum number of consecutive trend values stored at one time shall be 100 per variable.
6. When drive storage memory is full, most recent data shall overwrite oldest data.
7. Archived and real-time trend data shall be available for viewing numerically and graphically by operators.

N. Custom Trends: Operator shall be able to define a custom trend log for any I/O point in DDC system.

1. Each trend shall include interval, start time, and stop time.
2. Data shall be sampled and stored on DDC controller, within storage limits of DDC controller, and then uploaded to archive on workstation and server hard drives.
3. Data shall be retrievable for use in spreadsheets and standard database programs.

O. Programming Software:

1. Include programming software to execute sequences of operation indicated.
2. Include programming routines in simple and easy to follow logic with detailed text comments describing what the logic does and how it corresponds to sequence of operation.
3. Programming software shall be any of the following:

a. Graphic Based: Programming shall use a library of function blocks made from preprogrammed code designed for DDC control systems.

1) Function blocks shall be assembled with interconnection lines that represent to control sequence in a flowchart.
2) Programming tools shall be viewable in real time to show present values and logical results of each function block.

b. Menu Based: Programming shall be done by entering parameters, definitions, conditions, requirements and constraints.
c. Line by Line and Text Based: Programming shall declare variable types such as local, global, real, integer, and so on, at the beginning of the program. Use descriptive comments frequently to describe programming code.

4. Include means for detecting programming errors and testing software control strategies with a simulation tool before implementing in actual control. Simulation tool may be inherent with programming software or as a separate product.

P. Database Management Software:

1. Where a separate SQL database is used for information storage, DDC system shall include database management software that separates database monitoring and managing functions by supporting multiple separate windows.
2. Database secure access shall be accomplished using standard SQL authentication including ability to access data for use outside of DDC system applications.
3. Database management function shall include summarized information on trend, alarm, event, and audit for the following database management actions:

    a. Backup.
    b. Purge.
    c. Restore.

4. Database management software shall support the following:

    a. Statistics: Display database server information and trend, alarm, event, and audit information on database.
    b. Maintenance: Include method of purging records from trend, alarm, event and audit databases by supporting separate screens for creating a backup before purging, selecting database, and allowing for retention of a selected number of day's data.
    c. Backup: Include means to create a database backup file and select a storage location.
    d. Restore: Include a restricted means of restoring a database by requiring operator to have proper security level.

5. Database management software shall include information of current database activity, including the following:

    a. Ready.
    b. Purging record from a database.
    c. Action failed.
    d. Refreshing statistics.
    e. Restoring database.
    f. Shrinking a database.
    g. Backing up a database.
    h. Resetting Internet information services.
    i. Starting network device manager.
    j. Shutting down the network device manager.
    k. Action successful.

6. Database management software monitoring functions shall continuously read database information once operator has logged on.
7. Include operator notification through on-screen pop-up display and e-mail message when database value has exceeded a warning or alarm limit.
8. Monitoring settings window shall have the following sections:

    a. Allow operator to set and review scan intervals and start times.

b. E-mail: Allow operator to create and review e-mail and phone text messages to be delivered when a warning or an alarm is generated.
c. Warning: Allow operator to define warning limit parameters, set reminder frequency and link e-mail message.
d. Alarm: Allow operator to define alarm limit parameters, set reminder frequency and link e-mail message.
e. Database Login: Protect system from unauthorized database manipulation by creating a read access and a write access for each of trend, alarm, event and audit databases as well as operator proper security access to restore a database.

9. Monitoring settings taskbar shall include the following informational icons:

a. Normal: Indicates by color and size, or other easily identifiable means that all databases are within their limits.
b. Warning: Indicates by color and size, or other easily identifiable means that one or more databases have exceeded their warning limit.
c. Alarm: Indicates by color and size, or other easily identifiable means that one or more databases have exceeded their alarm limit.

2.16 OFFICE APPLICATION SOFTWARE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Microsoft Corporation.

B. Include current version of office application software at time of Substantial Completion.

C. Office application software package shall include multiple separate applications and use a common platform for all applications, similar to Microsoft's "Office Professional."

1. Database.
2. E-mail.
3. Presentation.
4. Publisher.
5. Spreadsheet.
6. Word processing.

2.17 ASHRAE 135 GATEWAYS

A. Include BACnet communication ports, whenever available as an equipment OEM standard option, for integration via a single communication cable. BACnet-controlled plant equipment includes, but is not limited to, boilers, chillers, and variable-speed drives.

B. Include gateways to connect BACnet to legacy systems, existing non-BACnet devices, and existing non-BACnet DDC-controlled equipment, only when specifically requested and approved by Owner.

C. Include with each gateway an interoperability schedule showing each point or event on legacy side that BACnet "client" will read, and each parameter that BACnet network will write to. Describe this interoperability of BACnet services, or BIBBs, defined in ASHRAE 135, Annex K.

D. Gateway Minimum Requirements:

1. Read and view all readable object properties on non-BACnet network to BACnet network and vice versa where applicable.
2. Write to all writeable object properties on non-BACnet network from BACnet network and vice versa where applicable.
3. Include single-pass (only one protocol to BACnet without intermediary protocols) translation from non-BACnet protocol to BACnet and vice versa.
4. Comply with requirements of Data Sharing Read Property, Data Sharing Write Property, Device Management Dynamic Device Binding-B, and Device Management Communication Control BIBBs according to ASHRAE 135.
5. Hardware, software, software licenses, and configuration tools for operator-to-gateway communications.
6. Backup programming and parameters on CD media and the ability to modify, download, backup, and restore gateway configuration.

2.18 ASHRAE 135 PROTOCOL ANALYZER

A. Analyzer and required cables and fittings for connection to ASHRAE 135 network.

B. Analyzer shall include the following minimum capabilities:

1. Capture and store to a file data traffic on all network levels.
2. Measure bandwidth usage.
3. Filtering options with ability to ignore select traffic.

2.19 CEA-709.1-C NETWORK HARDWARE

A. Routers:

1. Network routers, including routers configured as repeaters, shall comply with requirements of CEA-709.1-C and include connection between two or more CEA-709.3 TP/FT-10 channels or between two or more CEA-709.3 TP/FT-10 channels and a TP/XF-1250 channel.
2. IP Routers:

    a. Perform layer three routing of CEA-709.1-C packets over an IP network according to CEA-852-B.
    b. Include appropriate connection to the IP network and connections to CEA-709.3 TP/FT-10 or TP/XF-1250 network.
    c. Support the Dynamic Host Configuration Protocol for IP configuration and use of an CEA-852-B Configuration Server (for CEA-852-B configuration), but shall not rely on these services for configuration.
    d. Capable of manual configuration via a console RS-232 port.

B. Gateways:

1. Perform bidirectional protocol translation from one non-CEA-709.1-C protocol to CEA-709.1-C.
2. Incorporate a network connection to a TP/FT-10 network according to CEA-709.3 and a connection for a non-CEA-709.1-C network.

2.20 WIRELESS ROUTERS FOR OPERATOR INTERFACE

A. Single-Band Wireless Routers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Cisco Linksys.
   b. D-Link Corporation/D-Link Systems, Inc.
   c. NETGEAR Inc.

2. Description: High-speed router with integral Ethernet ports.

3. Technology: IEEE 802.11n; 2.4-GHz speed band.
4. Speed: Up to 300 Mbps.
5. Compatibility: IEEE 802.11n/g/b/a wireless devices.
6. Ethernet Ports: Four, gigabit (1000 Mbps).
7. Wireless Security: Wi-Fi Protected Access (WPA) and WPA2 according to IEEE 802.11i.

B. Dual-Band Wireless Routers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Cisco Linksys.
   b. D-Link Corporation/D-Link Systems, Inc.
   c. NETGEAR Inc.

2. Description: High-speed, dual-band router with integral Ethernet ports and USB port.

3. Technology: IEEE 802.11n; 2.4- and 5-GHz speed bands.
4. Speed: Up to 300 Mbps on 2.4-GHz band and up to 450 Mbps on 5-GHz band.
5. Compatibility: IEEE 802.11n/g/b/a wireless devices.
6. Ethernet Ports: Four, gigabit (1000 Mbps).
7. USB Port: One, USB 2.0 or 3.0.
8. Wireless Security: Wi-Fi Protected Access (WPA) and WPA2 according to IEEE 802.11i.

2.21 DDC CONTROLLERS

A. DDC system shall consist of a combination of network controllers, programmable application controllers and application-specific controllers to satisfy performance requirements indicated.

B. DDC controllers shall perform monitoring, control, energy optimization and other requirements indicated.

C. DDC controllers shall use a multitasking, multiuser, real-time digital control microprocessor with a distributed network database and intelligence.

D. Each DDC controller shall be capable of full and complete operation as a completely independent unit and as a part of a DDC system wide distributed network.

E. Environment Requirements:

1. Controller hardware shall be suitable for the anticipated ambient conditions.
2. Controllers located in conditioned space shall be rated for operation at 32 to 120 deg F.
3. Controllers located outdoors shall be rated for operation at 40 to 150 deg F.

F. Power and Noise Immunity:

1. Controller shall operate at 90 to 110 percent of nominal voltage rating and shall perform an orderly shutdown below 80 percent of nominal voltage.
2. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios with up to 5 W of power located within36 inches of enclosure.

G. DDC Controller Spare Processing Capacity:

1. Include spare processing memory for each controller. RAM, PROM, or EEPROM will implement requirements indicated with the following spare memory:

    a. Network Controllers: 60 percent.
    b. Programmable Application Controllers: Not less than 70 percent.
    c. Application-Specific Controllers: Not less than 80 percent.

2. Memory shall support DDC controller's operating system and database and shall include the following:

    a. Monitoring and control.
    b. Energy management, operation and optimization applications.
    c. Alarm management.
    d. Historical trend data of all connected I/O points.
    e. Maintenance applications.
    f. Operator interfaces.
    g. Monitoring of manual overrides.

H. DDC Controller Spare I/O Point Capacity: Include spare I/O point capacity for each controller as follows:

1. Network Controllers:

    a. 20 percent of each AI, AO, BI, and BO point connected to controller.
    b. Minimum Spare I/O Points per Controller:

        1) AIs: Three.
        2) AOs: Three.
        3) BIs: Five.
        4) BOs: Five.

2. Programmable Application Controllers:

    a. 20 percent of each AI, AO, BI, and BO point connected to controller.
    b. Minimum Spare I/O Points per Controller:

        1) AIs: Three.
        2) AOs: Three.
        3) BIs: Five.
        4) BOs: Five.

3. Application-Specific Controllers:

    a. 10 percent of each AI, AO, BI, and BO point connected to controller.
    b. Minimum Spare I/O Points per Controller:

        1) AIs: Two.
        2) AOs: Two.
        3) BIs: Two.
        4) BOs: Two.

I. Maintenance and Support: Include the following features to facilitate maintenance and support:

1. Mount microprocessor components on circuit cards for ease of removal and replacement.
2. Means to quickly and easily disconnect controller from network.
3. Means to quickly and easily access connect to field test equipment.
4. Visual indication that controller electric power is on, of communication fault or trouble, and that controller is receiving and sending signals to network.

J. General Requirements for CEA-709.1-C DDC Controllers:

1. Controllers shall be LonMark certified.
2. Distinguishable and accessible switch, button, or pin, when pressed shall broadcast its 48-bit Node ID and Program ID over network.
3. TP/FT-10 transceiver according to CEA-709.3 and connections for TP/FT-10 control network wiring.
4. TP/XF-1250 transceiver according to CEA-709.3 and connections for TP/XF-1250 control network wiring.
5. Communicate using CEA-709.1-C protocol.
6. Controllers configured into subnets, as required, to comply with performance requirements indicated.
7. Network communication through LNS network management and database standard for CEA-709.1-C network devices.
8. Locally powered, not powered through network connection.
9. Functionality required to support applications indicated, including, but not limited to, the following:

    a. Input and outputs indicated and as required to support sequence of operation and application in which it is used. SNVTs shall have meaningful names identifying the value represented by an SNVT. Unless an SNVT of an appropriate engineering type is unavailable, all network variables shall be of an SNVT with engineering units appropriate to value the variable represents.
    b. Configurable through SCPTs defined in LonMark SCPT List, operator-defined UCPTs, network configuration inputs (NCIs) of an SNVT type defined in LonMark SNVT List, NCIs of an operator-defined network variable type, or hardware settings on controller itself for all settings and parameters used by application in which it is used.

10. Programmable controllers shall conform to LonMark Interoperability Guidelines and have LonMark certification.

K. Input and Output Point Interface:

1. Hardwired input and output points shall connect to network, programmable application and application-specific controllers.

2. Input and output points shall be protected so shorting of point to itself, to another point, or to ground will not damage controller.
3. Input and output points shall be protected from voltage up to 24 V of any duration so that contact will not damage controller.
4. AIs:

    a. AIs shall include monitoring of low-voltage (zero- to 10-V dc), current (4 to 20 mA) and resistance signals from thermistor and RTD sensors.
    b. AIs shall be compatible with, and field configurable to, sensor and transmitters installed.
    c. Controller AIs shall perform analog-to-digital (A-to-D) conversion with a minimum resolution of 12 bits or better to comply with accuracy requirements indicated.
    d. Signal conditioning including transient rejection shall be provided for each AI.
    e. Capable of being individually calibrated for zero and span.
    f. Incorporate common-mode noise rejection of at least 50 dB from zero to 100 Hz for differential inputs, and normal-mode noise rejection of at least 20 dB at 60 Hz from a source impedance of 10000 ohms.

5. AOs:

    a. Controller AOs shall perform analog-to-digital (A-to-D) conversion with a minimum resolution of 12 bits or better to comply with accuracy requirements indicated.
    b. Output signals shall have a range of 4 to 20 mA dc or zero- to 10-V dc as required to include proper control of output device.
    c. Capable of being individually calibrated for zero and span.
    d. AOs shall not exhibit a drift of greater than 0.4 percent of range per year.

6. BIs:

    a. Controller BIs shall accept contact closures and shall ignore transients of less than 5-ms duration.
    b. Isolation and protection against an applied steady-state voltage of up to 180-V ac peak.
    c. BIs shall include a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against effects of contact bounce and noise.
    d. BIs shall sense "dry contact" closure without external power (other than that provided by the controller) being applied.
    e. Pulse accumulation input points shall comply with all requirements of BIs and accept up to 10 pulses per second for pulse accumulation. Buffer shall be provided to totalize pulses. Pulse accumulator shall accept rates of at least 20 pulses per second. The totalized value shall be reset to zero on operator's command.

7. BOs:

    a. Controller BOs shall include relay contact closures or triac outputs for momentary and maintained operation of output devices.

        1) Relay contact closures shall have a minimum duration of 0.1 second. Relays shall include at least 180 V of isolation. Electromagnetic interference suppression shall be provided on all output lines to limit transients to non-damaging levels. Minimum contact rating shall be 1 A at 24-V ac.
        2) Triac outputs shall include at least 180 V of isolation. Minimum contact rating shall be 1 A at 24-V ac.

b. BOs shall include for two-state operation or a pulsed low-voltage signal for pulse-width modulation control.
c. BOs shall be selectable for either normally open or normally closed operation.
d. Include tristate outputs (two coordinated BOs) for control of three-point floating-type electronic actuators without feedback.
e. Limit use of three-point floating devices to VAV terminal unit control applications, and other applications indicated on Drawings. Control algorithms shall operate actuator to one end of its stroke once every 24 hours for verification of operator tracking.

2.22 NETWORK CONTROLLERS

A. General Network Controller Requirements:

1. Include adequate number of controllers to achieve performance indicated.
2. System shall consist of one or more independent, standalone, microprocessor-based network controllers to manage global strategies indicated.
3. Controller shall have enough memory to support its operating system, database, and programming requirements.
4. Data shall be shared between networked controllers and other network devices.
5. Operating system of controller shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
6. Controllers shall have a real-time clock.
7. Controller shall continually check status of its processor and memory circuits. If an abnormal operation is detected, controller shall assume a predetermined failure mode and generate an alarm notification.
8. Controllers shall be fully programmable.

B. Communication:

1. Network controllers shall communicate with other devices on DDC system Level one network.
2. Network controller also shall perform routing if connected to a network of programmable application and application-specific controllers.

C. Operator Interface:

1. Controller shall be equipped with a service communications port for connection to a portable operator's workstation or PDA.

D. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall maintain BIOS and programming information in event of a power loss for at least **96** hours.

2.23 PROGRAMMABLE APPLICATION CONTROLLERS

A. General Programmable Application Controller Requirements:

1. Include adequate number of controllers to achieve performance indicated.
2. Controller shall have enough memory to support its operating system, database, and programming requirements.
3. Data shall be shared between networked controllers and other network devices.
4. Operating system of controller shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
5. Controllers shall have a real-time clock.
6. Controller shall continually check status of its processor and memory circuits. If an abnormal operation is detected, controller shall assume a predetermined failure mode and generate an alarm notification.
7. Controllers shall be fully programmable.

B. Communication:

1. Programmable application controllers shall communicate with other devices on network.

C. Operator Interface:

1. Controller shall be equipped with a service communications port for connection to a portable operator's workstation or PDA.

D. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall maintain BIOS and programming information in event of a power loss for at least 72 hours.

2.24 APPLICATION-SPECIFIC CONTROLLERS

A. Description: Microprocessor-based controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment. Controllers are not fully user-programmable but are configurable and customizable for operation of equipment they are designed to control.

1. Capable of standalone operation and shall continue to include control functions without being connected to network.
2. Data shall be shared between networked controllers and other network devices.

B. Communication: Application-specific controllers shall communicate with other application-specific controller and devices on network, and to programmable application and network controllers.

C. Operator Interface: Controller shall be equipped with a service communications port for connection to a portable operator's workstation.

D. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall use nonvolatile memory and maintain all BIOS and programming information in event of power loss.

2.25 CONTROLLER SOFTWARE

A. General Controller Software Requirements:

1. Software applications shall reside and operate in controllers. Editing of applications shall occur at operator workstations.
2. I/O points shall be identified by up to 30-character point name and up to **16**-character point descriptor. Same names shall be used at operator workstations.
3. Control functions shall be executed within controllers using DDC algorithms.
4. Controllers shall be configured to use stored default values to ensure fail-safe operation. Default values shall be used when there is a failure of a connected input instrument or loss of communication of a global point value.

B. Security:

1. Operator access shall be secured using individual security passwords and user names.
2. Passwords shall restrict operator to points, applications, and system functions as assigned by system manager.
3. Operator log-on and log-off attempts shall be recorded.
4. System shall protect itself from unauthorized use by automatically logging off after last keystroke. The delay time shall be operator-definable.

C. Scheduling: Include capability to schedule each point or group of points in system. Each schedule shall consist of the following:

1. Weekly Schedule:

a. Include separate schedules for each day of week.
b. Each schedule should include the capability for start, stop, optimal start, optimal stop, and night economizer.
c. Each schedule may consist of up to 10 events.
d. When a group of objects are scheduled together, include capability to adjust start and stop times for each member.

2. Exception Schedules:

a. Include ability for operator to designate any day of the year as an exception schedule.
b. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed, it will be discarded and replaced by regular schedule for that day of week.

3. Holiday Schedules:

a. Include capability for operator to define up to 99 special or holiday schedules.
b. Schedules may be placed on scheduling calendar and will be repeated each year.

c. Operator shall be able to define length of each holiday period.

D. System Coordination:

1. Include standard application for proper coordination of equipment.
2. Application shall include operator with a method of grouping together equipment based on function and location.
3. Group may then be used for scheduling and other applications.

E. Binary Alarms:

1. Each binary point shall be set to alarm based on operator-specified state.
2. Include capability to automatically and manually disable alarming.

F. Analog Alarms:

1. Each analog object shall have both high and low alarm limits.
2. Alarming shall be able to be automatically and manually disabled.

G. Alarm Reporting:

1. Operator shall be able to determine action to be taken in event of an alarm.
2. Alarms shall be routed to appropriate operator workstations based on time and other conditions.
3. Alarm shall be able to start programs, print, be logged in event log, generate custom messages, and display graphics.

H. Remote Communication:

1. System shall have ability to dial out in the event of an alarm.

I. Electric Power Demand Limiting:

1. Demand-limiting program shall monitor building or other operator-defined electric power consumption from signals connected to electric power meter or from a watt transducer or current transformer.
2. Demand-limiting program shall predict probable power demand such that action can be taken to prevent exceeding demand limit. When demand prediction exceeds demand limit, action will be taken to reduce loads in a predetermined manner. When demand prediction indicates demand limit will not be exceeded, action will be taken to restore loads in a predetermined manner.
3. Demand reduction shall be accomplished by the following means:

   a. Reset air-handling unit supply temperature set points.
   b. Reset space temperature set points.
   c. De-energize equipment based on priority.

4. Demand-limiting parameters, frequency of calculations, time intervals, and other relevant variables shall be based on the means by which electric power service provider computes demand charges.
5. Include demand-limiting prediction and control for any individual meter monitored by system or for total of any combination of meters.
6. Include means operator to make the following changes online:

a. Addition and deletion of loads controlled.
b. Changes in demand intervals.
c. Changes in demand limit for meter(s).
d. Maximum shutoff time for equipment.
e. Minimum shutoff time for equipment.
f. Select rotational or sequential shedding and restoring.
g. Shed and restore priority.

7. Include the following information and reports, to be available on an hourly, daily, weekly, monthly and annual basis:

a. Total electric consumption.
b. Peak demand.
c. Date and time of peak demand.
d. Daily peak demand.

J. Maintenance Management: System shall monitor equipment status and generate maintenance messages based on operator-designated run-time, starts, and calendar date limits.

K. Sequencing: Include application software based on sequences of operation indicated to properly sequence chillers, boilers, and other applicable HVAC equipment.

L. Control Loops:

1. Support any of the following control loops, as applicable to control required:

a. Two-position (on/off, open/close, slow/fast) control.
b. Proportional control.
c. Proportional plus integral (PI) control.
d. Proportional plus integral plus derivative (PID) control.

1) Include PID algorithms with direct or reverse action and anti-windup.
2) Algorithm shall calculate a time-varying analog value used to position an output or stage a series of outputs.
3) Controlled variable, set point, and PID gains shall be operator-selectable.

e. Adaptive (automatic tuning).

M. Staggered Start: Application shall prevent all controlled equipment from simultaneously restarting after a power outage. Order which equipment (or groups of equipment) is started, along with the time delay between starts, shall be operator-selectable.

N. Energy Calculations:

1. Include software to allow instantaneous power or flow rates to be accumulated and converted to energy usage data.
2. Include an algorithm that calculates a sliding-window average (rolling average). Algorithm shall be flexible to allow window intervals to be operator specified (such as 15, 30, or 60 minutes).
3. Include an algorithm that calculates a fixed-window average. A digital input signal shall define start of window period (such as signal from utility meter) to synchronize fixed-window average with that used by utility.

O. Anti-Short Cycling:

1. BO points shall be protected from short cycling.
2. Feature shall allow minimum on-time and off-time to be selected.

P. On and Off Control with Differential:

1. Include an algorithm that allows a BO to be cycled based on a controlled variable and set point.
2. Algorithm shall be direct- or reverse-acting and incorporate an adjustable differential.

Q. Run-Time Totalization:

1. Include software to totalize run-times for all BI and BO points.
2. A high run-time alarm shall be assigned, if required, by operator.

2.26 ENCLOSURES

A. General Enclosure Requirements:

1. House each controller and associated control accessories in an enclosure. Enclosure shall serve as central tie-in point for control devices such as switches, transmitters, transducers, power supplies and transformers.
2. Do not house more than one controller in a single enclosure.
3. Include enclosure door with key locking mechanism. Key locks alike for all enclosures and include one pair of keys per enclosure.
4. Equip doors of enclosures housing controllers and components with analog or digital displays with windows to allow visual observation of displays without opening enclosure door.
5. Individual wall-mounted single-door enclosures shall not exceed 36 inches wide and 60 inches high.
6. Individual wall-mounted double-door enclosures shall not exceed 60 inches wide and 36 inches high.
7. Freestanding enclosures shall not exceed 48 inches wide and 72 inches high.
8. Include wall-mounted enclosures with brackets suitable for mounting enclosures to wall or freestanding support stand as indicated.
9. Supply each enclosure with a complete set of as-built schematics, tubing, and wiring diagrams and product literature located in a pocket on inside of door. For enclosures with windows, include pocket on bottom of enclosure.

B. Internal Arrangement:

1. Internal layout of enclosure shall group and protect electric, and electronic components associated with a controller, but not an integral part of controller.
2. Arrange layout to group similar products together.
3. Include a barrier between line-voltage and low-voltage electrical and electronic products.
4. Factory or shop install products, tubing, cabling and wiring complying with requirements and standards indicated.
5. Terminate field cable and wire using heavy-duty terminal blocks.
6. Include spare terminals, equal to not less than 20 percent of used terminals.
7. Include spade lugs for stranded cable and wire.
8. Install a maximum of two wires on each side of a terminal.
9. Include enclosure field power supply with a toggle-type switch located at entrance inside enclosure to disconnect power.

10. Include enclosure with a line-voltage nominal 20-A GFCI duplex receptacle for service and testing tools. Wire receptacle on hot side of enclosure disconnect switch and include with a 5-A circuit breaker.
11. Mount products within enclosure on removable internal panel(s).
12. Include products mounted in enclosures with engraved, laminated phenolic nameplates (black letters on a white background). The nameplates shall have at least 1/4-inch-high lettering.
13. Route tubing cable and wire located inside enclosure within a raceway with a continuous removable cover.
14. Label each end of cable, wire and tubing in enclosure following an approved identification system that extends from field I/O connection and all intermediate connections throughout length to controller connection.
15. Size enclosure internal panel to include at least 25 percent spare area on face of panel.

C. Environmental Requirements:

1. Evaluate temperature and humidity requirements of each product to be installed within each enclosure.
2. Calculate enclosure internal operating temperature considering heat dissipation of all products installed within enclosure and ambient effects (solar, conduction and wind) on enclosure.
3. Where required by application, include temperature-controlled electrical heat to maintain inside of enclosure above minimum operating temperature of product with most stringent requirement.
4. Where required by application, include temperature-controlled ventilation fans with filtered louver(s) to maintain inside of enclosure below maximum operating temperature of product with most stringent requirement.
5. Include temperature-controlled cooling within the enclosure for applications where ventilation fans cannot maintain inside temperature of enclosure below maximum operating temperature of product with most stringent requirement.
6. Where required by application, include humidity-controlled electric dehumidifier or cooling to maintain inside of enclosure below maximum relative humidity of product with most stringent requirement and to prevent surface condensation within enclosure.

D. Wall-Mounted, NEMA 250, Type 1:

1. Enclosure shall be NRTL listed according to UL 50 or UL 50E.
2. Construct enclosure of steel, not less than:

    a. Enclosure size less than 24 in.: 0.053 inch or 0.067 inch thick.
    b. Enclosure size 24 in. and larger: 0.067 in. thick.

3. Finish enclosure inside and out with polyester powder coating that is electrostatically applied and then baked to bond to substrate.

    a. Exterior color shall be manufacturer's standard.
    b. Interior color shall be manufacturer's standard.

4. Hinged door full size of front face of enclosure and supported using:

    a. Enclosures sizes less than 36 in. tall: Multiple butt hinges.
    b. Enclosures sizes 36 in. tall and larger: Continuous piano hinges.

5. Removable internal panel with a white polyester powder coating that is electrostatically applied and then baked to bond to substrate.

    a. Size less than 24 in.: Solid or Perforated steel, 0.053 in. thick.
    b. Size 24 in. and larger: Solid aluminum, 0.10 in. or steel, 0.093 in. thick.

6. Internal panel mounting hardware, grounding hardware and sealing washers.
7. Grounding stud on enclosure body.
8. Thermoplastic pocket on inside of door for record Drawings and Product Data.

E. Wall Mounted NEMA 250, Types 4 and 12:

1. Enclosure shall be NRTL listed according to UL 508A.
2. Seam and joints are continuously welded and ground smooth.
3. Where recessed enclosures are indicated, include enclosures with face flange for flush mounting.
4. Externally formed body flange around perimeter of enclosure face for continuous perimeter seamless gasket door seal.
5. Single-door enclosure sizes up to 60 inches tall by 36 inches wide.
6. Double-door enclosure sizes up to 36 inches tall by 60 inches wide.
7. Construct enclosure of steel, not less than the following:

    a. Size Less Than 24 Inches: 0.053 inch or 0.067 inch thick.
    b. Size 24 Inches and Larger: 0.067 inch thick.

8. Finish enclosure with polyester powder coating that is electrostatically applied and then baked to bond to substrate.

    a. Exterior color shall be manufacturer's standard.
    b. Interior color shall be manufacturer's standard.

9. Corner-formed door, full size of enclosure face, supported using multiple concealed hinges with easily removable hinge pins.

    a. Sizes through 24 Inches Tall: Two hinges.
    b. Sizes between 24 Inches through 48 Inches Tall: Three hinges.
    c. Sizes Larger 48 Inches Tall: Four hinges.

10. Double-door enclosures with overlapping door design to include unobstructed full-width access.

    a. Single-door enclosures 48 inches and taller, and all double-door enclosures, with three-point (top, middle and bottom) latch system.

11. Removable internal panel with a white polyester powder coating that is electrostatically applied and then baked to bond to substrate.

    a. Size Less Than 24 Inches: Solid or perforated steel, 0.053 inch thick.
    b. Size 24 Inches and Larger: Solid aluminum, 0.10 inch or steel, 0.093 inch thick.

12. Internal panel mounting studs with hardware, grounding hardware, and sealing washers.
13. Grounding stud on enclosure body.
14. Thermoplastic pocket on inside of door for record Drawings and Product Data.

F. Freestanding, NEMA 250, Type 1:

1. Enclosure shall be NRTL listed according to UL 508A.
2. Seam and joints are continuously welded and ground smooth.
3. Externally formed body flange around perimeter of enclosure face.
4. Single-door enclosure sizes up to 84 inches tall by 36 inches wide.
5. Double-door enclosure sizes up to 84 inches tall by 72 inches wide.
6. Construct enclosure of steel, not less than 0.067 inch thick.
7. Finish enclosure with polyester powder coating that is electrostatically applied and then baked to bond to substrate.

    a. Exterior color shall be manufacturer's standard.
    b. Interior color shall be manufacturer's standard.

8. Corner-formed flush door, full size of enclosure face, supported using four concealed hinges with easily removable hinge pins.
9. Double-door enclosures with overlapping door design to include unobstructed full-width access.
10. Doors with three-point (top, middle, and bottom) latch system with single heavy-duty handle and integral locking mechanism.
11. Removable back covers.
12. Removable solid steel internal panel, 0.093 inch thick, with a white polyester powder coating that is electrostatically applied and then baked to bond to substrate.
13. Internal panel mounting studs with hardware, grounding hardware, and sealing washers.
14. Grounding stud on enclosure body.
15. Thermoplastic pocket on inside of door for record Drawings and Product Data.
16. Nominal 4-inch-tall integral lifting base, not less than 0.123 inch thick, with predrilled holes for attachment to mounting surface.
17. Each top end of enclosure fitted with lifting tabs, not less than 0.172 inch thick.
18. Internal rack-mount shelves and angles as required by application.

G. Freestanding, NEMA 250, Types 4 and 12:

1. Enclosure shall be NRTL listed according to UL 508A Enclosure shall be NRTL listed according to UL 508A.
2. Seam and joints are continuously welded and ground smooth.
3. Externally formed body flange around perimeter of enclosure face.
4. Type 12 Enclosure Sizes:

    a. Single-door enclosure sizes up to 90 inches tall by 36 inches wide.
    b. Double-door enclosure sizes up to 90 inches tall by 72 inches wide.

5. Type 4 Enclosure Sizes:

    a. Single-door enclosure sizes up to 72 inches tall by 36 inches wide.

6. Construct enclosure of steel, not less than 0.093 inch thick.
7. Finish enclosure with polyester powder coating that is electrostatically applied and then baked to bond to substrate.

    a. Exterior color shall be manufacturer's standard.
    b. Interior color shall be manufacturer's standard.

8. Corner-formed door with continuous perimeter oil-resistant gasket supported using continuous piano hinge full length of door.
9. Doors fitted with three-point (top, middle, and bottom) latch system with latching rod rollers and single, heavy-duty oil-tight handle with integral locking mechanism.
10. Removable solid steel internal panel, 0.093 inch thick, with a white polyester powder coating that is electrostatically applied and then baked to bond to substrate.
11. Internal panel mounting studs with hardware, grounding hardware, and sealing washers.
12. Grounding stud on enclosure body.
13. Thermoplastic pocket on inside of door for record Drawings and Product Data.
14. Top of enclosure fitted with no fewer than two lifting eyes.
15. Internal rack-mount shelves and angles as required by application.

H. Accessories:

1. Electric Heater:

   a. Aluminum housing with brushed finish.
   b. Thermostatic control with adjustable set point from zero to 100 deg F.
   c. Capacity: 100, 200, 400, and 800 W as required by application.
   d. Fan draws cool air from bottom of enclosure and passes air across thermostat and heating elements before being released into enclosure cavity. Heated air is discharged through the top of heater.

2. Ventilation Fans, Filtered Intake and Exhaust Grilles:

   a. Number and size of fans, filters and grilles as required by application.
   b. Compact cooling fans engineered for 50,000 hours of continuous operation without lubrication or service.
   c. Fans capable of being installed on any surface and in any position within enclosure for spot cooling or air circulation.
   d. Thermostatic control with adjustable set point from 32 to 140 deg F.
   e. Airflow Capacity at Zero Pressure:

      1) 4-Inch Fan: 100 cfm.
      2) 6-Inch Fan: 240 cfm.
      3) 10-Inch Fan: 560 cfm.

   f. Maximum operating temperature of 158 deg F.
   g. 4-inch fan thermally protected and provided with permanently lubricated ball-bearings.
   h. 6- and 10-inch fans with ball-bearing construction and split capacitor motors thermally protected to avoid premature failure.
   i. Dynamically balanced impellers molded from polycarbonate material.
   j. Fan furnished with power cord and polarized plug for power connection.
   k. Fan brackets, finger guards and mounting hardware provided with fans to complete installation.
   l. Removable Intake and Exhaust Grilles: ABS plastic or stainless steel of size to match fan size and suitable for NEMA 250, Types 1 and 12 enclosures.
   m. Filters for NEMA 250, Type 1 Enclosures: Washable foam or aluminum, of a size to match intake grille.
   n. Filters for NEMA 250, Type 12 Enclosures: Disposable, of a size to match intake grille.

3. Air Conditioner:

a. Electric-powered, self-contained air-conditioning unit specially designed for electrical enclosures to maintain temperature inside enclosure below ambient temperature outside enclosure.
b. Thermostatic control with adjustable set point from 60 to 120 deg F.
c. Enclosure side or top mounting with unit capacity as required by application.
d. Designed for closed-loop cooling with continuous operation in ambient environments up to 125 deg F.
e. HFC refrigerant.
f. Reusable and washable air filter.
g. High-performance, industrial-grade, and high-efficiency fans.
h. Furnished with power cord and polarized plug for power connection.
i. Condensate management system with base pan side drain.
j. Mounting hardware, gaskets, mounting template and instruction manual furnished with unit.
k. Outdoor units equipped with head pressure control for low ambient operation, compressor heater, coated condenser coil and thermostat.

4. Thermoelectric Humidifier:

a. ABS plastic enclosure.
b. Capacity of 8 oz. of water per 24 hours.
c. Built-in drain captures moisture and plastic hose directs moisture to outside enclosure through a drain.
d. Controlled to maintain enclosure relative humidity at an adjustable set point.
e. Unit power supply shall be internally wired to enclosure electrical power source.

5. Framed Fixed Window Kit for NEMA 250, Types 4, 4X, and 12 Enclosures:

a. 0.25-inch-thick, scratch-resistant acrylic or polycarbonate window mounted in a metal frame matching adjacent door material.
b. Enclosure types, except NEMA 250 Type 1, shall have a continuous gasket material around perimeter of window and frame to provide watertight seal.
c. Window kit shall be factory or shop installed before shipment to Project.

6. Frameless Fixed Window Kit for NEMA 250, Type 1 Enclosures:

a. 0.125-inch-thick, polycarbonate window mounted in enclosure door material.
b. Window attached to door with screw fasteners and continuous strip of high-strength double-sided tape around window perimeter.
c. Window kit shall be factory or shop installed before shipment to Project.

7. Frame Fixed or Hinged Window Kit for NEMA 250, Types 1 and 12 Enclosures:

a. 0.25-inch-thick, scratch-resistant acrylic or polycarbonate window mounted in a metal frame matching adjacent door material.
b. Enclosure types, except NEMA 250 Type 1, shall have a continuous gasket material around perimeter of window and frame to provide watertight seal.
c. Window kit shall be factory or shop installed before shipment to Project.

8. Bar handle with keyed cylinder lock set.

2.27 RELAYS

A. General-Purpose Relays:

1. Relays shall be heavy duty and rated for at least 10 A at 250-V ac and 60 Hz.
2. Relays shall be either double pole double throw (DPDT) or three-pole double throw, depending on the control application.
3. Use a plug-in-style relay with an eight-pin octal plug for DPDT relays and an 11-pin octal plug for three-pole double-throw relays.
4. Construct the contacts of either silver cadmium oxide or gold.
5. Enclose the relay in a clear transparent polycarbonate dust-tight cover.
6. Relays shall have LED indication and a manual reset and push-to-test button.
7. Performance:

    a. Mechanical Life: At least 10 million cycles.
    b. Electrical Life: At least 100,000 cycles at rated load.
    c. Pickup Time: 15 ms or less.
    d. Dropout Time: 10 ms or less.
    e. Pull-in Voltage: 85 percent of rated voltage.
    f. Dropout Voltage: 50 percent of nominal rated voltage.
    g. Power Consumption: 2 VA.
    h. Ambient Operating Temperatures: Minus 40 to 115 deg F.

8. Equip relays with coil transient suppression to limit transients to non-damaging levels.
9. Plug each relay into an industry-standard, 35-mm DIN rail socket. Plug all relays located in control panels into sockets that are mounted on a DIN rail.
10. Relay socket shall have screw terminals. Mold into the socket the coincident screw terminal numbers and associated octal pin numbers.

B. Multifunction Time-Delay Relays:

1. Relays shall be continuous duty and rated for at least 10 A at 240-V ac and 60 Hz.
2. Relays shall be DPDT relay with up to eight programmable functions to provide on/off delay, interval and recycle timing functions.
3. Use a plug-in-style relay with either an 8- or 11-pin octal plug.
4. Construct the contacts of either silver cadmium oxide or gold.
5. Enclose the relay in a dust-tight cover.
6. Include knob and dial scale for setting delay time.
7. Performance:

    a. Mechanical Life: At least 10 million cycles.
    b. Electrical Life: At least 100,000 cycles at rated load.
    c. Timing Ranges: Multiple ranges from 0.1 seconds to 100 minutes.
    d. Repeatability: Within 2 percent.
    e. Recycle Time: 45 ms.
    f. Minimum Pulse Width Control: 50 ms.
    g. Power Consumption: 5 VA or less at 120-V ac.
    h. Ambient Operating Temperatures: Minus 40 to 115 deg F.

8. Equip relays with coil transient suppression to limit transients to non-damaging levels.
9. Plug each relay into an industry-standard, 35-mm DIN rail socket. Plug all relays located in control panels into sockets that are mounted on a DIN rail.
10. Relay socket shall have screw terminals. Mold into the socket the coincident screw terminal numbers and associated octal pin numbers.

C. Latching Relays:

1. Relays shall be continuous duty and rated for at least 10 A at 250-V ac and 60 Hz.
2. Relays shall be either DPDT or three-pole double throw, depending on the control application.
3. Use a plug-in-style relay with a multibladed plug.
4. Construct the contacts of either silver cadmium oxide or gold.
5. Enclose the relay in a clear transparent polycarbonate dust-tight cover.
6. Performance:

    a. Mechanical Life: At least 10 million cycles.
    b. Electrical Life: At least 100,000 cycles at rated load.
    c. Pickup Time: 15 ms or less.
    d. Dropout Time: 10 ms or less.
    e. Pull-in Voltage: 85 percent of rated voltage.
    f. Dropout Voltage: 50 percent of nominal rated voltage.
    g. Power Consumption: 2 VA.
    h. Ambient Operating Temperatures: Minus 40 to 115 deg F.

7. Equip relays with coil transient suppression to limit transients to non-damaging levels.
8. Plug each relay into an industry-standard, 35-mm DIN rail socket. Plug all relays located in control panels into sockets that are mounted on a DIN rail.
9. Relay socket shall have screw terminals. Mold into the socket the coincident screw terminal numbers and associated octal pin numbers.

D. Current Sensing Relay:

1. Monitors ac current.
2. Independent adjustable controls for pickup and dropout current.
3. Energized when supply voltage is present and current is above pickup setting.
4. De-energizes when monitored current is below dropout current.
5. Dropout current is adjustable from 50 to 95 percent of pickup current.
6. Include a current transformer, if required for application.
7. House current sensing relay and current transformer in its own enclosure. Use NEMA 250, Type 12 enclosure for indoors and NEMA 250, Type 4 for outdoors.

E. Combination On-Off Status Sensor and On-Off Relay:

1. Description:

    a. On-off control and status indication in a single device.
    b. LED status indication of activated relay and current trigger.
    c. Closed-Open-Auto override switch located on the load side of the relay.

2. Performance:

    a. Ambient Temperature: Minus 30 to 140 deg F.
    b. Voltage Rating: Single-phase loads rated for 300-V ac. Three-phase loads rated for 600-V ac.

3. Status Indication:

    a. Current Sensor: Integral sensing for single-phase loads up to 20 A and external solid or split sensing ring for three-phase loads up to 150 A.

b. Current Sensor Range: As required by application.
c. Current Set Point: Fixed or adjustable as required by application.
d. Current Sensor Output:

1) Solid-state, single-pole double-throw contact rated for 30-V ac and dc and for 0.4 A.
2) Solid-state, single-pole double-throw contact rated for 120-V ac and 1.0 A.
3) Analog, zero- to 5- or 10-V dc.
4) Analog, 4 to 20 mA, loop powered.

4. Relay: Single-pole double-throw, continuous-duty coil; rated for 10-million mechanical cycles.
5. Enclosure: NEMA 250, Type 1 enclosure.

2.28 ELECTRICAL POWER DEVICES

A. Transformers:

1. Transformer shall be sized for the total connected load, plus an additional 25 percent of connected load.
2. Transformer shall be at least 40 VA.
3. Transformer shall have both primary and secondary fuses.

B. Power-Line Conditioner:

1. General Power-Line Conditioner Requirements:

a. Design to ensure maximum reliability, serviceability and performance.
b. Overall function of the power-line conditioner is to receive raw, polluted electrical power and purify it for use by electronic equipment. The power-line conditioner shall provide isolated, regulated, transient and noise-free sinusoidal power to loads served.

2. Standards: NRTL listed per UL 1012.
3. Performance:

a. Single phase, continuous, 100 percent duty rated KVA/KW capacity. Design to supply power for linear or nonlinear, high crest factor, resistive and reactive loads.
b. Automatically regulate output voltage to within 2 percent or better with input voltage fluctuations of plus 10 to minus 20 percent of nominal when system is loaded 100 percent. Use Variable Range Regulation to obtain improved line voltage regulation when operating under less than full load conditions.

1) At 75 Percent Load: Output voltage automatically regulated to within 3 percent with input voltage fluctuations of plus 10 to minus 35 percent of nominal.
2) At 50 Percent Load: Output voltage automatically regulated to within 3 percent with input voltage fluctuations of plus 10 to minus 40 percent of nominal.
3) At 25 Percent Load: Output voltage automatically regulated to within 3 percent with input voltage fluctuations of plus 10 to minus 45 percent of nominal.

c. With input voltage distortion of up to 40 percent, limit the output voltage sine wave to a maximum harmonic content of 5 percent.
d. Automatically regulate output voltage to within 2.5 percent when load (resistive) changes from zero percent to 100 percent to zero percent.
e. Output voltage returns to 95 percent of nominal level within two cycles and to 100 percent within three cycles when the output is taken from no load to full resistive load or vice-versa. Recovery from partial resistive load changes is corrected in a shorter period of time.
f. K Factor: 30, designed to operate with nonlinear, non-sinusoidal, high crest factor loads without overheating.
g. Input power factor within 0.95 approaching unity with load power factor as poor as 0.6.
h. Attenuate load-generated odd current harmonics 23 dB at the input.
i. Electrically isolate the primary from the secondary. Meet isolation criteria as defined in NFPA 70, Article 250-5D.
j. Lighting and Surge Protection: Compares to UL 1449 rating of 330 V when subjected to Category B3 (6000 V/3000 A) combination waveform as established by IEEE C62.41.
k. Common-mode noise attenuation of 140 dB.
l. Transverse-mode noise attenuation of 120 dB.
m. With loss of input power for up to 16.6 ms, the output sine wave remains at usable ac voltage levels.
n. Reliability of 200,000 hours' MTBF.
o. At full load, when measured at 1-m distance, audible noise is not to exceed 54 dB.
p. Approximately 92 percent efficient at full load.

4. Transformer Construction:

a. Ferroresonant, dry type, convection cooled, 600V class. Transformer windings of Class H (220 deg C) insulated copper.
b. Use a Class H installation system throughout with operating temperatures not to exceed 150 deg C over a 40-deg C ambient temperature.
c. Configure transformer primary for multi-input voltage. Include input terminals for source conductors and ground.
d. Manufacture transformer core using M-6 grade, grain-oriented, stress-relieved transformer steel.
e. Configure transformer secondary in a 240/120-V split with a 208-V tap or straight 120 V, depending on power output size.
f. Electrically isolate the transformer secondary windings from the primary windings. Bond neutral conductor to cabinet enclosure and output neutral terminal.
g. Include interface terminals for output power hot, neutral and ground conductors.
h. Label leads, wires and terminals to correspond with circuit wiring diagram.
i. Vacuum impregnate transformer with epoxy resin.

5. Cabinet Construction:

a. Design for panel or floor mounting.
b. NEMA 250, Type 1, general-purpose, indoor enclosure.
c. Manufacture the cabinet from heavy gauge steel complying with UL 50.
d. Include a textured baked-on paint finish.

C. Transient Voltage Suppression and High-Frequency Noise Filter Unit:

1. The maximum continuous operating voltage shall be at least 125 percent.

2. The operating frequency range shall be 47 to 63 Hz.
3. Protection modes according to NEMA LS-1.
4. The rated single-pulse surge current capacity, for each mode of protection, shall be no less than the following:

    a. Line to Neutral: 45,000 A.
    b. Neutral to Ground: 45,000 A.
    c. Line to Ground: 45,000 A.
    d. Per Phase: 90,000 A.

5. Clamping voltages shall be in compliance with test and evaluation procedures defined in NEMA LS-1. Maximum clamping voltage shall be as follows:

    a. Line to Neutral: 360 V.
    b. Line to Ground: 360 V.
    c. Neutral to Ground: 360 V.

6. Electromagnetic interference and RF interference noise rejection or attenuation values shall comply with test and evaluation procedures defined in NEMA LS-1.

    a. Line to Neutral:

        1) 100 kHz: 42 dB.
        2) 1 MHz: 25 dB.
        3) 10 MHz: 21 dB.
        4) 100 MHz: 36 dB.

    b. Line to Ground:

        1) 100 kHz: 16 dB.
        2) 1 MHz: 55 dB.
        3) 10 MHz: 81 dB.
        4) 100 MHz: 80 dB.

7. Unit shall have LED status indicator that extinguishes to indicate a failure.
8. Unit shall be listed by an NRTL as a transient voltage surge suppressor per UL 1449, and as an electromagnetic interference filter per UL 1283.
9. Unit shall not generate any appreciable magnetic field.
10. Unit shall not generate an audible noise.

D. DC Power Supply:

1. Plug-in style suitable for mating with a standard eight-pin octal socket. Include the power supply with a mating mounting socket.
2. Enclose circuitry in a housing.
3. Include both line and load regulation to ensure a stable output. To protect both the power supply and the load, power supply shall have an automatic current limiting circuit.
4. Performance:

    a. Output voltage nominally 25-V dc within 5 percent.
    b. Output current up to 100 mA.
    c. Input voltage nominally 120-V ac, 60 Hz.
    d. Load regulation within 0.5 percent from zero- to 100-mA load.
    e. Line regulation within 0.5 percent at a 100-mA load for a 10 percent line change.

f. Stability within 0.1 percent of rated volts for 24 hours after a 20-minute warmup.

2.29 UNINTERRUPTABLE POWER SUPPLY (UPS) UNITS

A. 250 through 1000 VA:

1. UPS units shall provide continuous, regulated output power without using their batteries during brown-out, surge, and spike conditions.
2. Load served shall not exceed 75 percent of UPS rated capacity, including power factor of connected loads.

    a. Larger-capacity units shall be provided for systems with larger connected loads.
    b. UPS shall provide five minutes of battery power.

3. Performance:

    a. Input Voltage: Single phase, 120- or 230-V ac, compatible with field power source.
    b. Load Power Factor Range (Crest Factor): 0.65 to 1.0.
    c. Output Voltage: 101- to 132-V ac, while input voltage varies between 89 and 152-V ac.
    d. On Battery Output Voltage: Sine wave.
    e. Inverter overload capacity shall be minimum 150 percent for 30 seconds.
    f. Recharge time shall be a maximum of six hours to 90 percent capacity after full discharge to cutoff.
    g. Transfer Time: 6 ms.
    h. Surge Voltage Withstand Capacity: IEEE C62.41, Categories A and B; 6 kV/200 and 500 A; 100-kHz ringwave.

4. UPS shall be automatic during fault or overload conditions.
5. Unit with integral line-interactive, power condition topology to eliminate all power contaminants.
6. Include front panel with power switch and visual indication of power, battery, fault and temperature.
7. Unit shall include an audible alarm of faults and front panel silence feature.
8. Unit with four NEMA WD 1, NEMA WD 6 Configuration 5-15R receptacles.
9. UPS shall include dry contacts (digital output points) for low battery condition and battery-on (primary utility power failure) and connect the points to the DDC system.
10. Batteries shall be sealed lead-acid type and be maintenance free. Battery replacement shall be front accessible by user without dropping load.
11. Include tower models installed in ventilated cabinets to the particular installation location.

B. 1000 through 3000 VA:

1. UPS units shall provide continuous, regulated output power without using their batteries during brown-out, surge, and spike conditions.
2. Load served shall not exceed 75 percent of UPS rated capacity, including power factor of connected loads.

    a. Larger-capacity units, or multiple units, shall be provided for systems with larger connected loads.
    b. UPS shall provide 10 minutes of battery power.

3. Performance:

a. Input Voltage: Single phase, 120-V ac, plus 20 to minus 30 percent.
b. Power Factor: Minimum 0.97 at full load.
c. Output Voltage: Single phase, 120-V ac, within 3 percent, steady state with rated output current of 10.0 A, 30.0-A peak.
d. Inverter overload capacity shall be minimum 150 percent for 30 seconds.
e. Recharge time shall be a maximum of eight hours to 90 percent capacity.

4. UPS bypass shall be automatic during fault or overload conditions.
5. UPS shall include dry contacts (digital output points) for low battery condition and battery-on (primary utility power failure) and connect the points to the DDC system.
6. Batteries shall be sealed lead-acid type and be maintenance free.
7. Include tower models installed in ventilated cabinets or rack models installed on matching racks, as applicable to the particular installation location and space availability/configuration.

2.30 PIPING AND TUBING

A. Process Tubing:

1. Products in this paragraph are intended for signals to instruments connected to liquid and steam systems.
2. Copper Tubing:

a. Seamless phosphor deoxidized copper, soft annealed or drawn tempered with chemical and physical properties according to ASTM B 75.
b. Performance, dimensions, weight and tolerance according to ASTM B 280.
c. Diameter, as required by application, of not less than nominal 0.25 inch.
d. Wall thickness, as required by application, but not less than 0.030 inch.

3. Copper Tubing Connectors and Fittings:

a. Brass, compression type.
b. Brass, solder-joint type.

4. Stainless-Steel Tubing:

a. Seamless Type 316 stainless steel, Grade TP, cold drawn, annealed and pickled, free from scale.
b. Chemical and physical properties according to ASTM A 269.
c. Diameter, as required by application, of not less than nominal 0.25 inch.
d. Wall thickness, as required by application, but not less than 0.035 inch.
e. Furnish stainless-steel tubing in 20-foot straight random lengths.

5. Stainless-Steel Tubing Connectors and Fittings:

a. Connectors and fittings shall be stainless steel, with stainless-steel collets, flareless type.
b. Connect instruments to tubing with connectors having compression connector on one end and IPS or NPT thread on other end.

2.31 CONTROL WIRE AND CABLE

A. Wire: Single conductor control wiring above 24 V.

1. Wire size shall be at least No. 16 AWG.
2. Conductor shall be 7/24 soft annealed copper strand with 2- to 2.5-inch lay.
3. Conductor insulation shall be 600 V, Type THWN or Type THHN, and 90 deg C according to UL 83.
4. Conductor colors shall be black (hot), white (neutral), and green (ground).
5. Furnish wire on spools.

B. Single Twisted Shielded Instrumentation Cable above 24 V:

1. Wire size shall be a minimum No. 20 AWG.
2. Conductors shall be a twisted, 7/24 soft annealed copper strand with a 2- to 2.5-inch lay.
3. Conductor insulation shall have a Type THHN/THWN or Type TFN rating.
4. Shielding shall be 100 percent type, 0.35/0.5-mil aluminum/Mylar tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
5. Outer jacket insulation shall have a 600-V, 90-deg C rating and shall be Type TC cable.
6. For twisted pair, conductor colors shall be black and white. For twisted triad, conductor colors shall be black, red and white.
7. Furnish wire on spools.

C. Single Twisted Shielded Instrumentation Cable 24 V and Less:

1. Wire size shall be a minimum No. 20 AWG.
2. Conductors shall be a twisted, 7/24 soft annealed copper stranding with a 2- to 2.5-inch lay.
3. Conductor insulation shall have a nominal 15-mil thickness, constructed from flame-retardant PVC.
4. Shielding shall be 100 percent type, 1.35-mil aluminum/polymer tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
5. Outer jacket insulation shall have a 300-V, 105-deg C rating and shall be Type PLTC cable.
6. For twisted pair, conductor colors shall be black and white. For twisted triad, conductor colors shall be black, red and white.
7. Furnish wire on spools.

D. LAN and Communication Cable: Comply with DDC system manufacturer requirements for network being installed.

1. Cable shall be plenum rated.
2. Cable shall comply with NFPA 70.
3. Cable shall have a unique color that is different from other cables used on Project.
4. Copper Cable for Ethernet Network:

    a. 100BASE-TX, 1000BASE-T, or 1000BASE-TX.
    b. TIA/EIA 586, Category 5e or Category 6.
    c. Minimum No. 24 AWG solid.
    d. Shielded Twisted Pair (STP) or Unshielded Twisted Pair (UTP).
    e. Thermoplastic insulated conductors, enclosed in a thermoplastic outer jacket, Class CMP as plenum rated.

2.32 RACEWAYS FOR CONTROL WIRING, CABLING, AND TUBING

A. Metal Conduits, Tubing, and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AFC Cable Systems; a part of Atkore International.
    b. Allied Tube & Conduit; a part of Atkore International.
    c. Anamet Electrical, Inc.
    d. Current Technology Inc.
    e. Electri-Flex Company.
    f. O-Z/Gedney; a brand of Emerson Industrial Automation.
    g. Picoma Industries, Inc.
    h. Plasti-Bond.
    i. Republic Conduit.
    j. Southwire Company.
    k. Western Tube and Conduit Corporation.
    l. Wheatland Tube Company.

2. 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.
3. GRC: Comply with NEMA ANSI C80.1 and UL 6.
4. ARC: Comply with NEMA ANSI C80.5 and UL 6A.
5. IMC: Comply with NEMA ANSI C80.6 and UL 1242.
6. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit or IMC.

    a. Comply with NEMA RN 1.
    b. Coating Thickness: 0.040 inch, minimum.

7. EMT: Comply with NEMA ANSI C80.3 and UL 797.
8. FMC: Comply with UL 1; zinc-coated steel.
9. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
10. Fittings for Metal Conduit: Comply with NEMA ANSI FB 1 and UL 514B.

    a. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
    b. Fittings for EMT:

        1) Material: Steel or die cast.
        2) Type: Setscrew or compression.

    c. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
    d. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

11. Joint Compound for IMC, GRC, or ARC: 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.

B. Nonmetallic Conduits, Tubing, and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AFC Cable Systems; a part of Atkore International.
    b. Anamet Electrical, Inc.
    c. CANTEX INC.
    d. Carlon; a brand of Thomas & Betts Corporation.
    e. CertainTeed Corporation.
    f. Condux International, Inc.
    g. Current Technology Inc.
    h. Dura-Line.
    i. Electri-Flex Company.
    j. Kraloy.
    k. RACO; Hubbell.

2. Listing and Labeling: Nonmetallic 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.
3. ENT: Comply with NEMA TC 13 and UL 1653.
4. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
5. LFNC: Comply with UL 1660.
6. Rigid HDPE: Comply with UL 651A.
7. Continuous HDPE: Comply with UL 651A.
8. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
9. RTRC: Comply with UL 2515A and NEMA TC 14.
10. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
11. Fittings for LFNC: Comply with UL 514B.
12. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Metal Wireways and Auxiliary Gutters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. B-line, an Eaton business.
    b. Hoffman; a brand of Pentair Equipment Protection.
    c. MonoSystems, Inc.
    d. Square D; by Schneider Electric.

2. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 4, or Type 12 unless otherwise indicated, and sized according to NFPA 70.

    a. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
4. Wireway Covers: Hinged, Screw-cover, or Flanged-and-gasketed type unless otherwise indicated.
5. Finish: Manufacturer's standard enamel finish.

D. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color as selected by Architect.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. MonoSystems, Inc.
b. Panduit Corp.
c. Wiremold / Legrand.

2.33 CONTROL POWER WIRING AND RACEWAYS

A. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" electrical power conductors and cables.

B. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for electrical power raceways and boxes.

2.34 FIBER-OPTIC CABLE, CONNECTORS, AND RACEWAY

A. Cables:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AMP NETCONNECT; a TE Connectivity Ltd. company.
b. AT&T.
c. Belden Inc.
d. Berk-Tek.
e. Communications Specialties, Inc.
f. Corning Cable Systems.
g. Optical Cable Corporation.
h. Times Fiber Communications, Inc.

2. Performance Requirements:

a. Fiber: Multimode graded index. Core/cladding size shall be either 62.5/125 or 100/140 micrometers.
b. Numerical Aperture:

1) 62.5/125 Micrometer Fiber: 0.275 plus or minus 0.015.
2) 100/140 Micrometer Fiber: 0.29 plus or minus 0.015.

c. Maximum Attenuation:

1) 850 nm: 6.0 dB/km.
2) 1300 nm: 5.0 dB/km.

d. Minimum Bandwidth Dispersion: 300 MHz-km at 850 nm.
e. Core/Cladding Index Difference: 0.3 percent plus or minus 0.05 percent, measured using refractive rear field measurement procedure.
f. Color-code finished fibers for easy identification.
g. Splice Loss: Fibers shall be spliced together to form a longer fiber using a commercially available fiber splicing machine recommended by cable manufacturer. Maximum loss per fiber splice shall be 0.20 dB.
h. Connection: Fibers shall be connected using fiber-optic connectors. Nominal connector loss shall not be greater than 1 dB.
i. Fiber-optic cable shall be suitable for use with 100Base-FX or 100Base-SX standard (as applicable) as defined in IEEE 802.3.

3. Mechanical and Environmental Requirements:

a. Tensile Strength: Fiber cable shall withstand a minimum tensile strength of 2700 N with maximum elongation of less than 0.5 percent.
b. Bending Radius: Minimum static bending radius for cable shall be 10 times outside diameter for non-armored cables and 20 times outside diameter for armored cables. Non-armored cables shall withstand being flexed at minimum static bending radius plus or minus 90 degrees for at least 20 cycles at 20 to 40 cycles per minute at 20 deg C. Armored cables shall withstand being flexed at minimum static bending radius plus or minus 90 degrees for at least 10 cycles at 20 to 40 cycles per minute at 20 deg C.
c. Vibration: Cable shall withstand a vibration test with vibration amplitude of 5 mm and frequency of 10 cycles per second for at least five hours.
d. Twist: Cable shall withstand twisting of 360 degrees over a length of 2 m for at least 10 cycles at 10 cycles per minute.
e. Temperature: Cable shall withstand the following temperatures:

1) Installation: Minus 30 to 70 deg C.
2) Operation: Minus 40 to 70 deg C.
3) Storage/Shipping: Minus 40 to 70 deg C.

f. Lifetime: Average lifetime of a 2-km, 12-fiber cable shall be at least 20 years when installed in a natural ambient environment. End of useful life shall be reached if failing to comply with requirements indicated or a spontaneous catastrophic fiber failure.
g. Crush Resistance: Cable shall withstand a compressive force of 705 N/cm for armored cables and 600 N/cm for non-armored cables. There shall be no attenuation increase after force is removed.

4. Cable Structure:

a. Number of Fibers: Supply the required number of fibers in each cable for DDC system indicated, plus not less than 50 percent spare. Cable structure shall have fibers grouped for easy handling.
b. Strength Members: Include cable with strength members to satisfy mechanical and environmental conditions indicated.
c. Cable Core: Core shall consist of stranded buffer tubes around a central member of appropriate geometric size and shall be filled and bound to maintain core

integrity. A fibrous strength member may be stranded around core to provide necessary strength for cable.

d. Cable Jacket: Protect cable by an extruded-polyethylene jacket.
e. Cable Armor: For cables requiring extra mechanical protection, one or two layers of galvanized corrugated steel tape coated by an anticorrosive compound shall be either helically or longitudinally applied over standard outer jacket. Apply a second outer jacket of polyethylene over coated steel tape. Thickness of sheaths and jackets are not specified as long as mechanical and environmental conditions are satisfied.
f. Cable Installation: Cables shall be suitable for a semiprotected outdoor installation.

5. Packaging and Shipping:

a. Seal both ends of each length of cable.
b. Test individual fibers in each cable before shipping to verify compliance with Specifications.

B. Connectors:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AMP NETCONNECT; a TE Connectivity Ltd. company.
b. AT&T.
c. Communications Specialties, Inc.
d. Corning Cable Systems.
e. Current Technology Inc.
f. Data Base Access Systems, Inc.
g. Liteway, Inc.
h. Times Fiber Communications, Inc.
i. Ultra Electronics, Nuclear Sensors & Process Instrumentation.

2. Performance Requirements:

a. Type: Fiber-optic connectors shall be either Type ST or Type SMA. Use either connector type exclusively. No substitutions are allowed.
b. Insertion Loss: Connector shall have an insertion loss of not greater than 1 dB.
c. Coupling Tolerance: Connector shall withstand at least 500 couplings with insertion loss within 0.25-dB tolerance limit.
d. Mechanical Requirements:

1) Connector shall enclose outermost coating of single fiber cable and be able to be mated or unmated without using a tool.
2) Mount connector rigidly in a metal frame.
3) Connector shall allow a semiskilled person to properly install connector to a single fiber easily in a field environment with simple tools.

C. Splice Organizer Cabinet:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. 3M.
b. ADC.

c. AMP NETCONNECT; a TE Connectivity Ltd. company.
d. Communications Specialties, Inc.
e. Corning Cable Systems.
f. Liteway, Inc.

2. Minimum Capacity: Each splice organizer shall accommodate number of connectors required for DDC system indicated, plus 100 percent spare.

3. Mounting: Wall mount the splice organizer cabinet.

D. Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anixter Inc.
b. Condux International, Inc.
c. Dura-Line.
d. Pacific Plastics Inc.

2. Mechanical and Performance Requirements:

a. Construction: Nonmetallic, flexible raceway system manufactured specifically for routing fiber-optic cables.
b. Suitable for use in return-air plenums, air-handling rooms, above ceilings and under access floors.
c. Exhibit low smoke generation and flame-spread characteristics, and have high-temperature service tolerance.
d. Size raceway according to NFPA 70 requirements for communications cables.
e. Tensile Strength at Yield: 10,800 psi.
f. Elongation at Break: 25 percent.

E. Cable Identification:

1. Labeling product shall be self-laminating cable marker.
2. Cable labeling shall include numeric designation, source, destination, and cable type.

2.35 ACCESSORIES

A. Pressure Electric Switches:

1. Diaphragm-operated snap acting switch.
2. Set point adjustable from 3 to 20 psig.
3. Differential adjustable from 2 to 6 psig.
4. Rated for resistance loads at 120-V ac.
5. Body and switch housing shall be metal.

B. Damper Blade Limit Switches:

1. Sense positive open and/or closed position of the damper blades.
2. NEMA 250, Type 13, oil-tight construction.
3. Arrange for the mounting application.
4. Additional waterproof enclosure when required by its environment.

5. Arrange to prevent "over-center" operation.

C. I/P and E/P Transducers:

1. Commercial Grade:

a. The transducer shall convert an AO signal to a stepped pneumatic signal. Unless otherwise required by the operating sequence, use a 3- to 15-psig pneumatic signal for pneumatic actuation.
b. Construct the entire assembly so that shock and vibration will neither harm the transducer nor affect its accuracy.
c. Transducer shall have auto/manual output switch, manual output control and an output pressure gage.
d. Accuracy: Within 1.0 percent of the output span.
e. Linearity: Within 0.5 percent of the output span.
f. Output Capacity: Not less than 550 scim at 15 psig.
g. Transducer shall have separate zero and span calibration adjustments.
h. The transducer shall withstand up to 40 psig of supply pressure without damage.
i. For use on only modulating pneumatic outputs that are associated with terminal units, including fan-coil units, VAV units, and unit heaters.

2. Industrial Grade:

a. The transducer shall convert an AO signal to a proportional pneumatic signal. Unless otherwise required by the operating sequence, use a 3- to 15-psig pneumatic signal for pneumatic actuation. A stepped pneumatic signal is unacceptable.
b. Construct the entire assembly so that shock and vibration will neither harm the transducer nor affect its accuracy.
c. Suitable for operation in an ambient temperature range of minus 40 to 150 deg F.
d. Accuracy: Within 0.5 percent of the output span.
e. Linearity: Within 0.5 percent of the output span.
f. Output Capacity: Not less than 5 scfm.
g. Transducer shall have zero and span calibration adjustments.
h. The transducer shall withstand up to 50 psig of supply pressure without damage.

D. E/P Switch:

1. Construct the body of cast aluminum or brass; three pipe body (common, normally open, and normally closed).
2. Internal construction of steel, copper or brass.
3. Air Connections: Barb.
4. Rating of 30 psig when installed in systems below 25 psig and of 150 psig when installed in systems above 25 psig.
5. Include coil transient suppression.

E. Instrument Enclosures:

1. Include instrument enclosure for secondary protection to comply with requirements indicated in "Performance Requirements" Article.
2. NRTL listed and labeled to UL 50.
3. Sized to include at least 25 percent spare area on subpanel.
4. Instrument(s) mounted within enclosure on internal subpanel(s).

5. Enclosure face with engraved, laminated phenolic nameplate for each instrument within enclosure.
6. Enclosures housing multiple instruments shall route tubing and wiring within enclosure in a raceway having a continuous removable cover.
7. Enclosures larger than **12 inches** shall have a hinged full-size face cover.
8. Equip enclosure with lock and common key.

F. Wall-Mounted Portable Operator's Workstation Cabinet:

1. Surface-mounted wall cabinet for tilt-out operation of laptop computers and PDAs.
2. Cabinet shall have a load limit of 50 lb.
3. Cabinet shall include the following:

    a. Oil-filled dampers for controlled lowering of equipment to operational position.
    b. 3RU EIA mounting rails.
    c. Removable laptop shelf.
    d. Separate top compartment with mounting area, hinged rail and security lock.
    e. Front ventilation slots.
    f. Knockouts for conduit connections on top and bottom of cabinet.

4. Cabinet shall be constructed of steel and painted with a powder-coat epoxy.
5. Inside center of backbox shall have provision to mount a field-furnished and -installed, single gang electrical outlet box.

2.36 IDENTIFICATION

A. Control Equipment, Instruments, and Control Devices:

1. Engraved tag bearing unique identification.

    a. Include instruments with unique identification identified by equipment being controlled or monitored, followed by point identification.

2. Letter size shall be as follows:

    a. Operator Workstations: Minimum of 0.5 inch high.
    b. Servers: Minimum of 0.5 inch high.
    c. Printers: Minimum of 0.5 inch high.
    d. DDC Controllers: Minimum of 0.5 inch high.
    e. Gateways: Minimum of 0.5 inch high.
    f. Repeaters: Minimum of 0.5 inch high.
    g. Enclosures: Minimum of 0.5 inch high.
    h. Electrical Power Devices: Minimum of 0.25 inch high.
    i. UPS units: Minimum of 0.5 inch high.
    j. Accessories: Minimum of 0.25 inch high.
    k. Instruments: Minimum of 0.25 inch high.
    l. Control Damper and Valve Actuators: Minimum of 0.25 inch high.

3. Tag shall consist of white lettering on black background.
4. Tag shall be engraved phenolic consisting of three layers of rigid laminate. Top and bottom layers are color-coded black with contrasting white center exposed by engraving through outer layer.
5. Tag shall be fastened with drive pins.

6. Instruments, control devices and actuators with Project-specific identification tags having unique identification numbers following requirements indicated and provided by original manufacturer do not require an additional tag.

B. Valve Tags:

1. Brass tags and brass chains attached to valve.
2. Tags shall be at least 1.5 inches in diameter.
3. Include tag with unique valve identification indicating control influence such as flow, level, pressure, or temperature; followed by location of valve, and followed by three-digit sequential number. For example: TV-1.001.
4. Valves with Project-specific identification tags having unique identification numbers following requirements indicated and provided by original manufacturer do not require an additional tag.

C. Raceway and Boxes:

1. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
2. Paint cover plates on junction boxes and conduit same color as the tape banding for conduits. After painting, label cover plate "HVAC Controls," using an engraved phenolic tag.

D. Equipment Warning Labels:

1. Acrylic label with pressure-sensitive adhesive back and peel-off protective jacket.
2. Lettering size shall be at least 14-point type with white lettering on red background.
3. Warning label shall read "CAUTION-Equipment operated under remote automatic control and may start or stop at any time without warning. Switch electric power disconnecting means to OFF position before servicing."
4. Lettering shall be enclosed in a white line border. Edge of label shall extend at least 0.25 inch beyond white border.

2.37 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate the following according to industry standards for each product, and to verify DDC system reliability specified in performance requirements:

1. DDC controllers.
2. Gateways.
3. Routers.
4. Operator workstations.

B. Product(s) and material(s) will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify compatibility with and suitability of substrates.

B. Examine roughing-in for products to verify actual locations of connections before installation.

1. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.
2. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where product will be installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 DDC SYSTEM INTERFACE WITH OTHER SYSTEMS AND EQUIPMENT

A. Communication Interface to Equipment with Integral Controls:

1. DDC system shall have communication interface with equipment having integral controls and having a communication interface for remote monitoring or control.
2. Equipment to Be Connected:

a. Domestic water booster pumps specified in Section 221123.13 "Domestic-Water Packaged Booster Pumps."
b. Air-terminal units specified in Section 233600 "Air Terminal Units."
c. Kitchen hoods specified in Section 233813 "Commercial-Kitchen Hoods."
d. Boilers specified in Section 235213 "Electric Boilers."
e. Boilers specified in Section 235216 "Condensing Boilers."
f. Boilers specified in Section 235223 "Cast-Iron Boilers."
g. Boilers specified in Section 235233 "Water-Tube Boilers."
h. Boilers specified in Section 235239 "Fire-Tube Boilers."
i. Feedwater equipment specified in Section 235313 "Boiler Feedwater Pumps."
j. Deaerators specified in Section 235316 "Deaerators."
k. Chillers specified in Section 236413.13 "Direct-Fired Absorption Water Chillers."
l. Chillers specified in Section 236413.16 "Indirect-Fired Absorption Water Chillers."
m. Chillers specified in Section 236416 "Centrifugal Water Chillers."
n. Chillers specified in Section 236423.11 "Water-Cooled, Scroll Water Chillers."
o. Chillers specified in Section 236423.21 "Air-Cooled, Scroll Water Chillers."
p. Chillers specified in Section 236426.11 "Water-Cooled, Rotary-Screw Water Chillers."
q. Chillers specified in Section 236426.21 "Air-Cooled, Rotary-Screw Water Chillers."
r. Cooling towers specified in Section 236500 "Cooling Towers."

s. Heat wheels and heat exchangers specified in Section 237200 "Air-to-Air Energy Recovery Equipment."
t. Air-handling units specified in Section 237313 "Modular Indoor Central-Station Air-Handling Units."
u. Roof-top units specified in Section 237413 "Packaged, Outdoor, Central-Station Air-Handling Units."
v. Dedicated outdoor-air units specified in Section 237433 "Dedicated Outdoor-Air Units."
w. Packaged terminal air-conditioners specified in Section 238113.11 "Packaged Terminal Air-Conditioners, Through-Wall Units," Section 238113.12 "Packaged Terminal Air-Conditioners, Freestanding Units," and Section 238113.13 "Packaged Terminal Air-Conditioners, outdoor, wall-mounted units."
x. Computer-room air-conditioning units specified in Section 238123.11 "Computer-Room Air Conditioners, Floor-Mounted Units (6 Tons (21 kW) And Smaller)," Section 238123.12 "Computer-Room Air Conditioners, Floor-Mounted Units (7 Tons (25 kW) And Larger)," Section 238123.13 "Computer-Room Air Conditioners, Ceiling-Mounted Units," Section 238123.14 "Computer-Room Air Conditioners, Console Units," Section 238123.18 "Computer-Room, Rack-Cooling Equipment."
y. Fan-coil units specified in Section 238219 "Fan Coil Units."
z. Unit ventilators specified in Section 238223 "Unit Ventilators."
aa. Humidifiers specified in Section 238413 "Humidifiers."
bb. Dehumification units specified in Section 238416 "Mechanical Dehumidification Units."
cc. Switchboards specified in Section 262300 "Low-Voltage Switchgear."
dd. Motor-control centers specified in Section 262419 "Motor-Control Centers."
ee. Variable-frequency controllers specified in Section 262923 "Variable-Frequency Motor Controllers."
ff. Generator sets specified in Section 263213 "Engine Generators."
gg. UPS specified in Section 263353 "Static Uninterruptible Power Supply."

B. Communication Interface to Other Building Systems:

1. DDC system shall have a communication interface with systems having a communication interface.
2. Systems to Be Connected:

a. Elevators specified in Section 142100 "Electric Traction Elevators."
b. Elevators specified in Section 142113 "Electric Traction Freight Elevators."
c. Elevators specified in Section 142400 "Hydraulic Elevators."
d. Elevators specified in Section 142413 "Hydraulic Freight Elevators."
e. Escalators specified in Section 143100 "Escalators."
f. Automated water treatment systems specified in Section 232500 "HVAC Water Treatment."
g. Automated water treatment systems specified in Section 232516 "Water Treatment for Open-Loop Hydronic Systems."
h. Automated water treatment systems specified in Section 232519 "Water Treatment for Steam System Feedwater."
i. Power monitoring specified in Section 260913 "Electrical Power Monitoring and Control."
j. Lighting controls specified in Section 260926 "Lighting Control Panelboards."
k. Lighting controls specified in Section 260943.16 "Addressable-Luminaire Lighting Controls."
l. Lighting controls specified in Section 260943.23 "Relay-Based Lighting Controls."

m. Fire-alarm system specified in Section 283111 "Digital, Addressable Fire Alarm System."
n. Fire-alarm system specified in Section 283112 "Zoned (DC Loop) Fire-Alarm System."
o. Access controls specified in Section 281300 "Access Control."
p. Intrusion detection specified in Section 281600 "Intrusion Detection."
q. Perimeter security specified in Section 281643 "Perimeter Security Systems."

3.3 DDC SYSTEM INTERFACE WITH EXISTING SYSTEMS

A. Interface with Existing Systems:

1. DDC systems shall interface existing systems to achieve integration.
2. Monitoring and Control of DDC System by Existing Control System:

a. DDC system performance requirements shall be satisfied when monitoring and controlling DDC system by existing control system.
b. Operator of existing system shall be able to upload, download, monitor, trend, control and program every input and output point in DDC system from existing control system using existing control system software and operator workstations.
c. Remote monitoring and control from existing control system shall not require operators of existing control system to learn new software.
d. Interface of DDC system into existing control system shall be transparent to operators of existing control system and allow operators to program, monitor, and control DDC system from any operator workstation connected to existing control system.

3. Integration of Existing Control System into DDC System:

a. Existing control system performance requirements shall be satisfied when monitoring and controlling existing control system through DDC system.
b. Operator shall be able to upload, download, monitor, alarm, report, trend, control and program every input and output point in existing system from DDC system using operator workstations and software provided. The combined systems shall share one database.
c. Interface of existing control system I/O points into DDC system shall be transparent to operators. All operational capabilities shall be identical regardless of whether I/O already exists or I/O is being installed.

B. Integration with Existing Enterprise System:

1. DDC system shall interface with an existing enterprise system to adhere to Owner standards already in-place and to achieve integration.
2. Owner's control system integrator will provide the following services:

a. Enterprise system expansion and development of graphics, logs, reports, trends and other operational capabilities of enterprise system for I/O being added to DDC control system for use by enterprise system operators.
b. Limited assistance during commissioning to extent of DDC system integration with existing enterprise system.
c. Prepare on-site demonstration mockup of integration of DDC system to be installed with existing system before installing DDC system.

3. Engage Owner's control system integrator to provide the following services:

    a. Enterprise system expansion and development of graphics, logs, reports, trends and other operational capabilities of enterprise system for I/O being added to DDC control system for use by enterprise system operators.
    b. Limited assistance during commissioning to extent of DDC system integration with existing enterprise system.
    c. Prepare on-site demonstration mockup of integration of DDC system to be installed with existing system before installing DDC system.

4. Control System Integrator Contact Information:

    a. Company: .
    b. Company Street Address: .
    c. Company Contact: .
    d. Phone Number: .
    e. E-mail Address: .

5. Attend meetings with control system integrator to integrate DDC system.

3.4 CONTROL DEVICES FOR INSTALLATION BY INSTALLERS

A. Deliver selected control devices, specified in indicated HVAC instrumentation and control device Sections, to identified equipment and systems manufacturers for factory installation and to identified installers for field installation.

B. Deliver the following to duct fabricator and Installer for installation in ductwork. Include installation instructions to Installer and supervise installation for compliance with requirements.

1. DDC control dampers, which are specified in Section 230923.12 "DDC Control Dampers."
2. Airflow sensors and switches, which are specified in Section 230923.14 "Flow Instruments."
3. Pressure sensors, which are specified in Section 230923.23 "Pressure Instruments."

C. Deliver the following to plumbing and HVAC piping installers for installation in piping. Include installation instructions to Installer and supervise installation for compliance with requirements.

1. DDC control valves, which are specified in Section 230923.11 "Control Valves."
2. Pipe-mounted flow meters, which are specified in Section 230923.14 "Flow Instruments."
3. Pipe-mounted sensors, switches and transmitters. Flow meters are specified in Section 230923.14 "Flow Instruments." Liquid and steam temperature sensors, switches, and transmitters are specified in Section 230923.27 "Temperature Instruments."
4. Tank-mounted sensors, switches and transmitters. Pressure sensors, switches, and transmitters are specified in Section 230923.23 "Pressure Instruments." Liquid and steam temperature sensors, switches, and transmitters are specified in Section 230923.27 "Temperature Instruments."
5. Pipe- and tank-mounted thermowells. Liquid and steam thermowells are specified in Section 230923.27 "Temperature Instruments."

3.5 CONTROL DEVICES FOR EQUIPMENT MANUFACTURER FACTORY INSTALLATION

A. Deliver the following to air-handling unit manufacturer for factory installation. Include installation instructions to air-handling unit manufacturer.

1. Programmable application or application-specific controller.
2. Unit-mounted DDC control dampers and actuators, which are specified in Section 230923.12 "Control Dampers."
3. Unit-mounted airflow sensors, switches and transmitters, which are specified in Section 230923.14 "Flow Instruments."
4. Unit-mounted gas sensors and transmitters, which are specified in Section 230923.16 "Gas Instruments."
5. Unit-mounted leak-detection switches, which are specified in Section 230923.18 "Leak-Detection Instruments."
6. Unit-mounted speed sensors, switches and transmitters, which are specified in Section 230923.24 "DDC Speed Instruments."
7. Unit-mounted pressure sensors, switches and transmitters, which are specified in Section 230923.23 "Pressure Instruments."
8. Unit-mounted temperature sensors, switches and transmitters. Air-temperature sensors, switches, and transmitters are specified in Section 230923.27 "Temperature Instruments."
9. Relays.

B. Deliver the following to terminal unit manufacturer for factory installation. Include installation instructions to terminal unit manufacturer.

1. Programmable application or application-specific controller.
2. Electric damper actuator. Dampers actuators are specified in Section 230923.12 "Control Dampers."
3. Unit-mounted flow and pressure sensors, transmitters and transducers. Flow sensors, transmitters, and transducers are specified in Section 230923.14 "Flow Instruments." Pressure sensors, switches, and transmitters are specified in Section 230923.23 "Pressure Instruments."
4. Unit-mounted temperature sensors. Air-temperature sensors, switches, and transmitters are specified in Section 230923.27 "Temperature Instruments."
5. Relays.

C. Deliver the following to fan-coil unit manufacturer for factory installation. Include installation instructions to fan-coil unit manufacturer.

1. Programmable application or application-specific controller.
2. Unit-mounted temperature sensors. Air-temperature sensors, switches, and transmitters are specified in Section 230923.27 "Temperature Instruments."
3. Flow and pressure switches. Air and liquid flow sensors, transmitters, and transducers are specified in Section 230923.14 "Flow Instruments." Pressure sensors, switches, and transmitters are specified in Section 230923.23 "Pressure Instruments."
4. Leak-detection switches, which are specified in Section 230923.18 "Leak-Detection Instruments."
5. Relays.

3.6 GENERAL INSTALLATION REQUIREMENTS

A. Install products to satisfy more stringent of all requirements indicated.

B. Install products level, plumb, parallel, and perpendicular with building construction.

C. Support products, tubing, piping wiring and raceways. Brace products to prevent lateral movement and sway or a break in attachment when subjected to a force.

D. If codes and referenced standards are more stringent than requirements indicated, comply with requirements in codes and referenced standards.

E. Fabricate openings and install sleeves in ceilings, floors, roof, and walls required by installation of products. Before proceeding with drilling, punching, and cutting, check for concealed work to avoid damage. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

F. Firestop penetrations made in fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

G. Seal penetrations made in acoustically rated assemblies. Comply with requirements in Section 079200 "Joint Sealants."

H. Welding Requirements:

1. Restrict welding and burning to supports and bracing.
2. No equipment shall be cut or welded without approval. Welding or cutting will not be approved if there is risk of damage to adjacent Work.
3. Welding, where approved, shall be by inert-gas electric arc process and shall be performed by qualified welders according to applicable welding codes.
4. If requested on-site, show satisfactory evidence of welder certificates indicating ability to perform welding work intended.

I. Fastening Hardware:

1. Stillson wrenches, pliers, and other tools that damage surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening fasteners.
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.

J. If product locations are not indicated, install products in locations that are accessible and that will permit service and maintenance from floor, equipment platforms, or catwalks without removal of permanently installed furniture and equipment.

K. Corrosive Environments:

1. Avoid or limit use of materials in corrosive airstreams and environments, including, but not limited to, the following:

    a. Laboratory exhaust-air streams.
    b. Process exhaust-air streams.

2. When conduit is in contact with a corrosive airstream and 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. Comply with requirements for installation of raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

3. Where instruments are located in a corrosive airstream and are not corrosive resistant from manufacturer, field install products in NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.7 OPERATOR WORKSTATION INSTALLATION

A. Desktop Operator Workstations Installation:

1. Install operator workstation(s) at location(s) directed by Owner.
2. Install multiple-receptacle power strip with cord for use in connecting multiple workstation components to a single duplex electrical power receptacle.
3. Install software on workstation(s) and verify software functions properly.
4. Develop Project-specific graphics, trends, reports, logs and historical database.
5. Power workstation through a UPS unit. Locate UPS adjacent to workstation.

B. Portable Operator Workstations Installation:

1. Turn over portable operator workstations to Owner at Substantial Completion.
2. Install software on workstation(s) and verify software functions properly.

C. Color Graphics Application:

1. Use system schematics indicated as starting point to create graphics.
2. Develop Project-specific library of symbols for representing system equipment and products.
3. Incorporate digital images of Project-completed installation into graphics where beneficial to enhance effect.
4. Submit sketch of graphic layout with description of all text for each graphic for Owner's review before creating graphic using graphics software.
5. Seek Owner input in graphics development once using graphics software.
6. Final editing shall be done on-site with Owner's review and feedback.
7. Refine graphics as necessary for Owner acceptance.
8. On receiving Owner acceptance, print a hard copy for inclusion in operation and maintenance manual. Prepare a scanned copy PDF file of each graphic and include with softcopy of DDC system operation and maintenance manual.

D. Wall-Mounted Portable Operator's Workstation Cabinet Installation:

1. Install wall-mounted portable operator's workstation cabinet(s) at location(s) indicated on Drawings.
2. Install wall-mounted portable operator's workstation cabinet(s) at following location(s) and at locations directed by Owner:

    a. Each mechanical room.
    b. Chiller room.
    c. Boiler room.

3. Connect each cabinet to 120-V, single-phase, 60Hz field power source, and install single gang electrical box with NEMA WD 6, Type 20R duplex receptacle and metal cover plate in cabinet. Comply with requirements in Section 262726 "Wiring Devices."
4. Connect each cabinet to Ethernet network and install an Ethernet network port for connection to portable operator workstation Ethernet cable. Comply with requirements in Section 271500 "Communications Horizontal Cabling."

3.8 POT INSTALLATION

A. Install one portable operator terminal(s).

B. Turn over POTs to Owner at Substantial Completion.

C. Install software on each POT and verify that software functions properly.

3.9 PRINTER INSTALLATION

A. Provide the following printer(s) at location(s) directed by Owner:

1. Color Laser: Quantity, one.
2. Color Inkjet: Quantity, one.

B. Install printer software on workstations and verify that software functions properly.

3.10 GATEWAY INSTALLATION

A. Install gateways if required for DDC system communication interface requirements indicated.

1. Install gateway(s) required to suit indicated requirements.

B. Test gateway to verify that communication interface functions properly.

3.11 ROUTER INSTALLATION

A. Install routers if required for DDC system communication interface requirements indicated.

1. Install router(s) required to suit indicated requirements.

B. Test router to verify that communication interface functions properly.

3.12 CONTROLLER INSTALLATION

A. Install controllers in enclosures to comply with indicated requirements.

B. Connect controllers to field power supply and to UPS units where indicated.

C. Install controller with latest version of applicable software and configure to execute requirements indicated.

D. Test and adjust controllers to verify operation of connected I/O to achieve performance indicated requirements while executing sequences of operation.

E. Installation of Network Controllers:

1. Quantity and location of network controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.

2. Install controllers in a protected location that is easily accessible by operators.
3. Top of controller shall be within 72 inches of finished floor.

F. Installation of Programmable Application Controllers:

1. Quantity and location of programmable application controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.
2. Install controllers in a protected location that is easily accessible by operators.
3. Top of controller shall be within 72 inches of finished floor.

G. Application-Specific Controllers:

1. Quantity and location of application-specific controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.
2. For controllers not mounted directly on equipment being controlled, install controllers in a protected location that is easily accessible by operators.

3.13 INSTALLATION OF WIRELESS ROUTERS FOR OPERATOR INTERFACE

A. Install wireless routers to achieve optimum performance and best possible coverage.

B. Mount wireless routers in a protected location that is within 60 inches of floor and easily accessible by operators.

C. Connect wireless routers to field power supply and to UPS units if network controllers are powered through UPS units.

D. Install wireless router with latest version of applicable software and configure wireless router with WPA2 security and password protection. Create access password with not less than 12 characters consisting of letters and numbers and at least one special character. Document password in operations and maintenance manuals for reference by operators.

E. Test and adjust wireless routers for proper operation with portable workstation and other wireless devices intended for use by operators.

3.14 ENCLOSURES INSTALLATION

A. Install the following items in enclosures, to comply with indicated requirements:

1. Gateways.
2. Routers.
3. Controllers.
4. Electrical power devices.
5. UPS units.
6. Relays.
7. Accessories.
8. Instruments.
9. Actuators

B. Attach wall-mounted enclosures to wall using the following types of steel struts:

1. For NEMA 250, Type 1 Enclosures: Use painted steel, galvanized-steel, or corrosion-resistant-coated steel strut and hardware.
2. For NEMA 250, Type 4 or Type 4X Enclosures and Enclosures Located Outdoors: Use stainless-steel strut and hardware.
3. Install plastic caps on exposed cut edges of strut.

C. Align top or bottom of adjacent enclosures of like size.

D. Install floor-mounted enclosures located in mechanical equipment rooms on concrete housekeeping pads. Attach enclosure legs using galvanized- or stainless-steel anchors.

E. Install continuous and fully accessible wireways to connect conduit, wire, and cable to multiple adjacent enclosures. Wireway used for application shall have protection equal to NEMA 250 rating of connected enclosures.

3.15 ELECTRIC POWER CONNECTIONS

A. Connect electrical power to DDC system products requiring electrical power connections.

B. Design of electrical power to products not indicated with electric power is delegated to DDC system provider and installing trade. Work shall comply with NFPA 70 and other requirements indicated.

C. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers" for electrical power circuit breakers.

D. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical power conductors and cables.

E. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for electrical power raceways and boxes.

3.16 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements in Section 260553 "Identification for Electrical Systems" for identification products and installation.

B. Install engraved phenolic nameplate with unique identification on face for each of the following:

1. Operator workstation.
2. Server.
3. Printer.
4. Gateway.
5. Router.
6. Protocol analyzer.
7. DDC controller.
8. Enclosure.
9. Electrical power device.
10. UPS unit.
11. Accessory.

C. Install engraved phenolic nameplate with unique instrument identification on face of each instrument connected to a DDC controller.

D. Install engraved phenolic nameplate with identification on face of each control damper and valve actuator connected to a DDC controller.

E. Where product is installed above accessible tile ceiling, also install matching engraved phenolic nameplate with identification on face of ceiling grid located directly below.

F. Where product is installed above an inaccessible ceiling, also install engraved phenolic nameplate with identification on face of access door directly below.

G. Warning Labels:

1. Shall be permanently attached to equipment that can be automatically started by DDC control system.
2. Shall be located in highly visible location near power service entry points.

3.17 NETWORK INSTALLATION

A. Install fiber-optic cable when connecting between the following network devices and when located in different buildings on campus, or when distance between devices exceeds **250 feet.**

1. Operator workstations.
2. Operator workstations and network controllers.
3. Network controllers.

B. Install copper or fiber-optic cable when connecting between the following network devices located in same building:

1. Operator workstations.
2. Operator workstations and network controllers.
3. Network controllers.

C. Install copper cable when connecting between the following:

1. Gateways.
2. Gateways and network controllers or programmable application controllers.
3. Routers.
4. Routers and network controllers or programmable application controllers.
5. Network controllers and programmable application controllers.
6. Programmable application controllers.
7. Programmable application controllers and application-specific controllers.
8. Application-specific controllers.

D. Install network cable in continuous raceway.

1. Where indicated on Drawings, cable trays may be used for copper cable in lieu of conduit.

3.18 NETWORK NAMING AND NUMBERING

A. Coordinate with Owner and provide unique naming and addressing for networks and devices.

B. ASHRAE 135 Networks:

1. MAC Address:

a. Every network device shall have an assigned and documented MAC address unique to its network.
b. Ethernet Networks: Document MAC address assigned at its creation.
c. ARCNET or MS/TP networks: Assign from 00 to 64.

2. Network Numbering:

a. Assign unique numbers to each new network.
b. Provide ability for changing network number through device switches or operator interface.
c. DDC system, with all possible connected LANs, can contain up to 65,534 unique networks.

3. Device Object Identifier Property Number:

a. Assign unique device object identifier property numbers or device instances for each device network.
b. Provide for future modification of device instance number by device switches or operator interface.
c. LAN shall support up to 4,194,302 unique devices.

4. Device Object Name Property Text:

a. Device object name property field shall support 32 minimum printable characters.
b. Assign unique device "Object Name" property names with plain-English descriptive names for each device.

1) Example 1: Device object name for device controlling boiler plant at Building 1000 would be "HW System B1000."
2) Example 2: Device object name for a VAV terminal unit controller could be "VAV unit 102".

5. Object Name Property Text for Other Than Device Objects:

a. Object name property field shall support 32 minimum printable characters.
b. Assign object name properties with plain-English names descriptive of application.

1) Example 1: "Zone 1 Temperature."
2) Example 2 "Fan Start and Stop."

6. Object Identifier Property Number for Other Than Device Objects:

a. Assign object identifier property numbers according to Drawings or tables indicated.

b. If not indicated, object identifier property numbers may be assigned at Installer's discretion but must be approved by Owner in advance, be documented and be unique for like object types within device.

3.19 CONTROL WIRE, CABLE AND RACEWAYS INSTALLATION

A. Comply with NECA 1.

B. Comply with TIA 568-C.1.

C. Wiring Method: Install cables in raceways and cable trays. 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 Section 260536 "Cable Trays for Electrical Systems."
3. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

D. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

E. Field 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.

F. Conduit Installation:

1. Install conduit expansion joints where conduit runs exceed 200 feet, and conduit crosses building expansion joints.
2. Coordinate conduit routing with other trades to avoid conflicts with ducts, pipes and equipment and service clearance.
3. Maintain at least 3-inch separation where conduits run axially above or below ducts and pipes.
4. Limit above-grade conduit runs to 100 feet without pull or junction box.
5. Do not install raceways or electrical items on any "explosion-relief" walls, or rotating equipment.
6. Do not fasten conduits onto the bottom side of a metal deck roof.
7. Flexible conduit is permitted only where flexibility and vibration control is required.
8. Limit flexible conduit to 3 feet long.
9. Conduit shall be continuous from outlet to outlet, from outlet to enclosures, pull and junction boxes, and shall be secured to boxes in such manner that each system shall be electrically continuous throughout.
10. Direct bury conduits underground or install in concrete-encased duct bank where indicated.

    a. Use rigid, nonmetallic, Schedule 80 PVC.
    b. Provide a burial depth according to NFPA 70, but not less than 24 inches.

11. Secure threaded conduit entering an instrument enclosure, cabinet, box, and trough, with a locknut on outside and inside, such that conduit system is electrically continuous throughout. Provide a metal bushing on inside with insulated throats. Locknuts shall be

the type designed to bite into the metal or, on inside of enclosure, shall have a grounding wedge lug under locknut.

12. Conduit box-type connectors for conduit entering enclosures shall have an insulated throat.
13. Connect conduit entering enclosures in wet locations with box-type connectors or with watertight sealing locknuts or other fittings.
14. Offset conduits where entering surface-mounted equipment.
15. Seal conduit runs used by sealing fittings to prevent the circulation of air for the following:

    a. Conduit extending from interior to exterior of building.
    b. Conduit extending into pressurized duct and equipment.
    c. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.

G. Wire and Cable Installation:

1. Cables serving a common system may be grouped in a common raceway. Install control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
2. Install cables with protective sheathing that is waterproof and capable of withstanding continuous temperatures of 90 deg C with no measurable effect on physical and electrical properties of cable.

    a. Provide shielding to prevent interference and distortion from adjacent cables and equipment.

3. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
5. UTP Cable Installation:

    a. Comply with TIA 568-C.2.
    b. Do not untwist UTP cables more than 1/2 inch from the point of termination, to maintain cable geometry.

6. Installation of Cable Routed Exposed under Raised Floors:

    a. Install plenum-rated cable only.
    b. Install cabling after the flooring system has been installed in raised floor areas.
    c. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

7. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire shall have a unique tag.
8. Provide strain relief.
9. Terminate wiring in a junction box.

    a. Clamp cable over jacket in junction box.
    b. Individual conductors in the stripped section of the cable shall be slack between the clamping point and terminal block.

10. Terminate field wiring and cable not directly connected to instruments and control devices having integral wiring terminals using terminal blocks.

11. Install signal transmission components according to IEEE C2, REA Form 511a, NFPA 70, and as indicated.
12. Keep runs short. Allow extra length for connecting to terminal boards. Do not bend flexible coaxial cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
13. Ground wire shall be copper and grounding methods shall comply with IEEE C2. Demonstrate ground resistance.
14. Wire and cable shall be continuous from terminal to terminal without splices.
15. Use insulated spade lugs for wire and cable connection to screw terminals.
16. Use shielded cable to transmitters.
17. Use shielded cable to temperature sensors.
18. Perform continuity and meager testing on wire and cable after installation.
19. Do not install bruised, kinked, scored, deformed, or abraded wire and cable. Remove and discard wire and cable if damaged during installation, and replace it with new cable.
20. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
21. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
22. Protection from Electro-Magnetic Interference (EMI): Provide installation free of (EMI). As a minimum, comply with the following requirements:

    a. Comply with BICSI TDMM and TIA 569-C for separating unshielded cable from potential EMI sources, including electrical power lines and equipment.
    b. Separation between open cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

        1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
        2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
        3) Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

    c. Separation between cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

        1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
        2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
        3) Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

    d. Separation between cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

        1) Electrical Equipment Rating Less Than 2 kVA: No requirement.
        2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
        3) Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

    e. Separation between Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inches.
    f. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.20 FIBER-OPTIC CABLE SYSTEM INSTALLATION

A. Comply with TIA 568-C.3, except where requirements indicated are more stringent.

B. Raceway Installation:

1. Install continuous raceway for routing fiber-optic cables.
2. Install raceways continuously between pull boxes and junction boxes. Raceways shall enter and be secured to enclosures.
3. 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.
4. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Use long radius elbows for all fiber-optic cables.
5. Entire raceway shall be complete and raceway interior cleaned before installation of fiber-optic cables.
6. Securely fasten raceway to building structure using clamps and clips designed for purpose.
7. Install nylon or polyethylene pulling line in raceways. Clearly label as "pulling line," indicating source and destination.

C. Fiber-Optic Cable Installation:

1. Route cables as efficiently as possible, minimizing amount of cable required.
2. Continuously lubricate cables during pulling-in process.
3. Do not exceed maximum pulling tensions provided by cable manufacturer. Monitor cable pulling tension with a mechanical tension meter.
4. Arrange cables passing through pull boxes to obtain maximum clearance among cables within box.
5. As cables emerge from intermediate point pull boxes, coil cable in a figure eight pattern with loops not less than 24 inches in diameter.
6. Terminate fiber-optic cables in a fiber-optic splice organizer cabinet, unless connected equipment can accept fiber-optic cables directly. Terminate cables with connectors.
7. Install and connect appropriate opto-electronic equipment and fiber jumper cables between opto-electronic equipment and fiber-optic cable system to DDC system fiber-optic cable system. Verify interface compatibility.

D. Cable and Raceway Identification:

1. Label cables at both ends. Labels shall be typed, not handwritten.
2. Mark raceways at each pull box indicating the type and number of cables within.

3.21 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Testing:

1. Perform preinstallation, in-progress, and final tests, supplemented by additional tests, as necessary.
2. Preinstallation Cable Verification: Verify integrity and serviceability for new cable lengths before installation. This assurance may be provided by using vendor verification documents, testing, or other methods. As a minimum, furnish evidence of verification for cable attenuation and bandwidth parameters.
3. In-Progress Testing: Perform standard tests for correct pair identification and termination during installation to ensure proper installation and cable placement. Perform tests in addition to those specified if there is any reason to question condition of material furnished and installed. Testing accomplished is to be documented by agency conducting tests. Submit test results for Project record.
4. Final Testing: Perform final test of installed system to demonstrate acceptability as installed. Testing shall be performed according to a test plan supplied by DDC system manufacturer. Defective Work or material shall be corrected and retested. As a minimum, final testing for cable system, including spare cable, shall verify conformance of attenuation, length, and bandwidth parameters with performance indicated.
5. Test Equipment: Use a fiber-optic time domain reflectometer for testing of length and optical connectivity.
6. Test Results: Record test results and submit copy of test results for Project record.

3.22 DDC SYSTEM I/O CHECKOUT PROCEDURES

A. Check installed products before continuity tests, leak 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 will impact performance.

D. Check instrument tubing for proper isolation, fittings, slope, dirt legs, drains, material and support.

E. Control Damper Checkout:

1. Verify that control dampers are installed correctly for flow direction.
2. Verify that proper blade alignment, either parallel or opposed, has been provided.
3. Verify that damper frame attachment is properly secured and sealed.
4. Verify that damper actuator and linkage attachment is secure.
5. Verify that actuator wiring is complete, enclosed and connected to correct power source.
6. Verify that damper blade travel is unobstructed.

F. Control Valve Checkout:

1. Verify that control valves are installed correctly for flow direction.
2. Verify that valve body attachment is properly secured and sealed.
3. Verify that valve actuator and linkage attachment is secure.
4. Verify that actuator wiring is complete, enclosed and connected to correct power source.
5. Verify that valve ball, disc or plug travel is unobstructed.
6. After piping systems have been tested and put into service, but before insulating and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks. Replace the valve if leaks persist.

G. Instrument Checkout:

1. Verify that instrument is correctly installed for location, orientation, direction and operating clearances.
2. Verify that attachment is properly secured and sealed.
3. Verify that conduit connections are properly secured and sealed.
4. Verify that wiring is properly labeled with unique identification, correct type and size and is securely attached to proper terminals.
5. Inspect instrument tag against approved submittal.
6. For instruments with tubing connections, verify that tubing attachment is secure and isolation valves have been provided.
7. For flow instruments, verify that recommended upstream and downstream distances have been maintained.
8. For temperature instruments:

    a. Verify sensing element type and proper material.
    b. Verify length and insertion.

3.23 DDC SYSTEM I/O ADJUSTMENT, CALIBRATION AND TESTING:

A. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.

B. Provide a written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.

C. For each analog instrument, make a three-point test of calibration for both linearity and accuracy.

D. Equipment and procedures used for calibration shall comply with instrument manufacturer's written instructions.

E. Provide diagnostic and test equipment for calibration and adjustment.

F. Field instruments and equipment used to test and calibrate installed instruments shall have accuracy at least twice the instrument accuracy being calibrated. An installed instrument with an accuracy of 1 percent shall be checked by an instrument with an accuracy of 0.5 percent.

G. Calibrate each instrument according to instrument instruction manual supplied by manufacturer.

H. If after calibration indicated performance cannot be achieved, replace out-of-tolerance instruments.

I. Comply with field testing requirements and procedures indicated by ASHRAE's Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements, and to supplement requirements indicated.

J. Analog Signals:

1. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.
2. Check analog current signals using a precision current meter at zero, 50, and 100 percent.

3. Check resistance signals for temperature sensors at zero, 50, and 100 percent of operating span using a precision-resistant source.

K. Digital Signals:

1. Check digital signals using a jumper wire.
2. Check digital signals using an ohmmeter to test for contact making or breaking.

L. Control Dampers:

1. Stroke and adjust control dampers following manufacturer's recommended procedure, from 100 percent open to 100 percent closed and back to 100 percent open.
2. Stroke control dampers with pilot positioners. Adjust damper and positioner following manufacturer's recommended procedure, so damper is 100 percent closed, 50 percent closed and 100 percent open at proper air pressure.
3. Check and document open and close cycle times for applications with a cycle time less than 30 seconds.
4. For control dampers equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

M. Control Valves:

1. Stroke and adjust control valves following manufacturer's recommended procedure, from 100 percent open to 100 percent closed and back to 100 percent open.
2. Stroke control valves with pilot positioners. Adjust valve and positioner following manufacturer's recommended procedure, so valve is 100 percent closed, 50 percent closed and 100 percent open at proper air pressures.
3. Check and document open and close cycle times for applications with a cycle time less than 30 seconds.
4. For control valves equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

N. Meters: Check sensors at zero, 50, and 100 percent of Project design values.

O. Sensors: Check sensors at zero, 50, and 100 percent of Project design values.

P. Switches: Calibrate switches to make or break contact at set points indicated.

Q. Transmitters:

1. Check and calibrate transmitters at zero, 50, and 100 percent of Project design values.
2. Calibrate resistance temperature transmitters at zero, 50, and 100 percent of span using a precision-resistant source.

3.24 DDC SYSTEM CONTROLLER CHECKOUT

A. Verify power supply.

1. Verify voltage, phase and hertz.
2. Verify that protection from power surges is installed and functioning.
3. Verify that ground fault protection is installed.
4. If applicable, verify if connected to UPS unit.
5. If applicable, verify if connected to a backup power source.

6. If applicable, verify that power conditioning units, transient voltage suppression and high-frequency noise filter units are installed.

B. Verify that wire and cabling is properly secured to terminals and labeled with unique identification.

C. Verify that spare I/O capacity is provided.

3.25 DDC CONTROLLER I/O CONTROL LOOP TESTS

A. Testing:

1. Test every I/O point connected to DDC controller to verify that safety and operating control set points are as indicated and as required to operate controlled system safely and at optimum performance.
2. Test every I/O point throughout its full operating range.
3. Test every control loop to verify operation is stable and accurate.
4. Adjust control loop proportional, integral and derivative settings to achieve optimum performance while complying with performance requirements indicated. Document testing of each control loop's precision and stability via trend logs.
5. Test and adjust every control loop for proper operation according to sequence of operation.
6. Test software and hardware interlocks for proper operation. Correct deficiencies.
7. Operate each analog point at the following:

    a. Upper quarter of range.
    b. Lower quarter of range.
    c. At midpoint of range.

8. Exercise each binary point.
9. For every I/O point in DDC system, read and record each value at operator workstation, at DDC controller and at field instrument simultaneously. Value displayed at operator workstation, at DDC controller and at field instrument shall match.
10. Prepare and submit a report documenting results for each I/O point in DDC system and include in each I/O point a description of corrective measures and adjustments made to achieve desire results.

3.26 DDC SYSTEM VALIDATION TESTS

A. Perform validation tests before requesting final review of system. Before beginning testing, first submit Pretest Checklist and Test Plan.

B. After approval of Test Plan, execute all tests and procedures indicated in plan.

C. After testing is complete, submit completed test checklist.

D. Pretest Checklist: Submit the following list with items checked off once verified:

1. Detailed explanation for any items that are not completed or verified.
2. Required mechanical installation work is successfully completed and HVAC equipment is working correctly.
3. HVAC equipment motors operate below full-load amperage ratings.

4. Required DDC system components, wiring, and accessories are installed.
5. Installed DDC system architecture matches approved Drawings.
6. Control electric power circuits operate at proper voltage and are free from faults.
7. Required surge protection is installed.
8. DDC system network communications function properly, including uploading and downloading programming changes.
9. Using BACnet protocol analyzer, verify that communications are error free.
10. Each controller's programming is backed up.
11. Equipment, products, tubing, wiring cable and conduits are properly labeled.
12. All I/O points are programmed into controllers.
13. Testing, adjusting and balancing work affecting controls is complete.
14. Dampers and actuators zero and span adjustments are set properly.
15. Each control damper and actuator goes to failed position on loss of power.
16. Valves and actuators zero and span adjustments are set properly.
17. Each control valve and actuator goes to failed position on loss of power.
18. Meter, sensor and transmitter readings are accurate and calibrated.
19. Control loops are tuned for smooth and stable operation.
20. View trend data where applicable.
21. Each controller works properly in standalone mode.
22. Safety controls and devices function properly.
23. Interfaces with fire-alarm system function properly.
24. Electrical interlocks function properly.
25. Operator workstations and other interfaces are delivered, all system and database software is installed, and graphic are created.
26. Record Drawings are completed.

E. Test Plan:

1. Prepare and submit a validation test plan including test procedures for performance validation tests.
2. Test plan shall address all specified functions of DDC system and sequences of operation.
3. Explain detailed actions and expected results to demonstrate compliance with requirements indicated.
4. Explain method for simulating necessary conditions of operation used to demonstrate performance.
5. Include a test checklist to be used to check and initial that each test has been successfully completed.
6. Submit test plan documentation 10 business days before start of tests.

F. Validation Test:

1. Verify operating performance of each I/O point in DDC system.

    a. Verify analog I/O points at operating value.
    b. Make adjustments to out-of-tolerance I/O points.

        1) Identify I/O points for future reference.
        2) Simulate abnormal conditions to demonstrate proper function of safety devices.
        3) Replace instruments and controllers that cannot maintain performance indicated after adjustments.

2. Simulate conditions to demonstrate proper sequence of control.

3. Readjust settings to design values and observe ability of DDC system to establish desired conditions.
4. After 24 Hours following Initial Validation Test:

    a. Re-check I/O points that required corrections during initial test.
    b. Identify I/O points that still require additional correction and make corrections necessary to achieve desired results.

5. After 24 Hours of Second Validation Test:

    a. Re-check I/O points that required corrections during second test.
    b. Continue validation testing until I/O point is normal on two consecutive tests.

6. Completely check out, calibrate, and test all connected hardware and software to ensure that DDC system performs according to requirements indicated.
7. After validation testing is complete, prepare and submit a report indicating all I/O points that required correction and how many validation re-tests it took to pass. Identify adjustments made for each test and indicate instruments that were replaced.

G. DDC System Response Time Test:

1. Simulate HLC.

    a. Heavy load shall be an occurrence of 50 percent of total connected binary COV, one-half of which represent an "alarm" condition, and 50 percent of total connected analog COV, one-half of which represent an "alarm" condition, that are initiated simultaneously on a one-time basis.

2. Initiate 10 successive occurrences of HLC and measure response time to typical alarms and status changes.
3. Measure with a timer having at least 0.1-second resolution and 0.01 percent accuracy.
4. Purpose of test is to demonstrate DDC system, as follows:

    a. Reaction to COV and alarm conditions during HLC.
    b. Ability to update DDC system database during HLC.

5. Passing test is contingent on the following:

    a. Alarm reporting at printer beginning no more than two seconds after the initiation (time zero) of HLC.
    b. All alarms, both binary and analog, are reported and printed; none are lost.
    c. Compliance with response times specified.

6. Prepare and submit a report documenting HLC tested and results of test including time stamp and print out of all alarms.

H. DDC System Network Bandwidth Test:

1. Test network bandwidth usage on all DDC system networks to demonstrate bandwidth usage under DDC system normal operating conditions and under simulated HLC.
2. To pass, none of DDC system networks shall use more than 70 percent of available bandwidth under normal and HLC operation.

3.27 DDC SYSTEM WIRELESS NETWORK VERIFICATION

A. DDC system Installer shall design wireless DDC system networks to comply with performance requirements indicated.

B. Installer shall verify wireless network performance through field testing and shall document results in a field test report.

C. Testing and verification of all wireless devices shall include, but not be limited to, the following:

1. Speed.
2. Online status.
3. Signal strength.

3.28 FINAL REVIEW

A. Submit written request to Architect and Construction Manager when DDC system is ready for final review. Written request shall state the following:

1. DDC system has been thoroughly inspected for compliance with contract documents and found to be in full compliance.
2. DDC system has been calibrated, adjusted and tested and found to comply with requirements of operational stability, accuracy, speed and other performance requirements indicated.
3. DDC system monitoring and control of HVAC systems results in operation according to sequences of operation indicated.
4. DDC system is complete and ready for final review.

B. Review by Architect and Construction Manager shall be made after receipt of written request. A field report shall be issued to document observations and deficiencies.

C. Take prompt action to remedy deficiencies indicated in field report and submit a second written request when all deficiencies have been corrected. Repeat process until no deficiencies are reported.

D. Should more than two reviews be required, DDC system manufacturer and Installer shall compensate entity performing review for total costs, labor and expenses, associated with third and subsequent reviews. Estimated cost of each review shall be submitted and approved by DDC system manufacturer and Installer before making the review.

E. Prepare and submit closeout submittals and begin procedures indicated in "Extended Operation Test" Article when no deficiencies are reported.

F. A part of DDC system final review shall include a demonstration to parties participating in final review.

1. Provide staff familiar with DDC system installed to demonstrate operation of DDC system during final review.
2. Provide testing equipment to demonstrate accuracy and other performance requirements of DDC system that is requested by reviewers during final review.
3. Demonstration shall include, but not be limited to, the following:

a. Accuracy and calibration of 10 I/O points randomly selected by reviewers. If review finds that some I/O points are not properly calibrated and not satisfying performance requirements indicated, additional I/O points may be selected by reviewers until total I/O points being reviewed that satisfy requirements equals quantity indicated.
b. HVAC equipment and system hardwired and software safeties and life-safety functions are operating according to sequence of operation. Up to 10 I/O points shall be randomly selected by reviewers. Additional I/O points may be selected by reviewers to discover problems with operation.
c. Correct sequence of operation after electrical power interruption and resumption after electrical power is restored for randomly selected HVAC systems.
d. Operation of randomly selected dampers and valves in normal-on, normal-off and failed positions.
e. Reporting of alarm conditions for randomly selected alarms, including different classes of alarms, to ensure that alarms are properly received by operators and operator workstations.
f. Trends, summaries, logs and reports set-up for Project.
g. For up to three HVAC systems randomly selected by reviewers, use graph trends to show that sequence of operation is executed in correct manner and that HVAC systems operate properly through complete sequence of operation including different modes of operations indicated. Show that control loops are stable and operating at set points and respond to changes in set point of 20 percent or more.
h. Software's ability to communicate with controllers, operator workstations, uploading and downloading of control programs.
i. Software's ability to edit control programs off-line.
j. Data entry to show Project-specific customizing capability including parameter changes.
k. Step through penetration tree, display all graphics, demonstrate dynamic update, and direct access to graphics.
l. Execution of digital and analog commands in graphic mode.
m. Spreadsheet and curve plot software and its integration with database.
n. Online user guide and help functions.
o. Multitasking by showing different operations occurring simultaneously on four quadrants of split screen.
p. System speed of response compared to requirements indicated.
q. For Each Network and Programmable Application Controller:

    1) Memory: Programmed data, parameters, trend and alarm history collected during normal operation is not lost during power failure.
    2) Operator Interface: Ability to connect directly to each type of digital controller with a portable operator workstation and PDA. Show that maintenance personnel interface tools perform as indicated in manufacturer's technical literature.
    3) Standalone Ability: Demonstrate that controllers provide stable and reliable standalone operation using default values or other method for values normally read over network.
    4) Electric Power: Ability to disconnect any controller safely from its power source.
    5) Wiring Labels: Match control drawings.
    6) Network Communication: Ability to locate a controller's location on network and communication architecture matches Shop Drawings.
    7) Nameplates and Tags: Accurate and permanently attached to control panel doors, instrument, actuators and devices.

r. For Each Operator Workstation:

1) I/O points lists agree with naming conventions.
2) Graphics are complete.
3) UPS unit, if applicable, operates.

s. Communications and Interoperability: Demonstrate proper interoperability of data sharing, alarm and event management, trending, scheduling, and device and network management. Use ASHRAE 135 protocol analyzer to help identify devices, view network traffic, and verify interoperability. Requirements must be met even if only one manufacturer's equipment is installed.

1) Data Presentation: On each operator workstation, demonstrate graphic display capabilities.
2) Reading of Any Property: Demonstrate ability to read and display any used readable object property of any device on network.
3) Set Point and Parameter Modifications: Show ability to modify set points and tuning parameters indicated. Modifications are made with messages and write services initiated by an operator using workstation graphics, or by completing a field in a menu with instructional text.
4) Peer-to-Peer Data Exchange: Network devices are installed and configured to perform without need for operator intervention to implement Project sequence of operation and to share global data.
5) Alarm and Event Management: Alarms and events are installed and prioritized according to Owner. Demonstrate that time delays and other logic are set up to avoid nuisance tripping. Show that operators with sufficient privileges are permitted.
6) Schedule Lists: Schedules are configured for start and stop, mode change, occupant overrides, and night setback as defined in sequence of operations.
7) Schedule Display and Modification: Ability to display any schedule with start and stop times for calendar year. Show that all calendar entries and schedules are modifiable from any connected operator workstation by an operator with sufficient privilege.
8) Archival Storage of Data: Data archiving is handled by operator workstation and server and local trend archiving and display is accomplished.
9) Modification of Trend Log Object Parameters: Operator with sufficient privilege can change logged data points, sampling rate, and trend duration.
10) Device and Network Management:

a) Display of network device status.
b) Display of BACnet Object Information.
c) Silencing devices transmitting erroneous data.
d) Time synchronization.
e) Remote device re-initialization.
f) Backup and restore network device programming and master database(s).
g) Configuration management of routers.

3.29 EXTENDED OPERATION TEST

10/2/19
Addendum #1

A. Extended operation test is intended to simulate normal operation of DDC system by Owner.

B. Operate DDC system for an operating period of 3 consecutive calendar days following Substantial Completion. Coordinate exact start date of testing with Owner.

C. Provide an operator familiar with DDC system installed to man an operator workstation during eight hours of each normal business day occurring during operating period.

D. During operating period, DDC system shall demonstrate correct operation and accuracy of monitored and controlled points as well as operation capabilities of sequences, logs, trends, reports, specialized control algorithms, diagnostics, and other software indicated.

1. Correct defects of hardware and software when it occurs.

E. Definition of Failures and Downtime during Operating Period:

1. Failed I/O point constituting downtime is an I/O point failing to perform its intended function consistently and a point physically failed due to hardware and software.
2. Downtime is when any I/O point in DDC system is unable to fulfill its' required function.
3. Downtime shall be calculated as elapsed time between a detected point failure as confirmed by an operator and time point is restored to service.
4. Maximum time interval allowed between DDC system detection of failure occurrence and operator confirmation shall be 0.5 hours.
5. Downtime shall be logged in hours to nearest 0.1 hour.
6. Power outages shall not count as downtime, but shall suspend test hours unless systems are provided with UPS and served through a backup power source.
7. Hardware or software failures caused by power outages shall count as downtime.

F. During operating period, log downtime and operational problems are encountered.

1. Identify source of problem.
2. Provide written description of corrective action taken.
3. Record duration of downtime.
4. Maintain log showing the following:

    a. Time of occurrence.
    b. Description of each occurrence and pertinent written comments for reviewer to understand scope and extent of occurrence.
    c. Downtime for each failed I/O point.
    d. Running total of downtime and total time of I/O point after each problem has been restored.

5. Log shall be available to Owner for review at any time.

G. For DDC system to pass extended operation test, total downtime shall not exceed 1 percent of total point-hours during operating period.

1. Failure to comply with minimum requirements of passing at end of operating period indicated shall require that operating period be extended one consecutive day at a time until DDC system passes requirement.

H. Evaluation of DDC system passing test shall be based on the following calculation:

1. Downtime shall be counted on a point-hour basis where total number of DDC system point-hours is equal to total number of I/O points in DDC system multiplied by total number of hours during operating period.
2. One point-hour of downtime is one I/O point down for one hour. Three points down for five hours is a total of 15 point-hours of downtime. Four points down for one-half hour is 2 point-hours of downtime.

3. Example Calculation: Maximum allowable downtime for 30-day test when DDC system has 1000 total I/O points (combined analog and binary) and has passing score of 1 percent downtime is computed by 30 days x 24 h/day x 1000 points x 1 percent equals 7200 point-hours of maximum allowable downtime.

I. Prepare test and inspection reports.

3.30 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.

3.31 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by DDC system manufacturer's authorized service representative. Include monthly preventive maintenance, repair or replacement of worn or defective components, cleaning, calibration and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.32 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two year(s).

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two year(s) from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule and access system and to upgrade computer equipment if necessary.

3.33 DEMONSTRATION

A. Engage a factory-authorized service representative with complete knowledge of Project-specific system installed to train Owner's maintenance personnel to adjust, operate, and maintain DDC system.

B. Extent of Training:

1. Base extent of training on scope and complexity of DDC system indicated and training requirements indicated. Provide extent of training required to satisfy requirements indicated even if more than minimum training requirements are indicated.
2. Inform Owner of anticipated training requirements if more than minimum training requirements are indicated.
3. Minimum Training Requirements:

a. Provide not less than 10 days of training total.

b. Stagger training over multiple training classes to accommodate Owner's requirements. All training shall occur before end of warranty period.
c. Total days of training shall be broken into not more than four separate training classes.
d. Each training class shall be not less than one consecutive day(s).

C. Training Schedule:

1. Schedule training with Owner 20 business days before expected Substantial Completion.
2. Schedule training to provide Owner with at least 10 business days of notice in advance of training.
3. Training shall occur within normal business hours at a mutually agreed on time. Unless otherwise agreed to, training shall occur Monday through Friday, except on U.S. Federal holidays, with two morning sessions and two afternoon sessions. Each morning session and afternoon session shall be split in half with 15-minute break between sessions. Morning and afternoon sessions shall be separated by 30-minute lunch period. Training, including breaks and excluding lunch period, shall not exceed eight hours per day.
4. Provide staggered training schedule as requested by Owner.

D. Training Attendee List and Sign-in Sheet:

1. Request from Owner in advance of training a proposed attendee list with name, phone number and e-mail address.
2. Provide a preprinted sign-in sheet for each training session with proposed attendees listed and no fewer than six blank spaces to add additional attendees.
3. Preprinted sign-in sheet shall include training session number, date and time, instructor name, phone number and e-mail address, and brief description of content to be covered during session. List attendees with columns for name, phone number, e-mail address and a column for attendee signature or initials.
4. Circulate sign-in sheet at beginning of each session and solicit attendees to sign or initial in applicable location.
5. At end of each training day, send Owner an e-mail with an attachment of scanned copy (PDF) of circulated sign-in sheet for each session.

E. Training Attendee Headcount:

1. Plan in advance of training for five attendees.
2. Make allowance for Owner to add up to two attendee(s) at time of training.
3. Headcount may vary depending on training content covered in session. Attendee access may be restricted to some training content for purposes of maintaining system security.

F. Training Attendee Prior Knowledge: For guidance in planning required training and instruction, assume attendees have the following:

1. Basic user knowledge of computers and office applications.
2. Basic knowledge of HVAC systems.
3. Basic knowledge of DDC systems.
4. Basic knowledge of DDC system and products installed.

G. Attendee Training Manuals:

1. Provide each attendee with a color hard copy of all training materials and visual presentations.

2. Hard-copy materials shall be organized in a three-ring binder with table of contents and individual divider tabs marked for each logical grouping of subject matter. Organize material to provide space for attendees to take handwritten notes within training manuals.
3. In addition to hard-copy materials included in training manual, provide each binder with a sleeve or pocket that includes a DVD or flash drive with PDF copy of all hard-copy materials.

H. Instructor Requirements:

1. One or multiple qualified instructors, as required, to provide training.
2. Instructors shall have not less than five years of providing instructional training on not less than five past projects with similar DDC system scope and complexity to DDC system installed.

I. Organization of Training Sessions:

1. Organize training sessions into logical groupings of technical content and to reflect different levels of operators having access to system. Plan training sessions to accommodate the following three levels of operators:

   a. Daily operators.
   b. Advanced operators.
   c. System managers and administrators.

2. Plan and organize training sessions to group training content to protect DDC system security. Some attendees may be restricted to some training sessions that cover restricted content for purposes of maintaining DDC system security.

J. Training Outline:

1. Submit training outline for Owner review at least 10 business day before scheduling training.
2. Outline shall include a detailed agenda for each training day that is broken down into each of four training sessions that day, training objectives for each training session and synopses for each lesson planned.

K. On-Site Training:

1. Owner will provide conditioned classroom or workspace with ample desks or tables, chairs, power and data connectivity for instructor and each attendee.
2. Instructor shall provide training materials, projector and other audiovisual equipment used in training.
3. Provide as much of training located on-site as deemed feasible and practical by Owner.
4. On-site training shall include regular walk-through tours, as required, to observe each unique product type installed with hands-on review of operation, calibration and service requirements.
5. Operator workstation provided with DDC system shall be used in training. If operator workstation is not indicated, provide a temporary workstation to convey training content.

L. Off-Site Training:

1. Provide conditioned training rooms and workspace with ample tables desks or tables, chairs, power and data connectivity for each attendee.
2. Provide capability to remotely access to Project DDC system for use in training.

3. Provide a workstation for use by each attendee.

M. Training Content for Daily Operators:

1. Basic operation of system.
2. Understanding DDC system architecture and configuration.
3. Understanding each unique product type installed including performance and service requirements for each.
4. Understanding operation of each system and equipment controlled by DDC system including sequences of operation, each unique control algorithm and each unique optimization routine.
5. Operating operator workstations, printers and other peripherals.
6. Logging on and off system.
7. Accessing graphics, reports and alarms.
8. Adjusting and changing set points and time schedules.
9. Recognizing DDC system malfunctions.
10. Understanding content of operation and maintenance manuals including control drawings.
11. Understanding physical location and placement of DDC controllers and I/O hardware.
12. Accessing data from DDC controllers.
13. Operating portable operator workstations.
14. Review of DDC testing results to establish basic understanding of DDC system operating performance and HVAC system limitations as of Substantial Completion.
15. Running each specified report and log.
16. Displaying and demonstrating each data entry to show Project-specific customizing capability. Demonstrating parameter changes.
17. Stepping through graphics penetration tree, displaying all graphics, demonstrating dynamic updating, and direct access to graphics.
18. Executing digital and analog commands in graphic mode.
19. Demonstrating control loop precision and stability via trend logs of I/O for not less than 10 percent of I/O installed.
20. Demonstrating DDC system performance through trend logs and command tracing.
21. Demonstrating scan, update, and alarm responsiveness.
22. Demonstrating spreadsheet and curve plot software, and its integration with database.
23. Demonstrating on-line user guide, and help function and mail facility.
24. Demonstrating multitasking by showing dynamic curve plot, and graphic construction operating simultaneously via split screen.
25. Demonstrating the following for HVAC systems and equipment controlled by DDC system:

    a. Operation of HVAC equipment in normal-off, -on and failed conditions while observing individual equipment, dampers and valves for correct position under each condition.
    b. For HVAC equipment with factory-installed software, show that integration into DDC system is able to communicate with DDC controllers or gateways, as applicable.
    c. Using graphed trends, show that sequence of operation is executed in correct manner, and HVAC systems operate properly through complete sequence of operation including seasonal change, occupied and unoccupied modes, warm-up and cool-down cycles and other modes of operation indicated.
    d. Hardware interlocks and safeties function properly and DDC system performs correct sequence of operation after electrical power interruption and resumption after power is restored.

e. Reporting of alarm conditions for each alarm, and confirm that alarms are received at assigned locations, including operator workstations.
f. Each control loop responds to set point adjustment and stabilizes within time period indicated.
g. Sharing of previously graphed trends of all control loops to demonstrate that each control loop is stable and set points are being maintained.

N. Training Content for Advanced Operators:

1. Making and changing workstation graphics.
2. Creating, deleting and modifying alarms including annunciation and routing.
3. Creating, deleting and modifying point trend logs including graphing and printing on an ad-hoc basis and operator-defined time intervals.
4. Creating, deleting and modifying reports.
5. Creating, deleting and modifying points.
6. Creating, deleting and modifying programming including ability to edit control programs off-line.
7. Creating, deleting and modifying system graphics and other types of displays.
8. Adding DDC controllers and other network communication devices such as gateways and routers.
9. Adding operator workstations.
10. Performing DDC system checkout and diagnostic procedures.
11. Performing DDC controllers operation and maintenance procedures.
12. Performing operator workstation operation and maintenance procedures.
13. Configuring DDC system hardware including controllers, workstations, communication devices and I/O points.
14. Maintaining, calibrating, troubleshooting, diagnosing and repairing hardware.
15. Adjusting, calibrating and replacing DDC system components.

O. Training Content for System Managers and Administrators:

1. DDC system software maintenance and backups.
2. Uploading, downloading and off-line archiving of all DDC system software and databases.
3. Interface with Project-specific, third-party operator software.
4. Understanding password and security procedures.
5. Adding new operators and making modifications to existing operators.
6. Operator password assignments and modification.
7. Operator authority assignment and modification.
8. Workstation data segregation and modification.

P. Video of Training Sessions:

1. Provide a digital video and audio recording of each training session. Create a separate recording file for each session.
2. Stamp each recording file with training session number, session name and date.
3. Provide Owner with two copies of digital files on DVDs or flash drives for later reference and for use in future training.
4. Owner retains right to make additional copies for intended training purposes without having to pay royalties.

END OF SECTION 230923

SECTION 27 5116 - SPECIALIZED LOCAL SOUND SYSTEMS

Commented [MJ1]:

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, entitled "Related Documents."

B. SCOPE OF SPECIFICATION:

C. Unit Prices: Refer to Division 01 Section "Unit Prices" for description of Work of this Section affected to Unit Prices.

D. This section covers the procurement, construction, installation, and training for the Audio Systems. The objective is to provide fully professional Sound Systems, completely installed on the premises and acceptance tested for use.

E. The intent of this section is to specify the required equipment, methods, and scope of services required to provide a premium professionally installed, performance tested Audio system. This section, in conjunction with the attached project details, defines the technical, functional, and performance requirements for the specified Sound Systems. Provide the following in accordance with Specifications and Drawings:
   1. Submittals delivered in a timely manner as described hereinafter.
   2. Verification of dimensions and other conditions at project site. Review conduit system as-shown in electrical section of building construction documents and, where applicable, as built conditions. Notify Consultant, Architect, GC, and EC within four weeks after award of contract of any deficiencies or inadequacies in conduit system design.
   3. Detailed design of Digital Signal Processor system "maps," including remote-control accommodations (If applicable).
   4. Power distribution within equipment racks including power connection to electrical outlets as described in electrical section of building construction documents.
   5. Incidentals necessary for a complete working system.
   6. Initial testing and adjustments, demonstration of system for approval, participation in acceptance tests, final adjustments as required.
   7. Record Documents, "As-Built" drawings and Owner's Manual.
   8. Training of operating personnel.
   9. Notify appropriate parties of conflicts in a timely manner.
   10. Work cooperatively with other trades to resolve conflicts.
   11. Fire alarm interface, override dry contact to shunt the sound system.

F. This Specification establishes the requirements necessary to achieve the intended performance and function of the Audio System(s) described herein. Therefore, all materials and labor that are specified are necessary to meet these requirements. It includes materials and labor required to provide a complete and operable system(s) as specified herein and shown with the Local Audio Systems drawings.

   1. Main Paging System

a. Paging Station in REC OFF. Room 211 **and OFFICE Rom 143** shall be provided with Multi-Zone System Processor and zone selector remote paging microphones.
b. Main Paging System Rack to be located in IT Room 211A. One (1) 20 amp circuit to be provided for Rack by Electrical Contractor.

2. Multi-Function/Fitness Activity Room 210 Local Sound Systems
This system is detailed in the following specification details here within. The system can be used for typical lectures, community meetings, or other public use by using the DSP Control to select this optional mode of operation.
a. Sound System to be mounted in rack located in Large Eq. Storage Room **210A**.
b. One (1) 20 amp circuit to be provided for Rack by Electrical Contractor.
c. Hearing Impaired System
This hearing-impaired system includes a Modulator(s), transmitter, and personal receivers. This system shall be integrated to the above sound systems; all System Modes shall feed the IR System.

3. Activity Space Room 149 Local Sound System
The Fitness Area system shall provide a high-quality program play back system utilizing Headset wireless systems. A DVD / Disc player and inputs for iPod and other MP3 audio sources are provided as well.
a. Fitness Room Sound System to be mounted in Portable Rack in back of room.

4. Activities Room 131B and Dance & Fitness Room 131A Local Sound Systems
The two sound systems shall provide a quality program play back system utilizing Headset wireless systems.
a. Dance & Fitness Room Sound Systems to be mounted in Portable Racks.

5. Multi-Purpose 1 Room 110A, and Multi-Purpose 2 Room 110B Local Sound Systems
This system is detailed in the following specification details here within. The system can be used for typical lectures, community meetings, or other public use by using the DSP Control to select this optional mode of operation. **Provide a separate Speaker zone for each room**.
a. Sound System to be mounted in rack located in Storage Room 113.
b. Three (3) 20 amp circuits to be provided for Rack by Electrical Contractor.
c. Hearing Impaired System
This hearing-impaired system includes **two** Modulator(s), transmitter, and personal receivers. This system shall be integrated to the above sound systems; all System Modes shall feed the IR System.

6. Pool Room 220A Local Sound System
This Pool Area shall provide a high-quality program play back system utilizing 2 handhelds and one earset wireless system. Inputs for iPod and other MP3 audio sources are provided as well.
a. Sound System to be mounted in rack located in IT Room 211A, and microphone in L.G. Office Room 222.
b. Hearing Impaired System
This hearing-impaired system includes a Modulator(s), transmitter, and personal receivers. This system shall be integrated to the above sound systems; all System Modes shall feed the IR System.

G. The Contractor will provide all materials and all necessary labor to complete said Sound Systems in compliance with this specification. Where a conflict exists with other specifications concerning such materials and labor, this specification takes precedence unless otherwise addressed in writing by the owner or owner's representative.

H. It is understood and agreed by the project contractor that the systems described herein shall be completed in every detail necessary to supply a complete, working system(s) implemented in a professional manor.

1. This text as well as the provided drawings are only necessary to define the design intent and anticipated performance requirements.

2. Equipment not discreetly mentioned or outlined in these documents shall be provided without claim for additional payment.

I. Drawings included with this document shall be considered part of this specification. The Contractor will provide complete and operating system(s) including all labor and materials for all assemblies and sub-assemblies either specified or implied within this project document.

1. Equipment function and features are to be provided by the Contractor. Where a specific item is listed by manufacturer's name and product number it identifies a minimum requirement for performance parameters and functionally defined by the product. This is not only limited to the device specified but also by the manufacturer's warranties.
2. If a Contractor intends to provide goods other than those specified, such as "an equivalent" device it must clearly be documented within the bid response. Proposed "equivalent" items must include a written certification from the manufacturer of the replaced item stating the equivalency of each item in regard to features, function, performance, and future system capabilities.
3. A contractor wishing to substitute items with an equivalent product must be willing to demonstrate the equivalency of said item to the owner and owner's representative at the contractor's expense. This proof of equivalency, in addition to the manufacturer's letter may include the following.

    a. "On-Site" side by side demonstration of both the specified unit and the proposed equivalent item.
    b. Independent laboratory test report. This is to include spreadsheet comparison of all critical distortion, frequency response, dynamic range, and power requirements. All tests based upon current AES standards.
    c. Equipment costs for proposed substitution items shall be listed showing the owner or owner's representative a cost savings incurred with the use of said proposed item.
    d. Contactor costs incurred, travel expenses, and other related costs shall be incurred by the contractor.
    e. Any professional services, service fees of engineers, consultants, or architects as a result of time being expended during this review, charged to the owner, shall be reimbursed to the owner by the contractor and/or his sub-contractor.

J. Special Insurance

1. Provide insurance fully covering all equipment against loss and damage during shipment, storage, installation, testing, adjustment and demonstration.

1.2 SUBSTITUTIONS

A. General: The Contractor has the burden of proving, at the Contractor's own cost and expense and to the satisfaction of the Architect, that the proposed product is similar and equal to the named product.

B. Basis:

1. Requests for acceptance of proposed equivalents made following the award of bid will be considered by the Architect only in the following cases:

    a. The named products cannot be obtained by the Contractor because of strikes, lockouts, bankruptcies or discontinuance of manufacturer and the Contractor makes a written request to the Architect for consideration of the proposed equivalent.
    b. The proposed equivalent, in the opinion of the Architect, is equal or superior to the named product and its use is to the advantage of the Owner.

2. A formal request must be made for the substitution documenting fully the above reason. Include complete data on the proposed substitution substantiating compliance with the Contract Documents including product identification and description, performance and test data, references and samples where applicable, and an itemized comparison of the proposed substitution with the products specified or named by Addenda, with data relating to Contract time schedule, design and artistic effect where applicable, and its relationship to separate contracts. Accompany the request by accurate installed cost data on the proposed substitution in comparison with the product specified.

C. Consideration:

1. A request for substitution is a representation by the Contractor that:

    a. The Contractor has personally investigated the proposed substitution and determined that it is equal or superior in all respects to that specified.
    b. The Contractor will provide the same warranty for the substitution that would be for that specified.
    c. The cost data presented is complete and includes all related costs under this Contract, but excludes costs under separate contracts and excludes Architect's re-design costs, and that the Contractor waives all claims for additional costs related to the substitution which subsequently become apparent.
    d. Indicate if there will be any cost impact on work by other trades.
    e. The Contractor will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

2. An accepted substitution will be documented by Change Order modifying the Specifications. The Contract Price will be changed only if the substitution results in cost savings to the Owner.

1.3 REFERENCES

A. AES (Audio Engineering Society)

B. ASTM (American Society of Tests and Measurements)

C. IEEE (Institute of Electrical and Electronic Measurements)

D. NAB (National Association of Broadcasters)

E. Building Industry Consulting Services International (BICSI),"Telecommunications Distributions Methods Manual," Twelfth Edition.

F. Electronic Industries Association/Telecommunications Industry Association (EIA/TIA) -568B, "Commercial Building Telecommunications Wiring Standard"

G. EIA/TIA-569A, "Commercial Building Standard for Telecommunications Pathways and Spaces"

H. EIA/TIA-606A, "Administration Standard for the Telecommunications Infrastructure of Commercial Buildings"

I. EIA/TIA-607, "Commercial Building Grounding/Bonding Requirements"

J. National Electrical Code (NEC), 2008 - National Fire Protection Agency (NFPA) 70

K. Institute of Electrical and Electronic Engineers (IEEE) 802.3 Carrier Sense Multiple Access with Collision Detection (Ethernet 100BASE-T)

L. Federal Communications Commission (FCC), Title 47, Code of Federal Regulations, Part 68.

M. National Institution for Communications Engineering Technology (NICET) J. International Communications Industry Association (ICIA).

1.4 DEFINITIONS

A. ADA: Americans with Disabilities Act

B. AV: Audiovisual

C. Bid: Herein, used interchangeably with "proposal"

D. CATV: Central or Master Antenna Television (broadband)

E. DSP: Digital Signal Processor

F. IR: Infrared

G. NIC: material and work which is Not In Contract and for which the Installer is not responsible except as otherwise detailed herein.

H. OFE: "Owner Furnished Equipment" which will be provided by The Owner. Be responsible for installing and integrating this equipment as detailed herein.

I. OFCI: "Owner Furnished Contractor Installed" Equipment which will be provided by The Owner. Be responsible for installing and integrating this equipment as detailed herein.

J. The term "shall" is mandatory.

K. The term "will" is informative.

L. The term "should" is advisory.

M. Term "provide" means furnish and install.

N. Bidder: Qualified firm intending to tender a bid on the systems described herein.

O. Construction Manager (CM) or General Contractor (GC): The representative responsible for general building construction and onsite coordination between sub-contractors

1.5 BID PROPOSALS

A. Itemized Bid Response

1. Each piece of equipment shall be individually priced and submitted with Bid Proposals. Provide itemized bid response to include equipment description, manufacturer, model number, unit price, and quantity on a per room basis. All equipment prices shall reflect required modifications and accessories as needed for a complete and functioning system.
2. Non-equipment charges shall be outlined separately as a single line item on a per room basis. A sum of the audio system total cost shall be provided with the bid proposal.

B. Contractor Qualification

1. Demonstrate at least three (3) years' experience in the fabrication, programming, assembly, and installation of audiovisual presentation and remote control systems of similar magnitude and quality as specified for the subject job. Submit documentation to this effect with the bid response. Be an authorized sales and service center for all listed components and offerings in this specification.
2. References: Furnish no less than three (3) references for installations of similar size (dollar amount & quantity of spaces receiving integrated technology) and scope, performed within the past three (3) years. At a minimum, reference information will include the reference company or institute name, contact person's name and title, telephone number, address, and detailed project description, as well as project manager's name, and contact information for the organization that is responsible for day-to-day operation of the Sound System installation.

C. Alternate Proposals

1. Any proposed alternate equipment choices should be requested in writing by the contractor prior to the proposal submission for approval. Each item on the alternate equipment list must be accompanied by catalog cut sheets and technical specifications.

D. Non-Equipment Charges, including but not be limited to:

1. Engineering: Including all required design drawings, run sheets, instruction manuals, console layout, step-by-step user guide, etc.
2. Pre-Installation: Work performed on the Installer's premises including all fabrication, modification, assembly, rack wiring, etc.
3. Installation: Including all on-site installation and wiring, shop drawing, coordination and supervision, testing, checkout, Owner training, etc., performed on the Owner's premises.
4. General and Administrative: Including all shipping, insurance, and guarantees.

E. Owner Furnished Equipment (OFE, OFCI)

1. Identify any Owner Furnished Equipment assumed in the Bid Proposal to be installed and integrated under this contract. Identify all assumed Owner Furnished equipment within each room/space type that will be required to complete the Audio systems installation.

F. State of the Art Development

1. Supply only the manufacturer's latest developed product. In cases where product development surpasses the criteria of the specification, inform the Architect and make the newer product available to the project at no additional cost. In no case shall discontinued or obsolete equipment be acceptable. The same requirement applies to software programs developed/updated during the warranty period.
2. Should a manufacturer discontinue a specified product, provide the manufacturer's recommended replacement at no additional cost to the owner. Should the manufacturer have no direct replacement product, Audio contractor shall propose a product of equal or greater specification from an alternate manufacturer at no additional cost to the owner.
3. Should a product recall by a specified manufacturer require temporary or permanent replacement of a product specified under this section, notify the Architect at the earliest possible time and arrange to replace the product in question as quickly as possible.

    a. Equipment found defective or subject to recall prior to scheduled installation shall not be delivered to the jobsite.
    b. Equipment defect or intended recall shall not relieve the Audio Contractor from any contractual obligations with regard to delivery schedule of product.
    c. Under no circumstances shall arrangement for alternate product require the Owner to accept superseded equipment except on a temporary basis

G. Service Contract

1. Submit the costs for a one-year service contract, renewable for up to three years, which shall commence with the completion of the two-year warranty period. These contracts shall be fixed-cost, and can be accepted at the option of the Owner.
2. The service contract shall include all of the services provided during the warranty period, including complete replacement or repair of defective equipment.

1.6 QUALITY ASSURANCE

A. Coordination

1. Coordinate this Section with work of other Project Manual sections and associated trades.
2. Specific references, herein, requiring coordination of certain work shall not obviate responsibility for other required coordination.
3. Coordinate access to the site and all facets of the installation with the GC. Attend coordination meetings as needed.

B. Standards and Codes

1. Comply with

    a. Local, state and federal codes
    b. Applicable National Electrical Code
    c. American National Standards Institute
    d. Underwriters' Laboratories, Inc. standards.

2. All equipment, material, accessories, and loose items provided by Contractor shall be new and shall conform to applicable requirements of the above-mentioned agencies.
3. If required by local authorities, provide certificates and labels indicating compliance with above-mentioned codes and standards where applicable.

C. Point of Contact

1. Designate to the Owner in writing, the responsible person who shall ensure timely and consistent communication with the Owner on progress of the contract. The designated representative shall have full knowledge of all engineering and production procedures and shall report status of the installation and upcoming work plans to the Owner's Project Manager and Consultant on a weekly basis.
2. Project manager shall have successfully managed not less than two (2) projects of similar size and scope (as defined in previous sections). Bid submission shall detail the percentage of time that the project manager and other key personnel will be involved with the project.

1.7 SYSTEM DESCRIPTION

A. Design Intent

1. Provide a complete and functioning audio system inclusive of all hardware, software and training to meet or exceed the performance features outlined in this document.

B. Design Standards

1. The Owner's goal is to have available a cohesive and fully functional system. Therefore, part of the development efforts for successfully implementing the Audio systems should include:

    a. Install the system in a manner that complies with BICSI and ICIA cable routing standards. Route all audio, video (if applicable), and control cabling elements in a subtle, unobtrusive manner to maintain the architectural and visual integrity of the building.
    b. Except where plenum cable is used above finished ceilings, it is required that all cabling be routed inside the comprehensive system of conduit. Floor and wall boxes shall serve as the primary interface points to the Audio system.
    c. Provide and install cover plates, connectors, and associated cabling to link all floor and wall boxes to all affiliated local and remote Audio components. No Wiremold or surface-mounted raceway will be permitted. The Audio contractor shall coordinate faceplate materials, colors, and finishes with the faceplates used by other trades on the project and the architect to match aesthetics.
    d. Provide and install security covers on any electronics with front panel controls that should not need to be adjusted after initial set-up. All components permanently mounted to rack rail systems shall be installed with industry accepted security screws.
    e. All ceiling mounted Audio equipment shall be secured to building structure.
    f. Steel cable security systems and padlocks to secure structure shall be provided for all surface mount loudspeakers, document cameras, flat panel displays, and projectors. All padlocks provided for security shall be keyed to a single master key.
    g. Provide intellectual property release and install an editable version of all master source code for all digital signal processing, remote control or microprocessor-based systems included on this project to an owner furnished personal computer. Also provide a hardcopy on portable media.
    h. Provide necessary audio, video, RGBHV, HDMI, DVI, USB, and control signal repeaters, extenders, and amplifiers for any run greater than 30 feet and as needed to maintain required signal levels for receipt at destination device. All audio lines shall be balanced at the source, prior to any cable pull longer than 20 feet. There are no exceptions.

i. For each input/output point of interface to the system, provide a suitable length patch cord for owner use for every signal type present. Provide umbilical style cable management for any mobile solutions.

2. Performance Standards: Unless restricted by the published specifications of a particular piece of equipment, or unless otherwise required, the following minimum performance standards shall be met by each system:

a. Analog Audio:
   1) S/N (including crosstalk and hum): 75 dB minimum
   2) Total Harmonic Distortion: 0.5% maximum from 30 Hz to 15,000Hz.
   3) Frequency Response: Flat within +1.0 dB, 30 Hz to15, 000Hz.

b. Performance Test Signal Paths: The signal paths for the above Performance Standards shall be as follows:

   1) Audio: From any and all source inputs (for microphones, audiotape units, digital video units, etc.) through all audio processing, audio distribution amplifiers (ADA), mixers, switchers, codec, etc., to all electrical signal destinations.

c. Remote Control Standards: As a minimum, the remote control system for each space shall be programmed to include the following:

   1) Owner Logo on first page.
   2) Automatic System Shutdown.
   3) AM/ PM Clock Settings.
   4) 50 % audio level default.
   5) Separate Program and Microphone Audio Level Control with mute function.
   6) Volume/ Mute control for program and speech audio reinforcement on every screen.
   7) Panel layout to include user screens, as well as, password protected technician pages.
   8) Raise and lower projection screen when projection is powered on/ off respectively.
   9) Assign room computer as default system source upon power up.
   10) Full function control of all source components, display units, processing devices and switching electronics.
   11) Follow-up programming and modifications as requested by the Owner shall be provided 6 months after system acceptance. Provide and install updated editable source code to the Owner following these updates.
   12) In the event the remote control system programming becomes compromised during the warranty period, provide the necessary effort to make the system fully functional once again.

1.8 PERFORMANCE REQUIREMENTS

A. Examine all Project Specifications and Drawings for requirements that affect work of this Section, whether or not such work is specifically mentioned in this Section.

B. Delegated Design: Design rigging, including comprehensive engineering analysis by a qualified professional engineer, licensed in the state where the project is located, using performance requirements and design criteria indicated.

C. Structural Performance: Rigging shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Design Loads: Weight of equipment, e.g. Ceiling Speakers, etc.

D. Seismic Performance: Speakers system and Sound system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

E. Minimum Standards: Comply with the following:

1. Tension Load Path Components and Systems: Design factor of eight (8).
2. Cable Bending Ratio: Minimum of 29 times the rope diameter.
3. Steel: 1/5 of stress yield.
4. Maximum Fleet Angle: Two (2) degrees for grooved drums and blocks

F. The Sound System must provide global muting function through dry contact closure for Fire Alarm and P/A System.

1. Tie –in to the Fire Panel to be completed by Fire Alarm Installer.

1.9 SUBMITTALS

A. Submit all related Submittal information at one time.

1. SUBMIT ALL ITEMS IN A SPECIFICATION SECTION AT THE SAME TIME. An incomplete submittal will be held until a complete submittal is accumulated, or may be rejected without further review and returned to the applicable parties. Include a copy of the Specification Paragraphs pertaining to the items submitted.
2. Submittal data is to be submitted in a three ring binder, a continuous spiral binder, or plastic binding that allows the booklet to lie flat while open. Each booklet shall contain the below in the following order:

a. Cover Sheet.

1) Include name of supplying contractor and project name.

b. The Submittal Bill of Materials Index/Equipment List column headings shall identify the following minimum information. Submittals must be submitted using the following “headings” in the order indicated from left-to-right on the Bill of Materials Index/Equipment List:

1) All Bill of Material items shall be listed in the Bill of Material Index/Equipment List, in the same order as they appear in the specification.

2) “Specification Section #”, reference specification section number/location that identifies each individual item, for every item specified and submitted.

3) Example of Specification Section number/location: 2.13, B., 7., c., 4), e)

4) "Description" of each item

5) Manufacturer's "Name" for each item

6) Manufacturer's "Model #" for each item

7) "Quantity" of each item being provided

8) Submittal Page Number(s) of specification sheet(s) for each item

c. Any submittal that does not include a submittal Bill of Materials, and provides a minimum of the information requested herein, shall be rejected without further review and returned to the applicable parties.

d. Submittal shall include complete Specifications and all applicable addendums, including type of materials, electrical characteristics, capacities, performance, and power requirements, to determine compliance with Contract Documents. All data submitted, including wiring diagrams, shall be complete for all equipment, and shall apply only to this specific project. All extraneous material shall be deleted or marked out. Items to be supplied shall be specifically indicated, using a method that will be visible after photocopying.

e. Maintain at the job site the latest equipment submittal showing the action taken by the Architect. Make this submittal available to Architect.

f. Regardless of any information included in the submittal submitted for review, the requirements of the Drawings and Specifications shall not be superseded in any way by the review. Review by the Architect does not relieve responsibility for submittal errors or from meeting the requirements of the Contract Documents.

g. It is intended that Submittal data be complete and accurate at the first submission. If the Submittal is returned marked "Resubmit" only one additional submission will be permitted.

h. List a minimum of four completed project references similar to the scope of this project that include DSP devices of same quality. Include project name, location, and contact names of references (NO EXCEPTIONS).

i. Provide a statement from the major manufactures showing the sound contractor is an authorized representative of that product. This is to insure products are current, recall notices are acknowledged, and correct programming/installation methods are employed as recommended by the manufacture (NO EXCEPTIONS).

j. Include a list of testing equipment owned by the Audio Contractor. At a minimum it shall include an Impedance Bridge (must be a metered bridge, not an LED meter), a Real Time Analyzer with full display and printer interface, Speaker Phase Checker, dB SPL Meter with selectable scales, and FFT-spectrum analyzers. At the option of the audio consultant the Audio Contactor maybe required to supply projective speaker coverage data using the EASE® System Design Program. (NO EXCEPTIONS)

k. A minimum of one contractor meeting will be required with the owner or owner's representative to review the scope of project. The intent of this is to review

submittals, proposed construction, proposed installation, and to coordinate sound system(s) installation with other trades.

3. Product Data: Specification Sheets shall be submitted on all items, including cable types. Submit a catalog sheet per product of equipment listed in the Detailed Bill of Materials, in the exact order as the Detailed Bill of Materials. Each catalog sheet shall describe mechanical, electrical and functional equipment specifications. The catalog sheet must also include an image of the product. Photocopy duplications of the manufacturer's original equipment catalog sheets will be allowed as long as they provide adequate clarity of both the printed word and graphics/pictures. If more than one product is shown on the catalog sheet the intended product must be denoted by either an arrow or highlight. Catalog data sheets or other published materials showing appearances, electrical ratings characteristics and connection requirements, performance characteristics, dimensions, weights, installation methods, and space requirements of equipment and its accessories, as listed below and required by the individual paragraphs:

    a. Identification Methods

    b. Grounding and Bonding

    c. Electrical Connections for Equipment

    d. Supports and Supplementary Steel

    e. Electrical Identification

    f. Test Report Formats

    g. Test Equipment

4. Authorized Distributor Certificate.

    a. Recently dated (within one year from submittal date) support letter from manufacturer stating that the supplying contractor is an Authorized Distributor of the product being supplied.

B. Shop Drawings

1. Submit shop drawings that indicate physical size and arrangement, (plans and elevations) construction details, provisions for conduits, access requirements for installation and maintenance, finishes, and materials used in fabrication. Supplement shop drawings with wiring diagrams and information as described under Product Data. Provide shop drawings as required by the individual paragraphs. Prior to fabrication submit contractor generated drawings for approval for all supplied systems. These drawings shall include, but are not limited to, the following:

    a. Title Sheet & Symbols Legend
    b. All panels, plates, and designation strips, including details relating to terminology, engraving, finish and color.
    c. All equipment racks, cabinets, consoles, tables, carts, support bases, and shelves.
    d. Schematic drawings (Audio & Control Signal Flow if applicable), system functional block drawings, including those for audio and video subsystems. Resubmission of contract drawings is unacceptable.
    e. All unusual equipment modifications.

f. Front mechanical drawings of each equipment rack.
g. Equipment location drawings.
h. Cable labeling plan.
i. Floor Plans, RCPs and Elevations: Show planned location for all elements and cable routing. Drawings should be at project standard scale and clearly legible.
j. DSP Programming shall be submitted showing all of the optional settings and modes of operation, NO EXCEPTIONS (if Applicable)

C. Form

1. Submit all materials for review as described above, specifically referenced to the Specification paragraph number (where applicable).

   a. Submit all drawings on sheets of one size, preferably the project standard size.
   b. Where materials are presented on sheets 11" x 17" or smaller, organize into three-ring binder which include:

      1) Dividers or tabs between logical sections
      2) Project name and binder title labels on face and edge of binders

   c. On submittal drawings, maintain 3/32" minimum lettering height. Submittals with text less than 1/16" in height may be rejected.

2. Partial Submittals may be rejected. If submitted individually and each in its entirety, the following Submittals shall not be considered partial:

   a. Personnel
   b. Milestones
   c. Conduit Verification Statement and Notifications
   d. Rigging and Mounting Drawings
   e. As-Built Documentation

3. Product Data and Shop drawings must be submitted together in order to be reviewed.

D. User Interface

1. In order to develop a user interface which is both functional and useable, provide working "Beta" copies of system software for review and comment by the owner, architect and the Audio consultant as per the below listed schedule:

   a. This is anticipated to be an interactive process, requiring at least three submittals prior to first beneficial use. At a minimum, the software development process will have the following milestones:

      1) Initial concept Submittal for Review
      2) First Beta Review
      3) Second Beta Review
      4) Final Implementation and On-Site Training: Prior to Final Acceptance
      5) Follow-up programming review and updates; Timing (within sixty-days from final acceptance)

E. Weekly Reporting

1. Commencing with project award, provide weekly status reporting of milestone task status, anticipated completion date, and related memo notes for the following tasks:

    a. Submittals
    b. Infrastructure verification
    c. Pre-wire status
    d. Equipment Procurement
    e. Shop fabrication
    f. Remote control system design
    g. Installation and Terminations
    h. Field testing and pre-acceptance testing
    i. Owner training
    j. First owner use
    k. Open Coordination Items and Questions
    l. Final acceptance demonstrations

2. Provide, in writing, within two weeks after award of Contract, the names, mailing address, phone numbers with extensions, email addresses and paging service numbers (if available) of the following project personnel:

    a. Project Manager
    b. Lead Systems Engineer
    c. Field Foreman
    d. Remote Control System Programmer(If Applicable)

F. Conduit Verification

1. Within four weeks after award of Contract, submit statement confirming that Contractor has reviewed the conduit system as designed in building construction documents and, where applicable, as built.
2. Notify Consultant, General Contractor, Architect or Electrical Contractor of deficiencies or inadequacies, if any, in conduit system design or installation. If none, so indicate.
3. Absent conduit verification by Contractor and after installation of conduit as designed, Contractor shall assume costs of equipment, materials, labor and engineering, including services of owner's representative(s) in designing and/or verifying revised wiring approach(es) as relate to providing a fully functional system using conduit as designed or as revised at the discretion of the owner.

G. Rigging and Mounting Drawings

1. Submit full size drawings outlining mounting and installation details of all Audio equipment requiring integration with cabinetry or architectural elements.
2. Details, stamped and signed by an appropriately licensed engineer, of all equipment mounting methods and materials provided by the Scope of Work, wherein failure of method or materials used for mounting or hanging permanently installed equipment could result in serious personal injury.

    a. Details provided by or requiring approval by licensed engineer may include: method of attachment to building structure or attachment and/or suspension points; method of attachment to supported equipment; all suspension materials; a materials list including specifications of all suspension materials; calculations used to determine loads and strengths of suspension materials, other as deemed necessary by the engineer.

3. In the absence of submitted approved, stamped and signed mounting and hanging details, the Owner reserves the right to acquire such engineering approval at the expense of the Contractor. Owner will notify Contractor of such intent. Contractor shall remedy within two weeks or Owner may proceed without Contractor approval and without relieving Contractor from any other obligations set forth by Contract.

H. Color Selection

1. Color options for all items as applicable coordinate with Architect.
2. Wall plate finishes should be coordinated with the Architect.

I. Samples

1. Coordinate color and finish samples of any furniture or equipment with Architect (if applicable).

1.10 CLOSEOUT SUBMITTALS

A. At the completion of the installation, but before Final Acceptance, provide for review and approval the following, in compliance with Division 1 Section Closeout Procedures.

1. Operation and Maintenance Manuals:

a. Equipment manufacturer's operation and service manuals for each make and model of equipment.
b. System Operation Manual. Produce a manual specifically for the subsystems detailed herein. The manual shall describe all procedures necessary to activate each system to provide for the functional requirements, except as specifically excluded by the Owner. This section shall provide a simple "How-to" users guide for the procedures needed to operate the system. This document shall contain a section on operating the systems equipment in the event of control system failure. Control system touch panel layouts shall be accompanied by narrative text describing "step-by-step" function engagement.

2. Warranty

a. Provide list and dates of activation of equipment warranties
b. Provide original manufacturers' certificates.

3. As-built Drawings

a. Include contractor generated (mark-up of contract documents is not acceptable) digital record diagrams for all systems including, but not limited to:

1) Schematic wiring diagrams with cable markings.
2) Internal wiring diagrams of the equipment rack cabinets.
3) Custom equipment modifications.
4) Final test results and nominal settings for all adjustable controls.

4. Software Passwords (if Applicable)

a. Software Passwords Schedule (i.e., a spreadsheet listing the manufacturer, model number and location in the Facility, of each piece of audio/video equipment, the software for which is password-protected).
b. Provide to Owner's Representative as a secure document separate from

c. Operating and Maintenance Manuals and As-Built Drawings.

5. Editable Control System Code

a. Provide the final control system code in an editable format.

6. Laminated Instruction Cards

a. Provide 8 ½ x 11 Instruction cards, approved by the Owner. Laminate step-by- step instructions outlining system operations for each room that has an Audio system. Provide editable file of card to Owner.

1.11 DELIVERY, STORAGE, HANDLING AND STAGING

A. Supply, transport, deliver, unload, move to the installation location, unpack, place, assemble, secure, connect, and install all equipment needed to complete the installation. Be responsible for transportation, parking, delivery, and on-site storage of the system's equipment. Be responsible for all transportation of personnel to and from the site.

B. Reconfirm before delivery that hallways, stairways, passages, doorways, rooms, entries, elevators and foyers are of sufficient size to accommodate the passage and installation of the equipment and systems. Off-site pre-staging of goods is encouraged.

C. The Owner's acknowledgment of delivery of goods and any payment made on account of such delivery shall not constitute acceptance (partial or otherwise) and shall not diminish obligations as specified.

D. The actual dates of delivery shall be under the absolute control of the Owner. The dates and times for delivery/installation are critical to the successful completion of the project. Deliveries shall normally be accepted only Monday through Friday 8:00 a.m. to 4:00 p.m. In the event it becomes necessary for goods to be installed outside these hours comply with the instructions of the Owner. Deliveries attempted outside these hours without prior consent of the Owner may be turned away. Comply with all instructions of the Owner and the Contractor concerning time of arrival at the site; which entrance shall be utilized for delivery; routes to be taken to reach the installation location; and other matters relating to the orderly and timely installation of the system.

E. Installation shall commence immediately upon delivery of materials to the jobsite, except as directed by Construction Manager. Time required from delivery date to completion of project shall be in accordance with the approved schedules.

1.12 SYSTEM TRAINING

A. Training: Provide training in the operation and maintenance of the system for personnel designated by the Owner. Record owner training sessions on DVD or other agreed upon media, and make training videos available to the owner at no charge. The training shall be organized as follows:

1. One (1) hour training classes for system technical operation and maintenance. This class shall cover the following topics:

    a. Review of signal flow diagrams.
    b. Review of all equipment functions, relevant to the function in this system.
    c. Review of initial equipment settings.
    d. Demonstration of all functional connections from a user perspective.
    e. Review & demonstration of replacement procedures for consumables (e.g., batteries). Was lamps
    f. Review of manufacturers' recommended routine maintenance procedures.

2. One (1) hour training classes for system engineering concerns. This class shall cover the following topics:

    a. Review of signal flow diagrams.
    b. Review of all equipment functions, relevant to the installation.
    c. Review of initial equipment settings.
    d. Review of manufacturer's recommended routine maintenance procedures.
    e. Review & demonstration of replacement procedures for consumables (e.g., batteries).
    f. Review & demonstration of control system software replacement/upgrade procedures.

3. Two (2) hour training classes addressing Audio system operations. The classes will demonstrate and describe the following:

    a. System set-up and operations.
    b. Control system operation.
    c. How to attach microphones, record Audio signals, and control the sound system.
    d. Video System operation & capabilities.
    e. Audio monitoring and ADA system operations.
    f. Cable antenna television system (CATV).
    g. Training may take place at any time (chosen by the Owner) after the systems are operational, up to a year following system acceptance.
    h. Close out submittals shall be provided prior to any training classes.
    i. Coordinate detailed specifics of the training session(s) time, date & location with the Owner.

1.13 WARRANTY

A. The system warranty shall be for twenty-four (24) months from the date of final acceptance. Provide all equipment, material, and labor required to uphold a full system warranty at no charge to the Owner. All manufacturers' equipment warranties shall be activated in the Owner's name and shall commence on the date of final acceptance. In the case of modified equipment, the manufacturer's warranty is normally voided. In such cases, provide the Owner with a warranty equivalent to that of the original manufacturer.

B. There shall be no cost to the Owner for maintenance performed during the warranty period beyond the fixed cost of the contract.

C. Provide a total of eight (8) engineering/ service labor hours to conduct preventive maintenance and the Owner directed system adjustments.

D. Each visit will include:

1. Checking and repairing microphones and microphone cables.
2. Conducting subjective and objective tests of the audio, video, and control systems of the installed audiovisual systems.

E. Repair and/or adjust any malfunctioning components located by the technician during this testing. Include control system programming updates and modifications as part of this service contract, providing an updated editable copy of the source code to the Owner.

F. Provide a service telephone number, staffed by a qualified technician familiar with the equipment installed. Staff this number during normal business hours.

G. Respond with an on-site technician within 24-hours of a service call (including Saturdays and Sundays) for all equipment and system failures.

H. Replace or repair, at no cost to the owner, any failed equipment hardware or software installations required to provide full system operations.

I. During the warranty period, advise the Owner in writing each time any routine software and firmware updates become available, giving the Owner the opportunity to upgrade the software/hardware should they so desire at no additional cost. Provide any necessary system modifications after installation of these updates to maintain a fully functioning system.

J. Provide updates to firmware during service period. Provide any necessary system modifications after installation of these updates to maintain a fully functioning system.

1.14 SEISMIC REQUIREMENTS

A. Equipment and work shall meet the restraint requirements for a Seismic Zone - 2 location, including installation and connections of material and equipment to the building structure

PART 2 - PRODUCTS

2.1 GENERAL

A. Manufactured Products: The components required for a complete sound system are defined by the following list. Quantities are only provided as a convenience. If a quantity differs between the drawing and this text, the greater quantity of items prevails. Items not listed, i.e. connectors, terminal strips, power supplies, etc. are the contractor's responsibility to complete a whole functional system.

1. All items provided by contractor shall be current models and "brand new" in manufacture.
2. Demonstration models, tested equipment, or previously used items will not be accepted.
3. Any item that is obsolete shall be identified to owner or owner's representative.
4. Owner or owner's representative reserves the right to accept or decline any proposed equipment substitute.

B. Custom Manufactured Items
All custom fabricated items are to be submitted in CAD format with submittal package and subject to the approval of the owner or owner's representative. Contractor is responsible for incurring costs if samples of fabricated panels are requested. Custom made panels are to be new in origin and made to order for this specific project.

2.2 PRODUCTS:

A. Main Paging System Bill of Materials:

MFG	MODEL	DESCRIPTION	QTY
Assorted	MISC	Assorted wire, plates, panels, connectors	1
Audix	MG18	Gooseneck mic for paging	3
Audix	ATS10	Push to Talk Mic Base for Gooseneck Mic	3
Bogen	RE84	Back Box	47
Bogen	TB8	Tile Bridge	47
Bogen	S86T725PG8UVK	Ceiling Speaker - with volume control	47
Bogen	AT10	Wall Mount Volume Control - 1 Gang	4
Community	dSPEC226AN	System Processor - 4 in , 6 out	2
Community	RP4/LC1	Selector at Paging Station	2
Community	C6	Ceiling Speakers 100, 101, 110A&B,131A&B, 200, 200C, 201, 210, 214,217,219 & 220A	47
Crown	CDi1000	Dual Channel 70 Volt Amp	1
Middle Atlantic	RSH4A	Custom Rack Mount Kit for Oppo Blue Ray	1
Middle Atlantic	PDS-620R	Sequencing 20 Amp Power Main and Pool	2
Middle Atlantic	HP	Bag of 100 Rack Screws	1
Middle Atlantic	EB-2	2 RU Blank Panels	2
Middle Atlantic	S-DEC	Remote Power switch for power	1
Middle Atlantic	UPS2200R	System UPS	1
Oppo	BDP-103	Blue Ray / DVD	2
ProCo	EXM-25	Mic Cables - extensions	3

Add. #1
10/2/19

ProCo	WPECA109	Single Gang Engraved Mic Plate - " Mic 1 "	3
ProCo	I-Plate	Input Plate for iPod / MP3	1
Samson	SM10	Mixer	3
Samson	SRKDR3U	3 RU Rack Drawer - Main and Pool	2

B. Multi-Function Room #210 Bill of Materials:

MFG	MODEL	DESCRIPTION	QTY
C2G	29218	HD-BASET Extender - lectern to projector	2
Community	D6	6" Ceiling Speaker –4 for 210	4
Community	dSPEC226AN	System Processor	1
Community	RP4 / LC1	Remote Volume / Selector for Each Zone	1
Crown	CDi1000	Dual Channel 70 Volt Amp	1
Listen Technologies	LA-125	Antenna Kit	1
Listen Technologies	LA-311-01	Carrying Case	1
Listen Technologies	LA-362	Rechargeable Batteries	4
Listen Technologies	LR-200-072	Assistive Listening Beltpack Receiver	4
Listen Technologies	LA-164	Ear Speaker	4
Listen Technologies	LA-166	Neckloop	2
Listen Technologies	LA-326	Rack Kit	1
Listen Technologies	LA-304	Listen Signage	1
Listen Technologies	LT-803-072-01	Assistive Listening Transmitter	1
Middle Atlantic	PDS-620R	Sequencing 20 Amp Power Strip	1
Middle Atlantic	S-DEC	Remote Key switch for power sequencer	1
ProCo	i-PLATE	Wall Plate - 1/8", Dual RCA and Mic In	2
ProCo	WPECA109	Single Gang Engraved Mic Plate - " Mic 1 "	2
RDL	ST-SSR1	Audio Relay for Page Override	1
RDL	PS-24AS	Power Supply	1
Samson	SM10	Mixer	1
Samson	SWC99HQ8	Handheld Wireless System with Rack Kit	2
Samson	SWC99BSE10	Earset Wireless System with Rack Kit	2
Samson	Q7VP	Microphone Package with stand and cable	2
Samson	SRKDR3U	3 RU Rack Drawer	1

C. Dance & Fitness Room #132A Bill of Materials:

MFG.	MODEL	DESCRIPTION	QTY.
Community	D6	6" Ceiling Speaker	2
Middle Atlantic	HW100	Pkg. of Rack Screws	1
Middle Atlantic	RSH4A	Custom Rack Mount Kit for Oppo Blue Ray	1
Middle Atlantic	PD920R	Power Strip	1
Oppo	BDP-103	Blue Ray / DVD	1
ProCo	i-PLATE	Wall Plate - 1/8", Dual RCA	1

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ProCo	WPECA109	Single Gang Engraved Mic Plate - " Mic 1 "	1
RDL	D-RLC10K	Volume Control	1
Rolls	RM67	Mixer	1
Samson	SRK-21	24 RU Rack on Casters with Rear Rails	1
Samson	MXS2800	Power Amps	1
Samson	SWC99HQ8	Handheld Wireless System with Rack Kit	1
Samson	SWC99BSE10	Earset Wireless System with Rack Kit	2
Samson	SRKDR3U	3 RU Rack Drawer	1

D. Activities Room #132B Bill of Materials:

MFG	MODEL	DESCRIPTION	QTY
Community	D6	6" Ceiling Speakers	2
Middle Atlantic	HW100	Pkg. of Rack Screws	1
Middle Atlantic	PD920R	Power Strip	1
ProCo	WPECA109	Single Gang Engraved Mic Plate - " Mic 1 "	1
ProCo	i-PLATE	Wall Plate - 1/8", Dual RCA	1
RDL	D-RLC10K	Volume Control	1
RDL	ST-LCR1	Contact Controlled Relay for System Override	1
RDL	PS-24AS	Power Supply	2
Samson	MXS2800	Power Amp	1
Samson	SWC99BSE10	Headset Wireless System with Rack Kit	1
Samson	S-Zone	Mixer	1
Samson	SRK-21	21 RU Rack with Casters	1
Samson	SRKDR3U	3 RU Rack Drawer	1

E. Activity Room #149 Bill of Materials:

MFG	MODEL	DESCRIPTION	QTY
Community	D6	6" Ceiling Speakers	2
Middle Atlantic	HW100	Pkg. of Rack Screws	1
Middle Atlantic	PD920R	Power Strip	1
Middle Atlantic	RSH4A	Custom Rack Mount Kit for Oppo Blue Ray	1
ProCo	WPECA109	Single Gang Engraved Mic Plate - " Mic 1 "	1
ProCo	i-PLATE	Wall Plate - 1/8", Dual RCA	1
RDL	D-RLC10K	Volume Control	1
RDL	ST-LCR1	Contact Controlled Relay for System Override	1
RDL	PS-24AS	Power Supply	1
Samson	MXS2800	Power Amp	1
Samson	SWC99BSE10	Headset Wireless System with Rack Kit	1
Samson	S-Zone	Mixer	1
Samson	SRK-12	12 RU Rack with Casters	1
Samson	SRKDR3U	3 RU Rack Drawer	1

F. Multi-Purpose Rooms #110A & 110B Bill of Materials:

Add. #1
10/2/19

MFG	MODEL	DESCRIPTION	QTY
C2G	29218	HD-BASET Extender - lectern to projector	2
Community	D6	Ceiling Speaker – **4-110A**, **4-110B**	**8**
Community	dSPEC226AN	System Processor	1
Community	RP4 / LC1	Remote Volume / Selector for Each Zone	1
Crown	CDi1000	Dual Channel 70 Volt Amp	2
Listen Technologies	LA-125	Antenna Kit	1
Listen Technologies	LA-311-01	Carrying Case	1
Listen Technologies	LA-362	Rechargeable Batteries	4
Listen Technologies	LR-200-072	Assistive Listening Beltpack Receiver	4
Listen Technologies	LA-164	Ear Speaker	4
Listen Technologies	LA-166	Neckloop	2
Listen Technologies	LA-326	Rack Kit	1
Listen Technologies	LA-304	Listen Signage	1
Listen Technologies	LT-803-072-01	Assistive Listening Transmitter	1
Middle Atlantic	PDS-620R	Sequencing 20 Amp Power Strip	1
Middle Atlantic	S-DEC	Remote Key switch for power sequencer	1
Middle Atlantic	ERK-4425-AV	Configured Rack with all accessories	1
Middle Atlantic	**RSH4A**	**Custom Rack Mount Kit for Oppo Blue Ray**	1
Middle Atlantic	HW100	Pkg of Rack Screws	1
Middle Atlantic	TD4	Rack Drawer	1
Middle Atlantic	UPS2200R	System UPS	1
ProCo	i-PLATE	Wall Plate - 1/8", Dual RCA and Mic In	**2**
ProCo	WPECA109	Single Gang Engraved Mic Plate - " Mic 1 "	**2**
RDL	ST-SSR1	Audio Relay for Page Override	**2**
RDL	PS-24AS	Power Supply	**2**
Samson	SWC99BSE10	Earset Wireless System with Rack Kit	**2**
Samson	SWC99HQ8	Handheld Wireless System with Rack Kit	**2**
Samson	Q7VP	Microphone Package with stand and cable	**2**
Samson	SM10	Mixer	**2**
Samson	SRKDR3U	3 RU Rack Drawer	1

G. Pool Room #220A Bill of Materials: Equipment in Room 222 LG Office & IT Room 211A.

MFG	MODEL	DESCRIPTION	QTY
Community	dSPEC226AN	System Processor	1
Community	RP4-LC1	Volume / Selector	1
Community	R.5-66Z	Speakers with hanging yoke	8
Listen Technologies	LA-125	Antenna Kit	1
Listen Technologies	LA-311-01	Carrying Case	1
Listen Technologies	LA-362	Rechargeable Batteries	4
Listen Technologies	LR-200-072	Assistive Listening Beltpack Receiver	4
Listen Technologies	LA-164	Ear Speaker	4

Listen Technologies	LA-166	Neckloop	2
Listen Technologies	LA-326	Rack Kit	1
Listen Technologies	LA-304	Listen Signage	1
Listen Technologies	LT-803-072-01	Assistive Listening Transmitter	1
ProCo	i-PLATE	2 Gang input plate for MP3 / iPod	1
ProCo	WPECA109	Single Gang Engraved Mic Plate - " Mic 1 "	1
Samson	TM25	Mic Cables - extensions	1
Samson	Q7VP	Mic with cable and stand and bag	1
Samson	MXS3500	Power Amps - Main Speakers	2
Samson	SWC99HQ8	Handheld Wireless System with Rack Kit	2
Samson	SWC99BSE10	Earset Wireless System with Rack Kit	1
Samson	SM10	Mixer	1
Samson	SWC99BLM10	Lavalier Wireless System with Rack Kit	1
RDL	ST-SSR1	Audio Relay for Page Override	1

H. Portable ListenIR Idsp System LS-88-01

1. Deliver the Portable ListenIR Idsp System LS-88-01 to the Director of Operations.

2. Furnish an Idsp portable IR assistive listening system for use by the hearing-impaired. The assistive listening system (ALS) shall be capable of broadcasting up to two (2) audio channels with the choice of four (4) mono carrier frequencies; 2.3, 2.8, 3.3 and 3.8 MHz. The system coverage area shall be up to 30,000 ft² (2787 m²) with single channel transmission. The system shall have a SNR of 60 dB or better and THD of less than 2%. The system shall have an audio frequency response of 63 Hz to 15 kHz, +/- 3db. The system shall include an omnidirectional table top microphone for audio pickup in the room. The system shall be transported or stored in a portable carrying case when the system is not in use.
3. The system receivers shall be capable of receiving on one (1) of four (4) wide band channels (carriers), (2.3 MHz), (2.8 MHz), (3.3 MHz) and (3.8 MHz). The receivers shall be tuned to a single channel and users shall not be able to change the channel. The receivers shall have the option of being lanyard or belt clip worn and the lanyard shall incorporate an integrated neck loop for compatibility with T-coil hearing aids. The receivers shall be intelligent and provide customized audio to either earphones or the integrated neck loop based upon which is connected.
4. The receivers shall have two (2) 3.5 mm (TRRS) connectors to drive the integrated neck loop lanyard or up to two (2) mono or stereo earphones. The receivers shall incorporate a multi-functional display (OLED) that indicates battery status, inventory number, volume level and a customizable channel name. The receivers shall employ a unique iDSPTM noise reduction technology. The receivers shall be fully programmable via PC software. The receivers shall have a micro USB connector used for programming/setup, inventory control, charging and firmware upgrades. The receivers shall incorporate automatic battery charging circuitry and use a non-proprietary lithium ion battery. The receivers shall automatically turn on when removed from the charging device and automatically turn off when returned to the charging device.

    a. The LS-88 is specified and includes:

LA-277	Conference Microphone	1
LA-338	Table Top Tripod	1
LA-346	Carrying Case	1

LA-401	Universal Ear Speaker	2
LA-423	4-Port USB Charger	1
LA-430	Intelligent Ear Phone/Neck Loop Lanyard	2
LR-4200 IR	Intelligent DSP IR Receiver	2
LT-84-01	ListenIR Transmitter/Radiator Combo	1

2.3 ACCESSORIES:

A. Mute Local Sound System broadcast during Fire Alarm. Provided between the local sound system and the fire alarm system, properly interface this cable to the Local Sound System (and coordinate with the Fire Alarm System Contractor the type of signaling required) and provide all hardware/programming required so when during a fire alarm the audio being broadcast by the local sound system will be muted. Once the fire alarm has ended, automatically return the local sound system to normal operations.

2.4 BONDING & GROUNDING JUMPER CABLE

A. Provide bonding and grounding jumper cable.
1. Refer to Division 26, Section - Grounding and Bonding for Communication Systems.

2.5 LOCAL SOUND SYSTEMS CABLING

A. Provide and terminate all cabling per manufacturers' recommendations for a completely operational system as specified.

B. At all back box locations, cables shall have a minimum 18" service loop coiled in back box.

C. All cables shall be individually home-run.

D. Microphone Cable: Provide one pair #22 AWG-shielded, stranded for each microphone.

E. Speaker Cable: Provide one pair #18 AWG-stranded from each speaker to applicable amplifier.
1. All cables shall be listed and labeled for environmental air plenums where cable is indicated in plenum spaces and is not indicated to be in raceway. Comply with requirements in Division 16 Section "Communications Horizontal Cabling."

2.6 COMPONENT MOUNTING RACKS

A. Configuration: Comply with CEA-310-E. Factory-fabricated units designed for interchangeable mounting, forced or convection air cooling, wiring connection, and enclosure of standard 19-inch relay rack modules.

B. Mounting Provisions: Equipped for wall mounting.

C. Cabinet: Factory-finished steel with component mounting rails and prewired plug strips for component power connections. Full front and rear doors with continuous hinges, handles, and cylindrical keyed locks.

2.7 UNINTERRUPTIBLE POWER SUPPLIES

A. Uninterruptible Power Supplies shall be APC Smart-UPS #SU SUA2200RM2U. Provide six feet (6') custom extension cord.
   1. APC Smart-UPS #SU SUA2200RM2U, or equal
      a. Output Power Capacity: 1980 Watts / 2200 VA
      b. Nominal Output Voltage: 120V
      c. Output Voltage Distortion: Less than 5% at full load
      d. Output Frequency (sync to mains): 47 - 53 Hz for 50 Hz nominal, 57 - 63 Hz for 60 Hz nominal
      e. Waveform Type: Sine wave
      f. Output Connections: (2) NEMA 5-20R and (6) NEMA 5-15R
      g. Nominal Input: Voltage 120V
      h. Input Frequency: 50/60 Hz +/- 3 Hz (auto sensing)
      i. Input Connections: NEMA 5-20P
      j. Surge energy rating: 480 Joules
      k. Filtering: Full time multi-pole noise filtering: 0.3% IEEE surge let-through: zero clamping response time: compliant with UL 1449
      l. Regulatory Approvals: BSMI, CSA, UL 1778, FCC Part 15 Class A
      m. Interface Port(s): DB-9 RS-232, Management Interface Slot, USB
      n. Management interface: included
      o. Manufacturer's Warranty: 2 years repair or replace

B. Confirm quantities needed for each rack or cabinet with the owner before installing.
   1. Provide a minimum of one (1) for each Cabinet or Rack, 1 at the MDF.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. All installation work shall be in accordance with, but not limited to, this specification and drawings. Work practices shall be performed in accordance with applicable standards, requirements, and recommendations of Federal and Local authorities having jurisdiction.
2. All discrepancies discovered and any discrepancies which are apparent at the date of submission of bids, shall be immediately corrected without additional charge to the Owner.
3. Clearly label all user controls for intended use and nominal setting. These labels shall be engraved and filled, or equal. Note: “Dymo” labels are not acceptable.
4. All equipment to be rack mounted shall be supplied with the appropriate rack mount kits.
5. The rack enclosure shall have a single button on/off power distribution panel (Furman M-8x2 or equal) located in the rack unit.
6. All rack mounted equipment that does not require user interface shall have a cover plate or vent panel to block access to the controls.
7. All rack and instructor stations shall include “security type” screws to secure rack- mounted components.
8. In rooms containing wireless microphones or assisted listening system, provide an antenna distribution system inclusive of remote antennas as needed to support transparent coverage throughout the space(s).
9. All rooms with separate audio reinforcement systems require control interfacing to the Fire Alarm system. Contact Closure cabling shall be provided by the Fire Alarm Installer from the Fire Alarm panel to each relevant Audio equipment rack location. Connect provided Contact Closure cabling to the Remote Control Bus input on the relevant Audio DSP unit. Program each audio system to mute in the event of an alarm.
10. All equipment shall be firmly secured in place unless requirements of portability dictate otherwise. Unless granted specific permission by the Owner, install and secure all boxes, equipment, etc., plumb and square.
11. Fastenings, mounting brackets and supports shall be adequate to support their loads with a safety factor of at least five (5). A safety chain or cable will be tied to all equipment suspended from above.
12. In the installation of equipment and cable, consideration shall be given not only to operational efficiency, but also to overall aesthetic factors.
13. All wiring practices within the systems shall follow all applicable local and state codes. Sound system equipment wiring practices shall be in strict conformance with “Sound System Engineering” 4th Edition publish 2013 by Focal Press, Don Davis, Eugene Patronis and Pat Brown.
14. Installation to include all standard safety practices. Fastenings, cabling, and supports for all fixed equipment must include a minimum safety standard factor of three or greater.
15. Provide adequate ventilation for all active electronic equipment.
16. All lines installed in conduits shall be splice free. Cabling shall be free from installation damage.
17. All connector wiring shall be by rosin core solder joints. No push on type connectors shall be accepted.
18. All cables to be numbered and identified in “As Built Documents”. Provide permanent cable identification.
19. Project shall be adequately staffed at all times. Coordination with other trades and cooperation is mandatory.
20. All equipment shall be installed without dents, scratches, free of marks and blemishes.

3.2 AUDIOVISUAL CABLE INSTALLATION

A. Cables shall be installed in conduit. Cables of different levels shall be in separate conduits and adhere to the following schedule of placement:

	Mic	**Line**	**Speaker**	**AC Power**
Mic	Same	6” apart	12” apart	12” apart
Line	6” apart	Same	12” apart	6” apart
Speaker	12” apart	12” apart	Same	Adjacent
AC Power	12” apart	6” apart	Adjacent	Same

B. All cables, regardless of length, shall be marked with wraparound cable markers at both ends. There shall be no unmarked cables at any place in the system. Marking codes used on cables shall correspond to codes shown on “as-built” drawings and/or run sheets. The labeling and numbering system will be coordinated with the Owner.

C. All wired microphones shall include at a minimum a 30ft. patch cable with heavy-duty jacket and XLR connectors (if applicable).

D. Loudspeakers operating at 8 ohms shall be installed with 12AWG cable as a minimum size/diameter.

E. Wall plate and floor box input/output panels shall be installed with audio/ video line drivers on runs exceeding 35ft (if applicable).

F. All cabling shall be neatly strapped, dressed, and adequately supported. Any exposed cabling shall be neatly enclosed in a protective covering.

G. Terminal blocks, boards, strips, or connectors shall be furnished for all cables, which interface, with racks, cabinets, consoles, or equipment modules.

H. All audio signal lines shall be balanced at Audio I/O plates. Provide ninety (90) degree connector adapters for all audio cabling at custom Audio I/O plates.

I. All cables shall be grouped according to the signals being carried. In order to reduce signal contamination, separate groups shall be formed for the following cables:

1. Power cables
2. Data cables (when applicable)
3. Audio cables carrying low level signals
4. Audio cables carrying line and high level signals

J. Supply cables as required to meet system performance standards. Any cabling installed in walls or ceilings shall be plenum rated. All cables shall be cut to the length dictated by the run plus the required service loop to permit future equipment movement and relocation.

K. For equipment mounted in drawers or on slides, the interconnecting cables shall be provided with a service loop of appropriate length.

L. No cable shall be installed with a bend radius less than that recommended by the cable manufacturer. Notify the construction manager in the event that a field condition interferes with the proper installation of any cables or equipment.

M. All RJ-45 connectors used for audiovisual transport shall utilize rugged connectors.

N. Grounding Procedures: In order to minimize problems resulting from improper grounding and to achieve maximum signal-to-noise ratios, the following grounding procedures shall be adhered to:

1. General: Because of the great number of possible variations in grounding systems, follow good engineering practice, as specified herein, and deviate from these practices only when necessary to minimize crosstalk and to maximize signal-to-noise ratios in the audio and control systems. Inform the Consultant in the event that there is a deviation from the standard grounding practices prior to actually performing the work.
2. System Ground: A single “system ground” shall be established for the system. All grounding conductors shall connect to this system ground. The system ground shall be provided in the equipment rack, and shall consist of a copper bar of sufficient size to accommodate all secondary ground conductors.
3. A copper conductor, having a maximum of 0.1 Ohms total resistance, shall connect the system ground bar to the nearest grounded, metallic electrical conduit of at least 2 inches in diameter. Be responsible for determining if the metallic conduit is properly electrically bonded to the building ground system, and shall show the grounding path of a document that is provided with the system documentation.
4. Secondary system grounding conductors shall be provided from all ungrounded equipment in each area, to the primary system grounding point for the area. Each of these grounding conductors shall have a maximum of 0.1 Ohms total resistance.
5. Under no conditions shall the AC neutral conductor, either in the power panel or in a receptacle outlet, be used for a system ground.

O. Audio Cable Shields: All balanced audio cable shields shall be grounded at one point only.

P. For ungrounded portable equipment, such as microphones, the shield shall be connected at both ends but grounded at only one end.

Q. Non-continuous cable supports

1. Audiovisual cables shall be supported AFC with adjustable non-continuous cable supports.
2. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of audiovisual cables.
3. Non-continuous cable supports shall have flared edges to prevent damage while installing cables.
4. Installation and configuration shall conform to the requirements of the current revision levels of ANSI/ EIA/TIA Standards 568 & 569, NFPA 70 (National Electrical Code), applicable local codes, and to the manufacturer’s installation instructions.
5. Do not exceed load ratings specified by manufacturer.
6. Follow manufacturer’s recommendations for allowable fill capacity for each size non-continuous cable support.
7. Non-continuous cable supports shall be ERICO Cable Cat TM J-hook series or approved equal.

3.3 REPAIR/RESTORATION

A. Any damage to any installed work or product caused by the unpacking, transporting, assembly, connecting, or configuring of the product shall be repaired at no charge to the Owner.

3.4 FIELD QUALITY CONTROL

A. Once installed and the System Checkout is complete, the system shall be demonstrated as operational to the Owner.

1. If the Audio system fails to meet the requirements of this document or those stated by the technical documentation, then the Owner shall reject the installed system and the contractor shall be given notice (either oral or in writing) to correct the failure.
2. If unable to overcome repeated performance deficiencies within thirty (30) days, and if requested to do so by the Owner, remove the equipment and replace at no expense to the Owner.
3. No warranties shall begin until the Owner has authorized final acceptance in writing.
4. Right to Revoke Acceptance: If any equipment and/or goods which have been previously accepted, specifically or by the making of payment, are found to have defects, damage, deficiencies, or fail to conform to the specification, for any cause not attributable to the Owner, the Owner may revoke acceptance.

B. Conduct pre-acceptance tests

1. Perform all system performance checks on the installed systems prior to final acceptance testing. The Owner / Audio Consultant, may witness the pre-acceptance tests. The Owner / Architect may inspect and operate system components in order to evaluate installation progress and technical compliance prior to acceptance testing.

C. Contractor System Checkout

1. Perform system checkout before acceptance tests are scheduled. Furnish all required test equipment. Perform all work necessary to determine and/or modify performance of the system to meet the requirements of this specification.
2. During performance testing, all equipment shall be operated under standard conditions as recommended by the manufacture.
3. Test all audio and video systems for compliance with the Performance Standards using test procedures that follow later in this specification.
4. Maintain documentation of all performance tests for reference by Consultant during the System Acceptance Tests.
5. At the conclusion of the tests, return all equipment settings to previously calibrated positions.
6. Provide written records of all test results in spreadsheet form.
7. Check all control functions, from all controlling devices to all controlled devices, for proper operation.
8. Adjust, balance, and align all equipment for optimum quality and to meet the manufacturer's published specifications. Establish and mark normal settings for all level controls, and record these settings in the "System Operation and Maintenance Manual."
9. Provide testing results and settings for all equipment and systems to the Audio Consultant at least three (3) business days prior to System Acceptance Testing.
10. Provide the Audio Consultant with all test results, manuals, software, as-built documentation, etc. prior to acceptance testing.

11. Inform the Owner and Audio Consultant that the systems are ready for System Acceptance Testing. The system shall be considered ready for acceptance testing when the following conditions are met:

    a. Audio Contractor has pre-tested all systems such that all sub-systems, functions, software, and equipment are de-bugged and operational
    b. Audio Contractor has supplied the Audio Consultant with the written test results and documentation as listed above for all rooms and systems
    c. Audio Contractor has supplied the Audio Consultant with close out (manuals, training materials, and other as-built) documentation revised to reflect comments and/or revisions arising from the review cycles listed elsewhere within this document

D. Final Acceptance Test

1. Testing will be performed with the Owner (or its designees) present to determine that the Audio system equipment satisfies the manufacturers' performance specifications and that the Audio system installed satisfactorily performs the functions required by this specification. Conduct formal pre-acceptance tests prior to the Owner's acceptance testing to ensure that the performance and functional specifications are satisfied by the installed system and the system is ready for the Owner's acceptance. The Audio contractor shall verify in the owner's presence that the installed Sound System satisfies the performance and functional requirements through formal acceptance testing. The Audio contractor shall be responsible for staging each room to be tested, and shall have sufficient personnel on site to run multiple systems at once (not less than three (3) personnel).

E. Test Equipment

1. Assemble the following test equipment (or equivalent) on site:

    a. Video signal generator, Leader 410C
    b. Combined waveform monitor/vectorscope, Leader 5872A
    c. Audio and Video cable, terminations, adapters, etc.
    d. Audio Test CD
    e. DVD/Blu-Ray
    f. Programmable Audio Test Generator.

F. Audio System Testing

1. Absolute Impedances

    a. Set any speaker level controls at zero attenuation. Measure absolute impedance value of each speaker line at 250, 500, 1000, 2000, and 4000 Hz without the amplifier connected but with all speakers connected. Impedance must not be below the rated load impedance of respective amplifier and may be any value equal to or above that. Check resistance of lines to all speakers and microphone receptacles with receptacles open and short-circuited.

2. Hum and Noise Level

    a. Test overall hum and noise, it should be at least 60 dB below rated power output of each amplifier with amplifier controls set for optimum signal to noise and full output and with inputs terminated with proper shielded resistor. (150 and 600 ohms).

3. Parasitic Oscillation and RF Pickup

a. Set up system for each specified mode of operation.
b. Use 5 MHZ band with oscilloscope and speaker monitoring.
c. Check to insure that the system is free of spurious oscillation and RF pickup in the absence of any input signal and also with the system driven momentarily to full output at 160 Hz.

4. Buzzes, Rattles, Distortions

a. Apply high quality music signal to the system. Adjust the sound system for frequent peaks at its specified maximum sound pressure level.
b. Apply sine-wave sweep from 50 to 5,000 Hz to 6 dB below full amplifier power.
c. In both cases, listen carefully for buzzes, rattles and objectionable distortion.
d. Correct all causes of such defects. If cause is not from system, promptly notify the architect indicating cause and suggested corrective procedures.

5. Equalize all audio systems for maximum gain before feedback in all room configurations.
6. Record all systems settings and include into Systems Operation manuals

G. Qualification Methods

1. Three methods will be used to qualify the Audio system for acceptance.

a. Inspection - A critical observation of qualifying factors, such as quality of workmanship, equipment placement, routing of cables, adequacy of technical documentation, etc., that do not lend themselves to demonstration or measurement.
b. Demonstration - A process of showing by reason or evidence that a given condition clearly satisfies the requirement.
c. Measurement - A process of determining the actual dimension, capacity, or amount of something, by measuring using calibrated standards.

2. Acceptance of the Work of this Section shall occur after completion of corrections and adjustments required by “Punch List” (as generated during Demonstration and Acceptance Testing of Completed Installation).
3. Owner reserves the right to use equipment, material and services provided as part of Work of this Section, prior to Acceptance, without incurring any obligation to accept any equipment or completed systems until Punch List work is complete and systems comply with Contract Documents.

3.5 GROUNDING

A. The Contractor shall follow all standard NEC and local codes for grounding practices on all of the audiovisual equipment and equipment racks.

B. All RGB video lines to external devices exceeding 100 feet or being powered from different power panels shall have suitable line drivers and isolation as specified herein.

C. It shall be the responsibility of the Contractor to follow good engineering practices. At no time shall there be a compromise in safety or any exception to the NEC and local codes.

D. Ground equipment, racks, and audio line shields to independent audio system ground ONLY as shown on drawings.

E. Ground all conduits ONLY to power system ground. Insulate all conduits and electrical boxes from this system including equipment racks, and audio system ground.

F. Ground case of power strips/channels in equipment racks to the racks and insulate from power system ground.

G. Provide a separate ground lead from each amplifier chassis and from each of the other items of equipment normally requiring grounding to the rack ground buss.

H. Insulate all conductors in conduit, including shields, from the conduit, back boxes, and from each other for the entire conduit length.

I. At each group of racks, provide a single labeled Isolated Ground bus bar terminal strip to land the individual labeled rack grounds.

J. At each rack, provide a lug bonded to the rack frame with a minimum #12 TW stranded wire to the Isolated Ground bus central to the rack group.

K. Equipment signal ground shall be to the Isolated Ground System via the green wire of the equipment power cord. Where equipment uses two (2) wire power cord, provide a green bond wire to rack IG bus bar, with gauge equal to the equipment main's power supply conductors.

L. Cable shields shall only be grounded by a single path to Isolated Ground.

M. Shields shall be tied to Isolated Ground at the driving or transmitting end of a run or circuit only, unless otherwise noted.

N. The resistance of the ground system from common ground point at racks to building ground point shall not exceed 0.1 ohm.

O. Provide isolated ground receptacles typical for all power receptacles for all equipment.

P. The Contractor shall ensure that ONLY the Local Sound System equipment is connected to the Local Sound System dedicated Ground system.

3.6 SEISMIC SUPPORTS, SUPPLEMENTARY STEEL AND CHANNELS

A. Provide all supports, supplementary steel and channels required for the proper Seismic installation, mounting, and support of all work installed under this Section.

B. All supports, supplementary steel and channels shall be furnished, installed, and secured with all fittings, support rods, and appurtenances required for a complete support or mounting system.

C. Supplementary steel and channels shall be firmly connected to the building construction in a manner approved by the Owner prior to the installation of same. Submit to the Owner, the locations proposed for using supplementary steel and channels for the support of equipment, fixtures, and raceways. The submittal shall indicate the mounting methods, size, and details of the supports, channels and steel. Submittal shall also indicate the weight that the supports, channels, and supplementary steel are to carry.

D. The type and size of the supporting channels and supplementary steel shall be of sufficient strength and size for seismic restraint and shall allow only a minimum deflection in conformance with the channel and supplementary steel manufacturer's requirements for loading.

E. All supplementary steel and channels shall be installed in a neat and workmanlike manner, parallel to the walls, floor, and ceiling construction. All turns shall be made with 90-degree and 45-degree fittings, as required to suit the construction and installation conditions.

F. All supplementary steel, channels, supports, and fittings, shall be Underwriters' Laboratories, Incorporated-approved, be galvanized steel, and be manufactured by Steel City, Unistrut, Power-Strut, T. J. Cope, Chalfant, or approved equal.

G. Provide supports to meet the required Seismic rating, as indicated under "Part One" of this Specification.

H. Provide beam clamps with set screws (C-clamp type).

I. Work under this Section shall be held in place by Seismic-rated methods.

J. Supporting from the roof decking will not be acceptable.

K. Provide expansion anchors on masonry units or brick work. Power-actuated supports will not be accepted.

L. Provide stainless steel or corrosion-resistant supports in corrosive areas, or in wet or damp areas.

M. Support work from the building structure, independent of suspended ceilings, roof deck, or other trades work. Where ductwork, pipes, pipe racks, type of building construction materials, or structural framing members provide obstruction or difficult support means, hanger rods shall be used in association with horizontal sections of steel support channels, in an approved manner.

N. All work shall be installed in a rigid and satisfactory manner, and shall be supported by bar hangers in frame construction, or shall be fastened directly with wood screws on wood, bolts with expansion shields on concrete, or brick toggle bolts on hollow masonry units, and machine screws or welded threaded studs on metal. Threaded studs of the proper type and holding capacity, driven-in by a power charge, and provided with lock washers and nuts, are acceptable for mounting of equipment on solid concrete walls or slabs.

O. Obtain written permission from the Owner to allow use of power-activated charges. Use only properly trained and licensed operators.

P. Do not use power charge-driven supports for any work that is to be hung from a horizontal surface without written permission from the Owner.

Q. Preset inserts of the proper type and holding capacity shall be used in overhead slab construction wherever possible.

R. Provide lateral supports for work to prevent excessive movement during a seismic event, using rods, braces, or galvanized or stainless steel cables.

S. Pendants, supports, or hanging rods longer than 12 inches (300mm) shall be laterally braced.

T. Where installed in damp, wet areas, and areas requiring wash-down, all surface-mounted panels, boxes, junction boxes, conduits, etc., shall be supported by spacers to provide clearance between wall and equipment.

3.7 TRAINING

A. Training see section 1.12

B. Training sessions by either the manufacturer or an authorized manufacturer's representative shall be videotaped for all applicable features, functions, programming and operations for owner's future reference.

C. As a minimum, training sessions shall consist of the following:

1. General project information and review shall be by the General Foreman or Superintendent of the Trade.
2. Specific system training with a detailed description of how the system will operate to meet the performance requirements of the Audiovisual system shall be by a Factory-Trained Representative and shall include:
   a. Video and Audio Systems overview.
   b. Start up, shut down, and reset procedures.
   c. Hands on training on all system hardware and features.
   d. Basic troubleshooting techniques.

3. Provide a troubleshooting guide to identify the source of system problems.

D. During the instruction period the Operating and Maintenance Manual shall be used and explained.

E. The Operating and Maintenance Manual material shall be bound in 3-ring binders and indexed. On the edge of the binder provide a clear see-through plastic holder with a typed card indicating the Project name, the Owner's name, the installer's name and the Volume number (e.g., Vol. No. 1 of 2).

F. Provide name, address, and telephone number of the manufacturer's representative and Service Company for all items supplied, so that the source of replacement parts and service can be readily obtained.

1. Include copies of manufacturers and installer's warranties and maintenance contracts, and performance bonds properly executed and signed by an authorized representative.
2. Include copies of all test reports and certifications.

3.8 ACCEPTANCE DEMONSTRATION

A. Systems installed under this Section shall be demonstrated to the Owner and Owner. Demonstrations are in addition to necessary testing and training sessions. Notify all parties at least seven (7) days prior to the scheduled demonstration. Schedule demonstrations in cooperation with, and at times convenient to, all parties, and so as to not disturb ongoing activities.

1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain audiovisual system equipment.
2. Demonstrate methods of determining optimum alignment and adjustment of components and settings for system controls.
3. Review equipment list and data in maintenance manuals. Systems shall be tested prior to the demonstrations and each system shall be fully operational and tested prior to arranging the Acceptance Demonstration. Final payments will be withheld until a satisfactory demonstration is provided for all systems indicated or requested.

B. If the demonstration is not complete, performing all functions, features and connections or interfaces with other systems, or if there is a failure during the demonstration, additional demonstrations shall be arranged. Provide and pay for all costs, labor, and expenses incurred for all attendees for each additional demonstration required for acceptance and demonstration of complete system operation.

C. Demonstrations shall be scheduled in ample time to complete all activities prior to final acceptance and Owner occupancy. Demonstrations shall take place at least 30 days prior to the scheduled project completion date and 30 days prior to owner's use and occupancy.

D. As a minimum, provide demonstrations for systems indicated under "Work Included" under Part One of the Specifications. Provide demonstrations of additional systems as requested by the Owner.

3.9 PROJECT OWNER COORDINATION

A. Prior to Substantial Completion of the project and in ample time to address and resolve any coordination issues, request and arrange meetings between the Owner, Owner's Vendors and Consultants, to discuss the Scope of Work for each system being provided, and the interface required for a fully functional and operational system upon project completion. Initial meetings shall be scheduled three months prior to the scheduled Substantial Completion date, or as soon as Submittals are submitted and reviewed for projects with shorter schedules.

B. At these meetings, the required interface shall be reviewed with the Owner, Requests for information required to complete programming or for coordination shall be presented, and system operation and philosophy shall be discussed.

C. Additional meetings shall be held as requested by any party so that all issues are resolved and with the goal and intent that all systems are fully operational and functional upon project Substantial Completion, and that the responsibility for all components required is clearly established.

3.10 CLEANING UP

A. Upon completion of all work and testing, thoroughly inspect all exposed portions of the installation and completely remove all exposed labels, markings, and foreign material.

B. The interior of all boxes and cabinets shall be left clean; exposed surfaces shall be cleaned and plated surfaces polished.

C. Repair damage to finished surfaces resulting from work under this Section.

D. Remove material and equipment from areas of work and storage areas.

E. All equipment shall be clean from dirt, dust, and fingerprints prior to final acceptance.

F. Touch up all damaged pre-finished equipment using materials and methods recommended by the Manufacturer.

3.11 PROJECT CLOSEOUT

A. Provide close-out submittals as required herein, including the following close out submittals.

1. Operation and Maintenance Manuals.
2. Record Drawings.
3. Warranties
4. Test Reports.
5. Extra Materials.

B. Obtain written receipts of acceptance close-out submittals submitted. Receipts shall specifically detail what is being delivered (description, quantity, and specification section) and shall be dated and signed by firm delivering materials, and by the Owner's Representative.

3.12 SCHEDULES

A. Equipment List

1. In part 2 of this specification is the equipment list for this space. Each of these items shall be priced using both the equipment make and model shown, or components with equivalent functionality and of newer make, which meet or exceed the performance characteristics that are outlined for each component in the list. If an item is listed as “Custom,” this means that the Contractor may use any manufacturer’s component appropriate for the function and quality required for that item. Submit a “build” quality shop drawing for approval, on any custom items

END OF SECTION 27 5116

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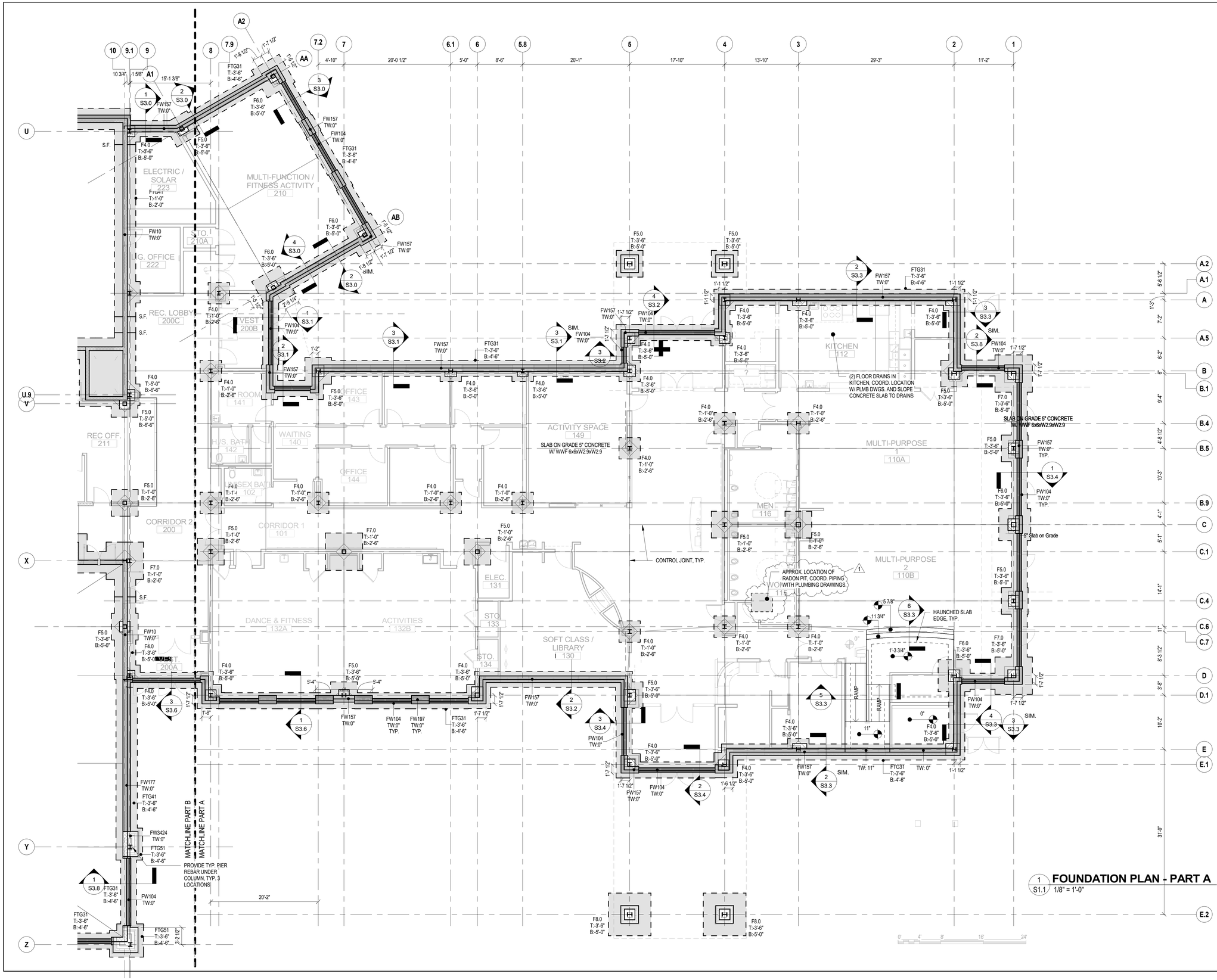

1 FOUNDATION PLAN - PART A
S1.1 1/8" = 1'-0"

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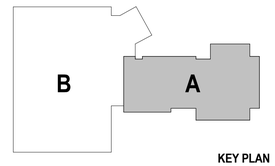

KEY PLAN

DEVELOPMENT OF:

WINDHAM SENIOR & COMMUNITY CENTER

WILLIMANTIC, CONNECTICUT

Project #: 1762

1	ADDENDUM 1	10/2/19

Revisions

Issue Dates:

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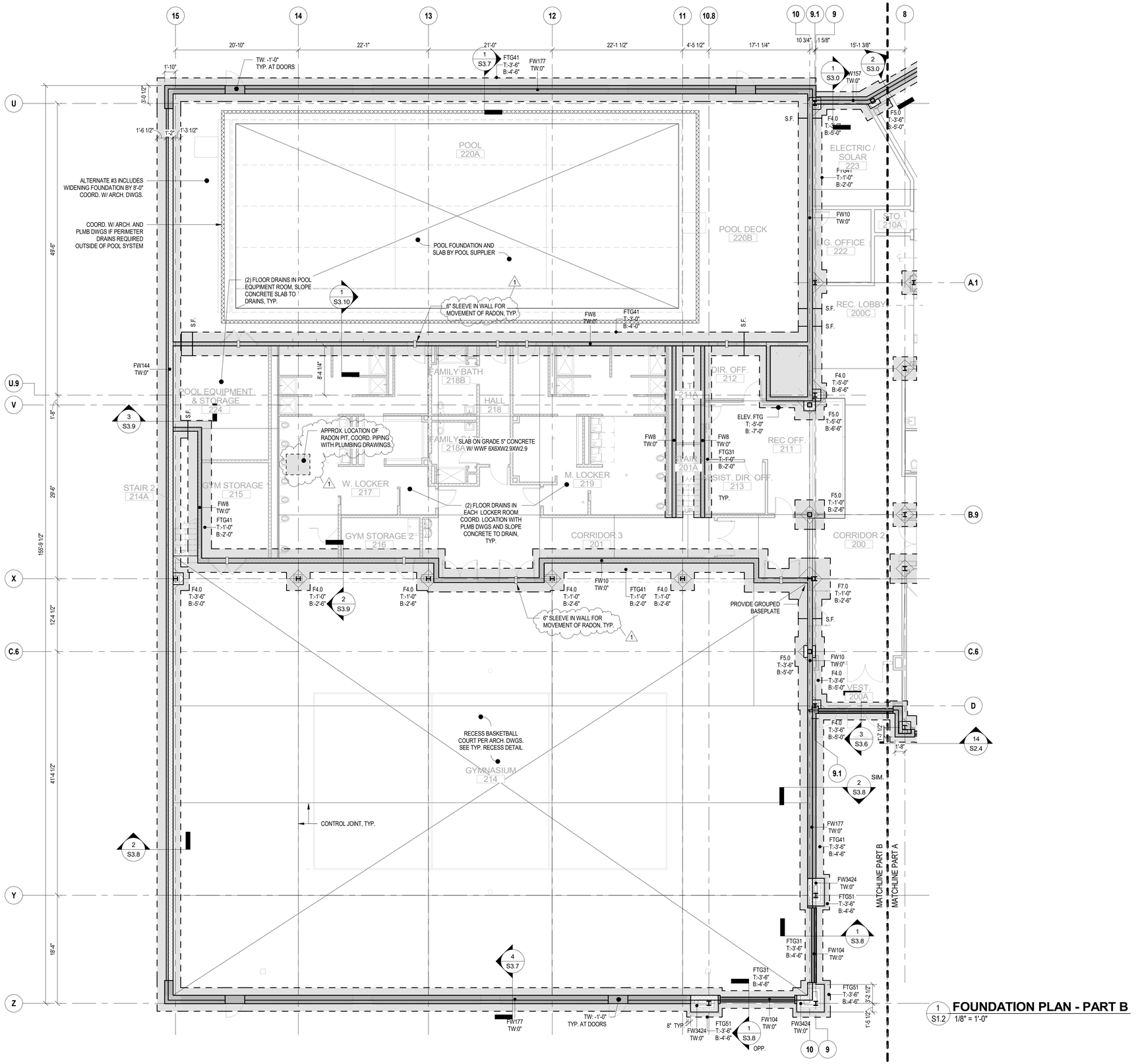
FOUNDATION PLAN - PART A

S1.1



1 FOUNDATION PLAN - PART B
S1.2 1/8" = 1'-0"

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B A

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FOUNDATION PLAN - PART B

S1.2

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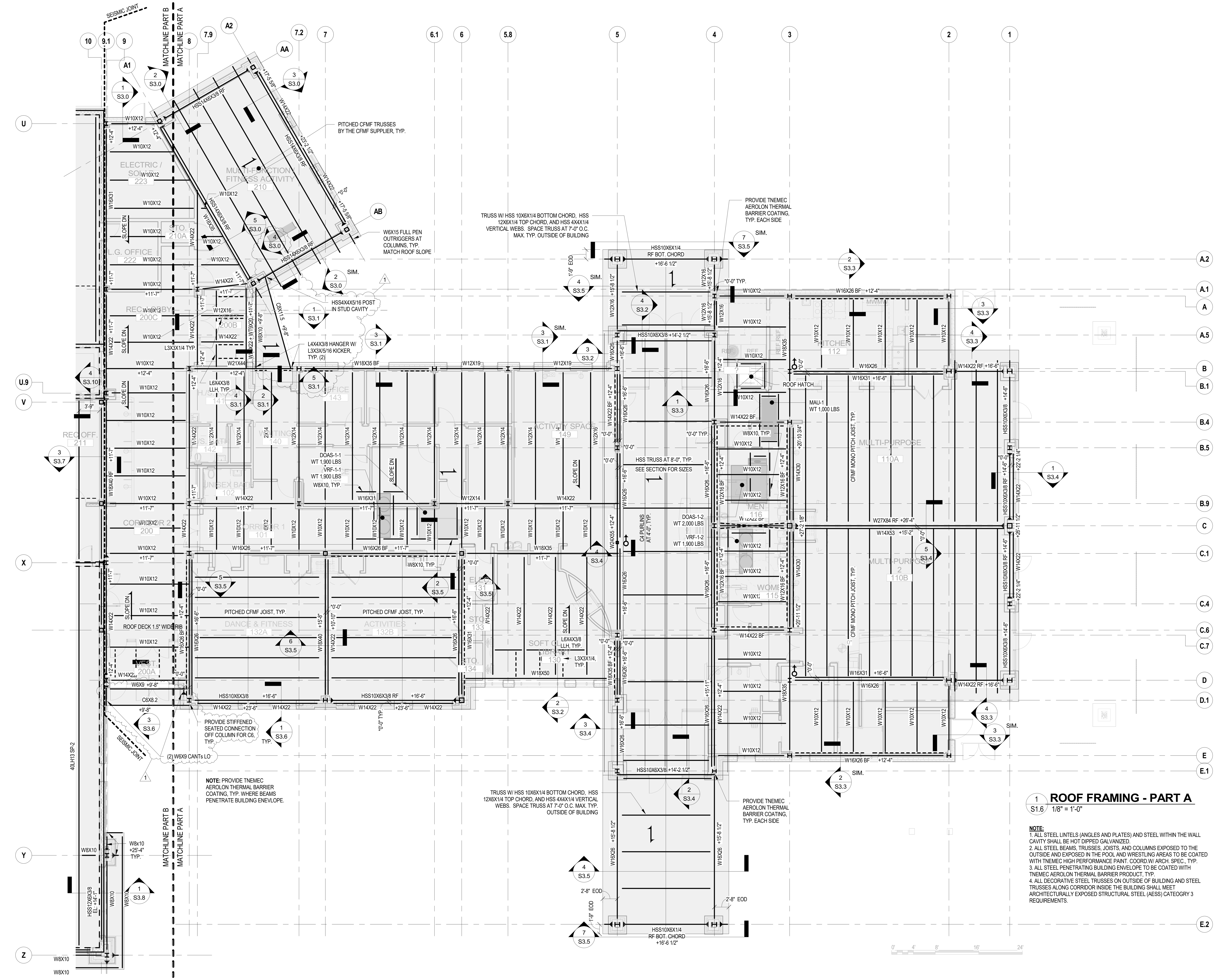

ROOF FRAMING - PART A

1/S1.6 1/8" = 1'-0"

NOTE:
1. ALL STEEL LINTELS (ANGLES AND PLATES) AND STEEL WITHIN THE WALL CAVITY SHALL BE HOT DIPPED GALVANIZED.
2. ALL STEEL BEAMS, TRUSSES, JOISTS, AND COLUMNS EXPOSED TO THE OUTSIDE AND EXPOSED IN THE POOL AND WRESTLING AREAS TO BE COATED WITH TNEMEC HIGH PERFORMANCE PAINT. COORD.W/ ARCH. SPEC., TYP.
3. ALL STEEL PENETRATING BUILDING ENVELOPE TO BE COATED WITH TNEMEC AEROLON THERMAL BARRIER PRODUCT, TYP.
4. ALL DECORATIVE STEEL TRUSSES ON OUTSIDE OF BUILDING AND STEEL TRUSSES ALONG CORRIDOR INSIDE THE BUILDING SHALL MEET ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS) CATEOGRY 3 REQUIREMENTS.

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KEY PLAN: B | A

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ROOF FRAMING PLAN - PART A

S1.6

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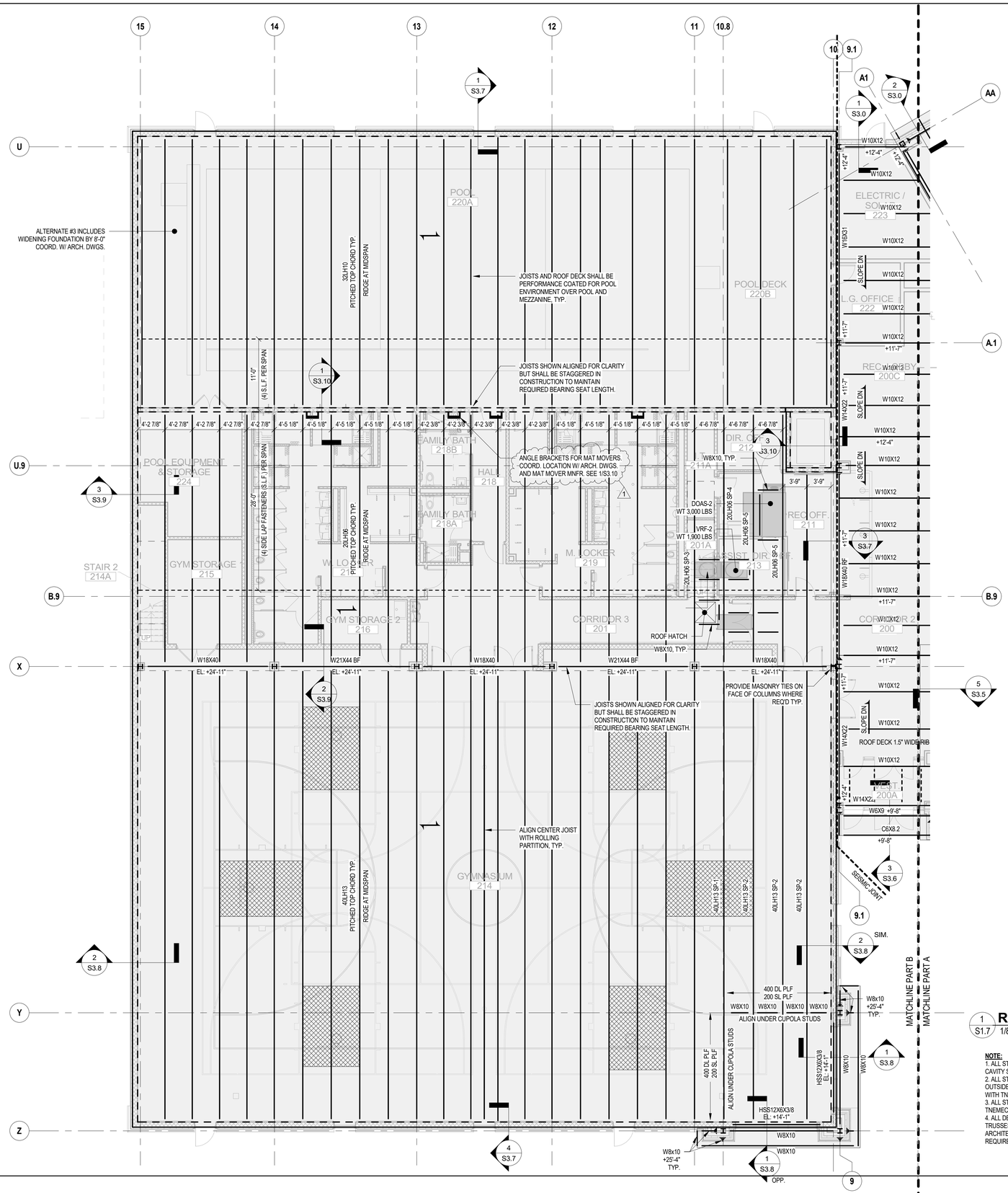
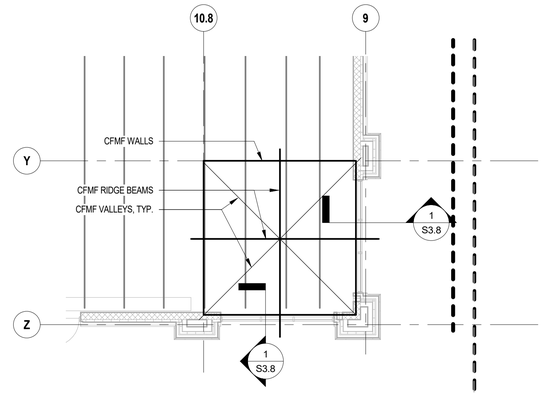
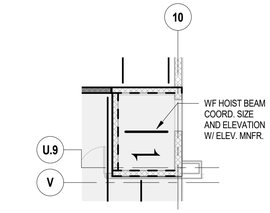




2 S1.7 **HIGH ROOF FRAMING CUPOLA**
1/8" = 1'-0"



3 S1.7 **HIGH ROOF FRAMING ELEVATOR**
1/8" = 1'-0"

LOADING ZONE A:
UNFACTORED, 1,500 LBS CONCENTRATED LOAD AT ANY TWO (2) LOCATIONS ALONG BOTTOM CHORD AT ANY LOCATION IN ZONE SIZE OF ZONE TO BE COORDINATED W/ EXACT PRODUCT AFTER PURCHASE

NOTES:
1. TYPICAL JOIST LOADING IS 200 PLF DEAD LOAD AND 150 PLF SNOW LOAD.
2. UNIFORM AND POINT LOADS SHOWN ON ROOF PLAN ARE IN ADDITION TO TYPICAL LOADING.
3. SNOW DRIFT LOAD SHOWN ON S0.2 IS IN ADDITION TO TYPICAL LOADING.
4. ALL LOADING IS UNFACTORED.
3. LOCATIONS TO BE COORDINATED WITH GENERAL CONTRACTOR AND TRADE CONTRACTOR

4 S1.7 **LOADING ZONE INFORMATION**
1/8" = 1'-0"

1 S1.7 **ROOF FRAMING - PART B**
1/8" = 1'-0"

NOTE:
1. ALL STEEL LINTELS (ANGLES AND PLATES) AND STEEL WITHIN THE WALL CAVITY SHALL BE HOT DIPPED GALVANIZED.
2. ALL STEEL BEAMS, TRUSSES, JOISTS, AND COLUMNS EXPOSED TO THE OUTSIDE AND EXPOSED IN THE POOL AND WRESTLING AREAS TO BE COATED WITH TNEMEC HIGH PERFORMANCE PAINT. COORD.W/ ARCH. SPEC., TYP.
3. ALL STEEL PENETRATING BUILDING ENVELOPE TO BE COATED WITH TNEMEC AEROLON THERMAL BARRIER PRODUCT, TYP.
4. ALL DECORATIVE STEEL TRUSSES ON OUTSIDE OF BUILDING AND STEEL TRUSSES ALONG CORRIDOR INSIDE THE BUILDING SHALL MEET ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS) CATEOGRY 3 REQUIREMENTS.

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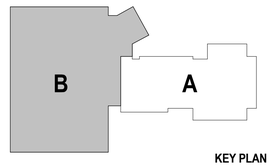

KEY PLAN

DEVELOPMENT OF:

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WILLIMANTIC, CONNECTICUT
Project #: 1762

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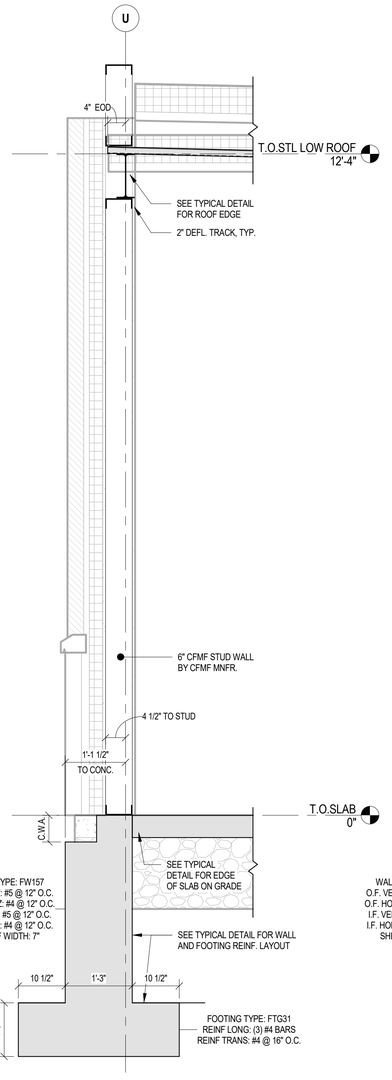
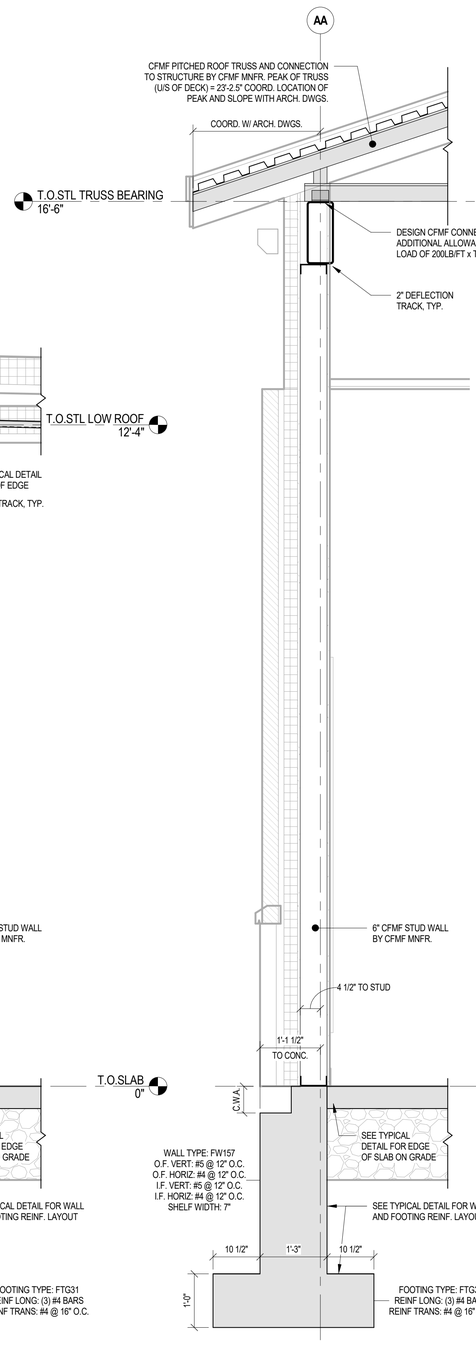
ROOF FRAMING PLAN - PART B

S1.7



1 SECTION
S3.0 3/4" = 1'-0"



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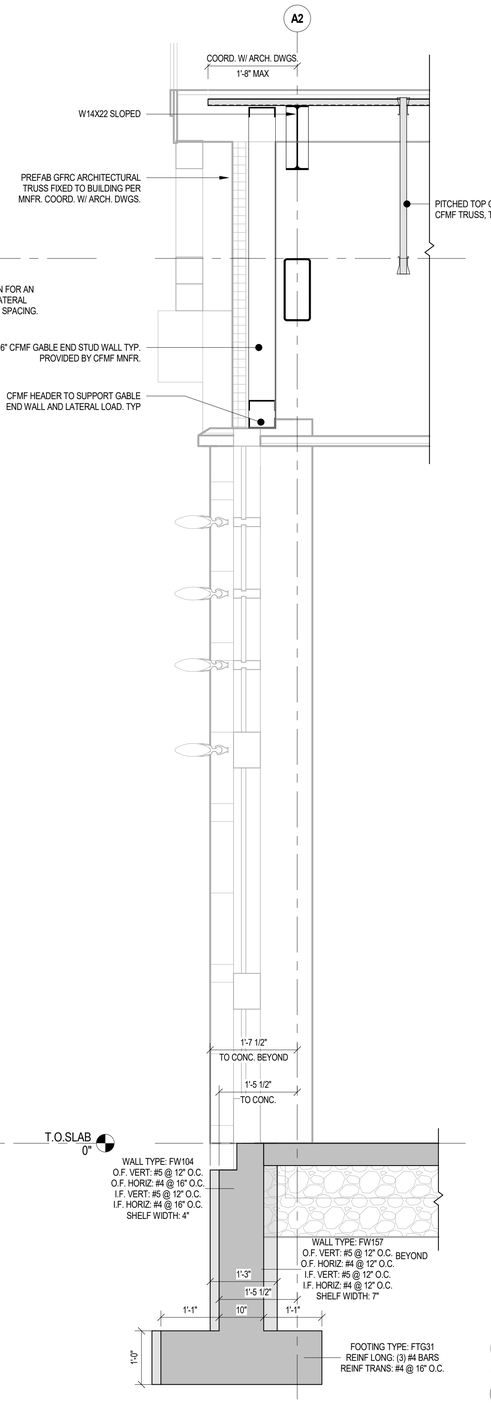

3 SECTION
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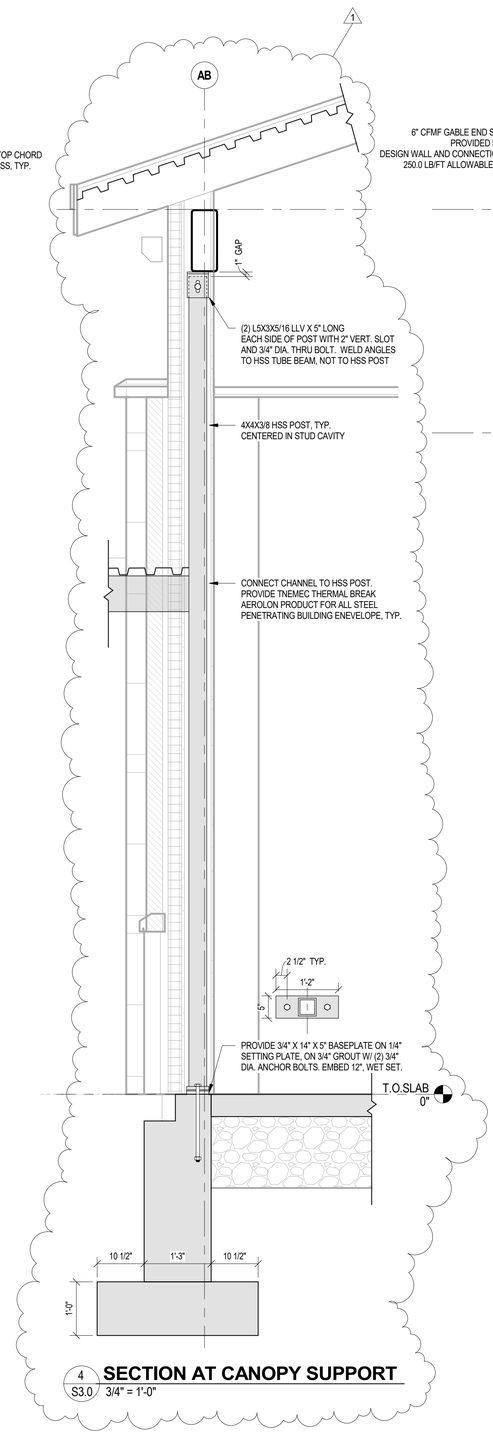
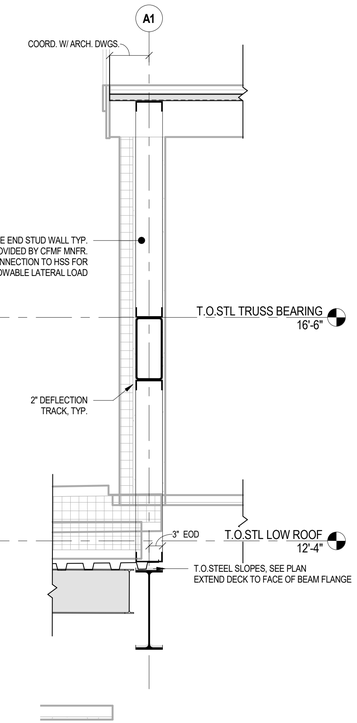


4 SECTION AT CANOPY SUPPORT
S3.0 3/4" = 1'-0"



5 SECTION
S3.0 3/4" = 1'-0"

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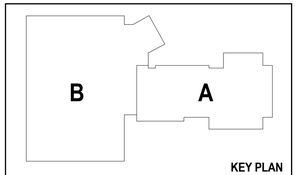

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S3.0

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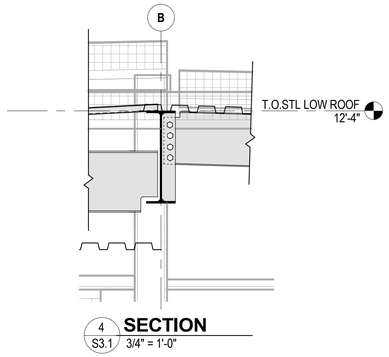

4 S3.1 **SECTION**
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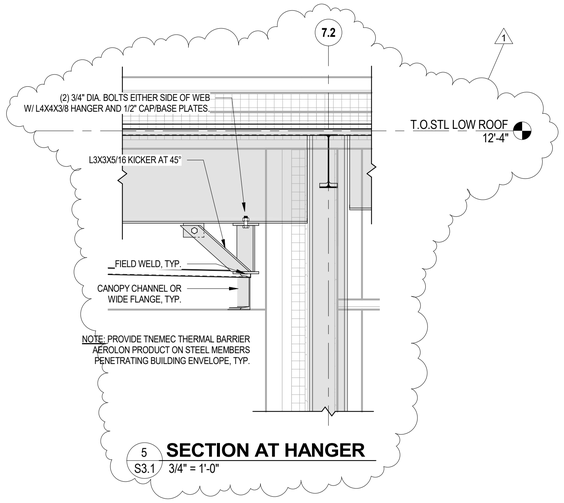

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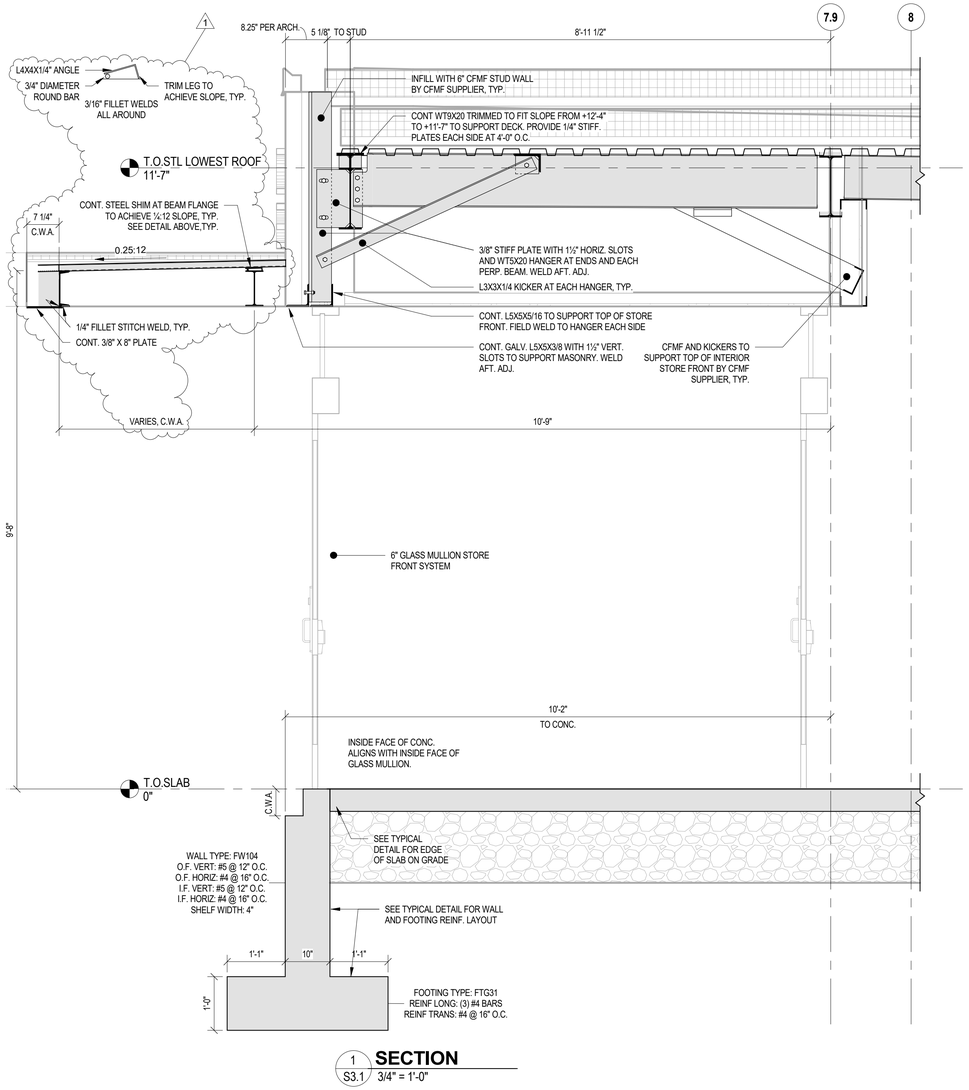

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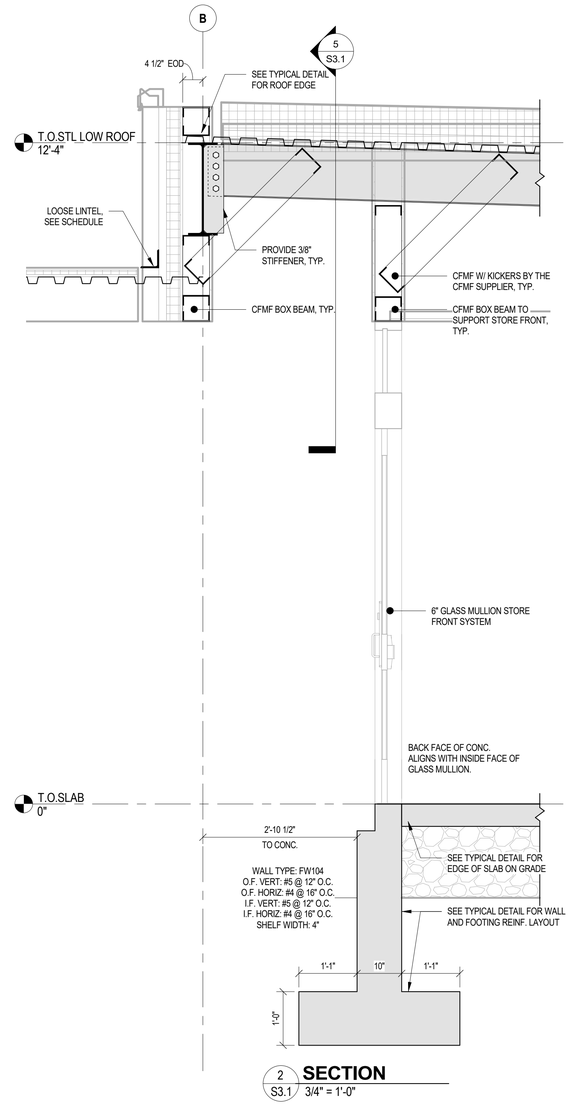

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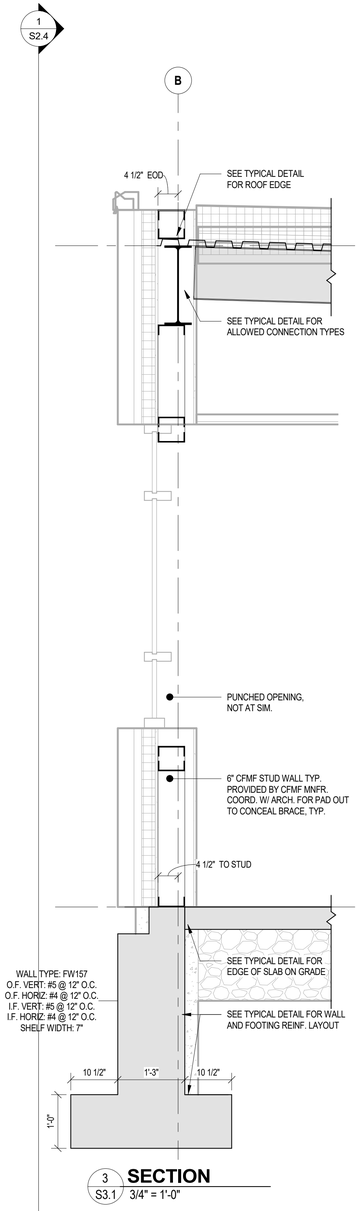
3/4" = 1'-0"



3 S3.1 **SECTION**
3/4" = 1'-0"

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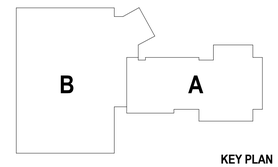

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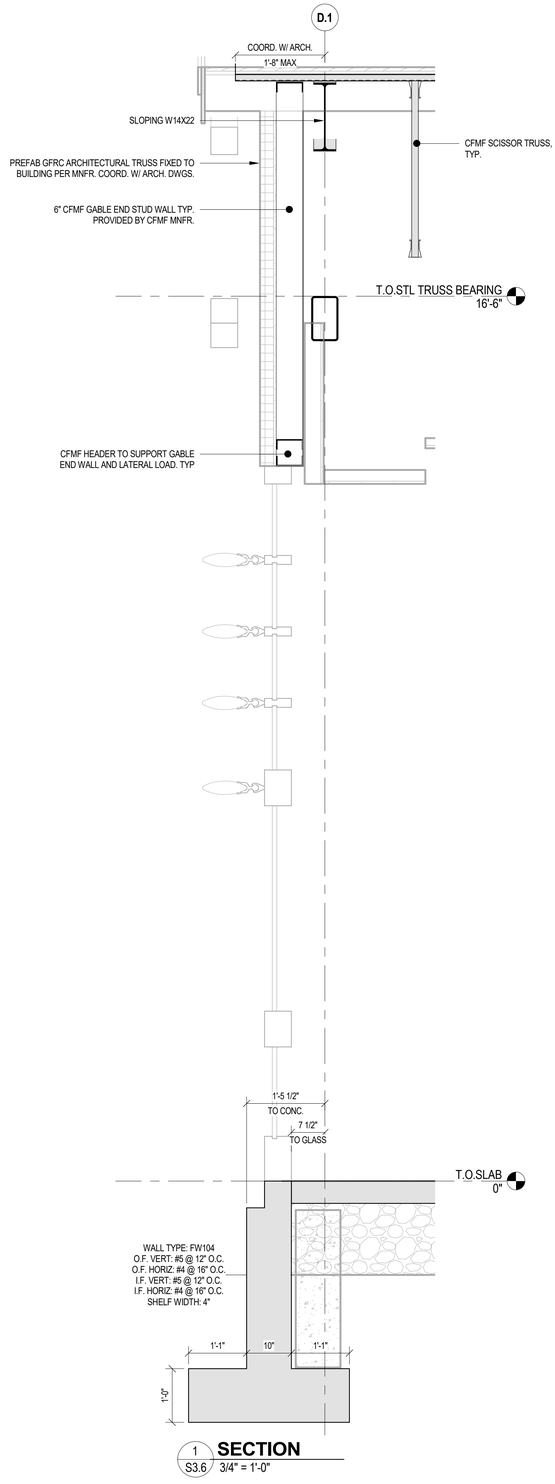

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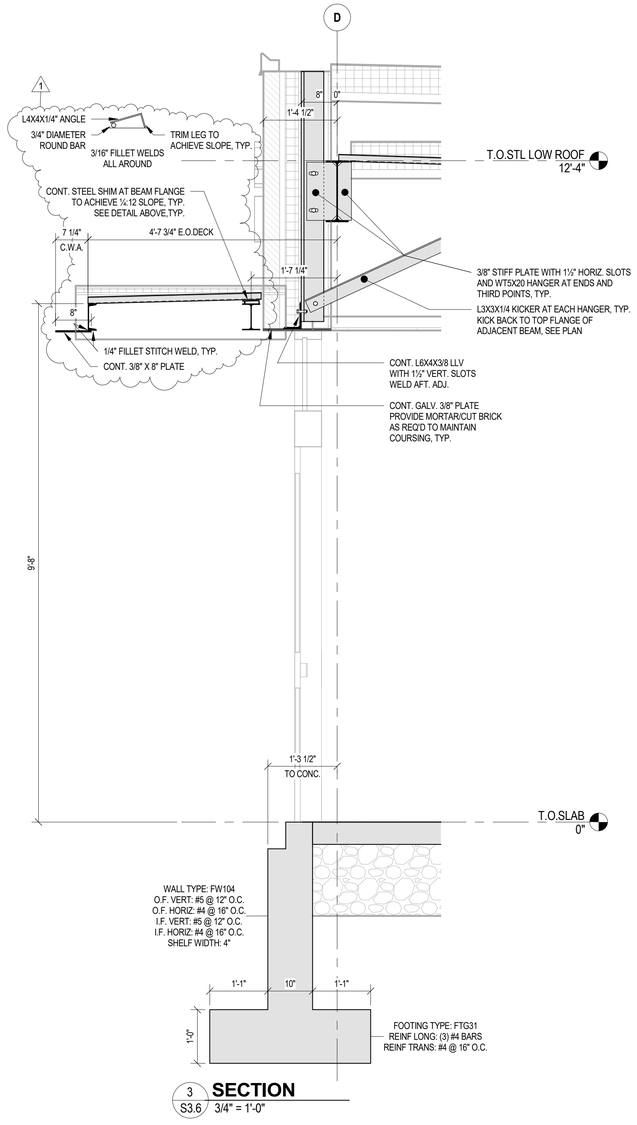

3 SECTION
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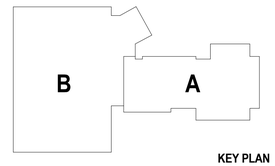

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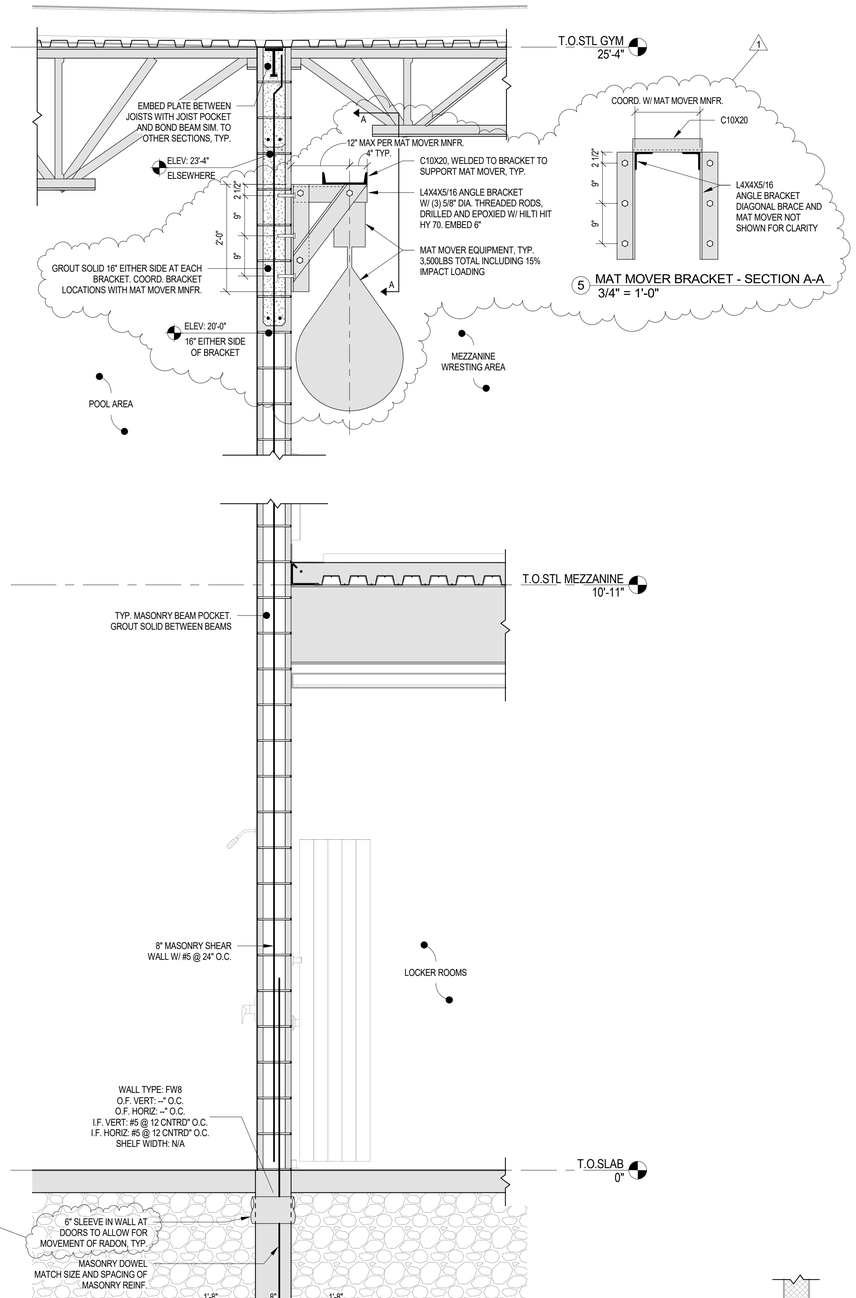
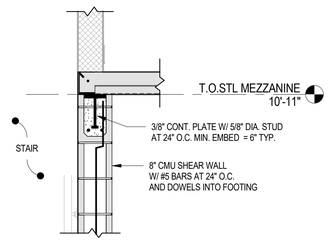


5 MAT MOVER BRACKET - SECTION A-A
3/4" = 1'-0"

1 SECTION
S3.10 3/4" = 1'-0"



2 SECTION
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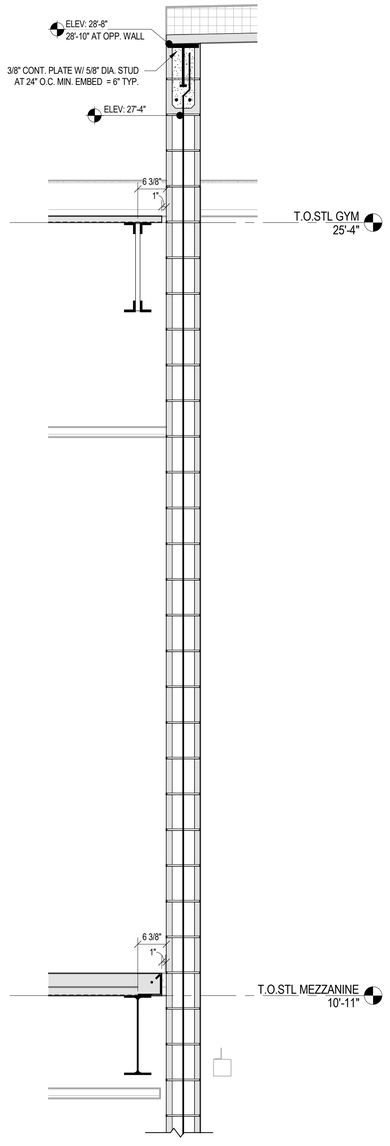
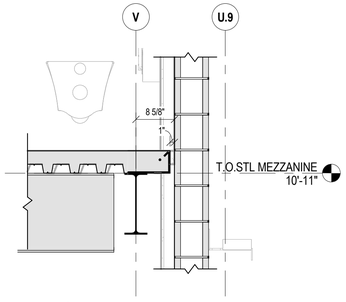


3 SECTION
S3.10 3/4" = 1'-0"



4 SECTION
S3.10 3/4" = 1'-0"

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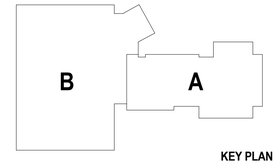

KEY PLAN

DEVELOPMENT OF:

WINDHAM SENIOR & COMMUNITY CENTER

WILLIMANTIC, CONNECTICUT
Project #: 1762

1	ADDENDUM 1	10/2/19

Revisions

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STRUCTURAL SECTIONS

S3.10

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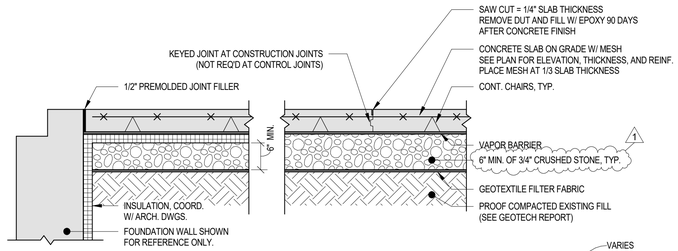
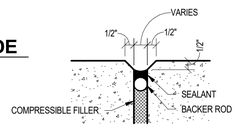
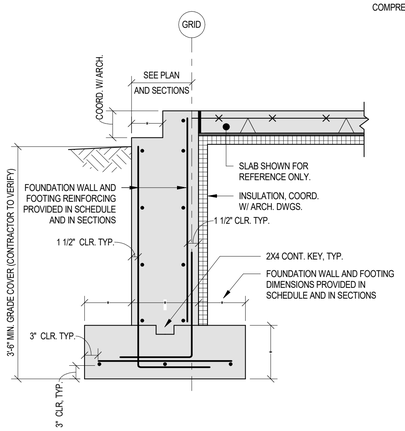


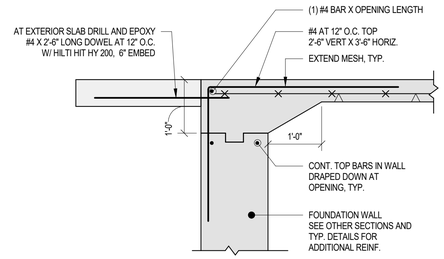
1 S5.1 **TYPICAL EDGE OF SLAB ON GRADE**
3/4" = 1'-0"



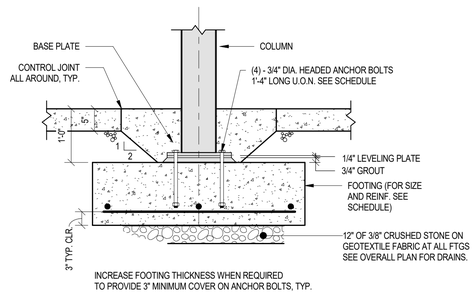
12 **TYPICAL JOINT FILLER**
3" = 1'-0"



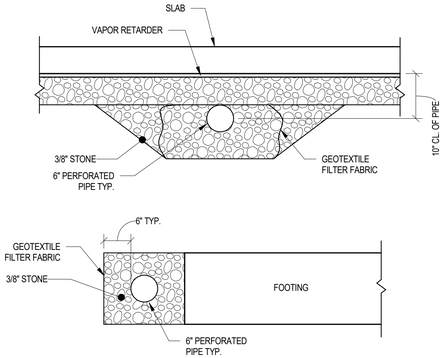
2 S5.1 **TYPICAL WALL AND FOOTING REINFORCING LAYOUT**
3/4" = 1'-0"



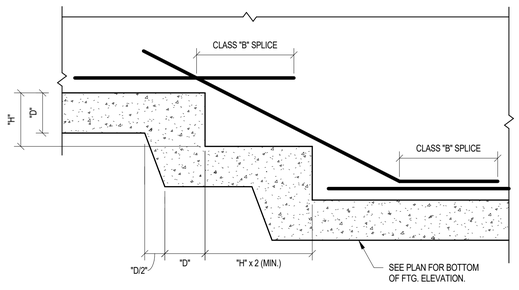
3 S5.1 **TYPICAL EDGE OF SLAB AND WALL AT DOORS**
3/4" = 1'-0"



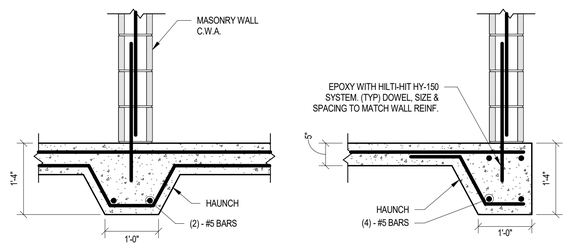
4 **TYPICAL INTERIOR COLUMN BASE PLATE FOOTING DETAIL**
3/4" = 1'-0"



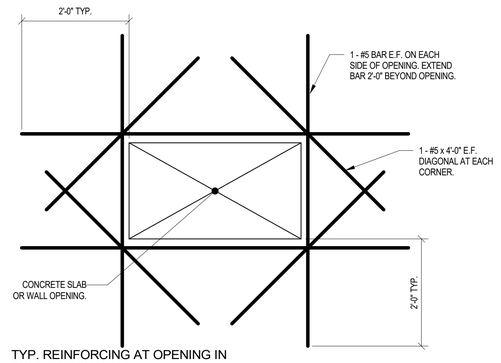
5 **TYP. UNDER DRAIN DETAIL AND FOOTING DRAIN DETAIL**
3/4" = 1'-0"



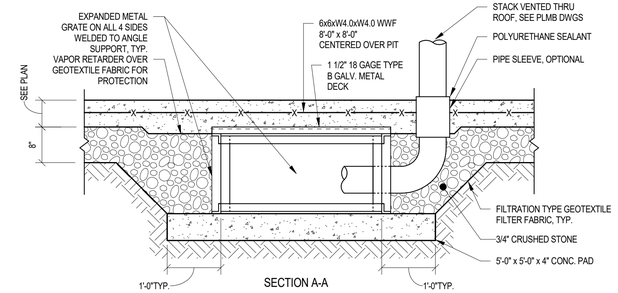
6 **TYP. STEPPED FOOTING DETAIL**
3/4" = 1'-0"



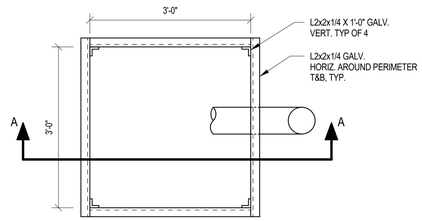
7 **TYP. SLAB HAUNCH AT CMU WALLS**
3/4" = 1'-0"

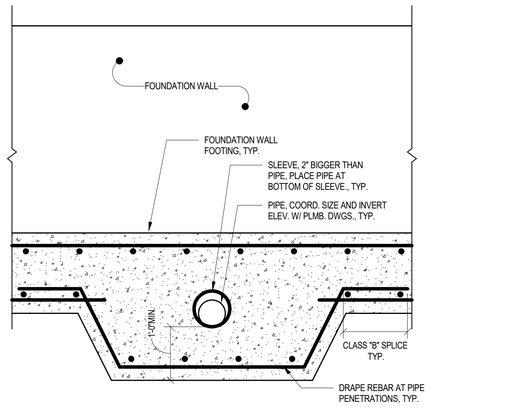


8 **TYP. REINFORCING AT OPENING IN FOUNDATION WALL**
3/4" = 1'-0"

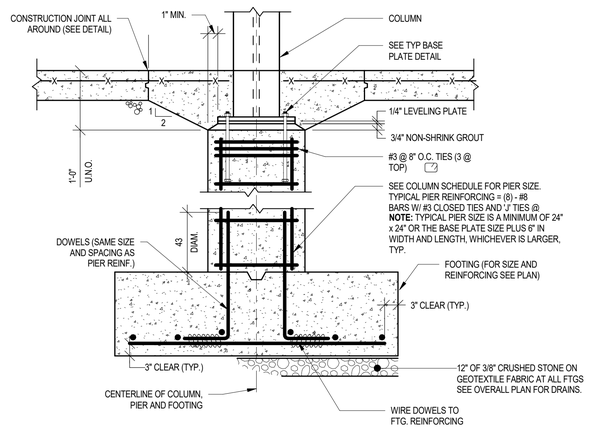


9 **TYPICAL RADON SUCTION PIT**
3/4" = 1'-0"





10 **TYP. PIPE THRU FOOTING**
3/4" = 1'-0"



11 **TYP. PIER DETAIL**
3/4" = 1'-0"

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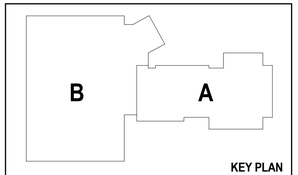

KEY PLAN

1	ADDENDUM 1	10/2/19

Revisions

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DEVELOPMENT OF:

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TYPICAL CONCRETE DETAILS

S5.1

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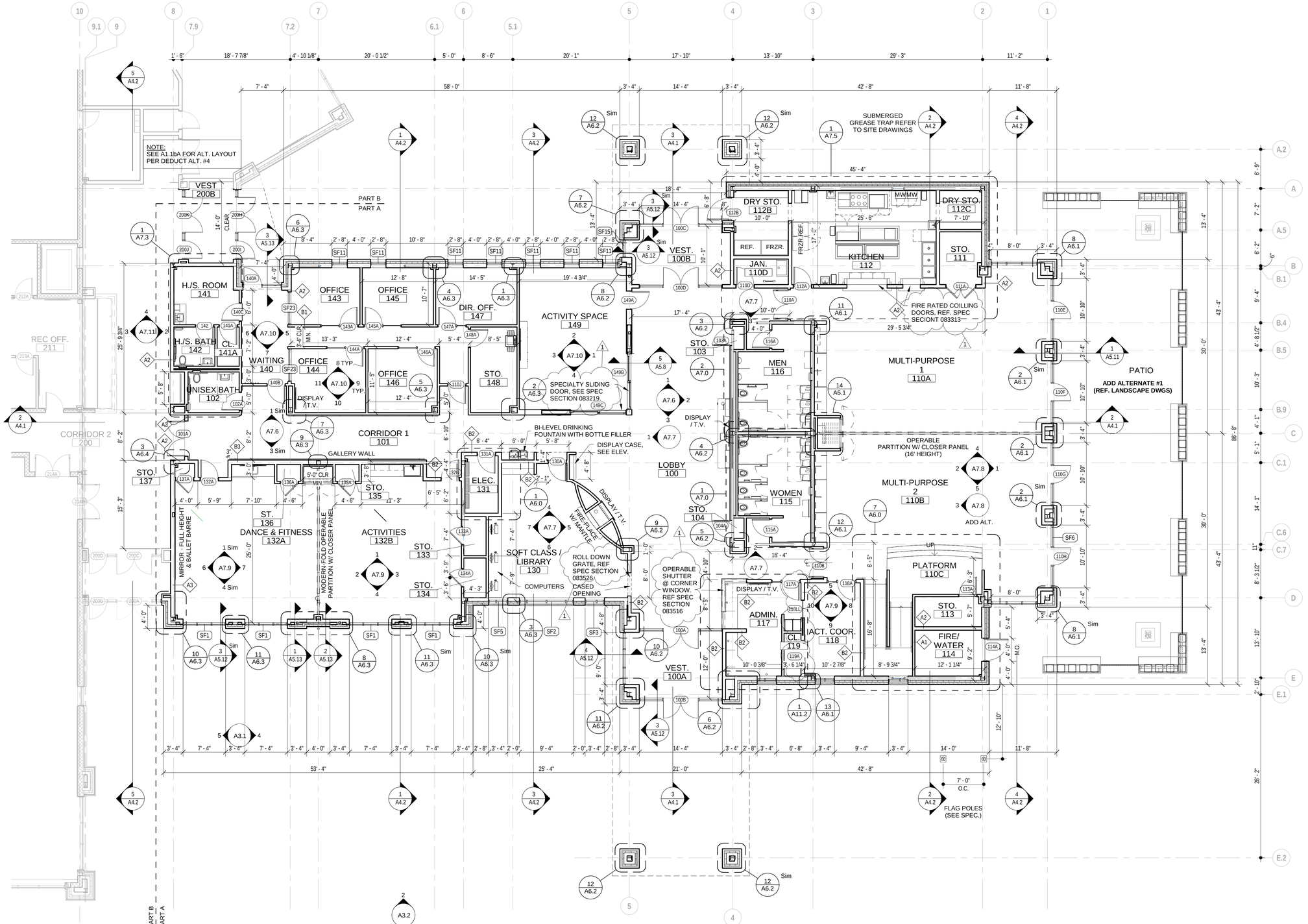

1 **FIRST FLOOR PLAN - PART A**
A1.1ar 1/8" = 1'-0"

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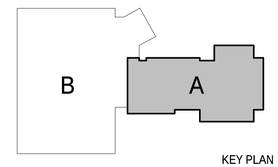

KEY PLAN

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FIRST FLOOR PLAN - PART A

A1.1ar

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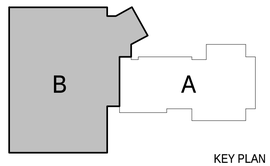

KEY PLAN

DEVELOPMENT OF:

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FIRST FLOOR PLAN - PART B

A1.1br

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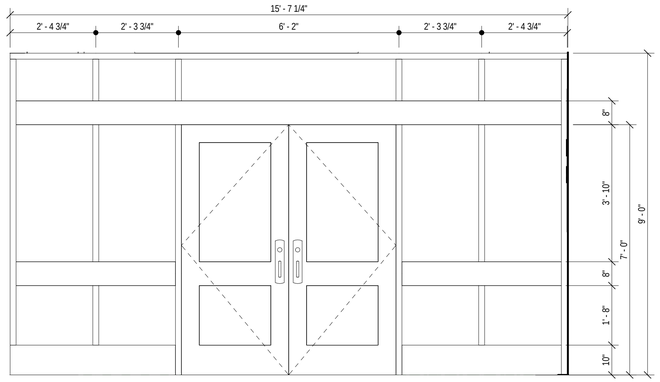
1 A1.1br **FIRST FLOOR PLAN - PART B** 1/8" = 1'-0"

STANDARD INTERIOR PARTITION WALLS TO BE TYPE B1 UNLESS OTHERWISE NOTED

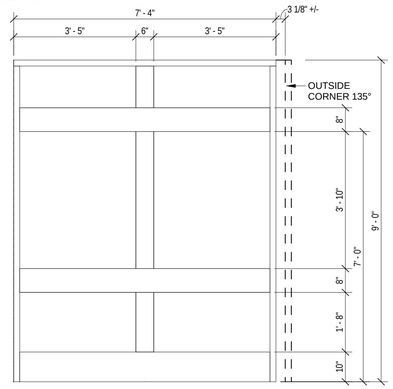
POOL 220A
RECREATION LAP POOL
4 LANES (BASE SCOPE)
(5TH LANE AS ALTERNATE #3 - SEE ALTERNATE DWGS)
(REF. TO POOL DRAWINGS & SPEC.)
RECREATION AREA
DEEP END
SLOPE
ACCESSIBLE RAMP
MECHANICAL POOL COVER
4" PERIMETER TRENCH DRAIN, SLOPE FLOOR 1/4":1' TO DRAIN
POOL DECK 220B
BI-LEVEL DRINKING FOUNTAIN
REFER TO POOL DRAWINGS FOR EQUIPMENT LAYOUT
POOL EQUIPMENT & STORAGE 224
GYM STORAGE 1 215
STAIR 2 214A
W. LOCKER 217
(54) LOCKERS
FAMILY BATH 218A
FAMILY BATH 218B
HALL 218
(58) LOCKERS
M. LOCKER 219
STAIR 201A
I.T. 211A
DIR. OFF. 212
REC OFF. 211
ASSIST. DIR. OFF. 213
COPIER
ELEV.
MOP SINK
GYM STORAGE 2 216
CORRIDOR 3 201
CORRIDOR 2 200
EDGE OF MEZZANINE LEVEL ABOVE
GYMNASIUM 214
42' - 0" WIDTH - YOUTH COURT
84' - 0" LENGTH - HIGH SCHOOL COURT
SLEEVE FOR VOLLEYBALL STANCHION POST
HIGH SCHOOL SIZE 84'x50' BASKETBALL COURT WITH (2) YOUTH CROSS-COURTS (BOTH 42'x58')
HIGH-SCHOOL SIZE VOLLEYBALL COURT
WALL PADDING @ ENTIRE CMU PERIMETER TYP.
WALL PADDING @ ENTIRE CMU PERIMETER TYP., SEE SPEC.
FLOOR CONTROL BOX
2" WALL-TO-FLOOR EXPANSION JOINT ALONG ENTIRE POOL/GYM WALL SEE DETAIL
2" EXPANSION JOINT - SEE DETAIL
(DEDUCT)-ALTERNATE #4 FITNESS ROOM SEE A1.1bA
ELECTRIC / SOLAR 223
MULTI-FUNCTION / FITNESS ACTIVITY 210
POOL ALARM CONTROL #2
STO. 210A
L.G. OFFICE 222
DISPLAY/TV
REC. LOBBY 200C
VEST 200B
PART B
PART A
H./S. ROOM 141
OFFICE 143
H./S. BATH 142
WAITING 140
UNISEX BATH 102
OFFICE 144
CORRIDOR 1 101
DANCE & FITNESS 132A
ACTIVITIES 132B
VEST. 200A



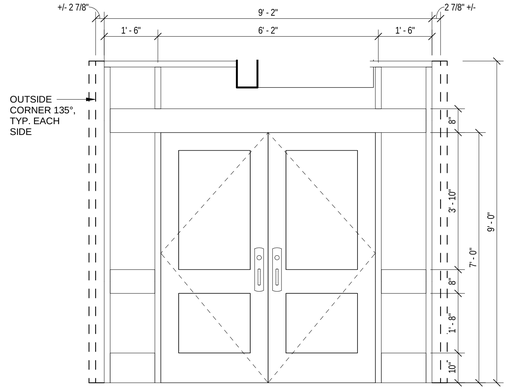
10 **STOREFRONT 24 - ALT4**
A1.1bAr 1/2" = 1'-0"

DOOR SCHEDULE - DEDUCT ALTERNATE #4

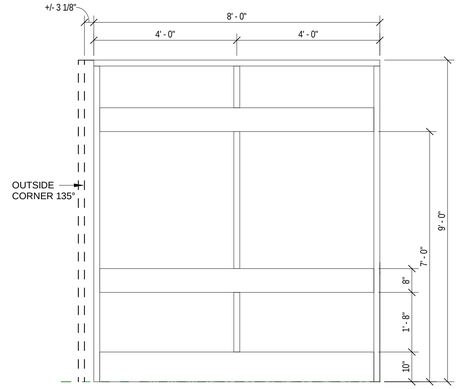
DOOR #	ROOM #	ROOM NAME	DOUBLE LEAF	DOOR					FRAME						HARD WARE		MAG. HOLD-OPEN	RATING		COMMENTS
				WIDTH	HEIGHT	TYPE	MATERIAL	GLAZING	TYPE	MATERIAL	GLAZING	HEAD	JAMB	SILL	SET #	PANIC		UL	STC	
200B-1	200B	VEST	•	6' - 0"	7' - 0"	6	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	J4/A9.5	S5/A9.5	1					REPLACES 200H - BASE BID
200B-2	200C	REC. LOBBY	•	6' - 0"	7' - 0"	6	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	J4/A9.5	S5/A9.5	2					REPLACES 200K - BASE BID
211B	211B	L.G. OFFICE		3' - 0"	7' - 0"	3	FG		FG-2	FG		H2/A9.0	J2/A9.0	-	36					REPLACES 222A - BASE BID
211C	211C	POOL STORAGE		3' - 0"	7' - 0"	3	FG		FG-2	FG		H2/A9.0	J2/A9.0	-	37					
211D	211D	ELECTRIC / SOLAR		3' - 0"	7' - 0"	3	HM		HM-2	HM		H4/A9.0	J4/A9.0	S2/A9.0	17					REPLACES 223A - BASE BID



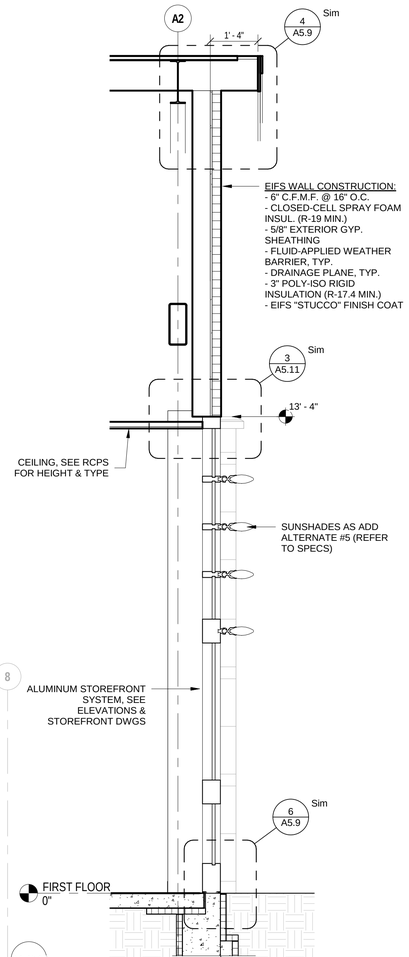
9 **STOREFRONT 27 - ALT4**
A1.1bAr 1/2" = 1'-0"

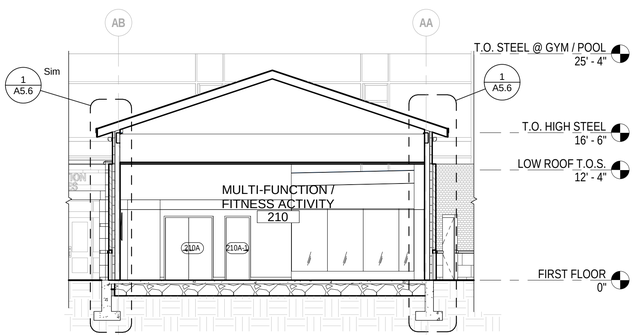


8 **STOREFRONT 26 - ALT4**
A1.1bAr 1/2" = 1'-0"

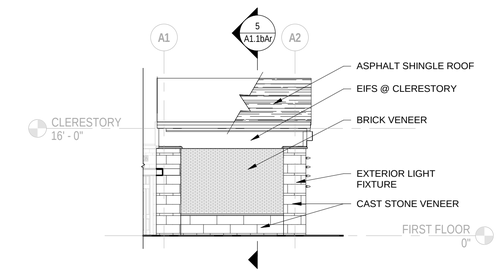


7 **STOREFRONT 25 - ALT4**
A1.1bAr 1/2" = 1'-0"

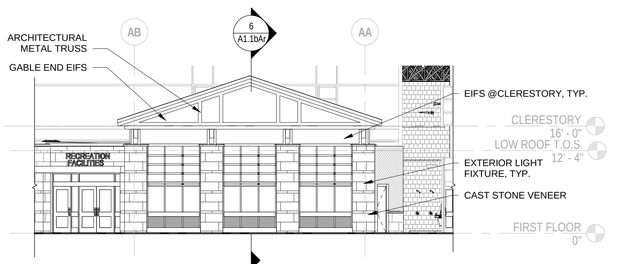




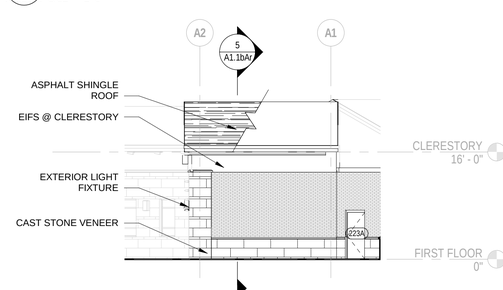
5 **CROSS SECTION THRU FITNESS / ACTIVITY ROOM**
A1.1bAr 1/8" = 1'-0"



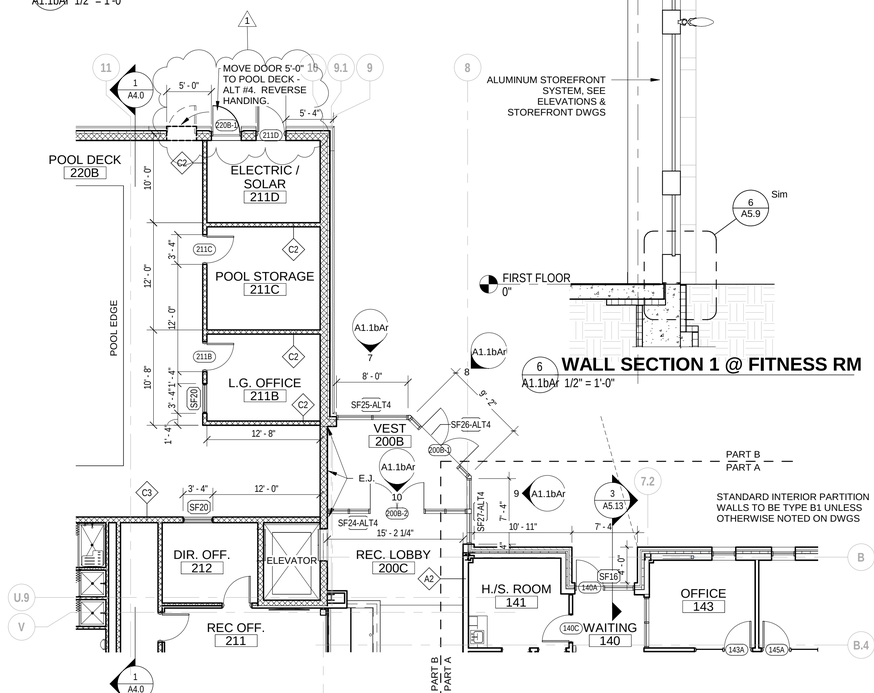
4 **MULTI-FUNCTION 210 - SOUTH EAST ELEVATION**
A1.1bAr 3/32" = 1'-0"



3 **MULTI-FUNCTION 210 - NORTH EAST ELEVATION**
A1.1bAr 3/32" = 1'-0"



2 **MULTI-FUNCTION 210 - NORTH WEST ELEVATION**
A1.1bAr 3/32" = 1'-0"



1 **DEDUCT-ALTERNATE #4 - MODIFIED REC. ENTRANCE w/o FITNESS RM.**
A1.1bAr 1/8" = 1'-0"

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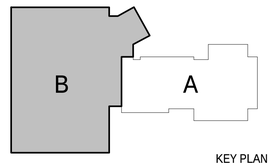

KEY PLAN

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ALTERNATE #4 - FITNESS ROOM DRAWINGS AND PART. DOOR SCHEDULE

A1.1bAr

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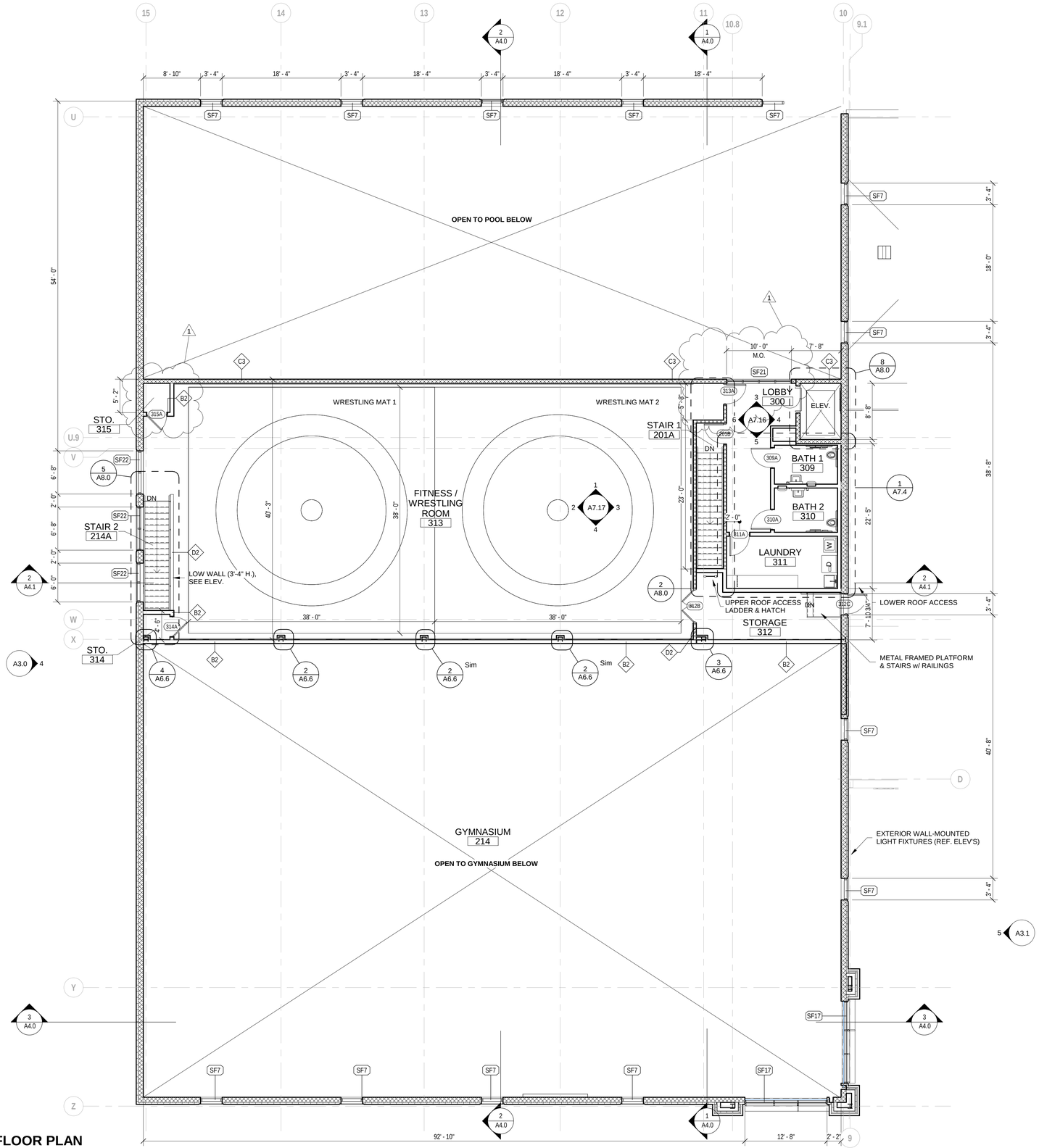

1 A1.2br **MEZZANINE FLOOR PLAN**
1/8" = 1'-0"

STANDARD INTERIOR PARTITION WALLS TO BE TYPE B1 UNLESS OTHERWISE NOTED

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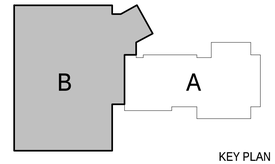

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MEZZANINE FLOOR PLAN

A1.2br

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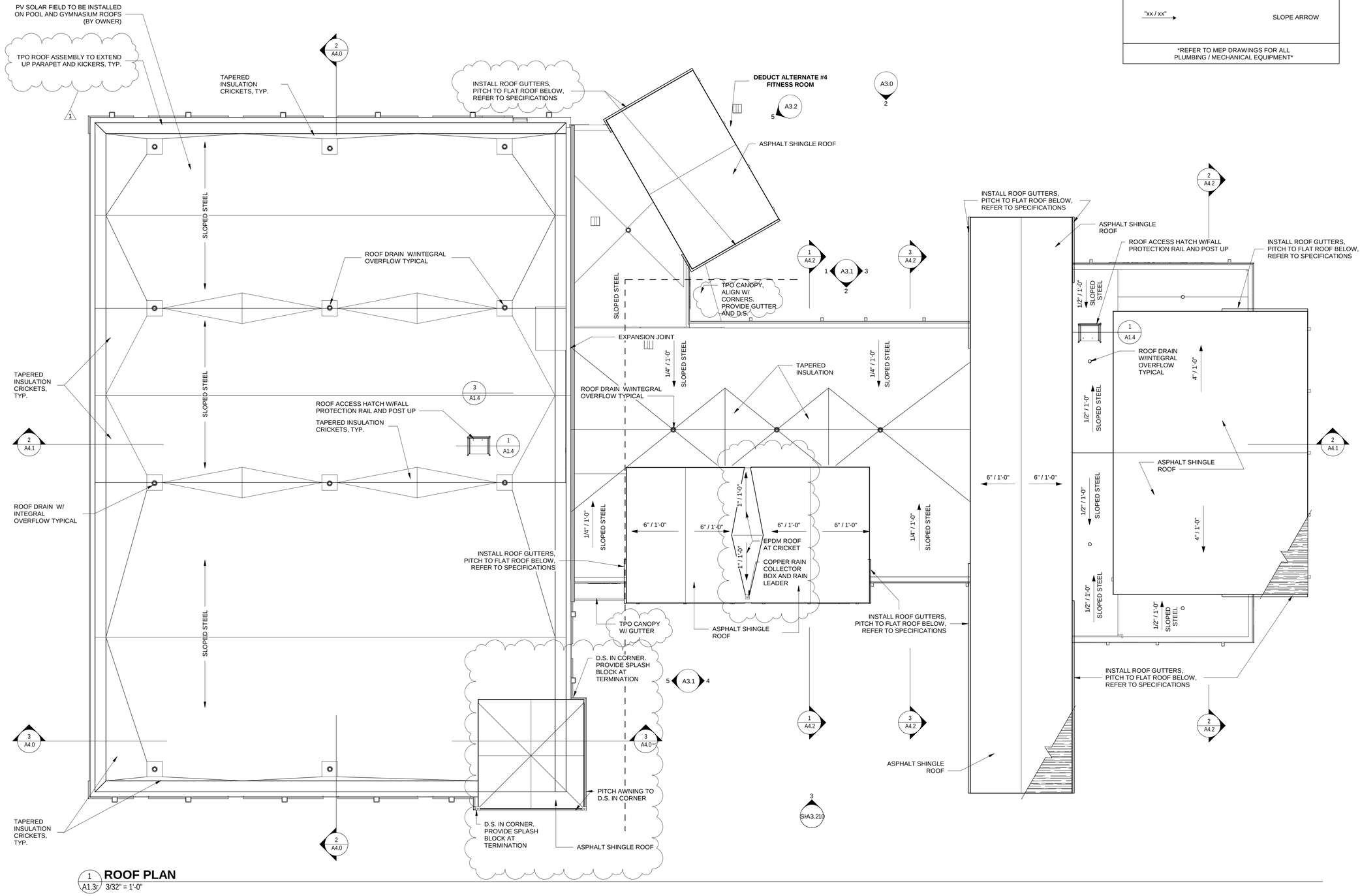

1 A1.3r **ROOF PLAN** 3/32" = 1'-0"

ROOF LEGEND

ROOF DRAIN

"xx / xx" SLOPE ARROW

REFER TO MEP DRAWINGS FOR ALL PLUMBING / MECHANICAL EQUIPMENT

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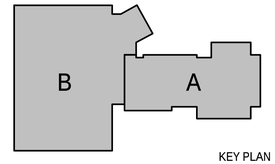

KEY PLAN

DEVELOPMENT OF:

WINDHAM SENIOR & COMMUNITY CENTER

WILLIMANTIC, CONNECTICUT

Project #: **1762**

1	ADDENDUM 1	10/2/19

Revisions

Issue Dates:

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ROOF PLAN

A1.3r

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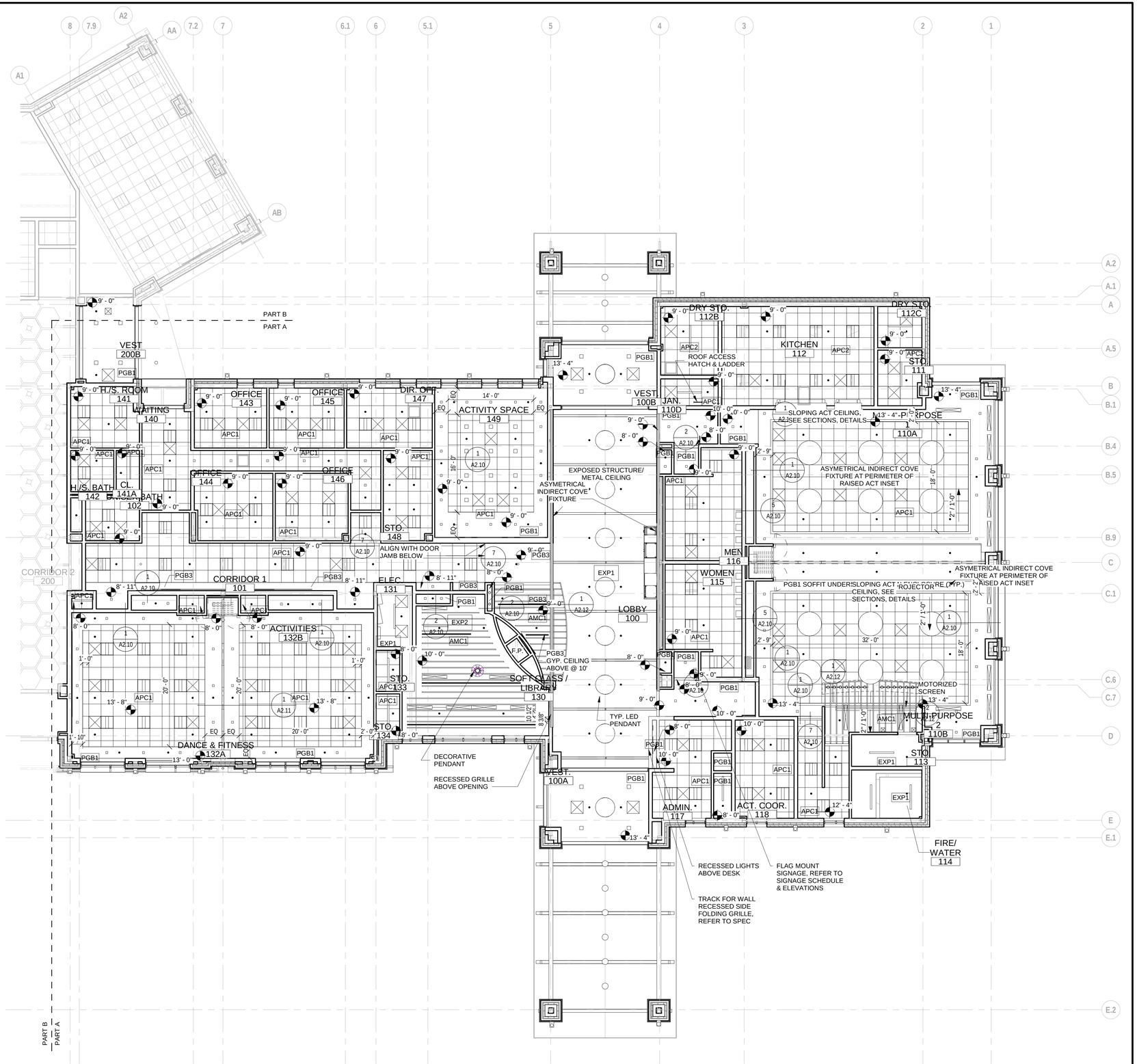
CEILING LEGEND

CODE	DESCRIPTION
APC1	ARMSTRONG; ULTIMA #1912, 2'X2' TILE , 3/4" THICK, 9/16" GRID
APC2	ARMSTRONG; HEALTH ZONE, SQUARE LAY IN 2X2 TILE, 5/8" THICK, 15/16" GRID
APC3	ARMSTRONG; SOUNDSCAPES SHAPES # 5444; HEXAGON ACOUSTICAL CLOUD, 48"X 48"X 7/8", COLOR 1: CUSTOM COLOR , COLOR: 2: CUSTOM COLOR, COLOR 3: CUSTOM COLOR *(CUSTOM COLORS TO MATCH BENJAMIN MOORE SAMPLE)*
AMC1	ARMSTRONG; METALWORKS BLADES - CLASSIC, PANEL WITH CAPS ON BOTH ENDS, M15 PERFORATIONS, COLOR: ARCHITECT TO SELECT FROM MANUF. FULL RANGE.
EXP1	EXPOSED CEILING, DRYFALL, COLOR TBD.
EXP2	EXPOSED CEILING, DRYFALL, COLOR TBD.
EXP3	EXPOSED DUCT WORK ACCENT, PAINTED, COLOR TBD.
EXP4	EXPOSED CEILING, TNEMEC, COLOR TBD.
HPC1	TNEMEC PAINT / COATING - REFER TO FINISH SCHEDULE
HPC2	TNEMEC PAINT / COATING - REFER TO FINISH SCHEDULE
PGB1	ARMSTRONG; DRYWALL SUSPENSION GRID SYSTEM. 5/8" GYPSUM WALL BOARD, PAINTED, COLOR TBD.
PGB2	ARMSTRONG; DRYWALL SUSPENSION GRID SYSTEM. 2HR RATED CEILING (UL415 - SYSTEM B) *1" TYPE C GWB, C-H CHANNEL, (2) LAYERS TYPE C GWB*
PGB3	5/8" GYPSUM WALL BOARD, MILDEW RESISTANT PAINT, COLOR TBD.
TC1	ARMSTRONG; TECTUM DIRECT - ATTACH # 8175T10; COLOR1, COLOR 2, COLOR 3 ALL TO MATCH BENJAMIN MOORE PAINT COLOR, PAINTED IN FIELD
TC2	ARMSTRONG; TECTUM CUSTOM SHAPE CLOUD; HEXAGON TECTUM CLOUD, 60"X 60"X 1 1/2", COLOR1, COLOR 2, COLOR 3 ALL TO MATCH BENJAMIN MOORE PAINT COLOR.



1 A2.1f **FIRST FLOOR RCP - PART A**
1/8" = 1'-0"

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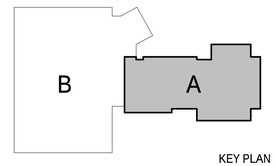

KEY PLAN

DEVELOPMENT OF:

WINDHAM SENIOR & COMMUNITY CENTER

WILLIMANTIC, CONNECTICUT
Project #: **1762**

Revisions

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FIRST FLOOR RCP - PART A

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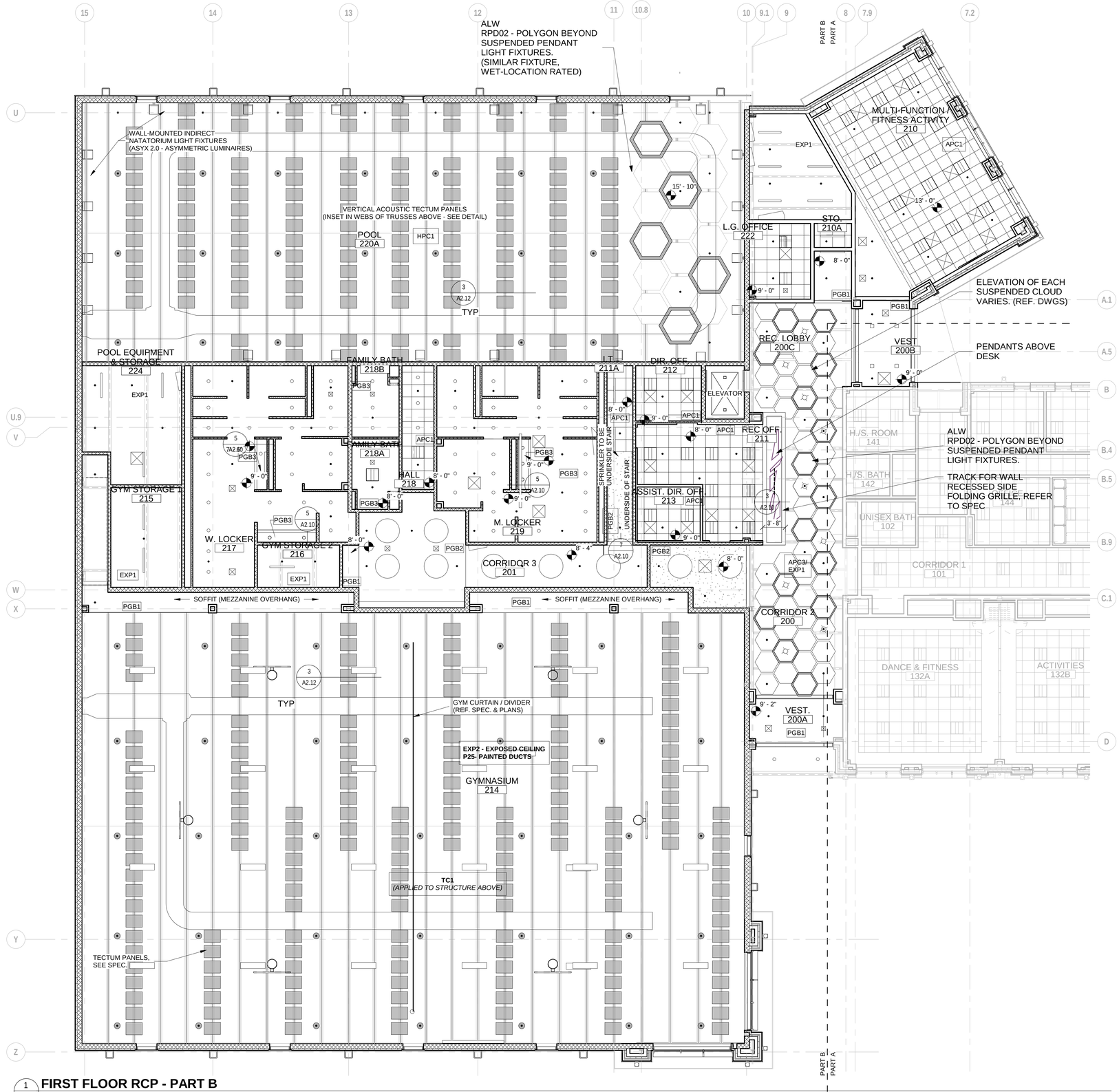

1 A2.2r **FIRST FLOOR RCP - PART B** 1/8" = 1'-0"

CEILING LEGEND

CODE	DESCRIPTION
APC1	ARMSTRONG; ULTIMA #1912, 2'X2' TILE , 3/4" THICK, 9/16" GRID
APC2	ARMSTRONG; HEALTH ZONE, SQUARE LAY IN 2X2 TILE, 5/8" THICK, 15/16" GRID
APC3	ARMSTRONG; SOUNDSCAPES SHAPES # 5444; HEXAGON ACOUSTICAL CLOUD, 48"X 48"X 7/8", COLOR 1: CUSTOM COLOR , COLOR: 2: CUSTOM COLOR, COLOR 3: CUSTOM COLOR *(CUSTOM COLORS TO MATCH BENJAMIN MOORE SAMPLE)*
AMC1	ARMSTRONG; METALWORKS BLADES - CLASSIC, PANEL WITH CAPS ON BOTH ENDS, M15 PERFORATIONS, COLOR: ARCHITECT TO SELECT FROM MANUF. FULL RANGE.
EXP1	EXPOSED CEILING, DRYFALL, COLOR TBD.
EXP2	EXPOSED CEILING, DRYFALL, COLOR TBD.
EXP3	EXPOSED DUCT WORK ACCENT, PAINTED, COLOR TBD.
EXP4	EXPOSED CEILING, TNEMEC, COLOR TBD.
HPC1	TNEMEC PAINT / COATING - REFER TO FINISH SCHEDULE
HPC2	TNEMEC PAINT / COATING - REFER TO FINISH SCHEDULE
PGB1	ARMSTRONG; DRYWALL SUSPENSION GRID SYSTEM. 5/8" GYPSUM WALL BOARD, PAINTED, COLOR TBD.
PGB2	ARMSTRONG; DRYWALL SUSPENSION GRID SYSTEM. 2HR RATED CEILING (UL415 - SYSTEM B) *1" TYPE C GWB, C-H CHANNEL, (2) LAYERS TYPE C GWB*
PGB3	5/8" GYPSUM WALL BOARD, MILDEW RESISTANT PAINT, COLOR TBD.
TC1	ARMSTRONG; TECTUM DIRECT - ATTACH # 8175T10; COLOR1, COLOR 2, COLOR 3 ALL TO MATCH BENJAMIN MOORE PAINT COLOR, PAINTED IN FIELD
TC2	ARMSTRONG; TECTUM CUSTOM SHAPE CLOUD; HEXAGON TECTUM CLOUD, 60"X 60"X 1 1/2", COLOR1, COLOR 2, COLOR 3 ALL TO MATCH BENJAMIN MOORE PAINT COLOR.

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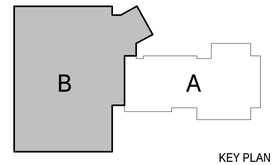

KEY PLAN

DEVELOPMENT OF:

WINDHAM SENIOR & COMMUNITY CENTER

WILLIMANTIC, CONNECTICUT
Project #: **1762**

Revisions

Issue Dates:

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FIRST FLOOR RCP - PART B

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CEILING LEGEND

CODE	DESCRIPTION
APC1	ARMSTRONG; ULTIMA #1912, 2'X2' TILE , 3/4" THICK, 9/16" GRID
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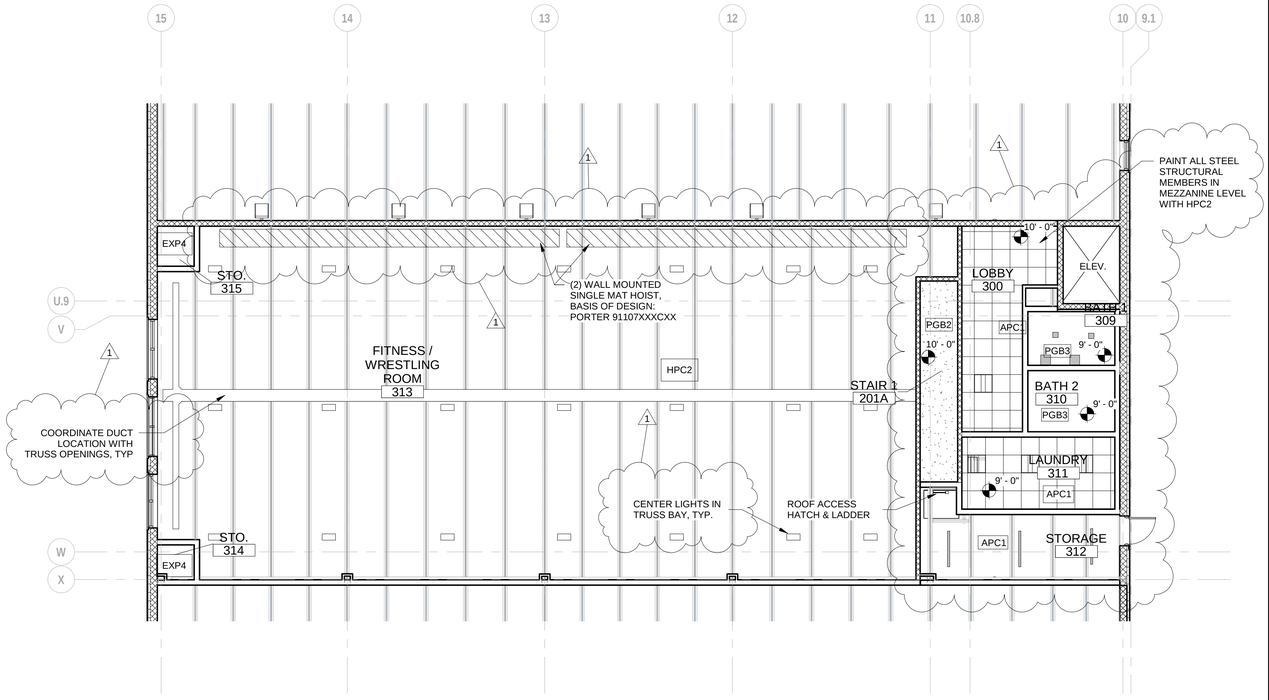
AMC1	ARMSTRONG; METALWORKS BLADES - CLASSIC, PANEL WITH CAPS ON BOTH ENDS, M15 PERFORATIONS, COLOR: ARCHITECT TO SELECT FROM MANUF. FULL RANGE.
EXP1	EXPOSED CEILING, DRYFALL, COLOR TBD.
EXP2	EXPOSED CEILING, DRYFALL, COLOR TBD.
EXP3	EXPOSED DUCT WORK ACCENT, PAINTED, COLOR TBD.
EXP4	EXPOSED CEILING, TNEMEC, COLOR TBD.
HPC1	TNEMEC PAINT / COATING - REFER TO FINISH SCHEDULE
HPC2	TNEMEC PAINT / COATING - REFER TO FINISH SCHEDULE
PGB1	ARMSTRONG; DRYWALL SUSPENSION GRID SYSTEM. 5/8" GYPSUM WALL BOARD, PAINTED, COLOR TBD.
PGB2	ARMSTRONG; DRYWALL SUSPENSION GRID SYSTEM. 2HR RATED CEILING (UL415 - SYSTEM B) *1" TYPE C GWB, C-H CHANNEL, (2) LAYERS TYPE C GWB*
PGB3	5/8" GYPSUM WALL BOARD, MILDEW RESISTANT PAINT, COLOR TBD.
TC1	ARMSTRONG; TECTUM DIRECT - ATTACH # 8175T10; COLOR1, COLOR 2, COLOR 3 ALL TO MATCH BENJAMIN MOORE PAINT COLOR, PAINTED IN FIELD
TC2	ARMSTRONG; TECTUM CUSTOM SHAPE CLOUD; HEXAGON TECTUM CLOUD, 60"X 60"X 1 1/2", COLOR1, COLOR 2, COLOR 3 ALL TO MATCH BENJAMIN MOORE PAINT COLOR.



1 A2.3r **MEZZANINE RCP**
1/8" = 1'-0"

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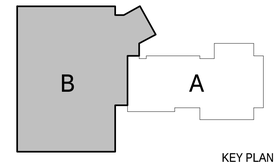

KEY PLAN

DEVELOPMENT OF:

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WILLIMANTIC, CONNECTICUT
Project #: **1762**

1	ADDENDUM 1	10/2/19

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MEZZANINE RCP

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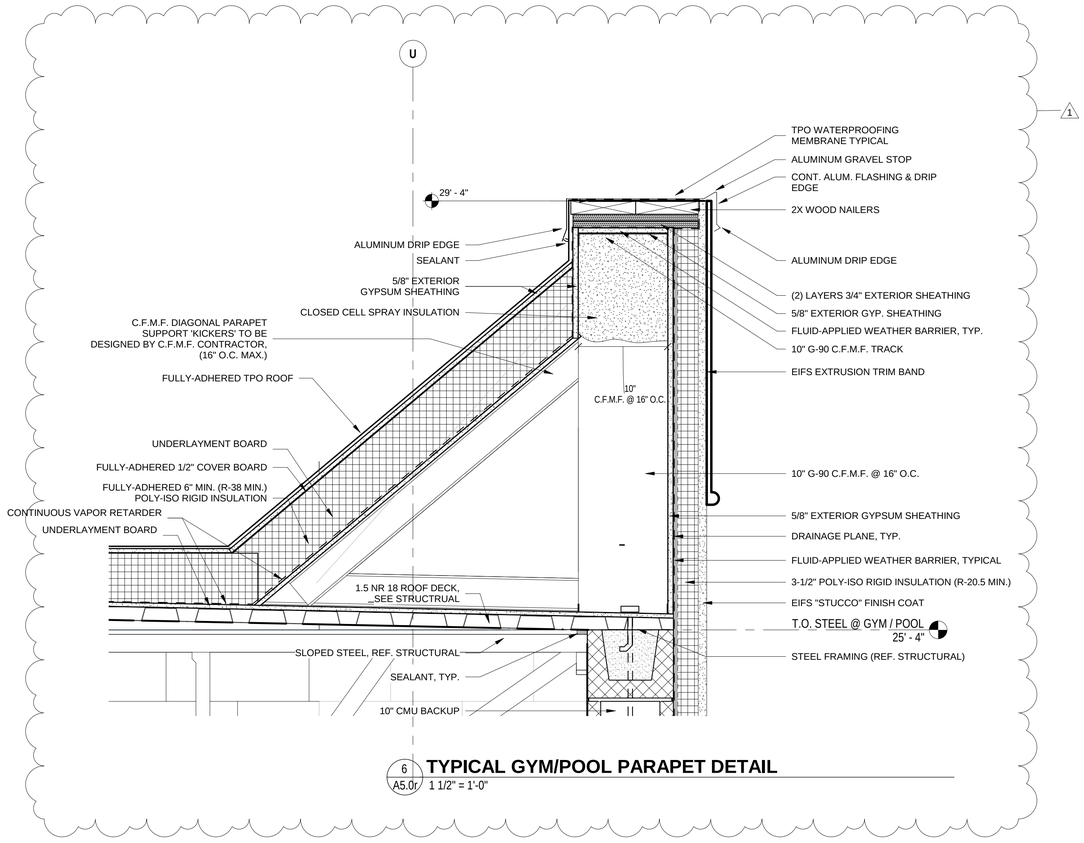
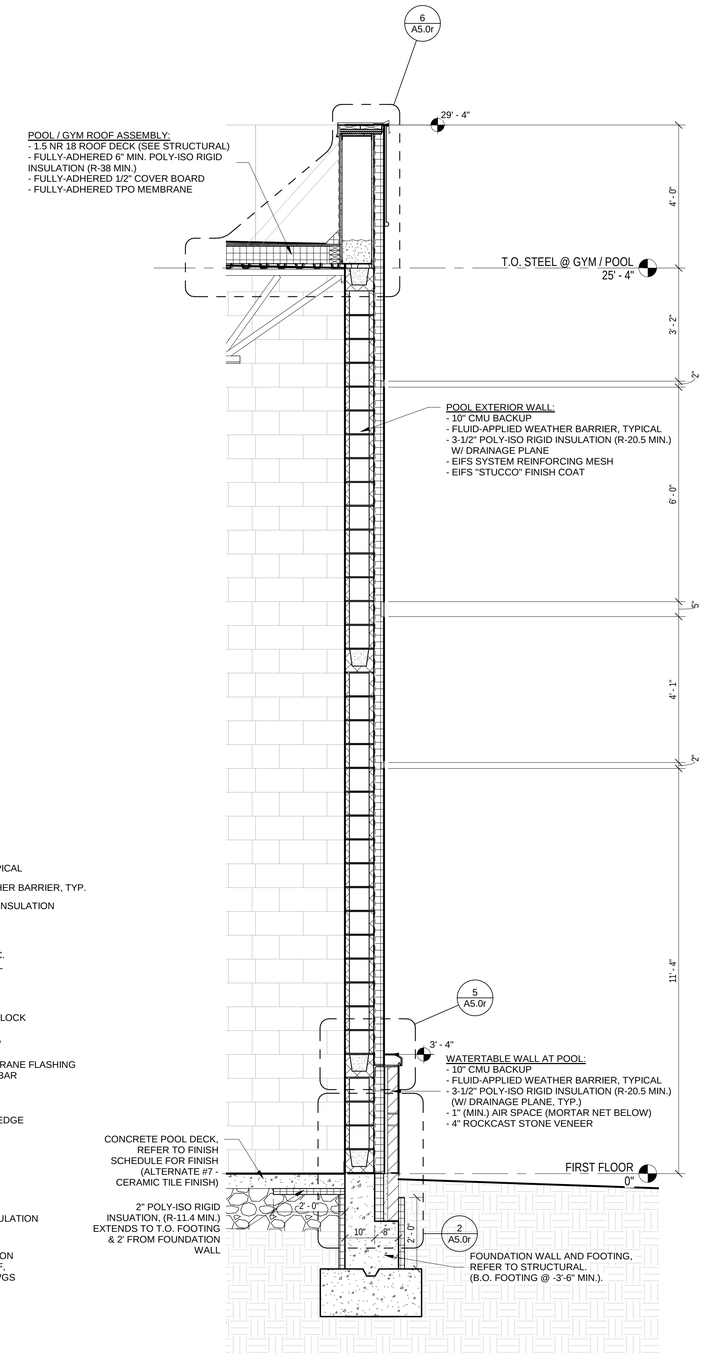
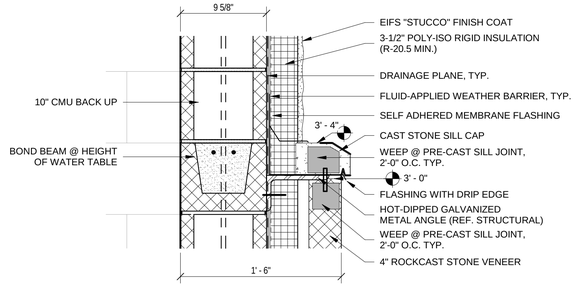


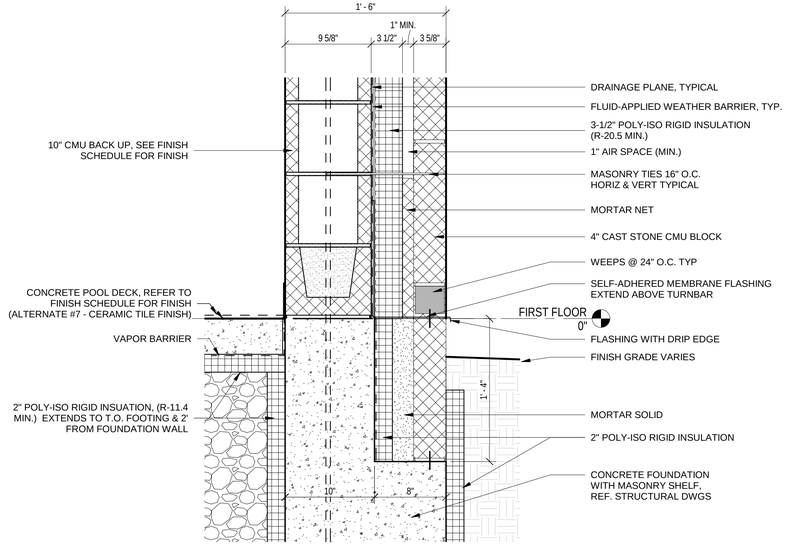
6 A5.0r **TYPICAL GYM/POOL PARAPET DETAIL**
1 1/2" = 1'-0"



1 A5.0r **WALL SECTION @ NORTH POOL WALL**
1/2" = 1'-0"



5 A5.0r **TYPICAL WATER-TABLE DETAIL (POOL)**
1 1/2" = 1'-0"



2 A5.0r **GRADE DETAIL @ EXTERIOR WALLS (POOL AREA)**
1 1/2" = 1'-0"

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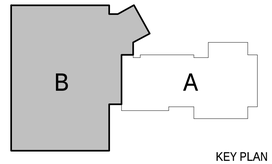

KEY PLAN

1	ADDENDUM 1	10/2/19

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DEVELOPMENT OF:

WINDHAM SENIOR & COMMUNITY CENTER

WILLIMANTIC, CONNECTICUT

Project #: **1762**

WALL SECTIONS & DETAILS

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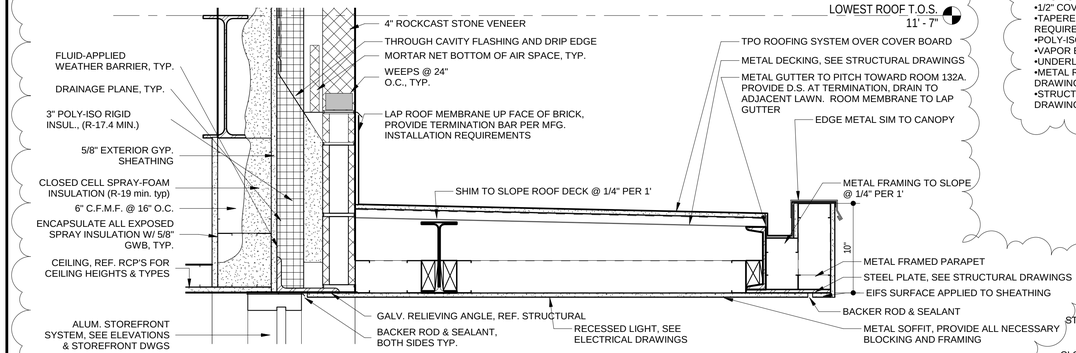
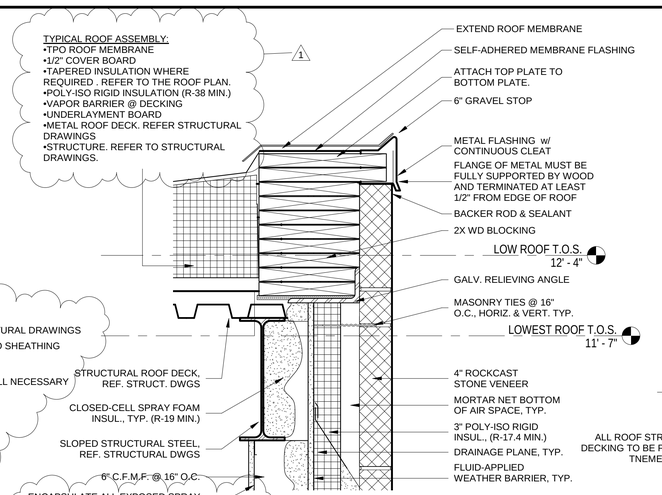
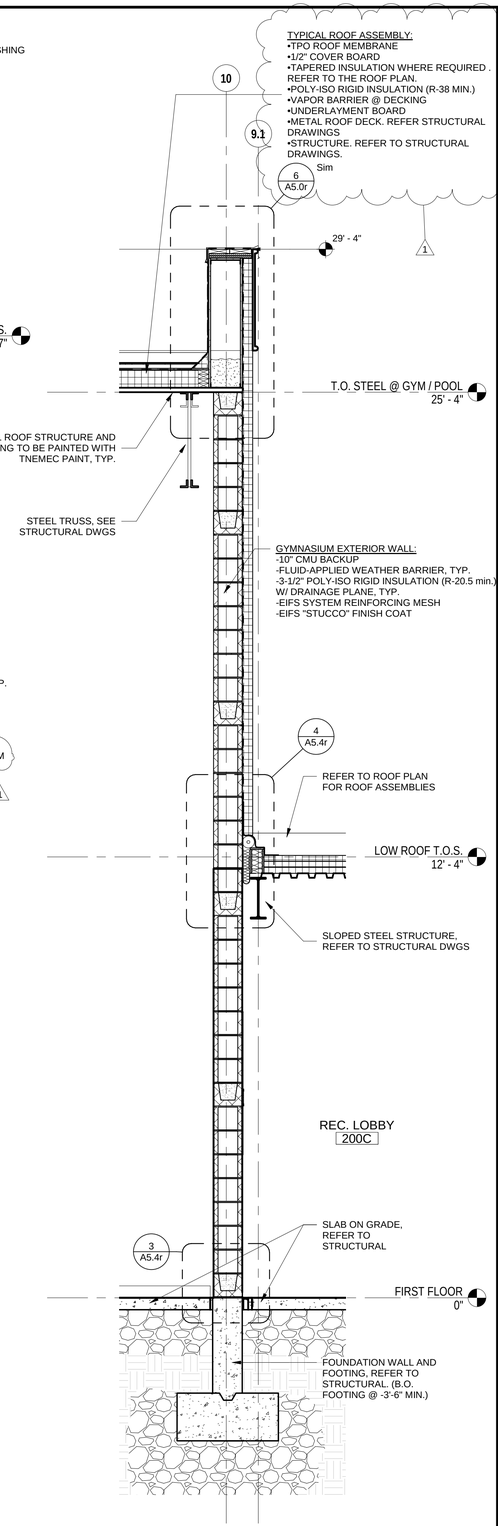


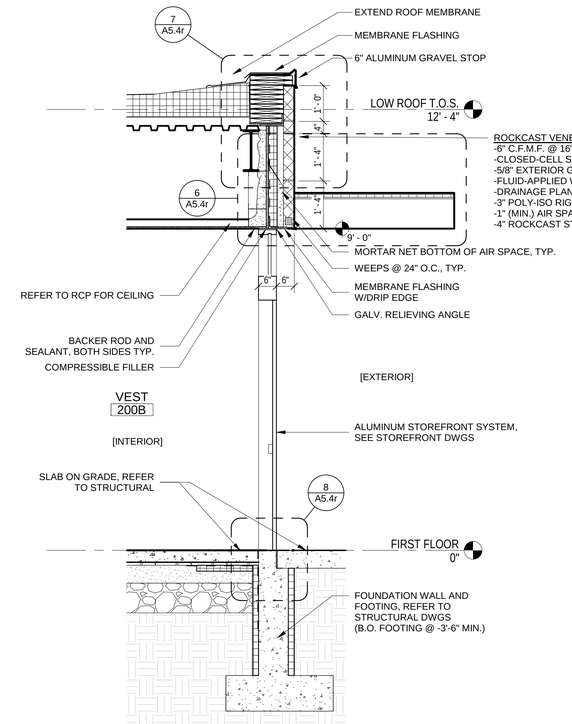
6 / A5.4r HEAD DETAIL @ VESTIBULE 200B ENTRY
1 1/2" = 1'-0"



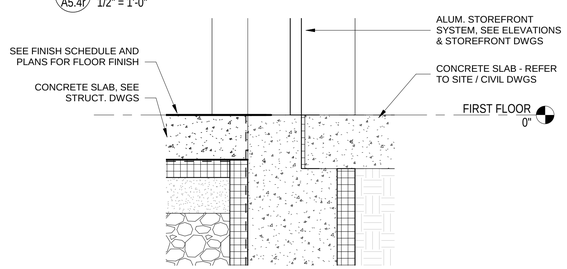
7 / A5.4r PARAPET DETAIL @ VESTIBULE ENTRY
1 1/2" = 1'-0"



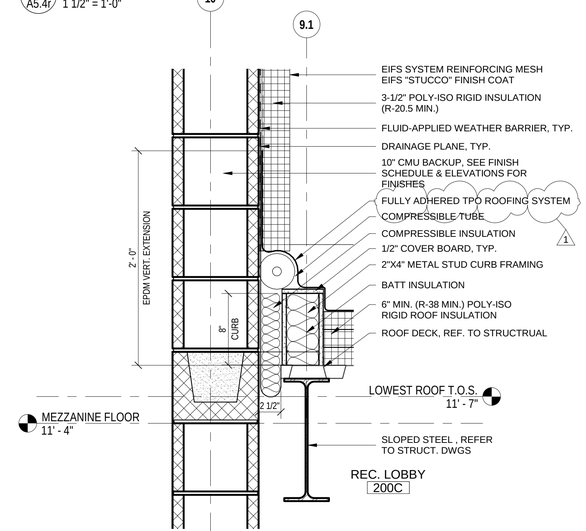
1 / A5.4r WALL SECTION @ REC. LOBBY & POOL
1/2" = 1'-0"



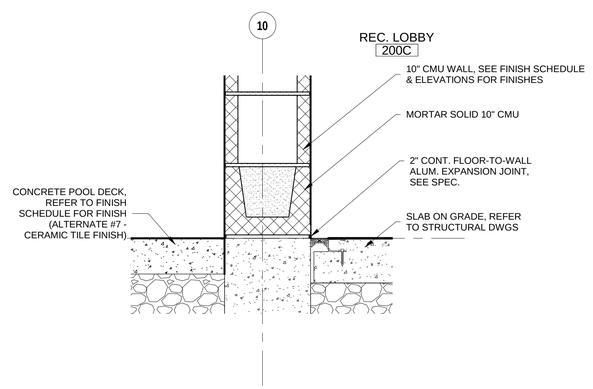
2 / A5.4r WALL SECTION @ REC. LOBBY VESTIBULE
1/2" = 1'-0"



8 / A5.4r FOUNDATION DETAIL @ VESTIBULE ENTRY
1 1/2" = 1'-0"



4 / A5.4r ENLARGED DETAIL @ REC LOBBY/POOL ROOF
1 1/2" = 1'-0"



3 / A5.4r FOUNDATION DETAIL @ REC. LOBBY/POOL
1 1/2" = 1'-0"

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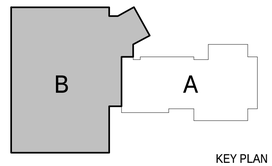

KEY PLAN

DEVELOPMENT OF:

WINDHAM SENIOR & COMMUNITY CENTER

WILLIMANTIC, CONNECTICUT
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WALL SECTIONS & DETAILS

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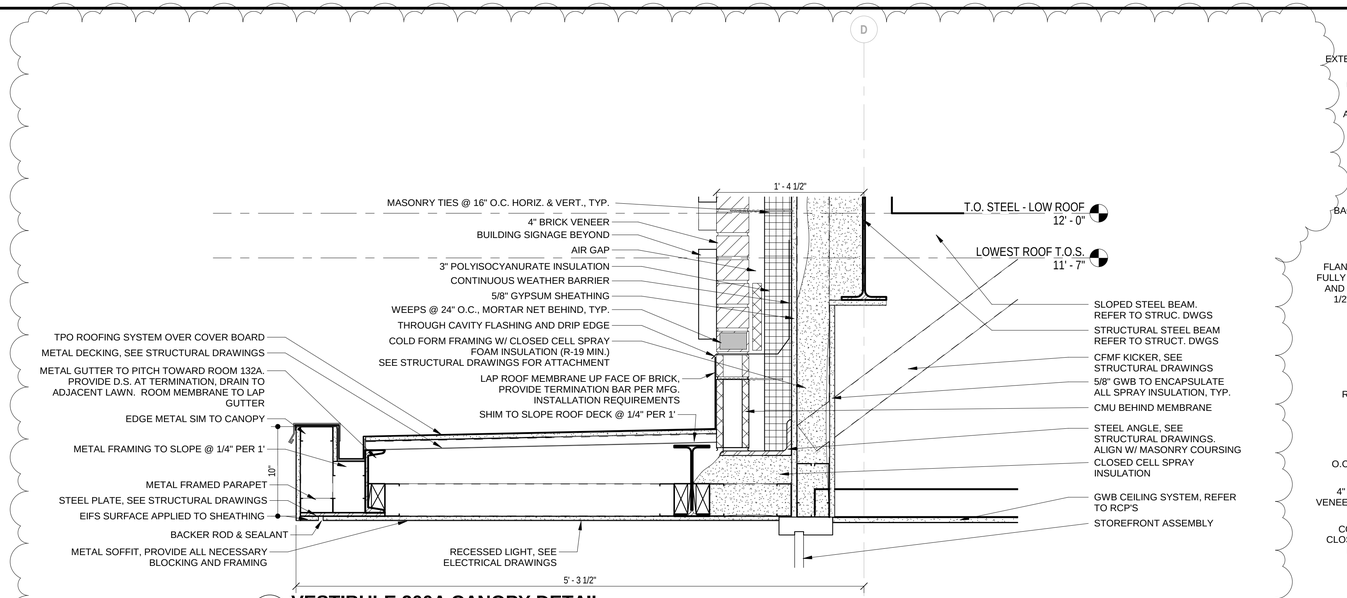
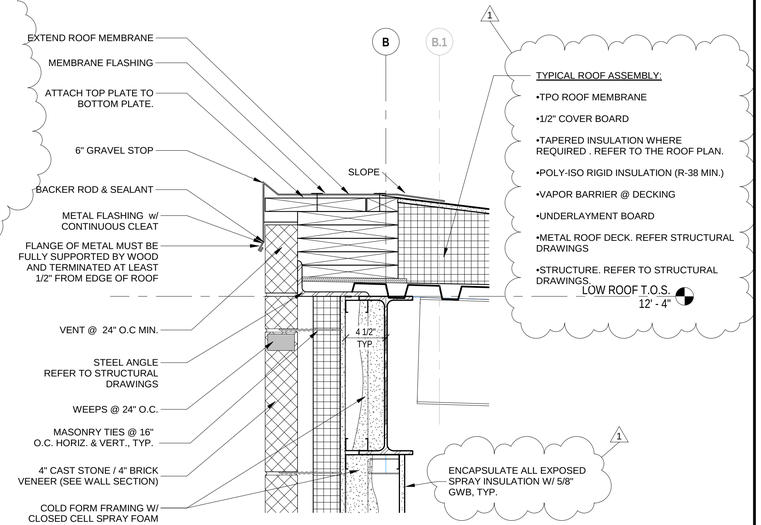
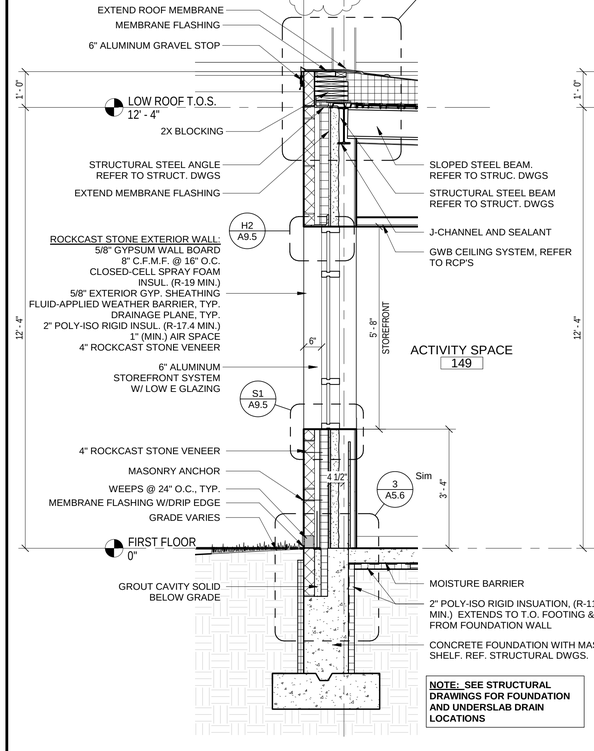


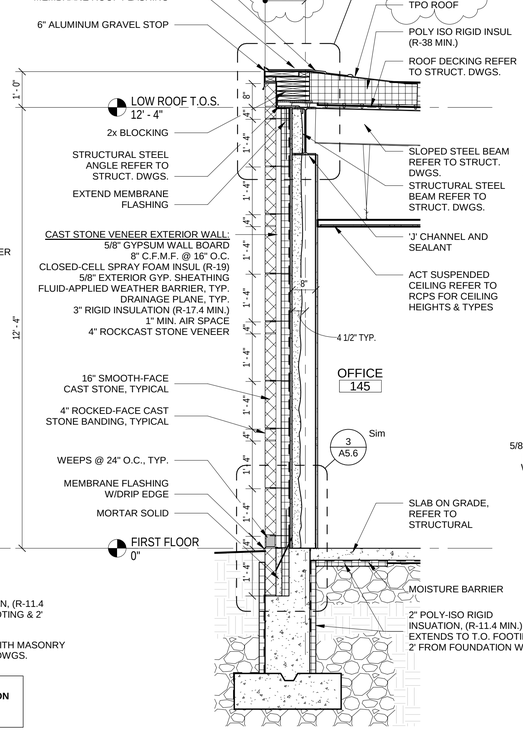
6 A5.7r **VESTIBULE 200A CANOPY DETAIL**
1 1/2" = 1'-0"



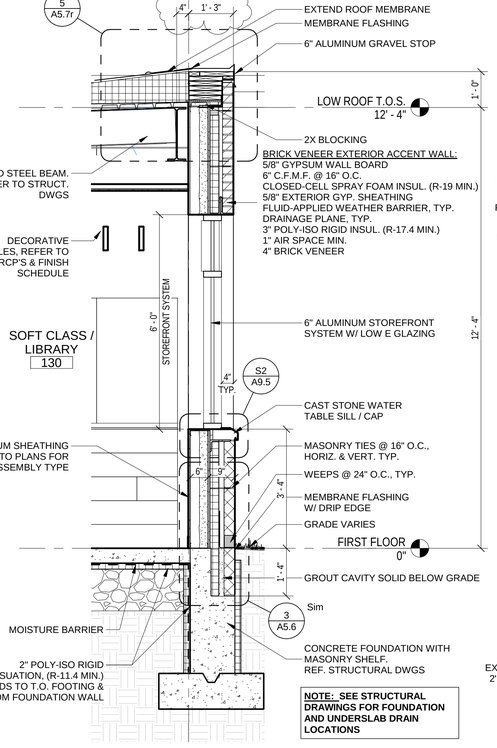
5 A5.7r **TYP GRAVEL-STOP ROOF DETAIL**
1 1/2" = 1'-0"



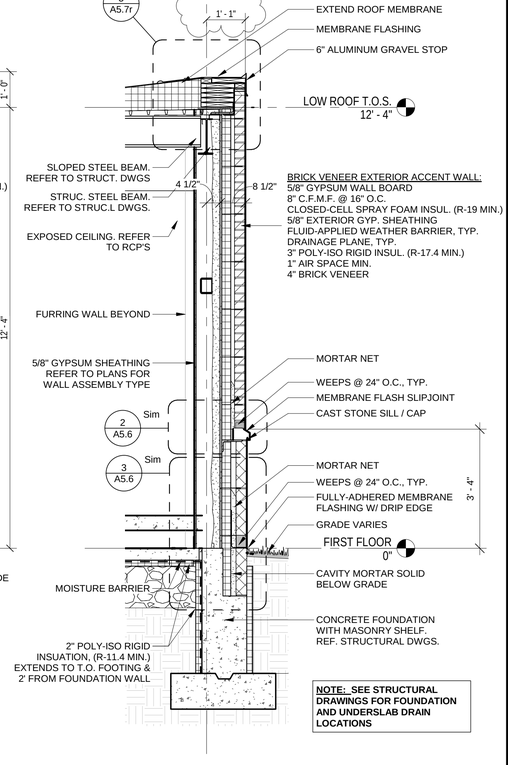
4 A5.7r **WALL SECTION @ ACTIVITY SPACE**
1/2" = 1'-0"



3 A5.7r **WALL SECTION @ OFFICE 109B**
1/2" = 1'-0"



2 A5.7r **WALL SECTION @ SOFT CLASS/ LIBRARY**
1/2" = 1'-0"



1 A5.7r **WALL SECTION @ M.P. STORAGE ROOM**
1/2" = 1'-0"

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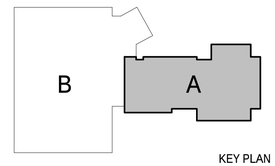

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WALL SECTIONS & DETAILS

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DOOR SCHEDULE

DOOR #	ROOM #	ROOM NAME	DOUBLE LEAF DOOR	DOOR WIDTH	DOOR HEIGHT	DOOR TYPE	DOOR MATERIAL	DOOR GLAZING	FRAME TYPE	FRAME MATERIAL	FRAME GLAZING	FRAME HEAD	FRAME JAMB	FRAME SILL	HARDWARE SET #	MAG. HOLD-OPEN	RATING UL	COMMENTS
100A	100A	VEST.	•	6' - 0"	7' - 0"	6	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	J4/A9.5	S5/A9.5	2			
100B	100A	VEST.	•	6' - 0"	7' - 0"	6	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	J4/A9.5	S5/A9.5	1			
100C	100B	VEST.	•	6' - 0"	7' - 0"	6	ALUM.		AL-1	ALUM.		H5/A9.5	J4/A9.5	S5/A9.5	1			
100D	100B	VEST.	•	6' - 0"	7' - 0"	6	ALUM.		AL-1	ALUM.		H5/A9.5	J4/A9.5	S5/A9.5	2			
100H				3' - 0"	7' - 0"	1	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	6/A6.5	S5/A9.5	9			
100I				3' - 0"	7' - 0"	1	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	6/A6.5	S5/A9.5	9			
101A	101	CORRIDOR 1	•	6' - 0"	7' - 0"	5	WD.	•	HM-1	HM		H1/A9.0	J1/A9.0	-	14	•	45	
102A	102	UNISEX BATH		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	S1/A9.0	21			
103A	103	STO.		3' - 0"	7' - 0"	4	WD.	•	HM-1	HM		H1/A9.0	J1/A9.0	-	23			
104A	104	STO.		3' - 0"	7' - 0"	4	WD.	•	HM-1	HM		H1/A9.0	J1/A9.0	-	23			
110A	110A	MULTI-PURPOSE 1	•	5' - 0"	7' - 0"	5	WD.	•	HM-1	HM		H1/A9.0	J1/A9.0	S2/A9.0	34			
110B	100	LOBBY	•	5' - 0"	7' - 0"	5	WD.	•	HM-1	HM		H1/A9.0	J1/A9.0	S2/A9.0	34			
110D	110D	JAN.		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	-	22		45	
110E	110A	MULTI-PURPOSE 1		3' - 0"	7' - 0"	1	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	J4/A9.5	S5/A9.5	5			
110F	110A	MULTI-PURPOSE 1		3' - 0"	7' - 0"	1	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	J4/A9.5	S5/A9.5	5			
110G	110B	MULTI-PURPOSE 2		3' - 0"	7' - 0"	1	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	J4/A9.5	S5/A9.5	5			
110H	110B	MULTI-PURPOSE 2		3' - 0"	7' - 0"	1	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	J4/A9.5	S5/A9.5	5			
110J	140A	CORRIDOR		3' - 0"	7' - 0"	4	WD.	•	HM-1	HM		H1/A9.0	J1/A9.0	S2/A9.0	27			
111A	111	STO.	•	5' - 0"	7' - 0"	7	WD.		HM-1	HM		H1/A9.0	J1/A9.0	-	29		45	
112A	112	KITCHEN		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	-	28		45	
112B	112B	DRY STO.		3' - 8"	7' - 0"	3	HM		HM-2	HM		H4/A9.0	J4/A9.0	S2/A9.0	18			
113A	113	STO.		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	-	22			
114A	114	FIRE/ WATER		3' - 8"	7' - 0"	3	HM		HM-2	HM		H4/A9.0	J4/A9.0	S2/A9.0	18			
115A	115	WOMEN		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	S1/A9.0	20			
116A	116	MEN		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	S1/A9.0	20			
117A	117	ADMIN		3' - 0"	7' - 0"	3	WD.		HM-3	HM	•	H1/A9.0	J1/A9.0	-	19			"SIDELIGHT 1"
118A	118	ACT. COOR.		3' - 0"	7' - 0"	3	WD.		HM-3	HM	•	H1/A9.0	J1/A9.0	-	19			"SIDELIGHT 1"
118LL	117	ADMIN		3' - 0"	7' - 0"	4	WD.		-	WD		-	-	-	40			POCKET DOOR
119A	118	ACT. COOR.	•	4' - 0"	7' - 0"	9	WD.		-	WD		-	-	-	41			RICHELIEU BARN DOORS (2) 28"X84"
130A	130	SOFT CLASS / LIBRARY		3' - 0"	7' - 0"	4	WD.	•	HM-1	HM		H1/A9.0	J1/A9.0	S2/A9.0	28		45	
131A	131	ELEC.		3' - 0"	7' - 0"	3	HM		HM-1	HM		H1/A9.0	J1/A9.0	-	22			
132A	132A	DANCE & FITNESS		3' - 0"	7' - 0"	2	WD.	•	HM-1	HM		H1/A9.0	J1/A9.0	S2/A9.0	27		45	
132B	132B	ACTIVITIES		3' - 0"	7' - 0"	2	WD.	•	HM-1	HM		H1/A9.0	J1/A9.0	S2/A9.0	27		45	
133A	133	STO.		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	-	23			
134A	134	STO.		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	-	23			
135A	135	STO.		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	-	23			
136A	132A	DANCE & FITNESS		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	-	23			
137A	137	STO.		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	-	23			
140A	140	WAITING		3' - 0"	7' - 0"	1	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	2/A6.5 (SIM)	S5/A9.5	7			
140B	101	CORRIDOR 1		3' - 0"	7' - 0"	4	WD.	•	HM-1	HM		H1/A9.0	J1/A9.0	S2/A9.0	27			
140C	141	H./S. ROOM		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	-	38			
141A	141A	CL.		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	-	26			
142	142	H./S. BATH		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	S1/A9.0	21			
143A	143	OFFICE		3' - 0"	7' - 0"	4	WD.	•	HM-3	HM	•	H1/A9.0	J1/A9.0	S2/A9.0	19			"SIDELIGHT 2"
144A	144	OFFICE		3' - 0"	7' - 0"	4	HM	•	HM-3	HM	•	H1/A9.0	J1/A9.0	S2/A9.0	19			"SIDELIGHT 2"
145A	145	OFFICE		3' - 0"	7' - 0"	4	WD.	•	HM-3	HM	•	H1/A9.0	J1/A9.0	S2/A9.0	19			"SIDELIGHT 2"
146A	146	OFFICE		3' - 0"	7' - 0"	3	WD.		HM-3	HM	•	H1/A9.0	J1/A9.0	S2/A9.0	19			"SIDELIGHT 2"
147A	147	DIR. OFF.		3' - 0"	7' - 0"	4	WD.	•	HM-3	HM	•	H1/A9.0	J1/A9.0	S2/A9.0	19			"SIDELIGHT 1"
148A	148	STO.		3' - 0"	7' - 0"	2	WD.	•	HM-1	HM		H1/A9.0	J1/A9.0	S2/A9.0	38			
149A	149	ACTIVITY SPACE		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	-	24			
149B	149	ACTIVITY SPACE		6' - 0"	7' - 0"	-	-	•	-	-		-	-	6/A5.8	0			SLIDING DOOR
149C	149	ACTIVITY SPACE		6' - 0"	7' - 0"	-	-	•	-	-		-	-	6/A5.8	0			SLIDING DOOR
200A	200A	VEST.	•	6' - 0"	7' - 0"	6	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	J4/A9.5	S5/A9.5	1			
200B	200A	VEST.		3' - 0"	7' - 0"	1	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	2/A6.5	S5/A9.5	5			
200C	200	CORRIDOR 2	•	6' - 0"	7' - 0"	6	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	J4/A9.5	S5/A9.5	2			
200D	200	CORRIDOR 2		3' - 0"	7' - 0"	1	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	1/A6.5	S5/A9.5	5			
200H	200B	VEST	•	6' - 0"	7' - 0"	6	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	J4/A9.5	S5/A9.5	1			DELETE DOOR IN DEDUCT ALT.#4
200I	200B	VEST		3' - 0"	7' - 0"	1	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	2/A6.5 (SIM)	S5/A9.5	5			DELETE DOOR IN DEDUCT ALT.#4
200J	200C	REC. LOBBY		3' - 0"	7' - 0"	1	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	1/A6.5	S5/A9.5	5			DELETE DOOR IN DEDUCT ALT.#4
200K	200C	REC. LOBBY	•	6' - 0"	7' - 0"	6	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	J4/A9.5	S5/A9.5	2			DELETE DOOR IN DEDUCT ALT.#4
201A	200	CORRIDOR 2	•	6' - 0"	7' - 0"	7	WD.		HM-2	HM		H2/A9.0	J2/A9.0	-	13	•	45	
201B	201A	STAIR 1		3' - 0"	7' - 0"	3	WD.		HM-2	HM		H2/A9.0	J2/A9.0	-	11		45	
210A	210	MULTI-FUNCTION / FITNESS ACTIVITY	•	6' - 0"	7' - 0"	5	WD.	•	HM-1	HM		H1/A9.0	J1/A9.0	S2/A9.0	33	•	45	DELETE DOOR IN DEDUCT ALT.#4
210A-1	210A	STO.		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	-	23			DELETE DOOR IN DEDUCT ALT.#4
211A	211	REC OFF.		3' - 0"	7' - 0"	4	WD.	•	HM-2	HM		H3/A9.0	J3/A9.0	S2/A9.0	19			
211A-1	211A	I.T.		3' - 0"	7' - 0"	3	WD.		HM-2	HM		H3/A9.0	J3/A9.0	-	31		45	
212A	212	DIR. OFF.		3' - 0"	7' - 0"	3	WD.		HM-2	HM		H3/A9.0	J3/A9.0	-	6		45	
213A	213	ASSIST. DIR. OFF.		3' - 0"	7' - 0"	4	WD.	•	HM-1	HM		H1/A9.0	J1/A9.0	-	19			
214A	214	GYMNASIUM	•	6' - 0"	7' - 0"	5	WD.	•	HM-2	HM		H2/A9.0	J2/A9.0	S2/A9.0	12		45	
214B	214	GYMNASIUM	•	6' - 0"	7' - 0"	5	WD.	•	HM-2	HM		H2/A9.0	J2/A9.0	S2/A9.0	8		45	
214C	214	GYMNASIUM		3' - 0"	7' - 0"	1	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	6/A6.5	S5/A9.5	8			

DOOR SCHEDULE

DOOR #	ROOM #	ROOM NAME	DOUBLE LEAF DOOR	DOOR WIDTH	DOOR HEIGHT	DOOR TYPE	DOOR MATERIAL	DOOR GLAZING	FRAME TYPE	FRAME MATERIAL	FRAME GLAZING	FRAME HEAD	FRAME JAMB	FRAME SILL	HARDWARE SET #	MAG. HOLD-OPEN	RATING UL	COMMENTS
214D	214	GYMNASIUM		3' - 0"	7' - 0"	1	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	6/A6.5	S5/A9.5	8			
214F	214	GYMNASIUM	•	6' - 0"	7' - 0"	5	WD.	•	HM-2	HM		H2/A9.0	J2/A9.0	S2/A9.0	12		45	
214G	214	GYMNASIUM	•	6' - 0"	7' - 0"	5	WD.	•	HM-2	HM		H2/A9.0	J2/A9.0	S2/A9.0	12		45	
215A	215	GYM STORAGE 1	•	6' - 0"	7' - 0"	7	WD.		HM-2	HM		H2/A9.0	J2/A9.0	S2/A9.0	30			
216A	216	GYM STORAGE 2		3' - 0"	7' - 0"	3	WD.		HM-2	HM		H2/A9.0	J2/A9.0	S2/A9.0	23			
217A	217	W. LOCKER		3' - 0"	7' - 0"	3	WD.		HM-2	HM		H2/A9.0	J2/A9.0	S1/A9.0	25		45	
217B	217	W. LOCKER		3' - 0"	7' - 0"	3	FG		FG-2	FG		H2/A9.0	J2/A9.0	S1/A9.0	32			
218A	218	HALL		3' - 0"	7' - 0"	3	WD.		HM-2	HM		H2/A9.0	J2/A9.0	-	10		45	
218B	218	HALL		3' - 0"	7' - 0"	3	FG		FG-2	FG		H2/A9.0	J2/A9.0	S2/A9.0	32			
218C	218A	FAMILY BATH		3' - 0"	7' - 0"	3	WD.		HM-2	HM		H2/A9.0	J2/A9.0	S1/A9.0	35			
218D	218B	FAMILY BATH		3' - 0"	7' - 0"	3	WD.		HM-2	HM		H2/A9.0	J2/A9.0	S1/A9.0	35			
219A	219	M. LOCKER		3' - 0"	7' - 0"	3	WD.		HM-2	HM		H2/A9.0	J2/A9.0	S1/A9.0	25		45	
219B	219	M. LOCKER		3' - 0"	7' - 0"	3	FG		FG-2	FG		H2/A9.0	J2/A9.0	S1/A9.0	32			
220B-1				3' - 0"	7' - 0"	1	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	6/A6.5	S5/A9.5	9			
220B-2				3' - 0"	7' - 0"	1	ALUM.	•	AL-1	ALUM.	•	H5/A9.5	6/A6.5	S5/A9.5	9			
222A	222	L.G. OFFICE		3' - 0"	7' - 0"	3	FG		FG-2	FG		H2/A9.0	J2/A9.0	S2/A9.0	36			DELETE DOOR IN DEDUCT ALT.#4
223A	223	ELECTRIC / SOLAR		3' - 0"	7' - 0"	3	HM		HM-2	HM		H4/A9.0	J4/A9.0	S2/A9.0	17			DELETE DOOR IN DEDUCT ALT.#4
224A	224	POOL EQUIPMENT & STORAGE	•	6' - 0"	7' - 0"	7	FG		FG-2	FG		H2/A9.0	J2/A9.0	-	37			
309A	309	BATH 1		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	S1/A9.0	39			
310A	310	BATH 2		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	S1/A9.0	39			
311A	311	LAUNDRY		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	S2/A9.0	28			
312B	312	STORAGE	•	5' - 0"	7' - 0"	7	WD.		HM-2	HM		H2/A9.0	J2/A9.0	S2/A9.0	30			
312C	312	STORAGE		3' - 0"	7' - 0"	3	HM		HM-2	HM		H4/A9.0	J4/A9.0	S2/A9.0	16			
313A	313	FITNESS / WRESTLING ROOM		3' - 0"	7' - 0"	3	WD.		HM-2	HM		H2/A9.0	J2/A9.0	S2/A9.0	15			
314A	314	STO.		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	-	23			
315A	315	STO.		3' - 0"	7' - 0"	3	WD.		HM-1	HM		H1/A9.0	J1/A9.0	-	23			

DOORS TO LOCK INTO EACH OTHER AT CORNER, NO PERMANENT POST TO BE INSTALLED. DOOR 149B TO HAVE SINGLE LEAF TELESCOPE, TERMINATE AT COLUMN 5/B.5. DOOR 149C TO FULLY RETRACT INTO WALL. REF SPEC SECTION 083219 FOR PRODUCT INFO.

QA+M architecture
QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

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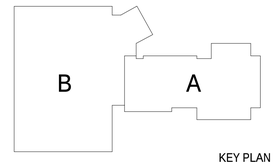

KEY PLAN

DEVELOPMENT OF:

WINDHAM SENIOR & COMMUNITY CENTER

WILLIMANTIC, CONNECTICUT
Project #: **1762**

1	ADDENDUM 1	10/2/19

Revisions

Issue Dates:

CONSTRUCTION BID SEPTEMBER 9, 2019

DOOR SCHEDULE

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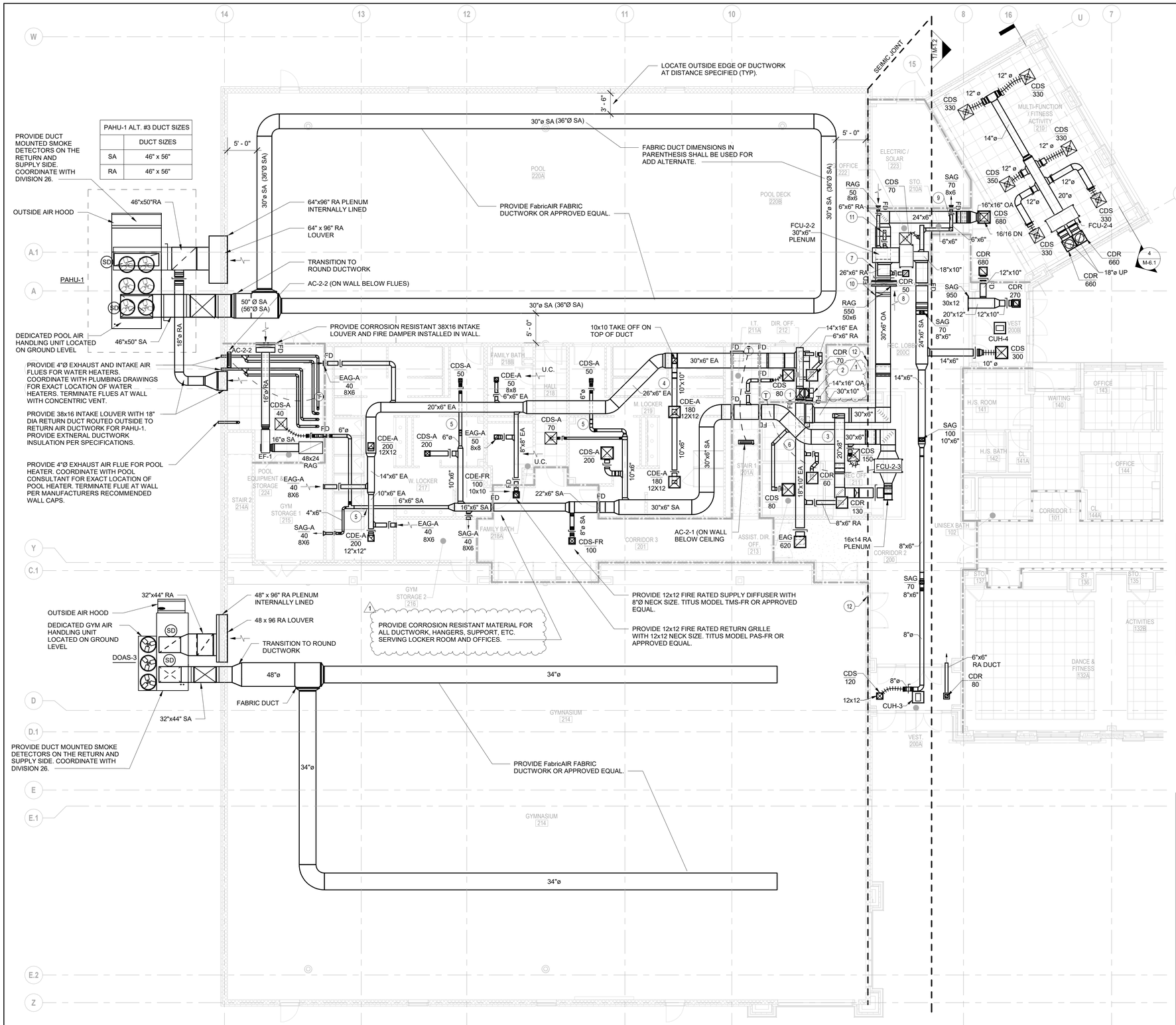
10/2/2019 8:53:32 AM C:\Revit Local\Windham CSC - Bidding Conformance_CENTRAL MODEL_brianpark.rvt



1 LEVEL 1 - MECHANICAL DUCTWORK FLOOR PLAN- PART B
M-1.3 1/8" = 1'-0"

FAN COIL UNIT-EA & OA BALANCE

TAG	OA AIRFLOW (CFM)	RUN OUT DUCT SIZE	EA AIRFLOW (CFM)	RUN OUT DUCT SIZE
FCU-2-1	1150	(2)	0	-
FCU-2-2	150	(2)	0	-
FCU-2-3	1100	(2)	0	-
FCU-2-4	680	(2)	0	-

NOTES:
1. PROVIDE MANUAL DAMPERS BEFORE CONNECTING OA AND EA DUCTS TO TO RA DUCT FOR FCU, WHETHER SHOWN ON DRAWINGS OR NOT.
2. SEE PLANS FOR RUNOUT DUCT SIZE.

GENERAL NOTE

1. SEE DIFFUSER, GRILLE AND REGISTER SCHEDULE ON SHEET M-3.2 FOR RUNOUT DUCT SIZES NOT SHOWN ON PLANS. RUNOUT DUCT SIZES SHALL BE SAME SIZE AS INDICATED NECK SIZE, UNLESS INDICATED ON PLANS.

RENOVATION KEYNOTES

1. 20x16 EA DUCTWORK UP TO DOAS-2. OFFSET IN CEILING SPACE UP TO CHASE ABOVE.
2. 20x16 OA DUCTWORK UP TO DOAS-2. OFFSET IN CEILING SPACE UP TO CHASE ABOVE.
3. 20x8 OA DUCTWORK ROUTED ABOVE 30X6 SA DUCT MAIN. ROUTE DUCTWORK BETWEEN TRUSSES AND COORDINATE STRUCTURE.
4. ROUTE EA RUNOUT DUCTWORK AHAP BETWEEN TRUSSES.
5. ROUTE SUPPLY AIR DUCT AHAP ABOVE EXHAUST MAIN. COORDINATE WITH STRUCTURE.
6. ROUTE 18x10 EA DUCT AHAP ABOVE 30x6 SA DUCT. TRANSITION TO 12x14 DUCT BEFORE CONNECTING TO 20x16 EA DUCT.
7. ROUTE 30x6 OA DUCT BELOW 50x6 SIDEWALL RAG, 26x6 RA DUCT AND 30x6 FCU PLENUM.
8. DUCTWORK FOR FCU-2-2 SHALL BE INSTALLED AHAP, TO ALLOW FOR 30x6 OA DUCTWORK TO BE ROUTED BELOW.
9. 6x6 SA DUCTWORK ROUTED ABOVE 24x6 OA DUCT.
10. 30x6 OA DUCTWORK OFFSET DOWN BELOW BEAM.
11. 8x6 OA DUCT TAP-OFF 30x6 OA DUCT MAIN AND CONNECT TO 30x6 FCU PLENUM WITH MANUAL DAMPER.
12. PROVIDE SEISMIC CONNECTIONS FOR ALL DUCTWORK, PIPING AND ACCESSORIES CROSSING SEISMIC JOINT. SEE STRUCTURAL PLANS.

QA+M architecture
QuinnsberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

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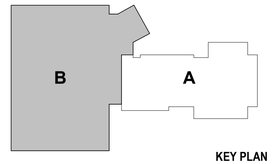


KEY PLAN

DEVELOPMENT OF:
WINDHAM SENIOR & COMMUNITY CENTER
WILLIMANTIC, CONNECTICUT
Project #: 1762

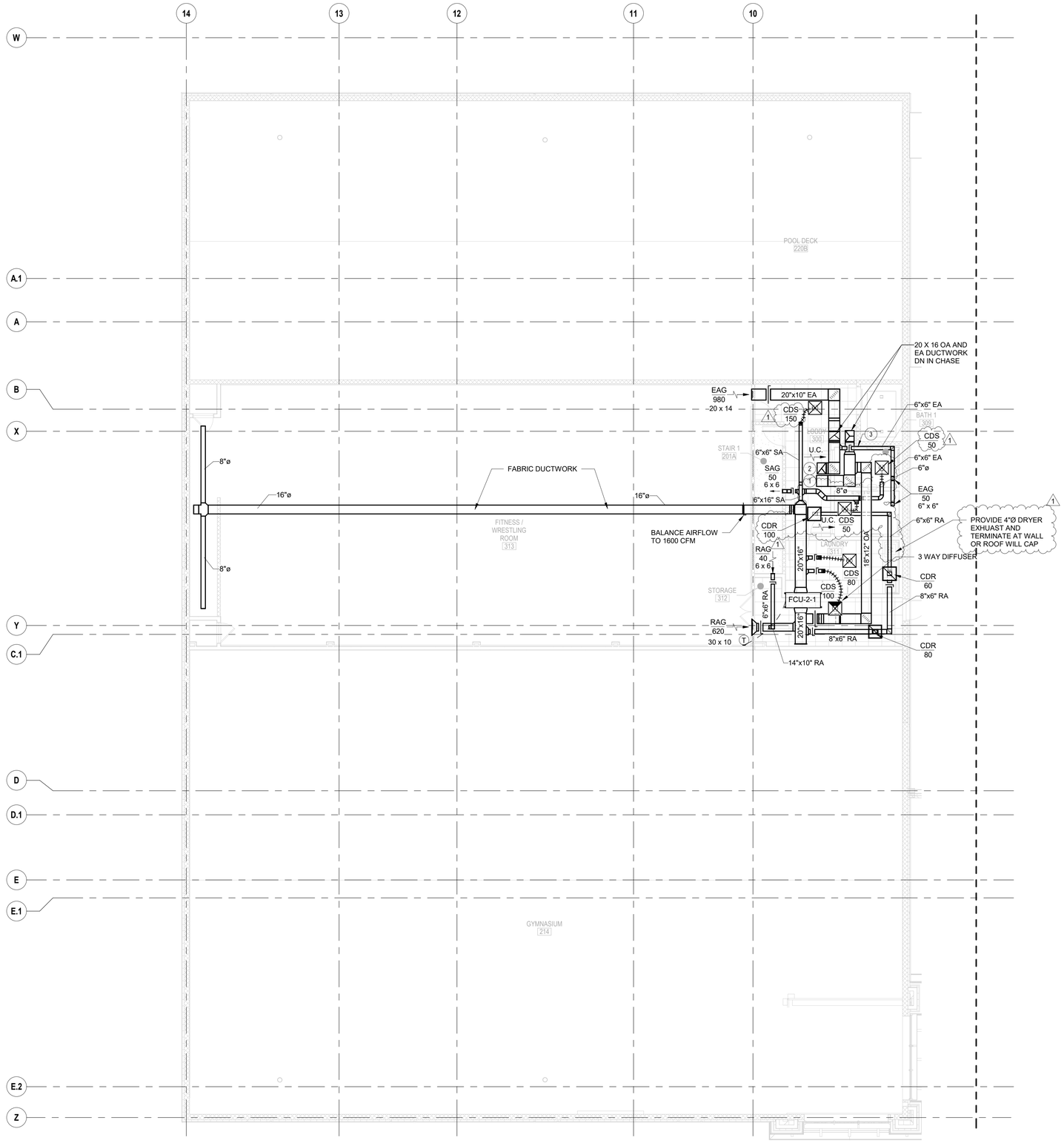
1	ADDENDUM 1	10/02/2019

Revisions
Issue Dates:

CONSTRUCTION BID SEPTEMBER 9, 2019

LEVEL 1 - MECHANICAL DUCTWORK FLOOR PLAN- PART B

M-1.3



1 LEVEL 2 - MECHANICAL DUCTWORK FLOOR PLAN- MEZZAINE
M-1.4 1/8" = 1'-0"

FAN COIL UNIT-EA & OA BALANCE

TAG	OA AIRFLOW (CFM)	RUN OUT DUCT SIZE	EA AIRFLOW (CFM)	RUN OUT DUCT SIZE
FCU-2-1	1150	(2)	0	-
FCU-2-2	150	(2)	0	-
FCU-2-3	1100	(2)	0	-
FCU-2-4	680	(2)	0	-

NOTES:
1. PROVIDE MANUAL DAMPERS BEFORE CONNECTING OA AND EA DUCTS TO TO RA DUCT FOR FCU, WHETHER SHOWN ON DRAWINGS OR NOT.
2. SEE PLANS FOR RUNOUT DUCT SIZE.

GENERAL NOTE

1. SEE DIFFUSER, GRILLE AND REGISTER SCHEDULE ON SHEET M-3.2 FOR RUNOUT DUCT SIZES NOT SHOWN ON PLANS. RUNOUT DUCT SIZES SHALL BE SAME SIZE AS INDICATED NECK SIZE, UNLESS INDICATED ON PLANS.

RENOVATION KEYNOTES

1. 20x20 OUTSIDE AIR DUCTWORK UP TO DOAS-2 1 LOCATED ON ROOF.
2. 20x20 EXHAUST AIR DUCTWORK UP TO DOAS-2 1 LOCATED ON ROOF.
3. 6x6 EXHAUST AIR DUCTWORK ROUTED OVER OUTSIDE AIR DUCT. COORDINATE WITH STRUCTURE.

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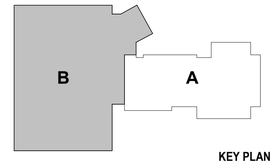

KEY PLAN

DEVELOPMENT OF:

WINDHAM SENIOR & COMMUNITY CENTER

WILLIMANTIC, CONNECTICUT
Project #: 1762

1	ADDENDUM 1	10/02/2019

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LEVEL 2 - MECHANICAL DUCTWORK FLOOR PLAN- MEZZAINE

M-1.4

KEYNOTES

1. EXTERIOR LIGHTS CONTROLLED VIA ASTRONOMICAL TIME CLOCK & LIGHTING CONTROL PANEL.

GENERAL NOTES

1. REFER TO LEGEND, ABBREVIATIONS AND NOTES ON SHEET E0.1 FOR MORE INFORMATION.
2. REFER TO LIGHTING FIXTURE SCHEDULE ON SHEET E5.0.
3. CONTRACTOR TO CONFIRM FUSE OR CIRCUIT BREAKER AND FEEDER SIZES WITH ACTUAL EQUIPEMENT TO BE INSTALLED PRIOR TO ROUGH - IN.
4. PROVIDE POWER CONDUCTORS TO SMOKE DAMPERS IN CORRIDOR 101 WALLS. COORDINATE WITH MECHANICAL CONTRACTOR ,SEE MECHANICAL PLAN FOR MORE INFORMATION.
5. PROVIDE SIGNAL + POWER OUTLET FOR WALL MOUNTED TV MONITOR .SEE ARCHITECTS PLAN AND ELEVATIONS FOR MORE INFORMATION.
6. PROVIDE SIGNAL + POWER OUTLET FOR CEILING MOUNTED PROJECTOR. SEE ARCHITECTS REFLECTED CEILING PLAN FOR MORE INFORMATION ALSO PROVIDE1"C FROM PROJECTOR SIGNAL BACK BOX TO FLUSH JBOX ON NORTH WALL OF STORAGE ROOM 113. SEE ARCHITECTS PLAN FOR MORE INFORMATION.
7. EGRESS AND EXIT LIGHT LAYOUT TO BE REVIEWED WITH AHJ PRIOR TO ROUGH-IN.

1 EL-1.1 FIRST FLOOR ELECTRICAL LIGHTING PLAN- PART A
1/8" = 1'-0"

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195 Scott Swamp Road
Farmington, CT 06032
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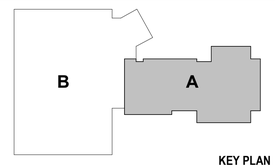

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DEVELOPMENT OF:

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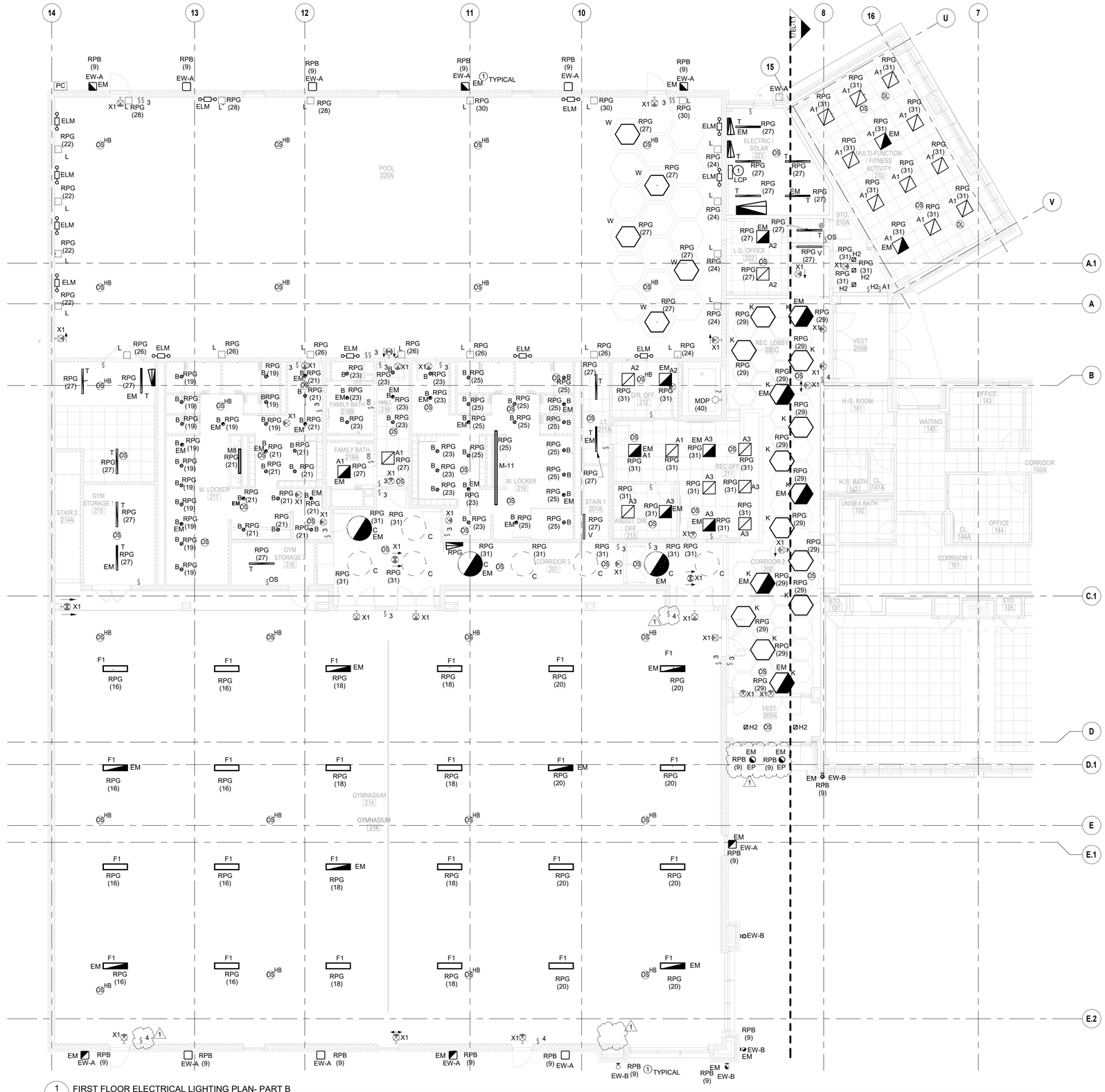
FIRST FLOOR ELECTRICAL LIGHTING PLAN- PART A

EL-1.1



1 EL-1.2 FIRST FLOOR ELECTRICAL LIGHTING PLAN- PART B
1/8" = 1'-0"

GENERAL NOTES

1. REFER TO LEGEND, ABBREVIATIONS AND NOTES ON SHEET E0.1 FOR MORE INFORMATION.
2. REFER TO LIGHTING FIXTURE SCHEDULE ON SHEET E5.0.
3. CONTRACTOR TO CONFIRM FUSE OR CIRCUIT BREAKER AND FEEDER SIZES WITH ACTUAL EQUIPEMENT TO BE INSTALLED PRIOR TO ROUGH - IN.
4. PROVIDE POWER CONDUCTORS TO SMOKE DAMPERS IN CORRIDOR 101 WALLS. COORDINATE WITH MECHANICAL CONTRACTOR ,SEE MECHANICAL PLAN FOR MORE INFORMATION.
5. PROVIDE SIGNAL + POWER OUTLET FOR WALL MOUNTED TV MONITOR .SEE ARCHITECTS PLAN AND ELEVATIONS FOR MORE INFORMATION.
6. PROVIDE SIGNAL + POWER OUTLET FOR CEILING MOUNTED PROJECTOR, SEE ARCHITECTS REFLECTED CEILING PLAN FOR MORE INFORMATION ALSO PROVIDE1"C FROM PROJECTOR SIGNAL BACK BOX TO FLUSH JBOX ON NORTH WALL OF STORAGE ROOM 113. SEE ARCHITECTS PLAN FOR MORE INFORMATION.
7. EGRESS AND EXIT LIGHT LAYOUT TO BE REVIEWED WITH AHJ PRIOR TO ROUGH-IN.

KEYNOTES

1. EXTERIOR LIGHTS CONTROLLED VIA ASTRONOMICAL TIME CLOCK & LIGHTING CONTROL PANEL ON CIRCUIT RPB-11.

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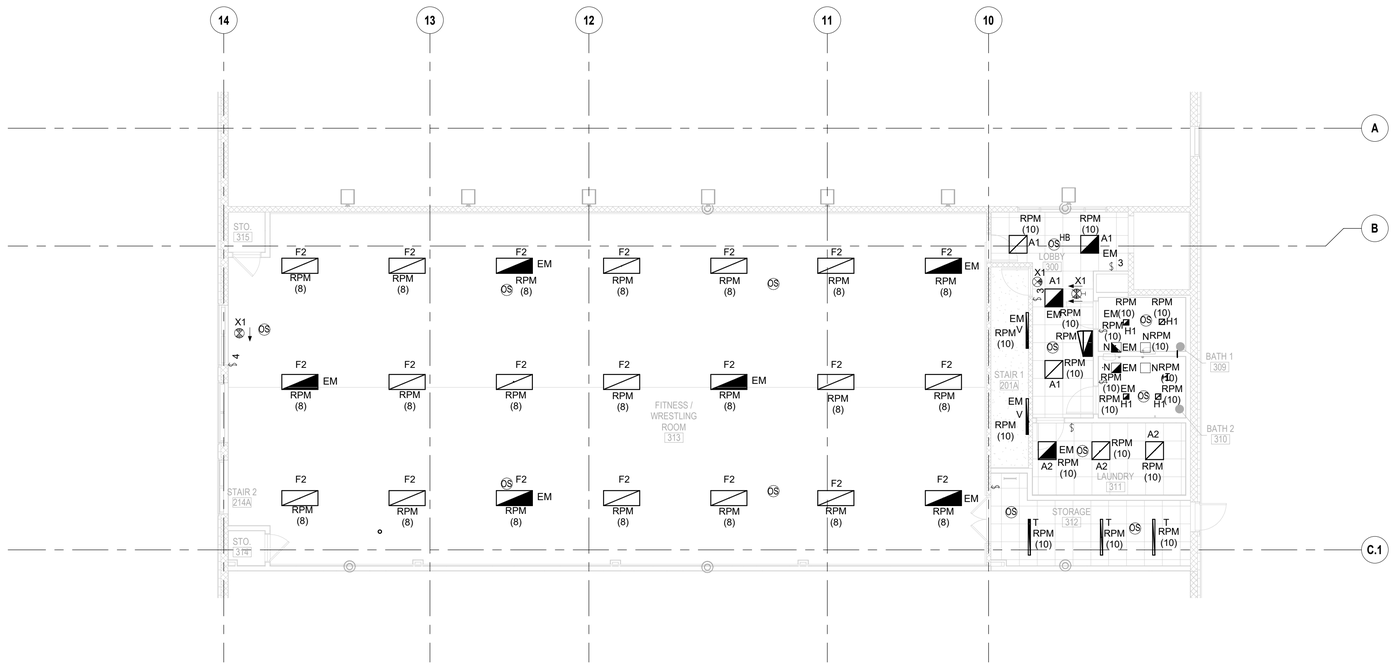
FIRST FLOOR ELECTRICAL LIGHTING PLAN- PART B

EL-1.2

GENERAL NOTES

1. REFER TO LEGEND, ABBREVIATIONS AND NOTES ON SHEET E0.1 FOR MORE INFORMATION.
2. REFER TO LIGHTING FIXTURE SCHEDULE ON SHEET E5.0.
3. CONTRACTOR TO CONFIRM FUSE OR CIRCUIT BREAKER AND FEEDER SIZES WITH ACTUAL EQUIPEMENT TO BE INSTALLED PRIOR TO ROUGH - IN.
4. PROVIDE POWER CONDUCTORS TO SMOKE DAMPERS "SD" IN CORRIDOR 101 WALLS. COORDINATE WITH MECHANICAL CONTRACTOR ,SEE MECHANICAL PLAN FOR MORE INFORMATION. ALSO SEE PANEL SCHEDULE MPA FOR MORE INFORMATION.
5. PROVIDE SIGNAL + POWER OUTLET FOR WALL MOUNTED TV MONITOR ,SEE ARCHITECTS PLAN AND ELEVATIONS FOR MORE INFORMATION.
6. PROVIDE SIGNAL + POWER OUTLET FOR CEILING MOUNTED PROJECTOR, SEE ARCHITECTS REFLECTED CEILING PLAN FOR MORE INFORMATION ALSO PROVIDE1"C FROM PROJECTOR SIGNAL BACK BOX TO FLUSH JBOX ON NORTH WALL OF STORAGE ROOM 113. SEE ARCHITECTS PLAN FOR MORE INFORMATION.
7. EGRESS AND EXIT LIGHT LAYOUT TO BE REVIEWED WITH AHJ PRIOR TO ROUGH-IN
8. LIGHTING CONTRACTOR SHALL CENTER LIGHTS IN TRUSS BAY.

1



1 SECOND FLOOR ELECTRICAL LIGHTING PLAN- PART B
EL-2.1 1/8" = 1'-0"

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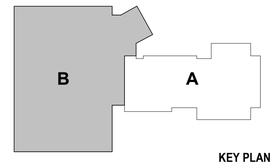

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SECOND FLOOR ELECTRICAL LIGHTING PLAN- PART B

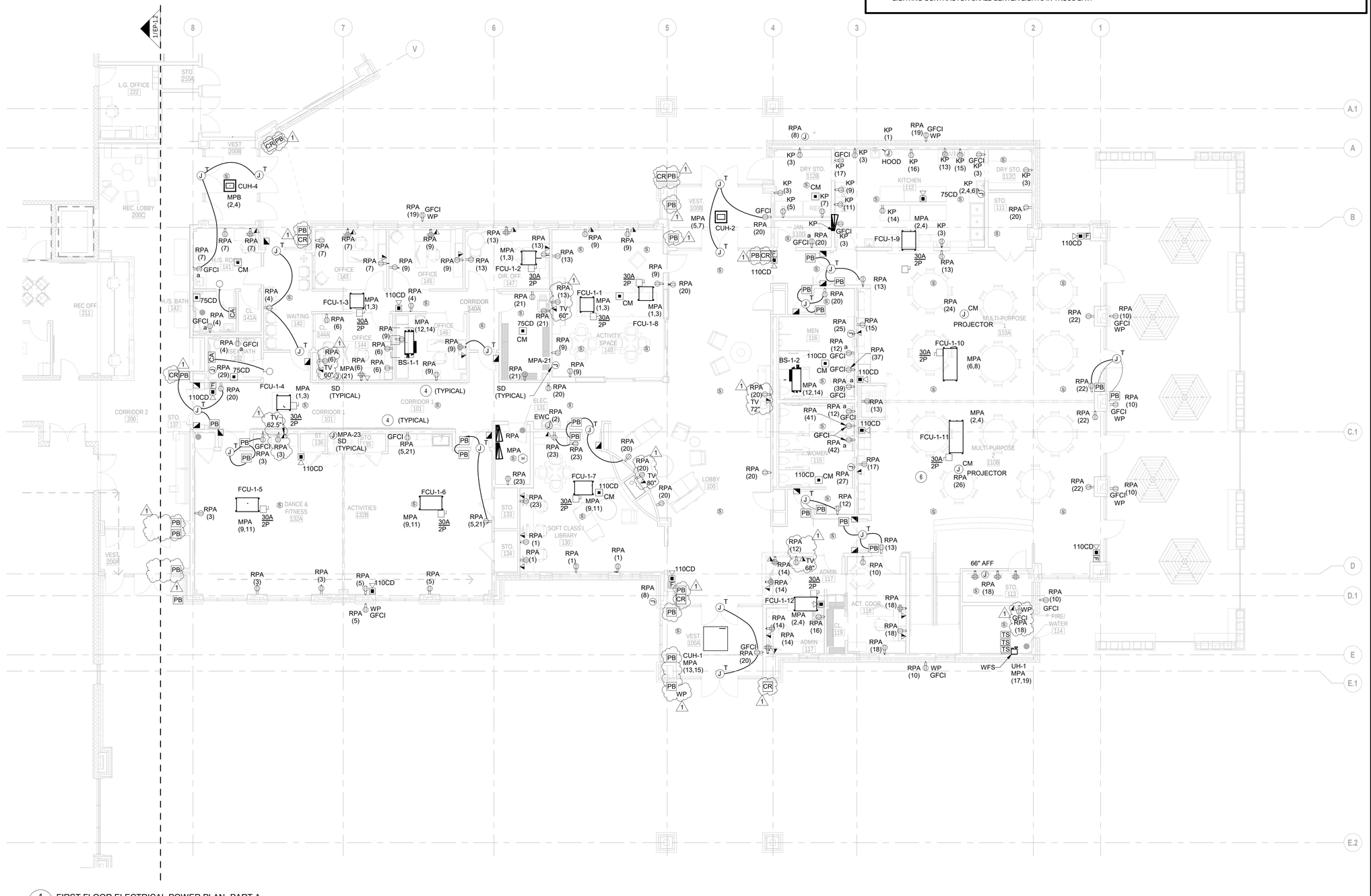
EL-2.1

KEY NOTES

Tag	Notes
1	SEE ELEVATOR PIT AND SHAFT DETAIL FOR MORE INFORMATION.
2	FOR POOL VAC
3	CEILING MOUNTED DISCONNECT.
4	PROVIDE 1-1/2" CONDUIT FROM FLOOR BOX AT LOCATION SHOWN TO FLUSH MOUNTED J-BOX LOCATED BEHIND SCORE BOARD FOR CONTROL CABLES. TYPICAL OF TWO.
5	MOUNT ELO (GAS SHUT-OFF) ADJACENT TO KITCHEN EXIT DOOR 54" A.F.F.

GENERAL NOTES

1. REFER TO LEGEND, ABBREVIATIONS AND NOTES ON SHEET E0.1 FOR MORE INFORMATION.
2. REFER TO LIGHTING FIXTURE SCHEDULE ON SHEET E5.0.
3. CONTRACTOR TO CONFIRM FUSE OR CIRCUIT BREAKER AND FEEDER SIZES WITH ACTUAL EQUIPEMENT TO BE INSTALLED PRIOR TO ROUGH - IN.
4. PROVIDE POWER CONDUCTORS TO SMOKE DAMPERS "SD" IN CORRIDOR 101 WALLS. COORDINATE WITH MECHANICAL CONTRACTOR ,SEE MECHANICAL PLAN FOR MORE INFORMATION. ALSO SEE PANEL SCHEDULE MPA FOR MORE INFORMATION.
5. PROVIDE SIGNAL + POWER OUTLET FOR WALL MOUNTED TV MONITOR .SEE ARCHITECTS PLAN AND ELEVATIONS FOR MORE INFORMATION.
6. PROVIDE SIGNAL + POWER OUTLET FOR CEILING MOUNTED PROJECTOR, SEE ARCHITECTS REFLECTED CEILING PLAN FOR MORE INFORMATION ALSO PROVIDE1"C FROM PROJECTOR SIGNAL BACK BOX TO FLUSH JBOX ON NORTH WALL OF STORAGE ROOM 113. SEE ARCHITECTS PLAN FOR MORE INFORMATION.
7. EGRESS AND EXIT LIGHT LAYOUT TO BE REVIEWED WITH AHJ PRIOR TO ROUGH-IN
8. LIGHTING CONTRACTOR SHALL CENTER LIGHTS IN TRUSS BAY.



1 FIRST FLOOR ELECTRICAL POWER PLAN- PART A
EP-1.1 1/8" = 1'-0"

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Farmington, CT 06032
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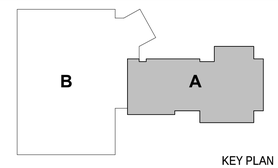

KEY PLAN

DEVELOPMENT OF:

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WILLIMANTIC, CONNECTICUT
Project #: **1762**

1	ADDENDUM 1	10/02/2019

Revisions

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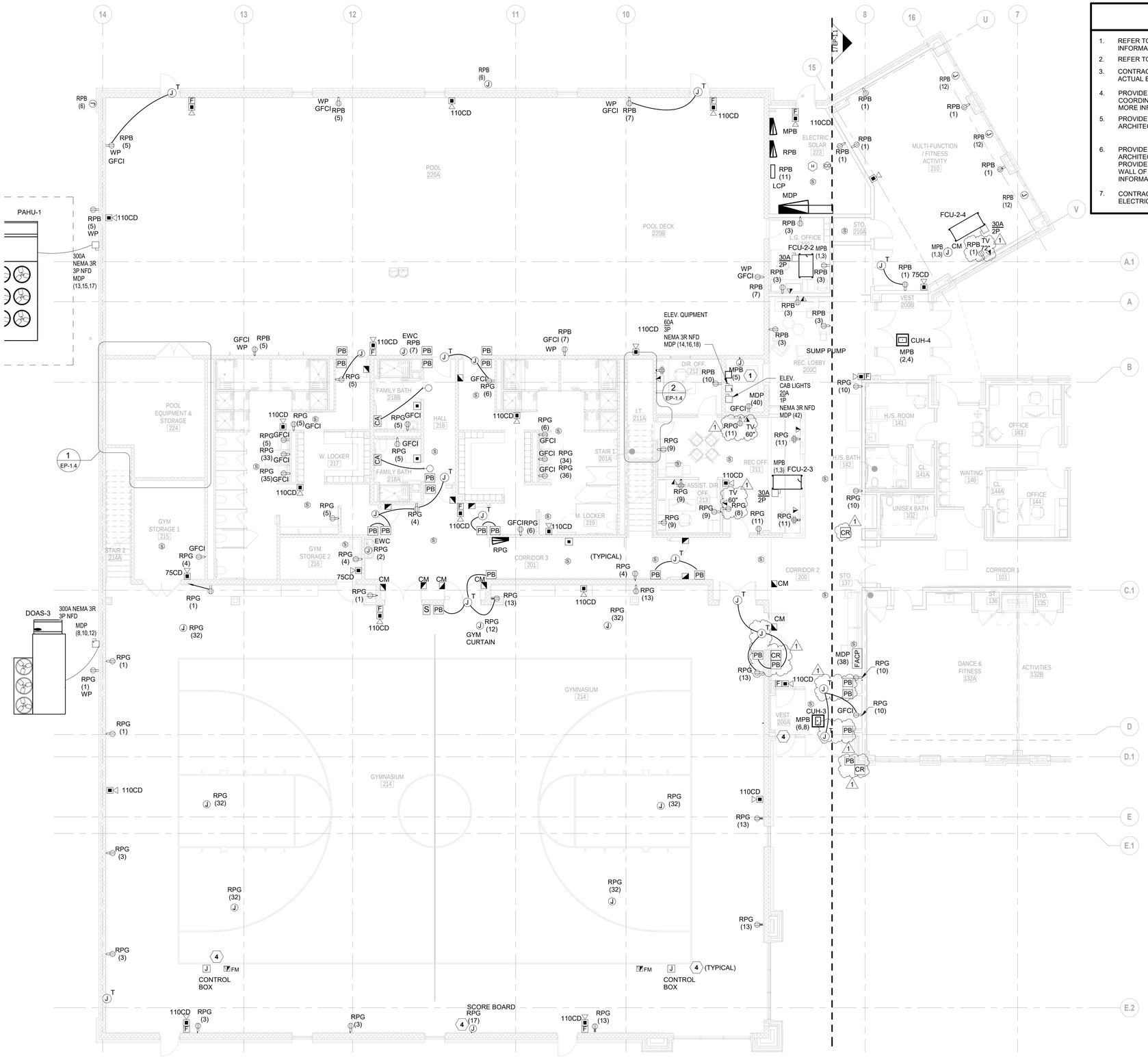
FIRST FLOOR ELECTRICAL POWER PLAN- PART A

EP-1.1



1 EP-1.2 FIRST FLOOR ELECTRICAL POWER PLAN- PART B
1/8" = 1'-0"

GENERAL NOTES

1. REFER TO LEGEND, ABBREVIATIONS AND NOTES ON SHEET E0.1 FOR MORE INFORMATION.
2. REFER TO LIGHTING FIXTURE SCHEDULE ON SHEET E5.0.
3. CONTRACTOR TO CONFIRM FUSE OR CIRCUIT BREAKER AND FEEDER SIZES WITH ACTUAL EQUIPEMENT TO BE INSTALLED PRIOR TO ROUGH - IN.
4. PROVIDE POWER CONDUCTORS TO SMOKE DAMPERS IN CORRIDOR 101 WALLS. COORDINATE WITH MECHANICAL CONTRACTOR ,SEE MECHANICAL PLAN FOR MORE INFORMATION.
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7. CONTRACTOR TO PROVIDE SCALED ELECTRICAL ROOM LAYOUT WITH ELECTRICAL DISTRIBUTION EQUIPMENT SUBMITTAL.

KEY NOTES

Tag	Notes
1	SEE ELEVATOR PIT AND SHAFT DETAIL FOR MORE INFORMATION.
2	FOR POOL VAC
3	CEILING MOUNTED DISCONNECT.
4	PROVIDE 1-1/2" CONDUIT FROM FLOOR BOX AT LOCATION SHOWN TO FLUSH MOUNTED J-BOX LOCATED BEHIND SCORE BOARD FOR CONTROL CABLES. TYPICAL OF TWO.
5	MOUNT ELO (GAS SHUT-OFF) ADJACENT TO KITCHEN EXIT DOOR 54" A.F.F.

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195 Scott Swamp Road
Farmington, CT 06032
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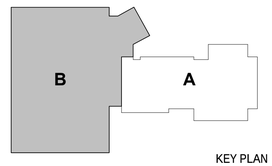

KEY PLAN

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Project #: **1762**

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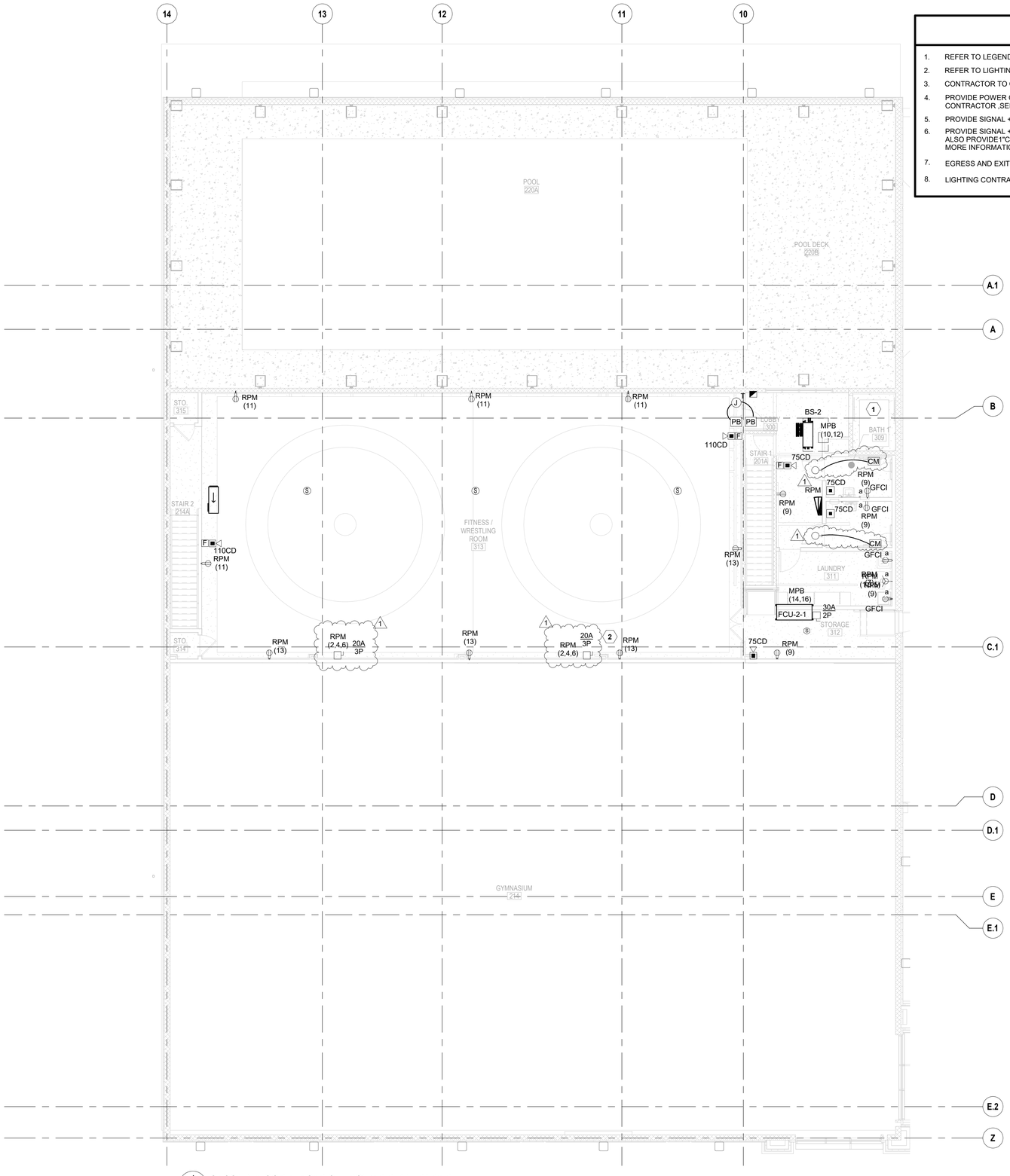
FIRST FLOOR ELECTRICAL POWER PLAN- PART B

EP-1.2



1 SECOND FLOOR ELECTRICAL POWER PLAN- PART B
EP-2.1 1/8" = 1'-0"

GENERAL NOTES

1. REFER TO LEGEND, ABBREVIATIONS AND NOTES ON SHEET E0.1 FOR MORE INFORMATION.
2. REFER TO LIGHTING FIXTURE SCHEDULE ON SHEET E5.0.
3. CONTRACTOR TO CONFIRM FUSE OR CIRCUIT BREAKER AND FEEDER SIZES WITH ACTUAL EQUIPEMENT TO BE INSTALLED PRIOR TO ROUGH - IN.
4. PROVIDE POWER CONDUCTORS TO SMOKE DAMPERS "SD" IN CORRIDOR 101 WALLS. COORDINATE WITH MECHANICAL CONTRACTOR ,SEE MECHANICAL PLAN FOR MORE INFORMATION. ALSO SEE PANEL SCHEDULE MPA FOR MORE INFORMATION.
5. PROVIDE SIGNAL + POWER OUTLET FOR WALL MOUNTED TV MONITOR .SEE ARCHITECTS PLAN AND ELEVATIONS FOR MORE INFORMATION.
6. PROVIDE SIGNAL + POWER OUTLET FOR CEILING MOUNTED PROJECTOR, SEE ARCHITECTS REFLECTED CEILING PLAN FOR MORE INFORMATION ALSO PROVIDE1"C FROM PROJECTOR SIGNAL BACK BOX TO FLUSH JBOX ON NORTH WALL OF STORAGE ROOM 113. SEE ARCHITECTS PLAN FOR MORE INFORMATION.
7. EGRESS AND EXIT LIGHT LAYOUT TO BE REVIEWED WITH AHJ PRIOR TO ROUGH-IN
8. LIGHTING CONTRACTOR SHALL CENTER LIGHTS IN TRUSS BAY.

KEY NOTES

⬡	
Tag	Notes
1	SEE ELEVATOR PIT AND SHAFT DETAIL FOR MORE INFORMATION.
2	COORDINATE WRESTLING EQUIPMENT POWER FEED, EXACT LOCATION AND MOUNTING HEIGHT WITH EQUIPMENT VENDOR AND OWNER OR CONSTRUCTION MANGER PRIOR TO ROUGH - IN

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QuinnBerryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
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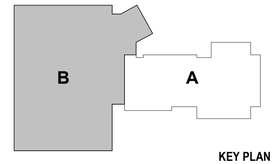

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DEVELOPMENT OF:
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Project #: 1762

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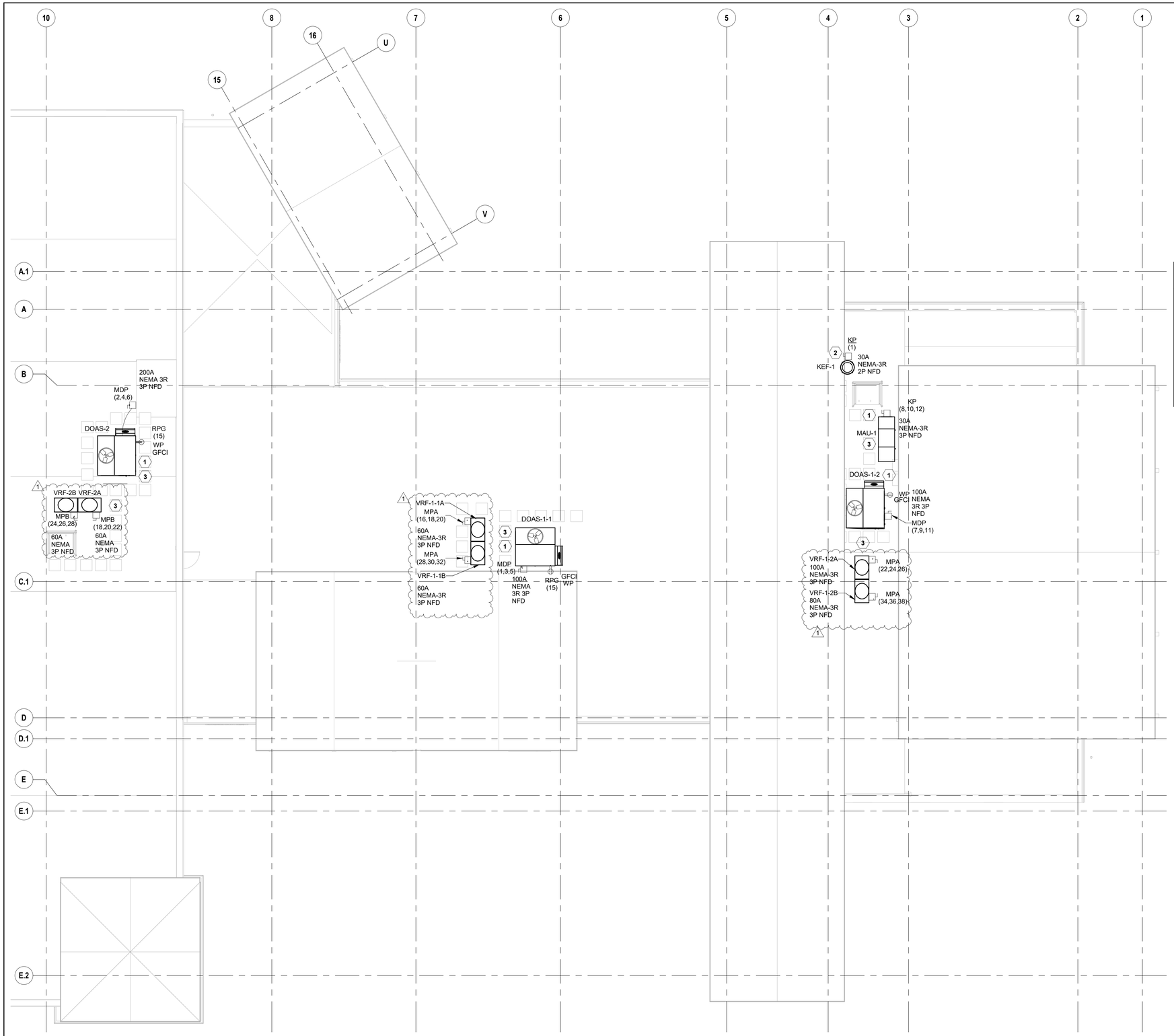
SECOND FLOOR ELECTRICAL POWER PLAN- PART B

EP-2.1



1 ELECTRICAL ROOF PLAN - PART B
EP-3.0 NTS

GENERAL NOTES

1. REFER TO LEGEND, ABBREVIATIONS AND NOTES ON SHEET E0.1 FOR MORE INFORMATION.
2. REFER TO LIGHTING FIXTURE SCHEDULE ON SHEET E5.0.
3. CONTRACTOR TO CONFIRM FUSE OR CIRCUIT BREAKER AND FEEDER SIZES WITH ACTUAL EQUIPEMENT TO BE INSTALLED PRIOR TO ROUGH - IN.
4. PROVIDE POWER CONDUCTORS TO SMOKE DAMPERS IN CORRIDOR 101 WALLS. COORDINATE WITH MECHANICAL CONTRACTOR ,SEE MECHANICAL PLAN FOR MORE INFORMATION.
5. PROVIDE SIGNAL + POWER OUTLET FOR WALL MOUNTED TV MONITOR .SEE ARCHITECTS PLAN AND ELEVATIONS FOR MORE INFORMATION.
6. PROVIDE SIGNAL + POWER OUTLET FOR CEILING MOUNTED PROJECTOR, SEE ARCHITECTS REFLECTED CEILING PLAN FOR MORE INFORMATION ALSO PROVIDE1"C FROM PROJECTOR SIGNAL BACK BOX TO FLUSH JBOX ON NORTH WALL OF STORAGE ROOM 113. SEE ARCHITECTS PLAN FOR MORE INFORMATION.
7. EGRESS AND EXIT LIGHT LAYOUT TO BE REVIEWED WITH AHJ PRIOR TO ROUGH-IN.

KEYNOTES

1. PROVIDE HVAC SERVICE LIGHT FIXTURE AS VAPOR TIGHT LED WITH GLASS GLOBE AND WIRE CAGE GUARD AS WELL AS WEATHERPROOF SWITCH. AT BASE POWERED FROM SAME CIRCUIT AS WP GFCI SERVICE RECEPTACLE. LUMARK - LVL20UG WITH STANTION POST.
2. EXHAUST FAN CIRCUIT ALSO FEEDS KITCHEN HOOD SEE SHEET EP-1.1 FOR MORE INFORMATION.
3. COORDINATE WITH MECHANICAL CONTRACTOR WITH ACTURAL EQUIPMENT INSTALLED, IF ADD ALTERNATE #4 IS SELECTED.

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QuinnBerryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
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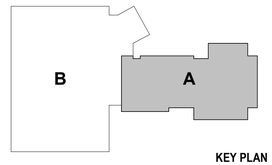

KEY PLAN

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ROOF PLAN ELECTRICAL POWER PLAN

EP-3.0

LIGHTING FIXTURE SCHEDULE

TYPE MARK	MANUFACTURER	CATALOG NUMBER	NOTES	CCT	WATTS
A1	METALUX	22CZ-LD5-24-UNV-L835-CD1-U	PROVIDE EM WHERE SHOWN	3500K	8W/FT
A2	METALUX	22CZ-LD5-32-UNV-L835-CD1-U	PROVIDE EM WHERE SHOWN	3500K	8W/FT
A3	METALUX	22CZ-LD5-39-UNV-L835-CD1-U	PROVIDE EM WHERE SHOWN	3500K	14.7W
B	HALO	SMD6R-12-935-WH-E		3500K	105W
C	IMPACT	C5518-35L0		3500K	35W
D	I2 SYSTEMS	CP-06W-35K-S-XX-XX-XX		3500K	43W
ELM	BEGHELLI	PEH-1-AT (RC)			
EP	DMF	NU6-QD-13LM-35K-83-HE70-DIM10-WH-WH-EM7		3500K	57W
F1	STARTEK	AVDNI-36-H-35K-PS-ALW05-U-PC	PROVIDE EMB10 BATTERY PACK IN LOCATIONS SHOWN	3500K	135.7W
F2	STARTEK	AVDNI-18-S-35K-PS-ALW05-U-PC	PROVIDE EMB10 BATTERY PACK IN LOCATIONS SHOWN	3500K	68.7W
G	ALW	MR1.5-3M3/4/3-CSS-LOW/80/3500K-0/10V/SLENS/LOW/80/3500K-0/10V/S-LENSXX-UNV		3500K	150W
H1	ALPHABET	NU4-QD-13LM-35K-80-HE70-DIM10-WH-WH-EM7		3500K	32W
H2	ALPHABET	NU6-QD-13LM-35K-83-HE70-DIM10-WH-WH-EM7		3500K	57W
J	MOTOLUX	M620XX-BC33903555-55-DL-XX	PROVIDE M202 REMOTE CONTROL	3500K	30W
K	ALW	RPD02-6L46-3500-0/10V/S-X-UNV-X			97W
L	AMETRIX	ASYX-WM-L-5-NT-D-F-L35-1-UUV-R-XX-STD-SVP D2-FM			400W
M8	ALW	LP3.5RT-TGRID-S8FT-8INCH-LOW-3500-X-EXT-N-X-N-N			14.2W
M-11	ALW	LP3.5RT-TGRID-S11FT-3INCH-LOW-3500-X-EXT-N-X-N-N			14.2W
N	ALW	RLP2W-S3-LOW-80/3500K-1/10VS-LENS-XX-UNV		3500K	7.2W
P	BRUCK	223-XX-XX-XX	PROVIDE 8' ENZIS CURVED TRACK KIT		5W
Q	ALW	RPD06-R1E/M-3M/3/4/3-3500-0/10V/S-LENS-X-X-UUV-EMB	ARCHITECT TO SPECIFY COLOR AND FINISH	3500K	184W
T	METALUX	4SNLED-LD5-56SL-LN-UUV-L8XX-CD1-U		3500K	46W
U4	NULITE	RP2-4D-06L35D-1C-FRF-XX-XX-48-4		3500K	25.7
U8	NULITE	RP2-4D-06L35D-1C-FRF-XX-XX-48-8		3500K	25.7
U16	NULITE	RP2-4D-06L35D-1C-FRF-XX-XX-48-16		3500K	25.7
U20	NULITE	RP2-4D-06L35D-1C-FRF-XX-XX-48-20		3500K	25.7
V	METALUX	4BCLED-LD4-32SL-F-UNV-L835-CD1-U		3500K	32.5
W	NOVAFLEX	NF-PRO-0-240-24V-3225K			5.9W/SG.FT
EMERGENCY AND EXIT SIGN					
X1	BEGHELLI	CYC-HT-LR-2-C-WCS	EDGELIT UNIVERSAL EXIT SIGN - 277V		2453V
EXTERIOR					
EP	DMF	DCC2-TW-L-20-30-X-X		3000K	29W
EW-A	LIGMAN	UJE-30391-39-VW-W30-X-120/277		3000K	39W
EW-B	PIL	079122		3000K	4.2W

Branch Panel: MPB

Location: | **Supply From:** MDP | **Mounting:** SURFACE | **Enclosure:** TYPE 1
Volts: 120/208 Wye | **Phases:** 3 | **Wires:** 4
A.I.C. Rating: 65,000 | **Mains Type:** MLO | **Mains Rating:** 400 A | **MCB Rating:** 400 A | **Feed Thru Lugs:**

Notes:

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	FCU-2-2,3,4 RMS 210,211,222	20 A	2	4	2000					2	25 A	CUH-4 VEST 200B	2
3	--	--	--			4	2000			--	--	--	4
5	REC ELEV SUMP PUMP	20 A	1					180	2000	2	25 A	CUH-3 VEST 200A	6
7	CIRC. PUMP	20 A	1	1000	2000					--	--	--	8
9	CIRC. PUMP	20 A	1			1000	250			2	15 A	BC-2 SECOND FLOOR	10
11	WATER HEATER RM 224 (GAS)	20 A	1					120	250	--	--	--	12
13	WATER HEATER RM224 (GAS)	20 A	1	120	924					2	20 A	FCU-2-1 SECOND FLOOR	14
15	AC-2-1 RM 211A	15 A	2			250	924			--	--	--	16
17	--	--	--					250	5280	3	60 A	VRF-2A (ROOF)	18
19	AC-2-2 RM 224	15 A	2	250	5280					--	--	--	20
21	--	--	--			250	5280			--	--	--	22
23	DISCONNECT SWITCH - EF-1	20 A	3					4	5280	3	60 A	VRF-2B (ROOF)	24
25	--	--	--	4	5280					--	--	--	26
27	--	--	--			4	5280			--	--	--	28
29	MOTORIZED SMOKE DAMPERS	20 A	1					0					30
31													32
33													34
35													36
37													38
39													40
41													42
			Total Load:	16862 VA		15242 VA		13364 VA					
			Total Amps:	143 A		129 A		111 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Power	13596 VA	100.00%	13596 VA		
Junction Box	180 VA	100.00%	180 VA	Total Conn. Load:	45468 VA
DISCONNECT SWITCH - MAU - 1	31692 VA	100.00%	31692 VA	Total Est. Demand:	45468 VA
				Total Conn.:	126 A
				Total Est. Demand:	126 A

Notes:
COORDINATE MOTORIZED SMOKE DAMPERS WITH DIV. 15 MECHANICAL EQUIPMENT CONTRACTOR, ALSO SEE GENERAL NOTE #4 ON SHEETS EP-1.1, EP-1.2 & EP-2.1.

Branch Panel: PP

Location: W. LOCKER 217 | **Supply From:** MDP | **Mounting:** SURFACE | **Enclosure:** TYPE 1
Volts: 120/208 Wye | **Phases:** 3 | **Wires:** 4
A.I.C. Rating: 22,000 | **Mains Type:** MLO | **Mains Rating:** 225 A | **MCB Rating:** 225 A | **Feed Thru Lugs:**

Notes:

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	VFD - RECIRC PUMP	20 A	3	2500	500					1	20 A	CHEM CONTROLER	2
3	--	--	--			2500	1000			2	20 A	Junction Box BOOSTER PUMP	4
5	--	--	--					2500	1000	--	--	--	6
7	Spare	20 A	1	0	500					1	20 A	HEATER	8
9	CONTROL SYSTEM	20 A	1			500	500			1	20 A	VENT MOTOR	10
11	FILTER CONTROLLER	20 A	1					500	1000	1	20 A	AIR COMPRESSOR	12
13	DISINFECTION SYSTEM	20 A	3	333									14
15	--	--	--			333							16
17	--	--	--					333					18
19													20
21													22
23													24
25													26
27													28
29													30
31													32
33													34
35													36
37													38
39													40
41													42
		Total Load:		3833 VA		4833 VA		5333 VA					
		Total Amps:		32 A		42 A		46 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Other	8000 VA	100.00%	8000 VA		
Power	4000 VA	100.00%	4000 VA	Total Conn. Load:	14000 VA
Junction Box	2000 VA	100.00%	2000 VA	Total Est. Demand:	14000 VA
				Total Conn.:	39 A
				Total Est. Demand:	39 A

Notes:

Branch Panel: KP

Location: DRY STO. 112B | **Supply From:** MDP | **Mounting:** SURFACE | **Enclosure:** TYPE 1
Volts: 120/208 Wye | **Phases:** 3 | **Wires:** 4
A.I.C. Rating: 22,000 | **Mains Type:** MLO | **Mains Rating:** 400 A | **MCB Rating:** 400 A | **Feed Thru Lugs:**

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	JUNCTION BOX 3 - BOX KITCHEN EXHAUST...	20 A	1	400	1900					3	40 A	Junction Box - BOOSTER HEATER RM 112	2
3	RECEPTACLES - KITCHEN ROOMS	20 A	1			1260	1900			--	--	--	4
5	RECEPTACLE - REFRIG. RM 112B	20 A	1					1000	1900	--	--	--	6
7	RECEPTACLE - FREEZER RM 112B	20 A	1	1000	1250					3	15 A	DISC. SWITCH - MAU-1	8
9	RECEPTACLE - REFRIG. KITCHEN 112	20 A	1			1000	1250			--	--	--	10
11	RECEPTACLE - FREEZER KITCHEN 112	20 A	1					1000	1250	--	--	--	12
13	RECEPTACLE- MOCROWAVE KITCHEN 112	20 A	1	1300	1000					1	20 A	REC PREP REFRIG	14
15	RECEPTACLE- MOCROWAVE KITCHEN 112	20 A	1			1300	1000			1	20 A	RECEPTACLE - CONU. OVEN KITCHEN 112	16
17	RECEPTACLE - PREP REFRIG	20 A	1					1000					18
19													20
21													22
23													24
25													26
27													28
29													30
31													32
33													34
35													36
37													38
39													40
41													42
		Total Load:		6850 VA		7710 VA		6150 VA					
		Total Amps:		58 A		65 A		51 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Power	3750 VA	100.00%	3750 VA		
Junction Box	6100 VA	100.00%	6100 VA	Total Conn. Load:	20710 VA
				Total Est. Demand:	20280 VA
				Total Conn.:	57 A
				Total Est. Demand:	56 A

Notes:

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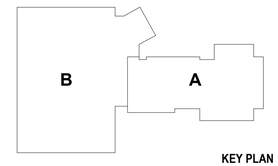

KEY PLAN

DEVELOPMENT OF:
WINDHAM SENIOR & COMMUNITY CENTER
WILLIMANTIC, CONNECTICUT
Project #: 1762

1	ADDENDUM 1	10/02/2019

Revisions
Issue Dates:

CONSTRUCTION BID
SEPTEMBER 9, 2019

ELECTRICAL SCHEDULES

E-5.0

Branch Panel: RPM

Location:
Supply From: MDP
Mounting: SURFACE
Enclosure: TYPE 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 22,000
Mains Type: MLO
Bus Rating: 225 A
MCB Rating: 225 A
Feed Thru Lugs:

CKT	Circuit Description	Note	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Note	Circuit Description	CKT
1	RECEPTACLE DRYER 2ND FLR RM 311		30 A	3	2000	333					3	20 A		J- Box MATTS MECH EQUIP RM 313	2
3	--	--	--	--			2000	333			--	--	--	--	4
5	--	--	--	--					2000	333	--	--	--	--	6
7	RECEPTACLE WASHER RM 311		20 A	1	1000	1443					1	20 A		LIGHTING RM313	8
9	RECEPTACLE GENERAL RM 311		20 A	1			900	325			1	20 A		LIGHTING RMS300,09,10,11,12	10
11	RECEPTACLE FITNESS RM 313		20 A	1					720						12
13	RECEPTACLE FITNESS RM 313		20 A	1	720										14
15															16
17															18
19															20
21															22
23															24
			Total Load:		5496 VA		3547 VA		3053 VA						
			Total Amps:		46 A		30 A		25 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	1482 VA	100.00%	1482 VA		
Other	6060 VA	100.00%	6060 VA	**Total Conn. Load:**	12095 VA
Junction Box	1000 VA	100.00%	1000 VA	**Total Est. Demand:**	12095 VA
				Total Conn.:	34 A
				Total Est. Demand:	34 A

Notes:
COORDINATE BREAKER AND CONDUCTORS WITH ACTUAL WRESTLING MATTS EQUIPMENT PROVIDED PRIOR TO ROUGH-IN.

Branch Panel: MPA

Location: ACTIVITIES 132B
Supply From: MDP
Mounting: SURFACE
Enclosure: TYPE 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 22,000
Mains Type: MLO
Bus Rating: 400 A
MCB Rating: 400 A
Feed Thru Lugs:

Notes:

CKT	Circuit Description	Note	Trip	Poles	A		B		C		Poles	Trip	Note	Circuit Description	CKT
1	FCU-1-1,1-2,1-3,1-4,1-8...		20 A	2	660	396					2	20 A		FCU-1-9,1-11,1-12 RMS110B,112,117	2
3	--	--	--	--			660	396			--	--	--	--	4
5	CUH-2 VEST 100B		25 A	2					2000	924	2	20 A		FCU-1-10 RM 110A	6
7	--	--	--	--	2000	924					--	--	--	--	8
9	FCU-1-5,1-6,1-7 RMS 132A-B, 130		20 A	2			300	0			1	20 A		Spare	10
11	--	--	--	--					300	400	2	15 A		BC-1A, BC-1B RMS 116,146	12
13	CUH-1 VEST 100A		25 A	2	2000	400					--	--	--	--	14
15	--	--	--	--			2000	5280			3	60 A		VRF-1-1A (ROOF)	16
17	UH-1 RM 114		20 A	2					1500	5280	--	--	--	--	18
19	--	--	--	--	1500	5280					--	--	--	--	20
21	MOTORIZED SMOKE DAMPERS		20 A	1			0	7200			3	80 A		VRF-1-2A (ROOF)	22
23	MOTORIZED SMOKE DAMPERS		20 A	1					0	7200	--	--	--	--	24
25					7200						--	--	--	--	26
27								5280			3	60 A		VRF-1-1B (ROOF)	28
29									5280		--	--	--	--	30
31					5280						--	--	--	--	32
33								7200			3	80 A		VRF-1-2B (ROOF)	34
35									7200		--	--	--	--	36
37					7200						--	--	--	--	38
39															40
41															42
			Total Load:		32840 VA		28316 VA		30084 VA						
			Total Amps:		276 A		236 A		253 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Power	16360 VA	100.00%	16360 VA		
Junction Box	0 VA	0.00%	0 VA	**Total Conn. Load:**	91240 VA
DISCONNECT SWITCH - MAU - 1	74880 VA	100.00%	74880 VA	**Total Est. Demand:**	91240 VA
				Total Conn.:	253 A
				Total Est. Demand:	253 A

Notes:
COORDINATE MOTORIZED SMOKE DAMPERS WITH DIV. 15 MECHANICAL EQUIPMENT CONTRACTOR, ALSO SEE GENERAL NOT #4 ON SHEET EP-1.1, EP-1.2 & EP-2.1.

Branch Panel: RPA

Location: CORRIDOR 1 101
Supply From: MDP
Mounting: SURFACE
Enclosure: TYPE 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 22,000
Mains Type: MLO
Mains Rating: 225 A
MCB Rating: 225 A
Feed Thru Lugs:

Notes:

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	Receptacle - RM 130	20 A	1	720	500					1	20 A	Junction Box - EWC COOR 101	2
3	RECEPTACLE - RM 122A	20 A	1			900	360			1	20 A	RECEPTACLE RMS 102,142	4
5	RECEPTACLE - OUTSIDE	20 A	1					1400	1080	1	20 A	RECEPTACLE RM 144	6
7	RECEPTACLE- RMS 141,143	20 A	1	1720	360					1	20 A	Junction Box IRRIGATION ALT #2	8
9	RECEPTACLE - RMS 145,146	20 A	1			1980	900			1	20 A	RECEPTACLE OUTSIDE	10
11	Spare	20 A	1					0	1220	1	20 A	RECEPTACLE RMS 115,116	12
13	RECEPTACLE - RMS 110A-B	20 A	1	1800	1440					1	20 A	RECEPTACLE RM 117	14
15	RECEPTACLE - RM 110A	20 A	1			180	180			1	20 A	RECEPTACLE RM 117 PRINTER	16
17	RECEPTACLE - RM 110B	20 A	1					180	1440	1	20 A	RECEPTACLE RMS 118,113,114	18
19	RECEPTACLE - OUTSIDE	20 A	1	360	2840					1	20 A	RECEPTACLE AREAS 100-A-B, 110D	20
21	RECEPTACLE - RM 132B	20 A	1			180	1220			1	20 A	RECEPTACLE RMS 110A-B	22
23	RECEPTACLE - RM 130	20 A	1					720	500	1	20 A	J-BOX RM 110A PROJECTOR	24
25	Junction Box - RM 116	20 A	1	180	500					1	20 A	J-BOX RM 110B PROJECTOR	26
27	Junction Box - RM 115	20 A	1			180	669			1	20 A	LIGHTING - DWELLING UNIT	28
29	Junction Box - RM 102	20 A	1					180	375	1	20 A	LIGHTING - MAIN COORIDOR 100	30
31	Spare	20 A	1	0	302					1	20 A	LIGHTING - KITCHEN AREAS 112	32
33	LIGHTING RMS 132A-B, 130	20 A	1			918	192			1	20 A	LIGHTING - RMS 115,116	34
35	LIGHTING RMS 143 THRU 149	20 A	1					670	398	1	20 A	LIGHTING RMS117A,118,113,114	36
37	RECEPTACLE - RMS 116	20 A	1	1400	1005					1	20 A	LIGHTING MULTIPURPOSE RM 1 110A	38
39	RECEPTACLE - RMS 116	20 A	1			1400	1195			1	20 A	LIGHTING MULTYPURPOSE RM 2 110B	40
41	RECEPTACLE - RMS 115	20 A	1					1400	1400	1	20 A	RECEPTACLE - RMS 115	42
		Total Load:		13115 VA		10365 VA		10904 VA					
		Total Amps:		110 A		86 A		92 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	1449 VA	100.00%	1449 VA		
Other	2610 VA	100.00%	2610 VA	**Total Conn. Load:**	33655 VA
Power	4000 VA	100.00%	4000 VA	**Total Est. Demand:**	27310 VA
Junction Box	1400 VA	100.00%	1400 VA	**Total Conn.:**	93 A
				Total Est. Demand:	76 A

Notes:
PROVIDE FEED THROUGH LUGS AND SECOND 42 SPACE PANEL AS SHOWN IN RISER ON SHEET E-6.0 WITH TWENTY (20) SINGLE PLOE 20A BREAKERS AS SPARES. ALSO PROVIDE FOUR (4) 3/4" CONDUITS INTO CEILING SPACE.

Branch Panel: RPB

Location:
Supply From: MDP
Mounting: SURFACE
Enclosure: TYPE 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 65,000
Mains Type: MLO
Mains Rating: 225 A
MCB Rating: 225 A
Feed Thru Lugs:

Notes:

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	RECEPTACLE - ROOMS 210, 213	20 A	1	1440	0					1	20 A	Spare	2
3	RECEPTACLE - ROOMS 200C, 222	20 A	1			2160	0			1	20 A	Spare	4
5	RECEPTACLE - ROOM 220A	20 A	1					720	360	1	20 A	J-BOX IRRIGATION ALT #2	6
7	RECEPTACLE - ROOM 220A	20 A	1	1040	0					1	20 A	Spare	8
9	LIGHTING EXTERIOR	20 A	1			1256	540			1	20 A	Receptacle - DIR. OFFICE 212	10
11	TIME CLOCK	20 A	1					100	1500	1	20 A	J-BOX FOR MOTORIZED SHADES	12
13													14
15													16
17													18
19													20
21													22
23													24
25													26
27													28
29													30
31													32
33													34
35													36
37													38
39													40
41													42
		Total Load:		2480 VA		3928 VA		2680 VA					
		Total Amps:		21 A		33 A		23 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	880 VA	100.00%	880 VA		
Power	100 VA	100.00%	100 VA	**Total Conn. Load:**	8969 VA
Junction Box	2360 VA	100.00%	2360 VA	**Total Est. Demand:**	8969 VA
				Total Conn.:	25 A
				Total Est. Demand:	25 A

Notes:

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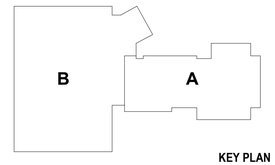


KEY PLAN

DEVELOPMENT OF:

WINDHAM SENIOR & COMMUNITY CENTER

WILLIMANTIC, CONNECTICUT
Project #: 1762

1	ADDENDUM 1	10/02/2019

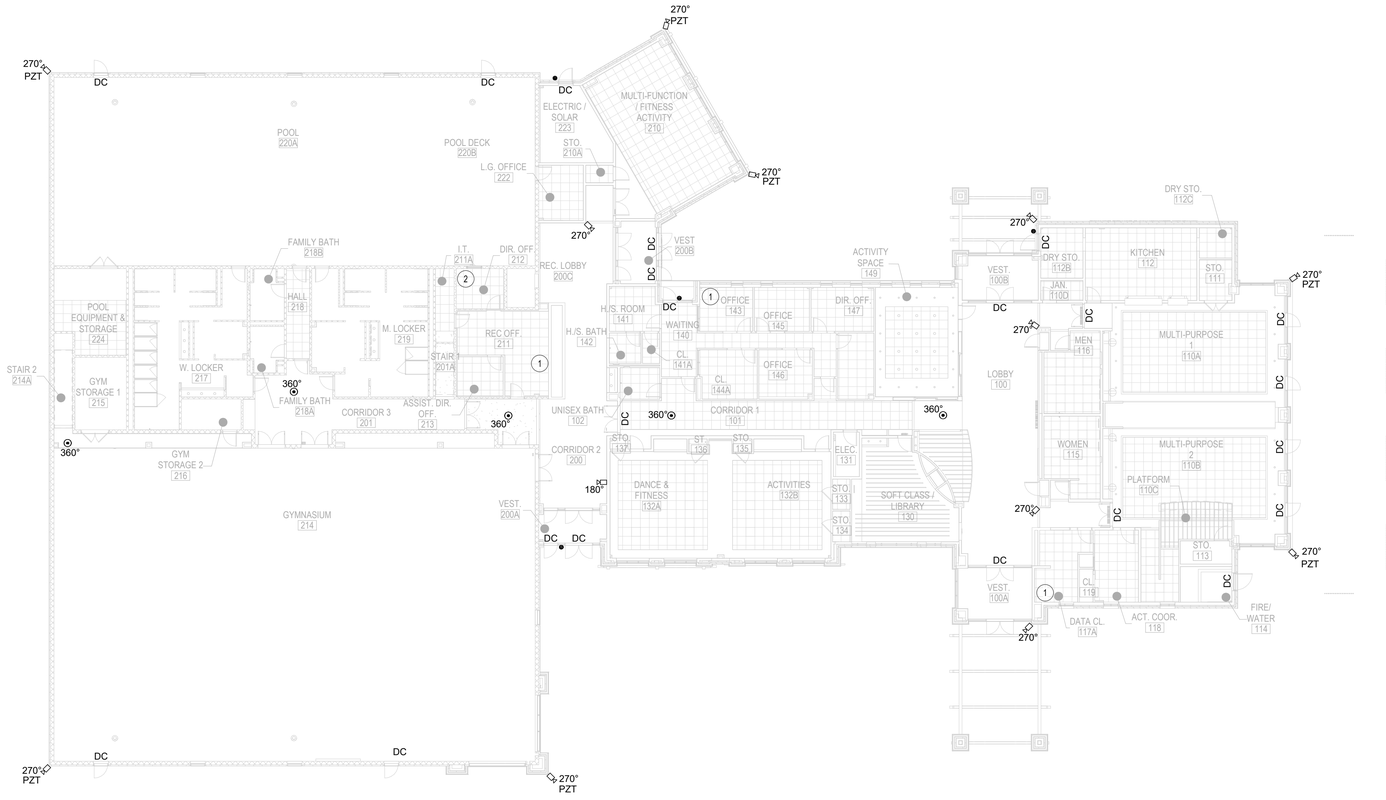
Revisions

Issue Dates:

CONSTRUCTION BID
SEPTEMBER 9, 2019

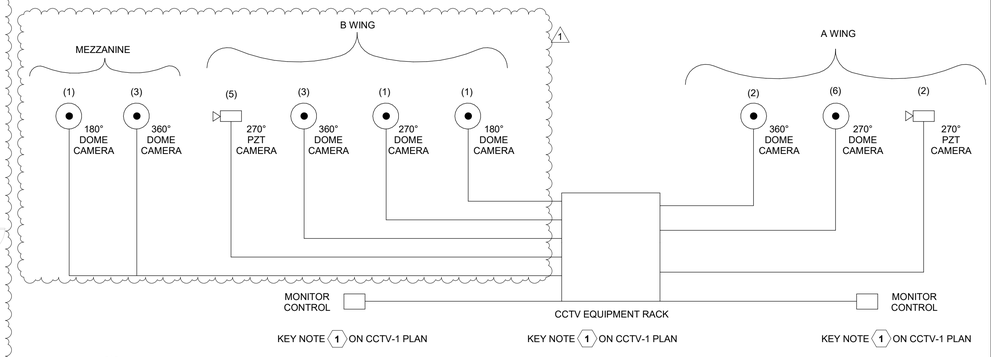
ELECTRICAL SCHEDULES

E-5.1



1 FIRST FLOOR - VIDEO MONITORING SYSTEM OVERALL PLAN
E-7.0 1/16" = 1'-0"

3 SECOND FLOOR - VIDEO MONITORING SYSTEM PLAN
E-7.0 N.T.S.



2 CCTV SYSTEM RISER DIAGRAM
E-7.0 NOT TO SCALE

CCTV & SECURITY SYSTEM KEY NOTES

1. CCTV MONITOR & CONTROL POINTS
2. CCTV SWITCHING & DVR EQPT. RACK & CAMERA CONTROL

CCTV & SECURITY SYSTEM LEGEND

PZT	▷▭	270°COVERAGE PAN/ZOOM/TILT CAPABILITY
360°	⊙	360°COVERAGE DOME CAMERA
270°	⊙	270°COVERAGE DOME CAMERA
180°	⊙	180°COVERAGE DOME CAMERA
	▭	24" LCD MONITOR WITH SELECTOR AND PZT CONTROL
	DC	SECURITY/DOOR CONTACTS
	•	KEY PAD/CARD READER)

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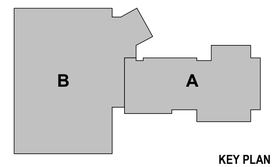

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VIDEO MONITORING SYSTEM OVERALL PLAN

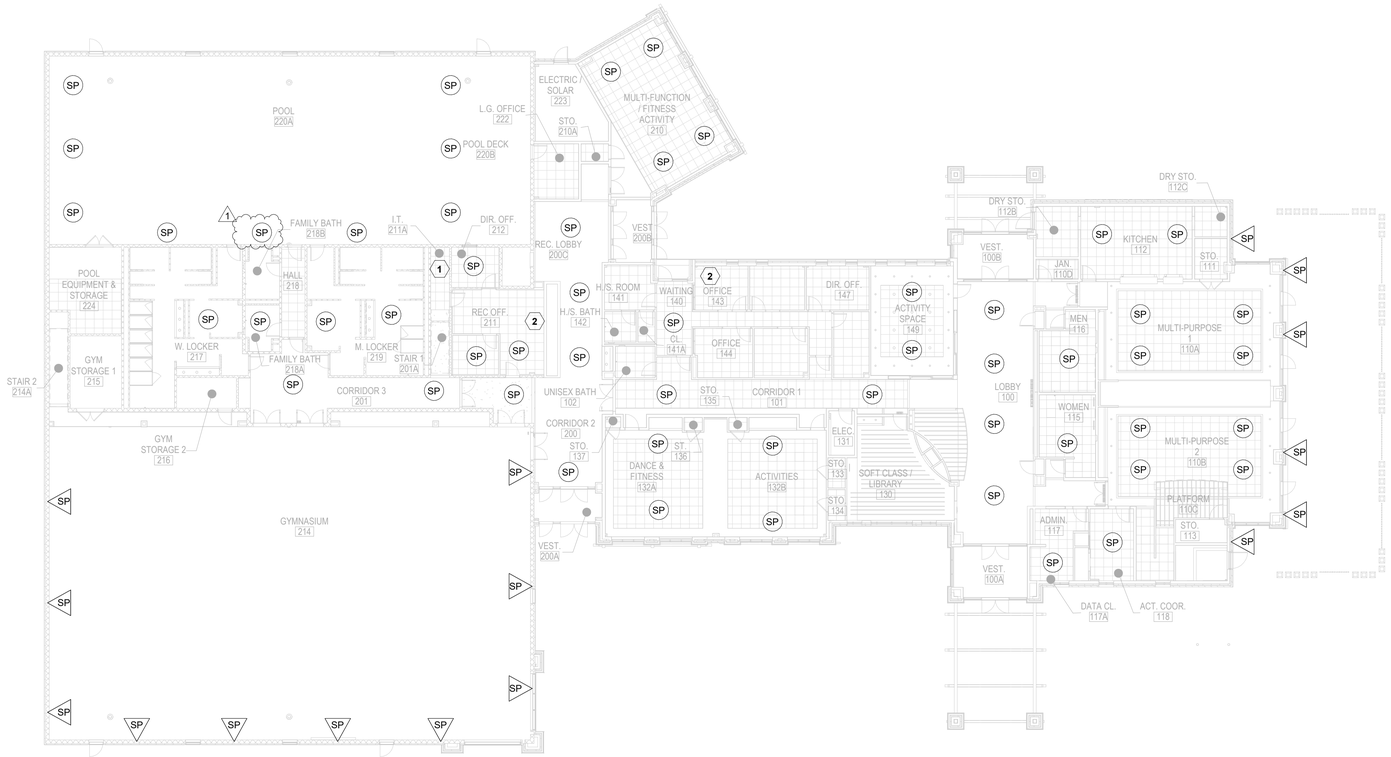
E-7.0

SOUND SYSTEM KEY NOTES

1	SOUND SYSTEM EQUIPMENT RACK (WITH PHONE BAKTHI)
2	SOUND SYSTEM MICRO PHONE POINTS

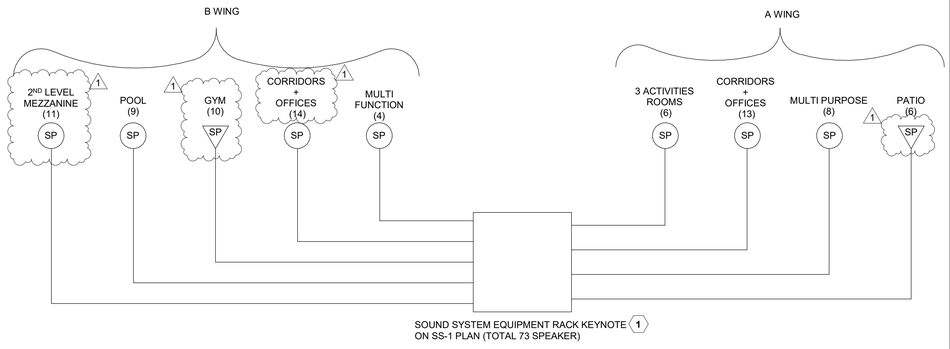
SOUND SYSTEM LEGEND

SP	CEILING MOUNTED SPEAKER
SP	WALL MOUNTED SPEAKER



1 E-8.0 FIRST FLOOR SPECIALIZED SOUND SYSTEM OVERALL PLAN
1/16" = 1'-0"

3 E-8.0 SECOND FLOOR SPECIALIZED SOUND SYSTEM PLAN
N.T.S.



2 E-8.0 SOUND SYSTEM RISER DIAGRAM
NOT TO SCALE

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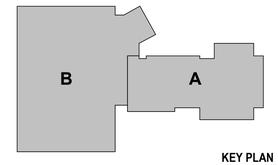

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SPECIALIZED SOUND SYSTEM OVERALL PLAN

E-8.0

PLUMBING ABBREVIATIONS

AD	AREA DRAIN
AFF	ABOVE FINISHED FLOOR
BLDG	BUILDING
BOP	BOTTOM OF PIPE
CO	CLEANOUT
CODP	CLEANOUT DECK PLATE
CM	COFFEE MAKER
CV	CHECK VALVE
CVO	CAPPED AND VALVED OUTLET
CW	COLD WATER
CLG	CEILING
CONN	CONNECT
CONT	CONTINUATION
DIA	DIAMETER
DN	DOWN
DR	DRAIN
DWG	DRAWING
(E)	EXISTING
(ER)	EXISTING TO BE REMOVED
(ERR)	EXISTING TO BE REMOVED & RELOCATED
EJ DIS	EJECTOR DISCHARGE
EL	ELEVATION
EWC	ELECTRIC WATER COOLER
FAI	FRESH AIR INLET
FD	FLOOR DRAIN
FU	FIXTURE UNIT
FL	FLOOR
FLH	FLOOR HYDRANT
FT	FEET
GC	GENERAL CONTRACTOR
GAL	GALLONS
GPM	GALLONS PER MINUTE
HB	HOSE BIBB
HCLG	HUNG CEILING
HW	HOT WATER
HWR	HOT WATER RETURN
ID	INSIDE DIAMETER
IW	INDIRECT WASTE
IN	INCH
JS	JANITOR'S SINK
LAV	LAVATORY
MAX	MAXIMUM
MIN	MINIMUM
MR	MOP RECEPTOR
NTS	NOT TO SCALE
OD	OUTSIDE DIAMETER
OS&Y	OUTSIDE SCREW & YOKE GATE VALVE
PC	PLUMBING CONTRACTOR
PD	PUMP DISCHARGE
PO	PLUGGED OUTLET
PRV	PRESSURE REDUCING VALVE
PSI	POUNDS PER SQUARE INCH
RD	ROOF DRAIN
SA	SHOCK ABSORBER
SAN	SANITARY
SD	SUMP PUMP DISCHARGE
SH	SHOWER
SK	SINK
SQ FT	SQUARE FEET
ST	STORM
TYP	TYPICAL
UR	URINAL
V	VENT
VB	VACUUM BREAKER
VTR	VENT THROUGH ROOF
W	WASTE
WC	WATER CLOSET
WCO	WALL CLEANOUT
WH	WALL HYDRANT
ZCVB	ZONE CONTROL VALVE BOX

PLUMBING SYSTEMS GENERAL NOTES

1. THE CONTRACTOR SHALL BECOME THOROUGHLY FAMILIAR WITH THE PROJECT DOCUMENTS OF ALL TRADES. THE DRAWINGS ARE DIAGRAMMATIC AND SHOW THE GENERAL ARRANGEMENT OF EQUIPMENT AND PIPING. THE CONTRACTOR SHALL COORDINATE THE EXACT LOCATION OF EQUIPMENT AND PIPING INSTALLATION WITH ALL TRADES BEFORE COMMENCING WORK.
2. THIS CONTRACT SHALL INCLUDE ALL THE NECESSARY PIPING, FITTINGS, TRANSITIONS ETC. AS NECESSARY TO INSTALL PLUMBING SYSTEM, AND TO AVOID ANY CONFLICTS WITH OTHER TRADES AND THE BUILDING STRUCTURE.
3. IT IS NOT THE INTENT OF THE DRAWINGS TO SHOW INDIVIDUAL BRANCH PIPING TO EACH PLUMBING FIXTURE, ONLY THE BRANCH PIPING TO GROUPS OF FIXTURES IS INDICATED. THE ENTIRE PLUMBING SYSTEM SHALL BE FULLY OPERATIONAL AND READY FOR BENEFICIAL USE BEFORE THE JOB IS CONSIDERED COMPLETE.
4. REFER TO LATEST ARCHITECTURAL PLANS FOR ELEVATIONS, SECTIONS, DETAILS, MOUNTING HEIGHTS, LOCATION OF PLUMBING FIXTURES. ALL HANDICAPPED DESIGNATED FIXTURES SHALL BE INSTALLED IN ACCORDANCE WITH ANSI AND ADA STANDARDS.
5. DO NOT SCALE DRAWINGS. CONTRACTOR SHALL VERIFY ALL DIMENSIONS & CONDITIONS IN THE FIELD AND SHALL NOTIFY THE ENGINEER IMMEDIATELY OF ANY & ALL DISCREPANCIES.
6. IT IS NOT INTENDED THAT THE DRAWINGS SHOW EVERY PIPE, FITTING, RISE/DROP OR DETAIL. SYSTEM & COMPONENTS SHALL BE INSTALLED ACCORDING TO THE INTENT AND MEANING OF CONTRACT DOCUMENTS AND IN ACCORDANCE WITH GOOD PRACTICE.
7. CONTRACTOR IS RESPONSIBLE TO PROVIDE COMPLETE AND OPERATIONAL SYSTEMS WITH FACILITIES AND SERVICES TO MEET REQUIREMENTS INDICATED AND IN ACCORDANCE WITH APPLICABLE CODES AND ORDINANCES.
8. EQUIPMENT AND COMPONENTS HAVING EQUAL PERFORMANCE CHARACTERISTICS BY OTHER MANUFACTURERS MAY BE CONSIDERED, PROVIDED DEVIATIONS IN DIMENSIONS, OPERATION AND OTHER CHARACTERISTICS DO NOT CHANGE DESIGN CONCEPT OR INTENDED PERFORMANCE AS JUDGED BY THE ENGINEER. BURDEN OF PROOF OF EQUALITY OF PRODUCTS IS ON THE CONTRACTOR.
9. CONTRACTOR IS RESPONSIBLE FOR THE SAFEKEEPING OF HIS OWN PROPERTY ON THE JOB SITE. OWNER ASSUMES NO RESPONSIBILITY FOR THE PROTECTION OF PROPERTIES AGAINST FIRE, THEFT AND ENVIRONMENTAL CONDITIONS.
10. CONTRACTOR IS RESPONSIBLE TO PROPERLY PROTECT OWNER'S PROPERTY AND EQUIPMENT FROM INJURY, AND DAMAGE TO SAME SHALL BE REPLACED BY CONTRACTOR.
11. CONTRACTOR IS TO CLEAN JOB SITE DAILY AND REMOVE FROM THE PREMISES ANY DIRT AND DEBRIS CAUSED BY THE PERFORMANCE OF THE WORK INCLUDED IN THIS CONTRACT.
12. ALL WORK TO BE PERFORMED IN A CLEAN AND WORKMANLIKE MANNER, CARE SHALL BE EXERCISED TO MINIMIZE ANY INCONVENIENCE OR DISTURBANCE TO OTHER AREAS OF THE BUILDING WHICH ARE TO REMAIN IN OPERATION. ISOLATE CONSTRUCTION AREAS BY MEANS OF TEMPORARY PARTITIONS AND/OR TARPS TO KEEP DUST AND DIRT WITHIN WORK AREA.
13. CONTRACTOR IS RESPONSIBLE TO PROPERLY SECURE AREAS OF CONSTRUCTION AT THE END OF EACH WORKING DAY.
14. EQUIPMENT AND PIPING TO BE INSTALLED IN ACCORDANCE WITH SEISMIC REQUIREMENTS OF THE INTERNATIONAL BUILDING CODE.
15. CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH ALL OTHER TRADES.
16. ALL EQUIPMENT SUPPORTS AND PIPE HANGERS TO BE CONNECTED FROM THE BUILDING STRUCTURE.
17. ALL NEW PENETRATIONS THRU RATED WALLS, FLOORS AND CEILINGS SHALL BE FIRESTOPPED AND SEALED TO MAINTAIN RATING. REFER TO SPECIFICATION SECTION 07801.
18. PROVIDE ACCESS PANELS/DOORS FOR ALL CONCEALED PLUMBING ITEMS REQUIRING ACCESS, COORDINATE WITH DIVISION 8.
19. PROVIDE SHUTOFF VALVES AT ALL BRANCH PIPING TAKEOFFS.
20. ALL BRANCH WATER PIPES TO HAVE STOP VALVES AT EACH PLUMBING FIXTURE.
21. INSULATE EXPOSED WASTE, HOT AND COLD WATER PIPING UNDER HANDICAP LAVATORIES.
22. INSULATE COLD WATER, HOT WATER AND RECIRCULATION PIPING, CONDENSATE DRAIN, STORM PIPING AND ROOF DRAIN BODIES.
23. EVERY FIXTURE SHALL BE PROPERLY PIPED TO WATER, SANITARY, WASTE, AND VENT SYSTEMS. REFER TO THE PLUMBING SCHEDULES ON MEP DRAWINGS FOR INDIVIDUAL PIPE SIZES TO EACH FIXTURE.
24. WHERE AN INACCESSIBLE CEILING IS INSTALLED (GYP BOARD OR EQUIVALENT), THE CONTRACTOR SHALL COORDINATE THE LOCATIONS OF ACCESS PANELS FOR ALL VALVES, CLEANOUTS, ETC., REQUIRING ACCESS, WITH THE ARCHITECT, PRIOR TO INSTALLATION OF SUCH DEVICES AND OTHER APPURTENANCES.
25. NO PIPING SHALL BE INSTALLED WITHIN STAIRS, STAIR WALLS, ELEVATOR MACHINE ROOMS, TRANSFORMERS VAULTS, ELECTRICAL ROOMS OR OVER ELECTRICAL PANELS/EQUIPMENT. ONLY DEDICATED PLUMBING PIPING WILL BE ALLOWED WITHIN EACH OF THE SPACES INDICATED ABOVE. COORDINATE THE LOCATION OF ALL PIPING WITH ALL OTHER TRADES, AND ADJUST AS NECESSARY
26. ALL PIPING IS TO BE RUN CONCEALED IN CEILINGS OR WALLS. PIPING IS TO BE EXPOSED ONLY WHERE NOTED ON DRAWINGS. IF CONTRACTOR CANNOT RUN PIPING CONCEALED, NOTIFY ENGINEER IMMEDIATELY TO RESOLVE CONFLICT.
27. INSTALL WATER HAMMER ARRESTORS (WHA) AT ALL QUICK-CLOSING VALVES (FLUSH VALVES, SOLENOID VALVES, ETC.) THROUGHOUT THE PLUMBING SYSTEM. WATER HAMMER ARRESTORS SHALL BE SIZED BASED ON SUPPLY FIXTURE UNITS PER PLUMBING DRAINAGE INSTITUTE (PDI) STANDARDS AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
28. PIPE ALL CONDENSATE DRAINS FROM MECHANICAL EQUIPMENT COOLING COILS, BY GRAVITY (INTERIOR AIR HANDLING UNITS, FAN COIL UNITS, ETC.) TO FLOOR DRAINS OR JANITOR'S SINKS THROUGH AN AIR GAP. EACH CONDENSATE DRAIN SHALL BE TRAPPED AT THE EQUIPMENT DRAIN OUTLET, REFER TO TRAP DETAILS ON DRAWINGS. COORDINATE EXACT LOCATION WITH THE HVAC CONTRACTOR AND ADJUST AS NECESSARY.
29. COORDINATE EXACT LOCATION OF ALL UNDERGROUND UTILITIES (WATER, GAS, SANITARY, ETC.) EXITING OR ENTERING THE BUILDING WITH THE SITE CONTRACTOR AND UTILITY DRAWINGS. COORDINATE ALL FOUNDATION WALL PENETRATIONS AND INVERT ELEVATIONS WITH THE GENERAL CONTRACTOR AND OR CONSTRUCTION MANAGER.
30. DOMESTIC WATER DROPS OR RISERS INSTALLED IN EXTERIOR WALLS, SHALL BE INSTALLED ON THE WARM SIDE OF THE BUILDING INSULATION, AND THE LOCATION SHALL BE MADE INFILTRATION FREE.
31. INSTALL TRAP PRIMERS FOR EACH INDIVIDUAL FLOOR DRAIN OR, AS A OPTION, CONTRACTOR MAY UTILIZED UTILITY DISTRIBUTION UNIT FOR MULTIPLE DRAIN. CONNECT TRAP PRIMER TO NEAREST ACTIVE COLD WATER MAIN; PROVIDE ISOLATION VALVES AND EXTEND TO FLOOR DRAIN.
32. INSTALL FLOOR MOUNTED EQUIPMENT, SUCH AS WATER HEATERS, STORAGE TANKS, ETC. ON A 4" HIGH CONCRETE HOUSEKEEPING PAD. COORDINATE SIZE AND FINAL LOCATION OF ALL CONCRETE PADS WITH THE STRUCTURAL ENGINEER. PADS SHALL BE MINIMUM 6" LARGER THAN THE EQUIPMENT IN BOTH HORIZONTAL DIRECTIONS.
33. COORDINATE ALL PLUMBING EQUIPMENT REQUIRING POWER, FOR EXACT LOCATION AND POWER REQUIREMENTS WITH THE ELECTRICAL CONTRACTOR.
34. ALL INDIRECT WASTE DRAINS SHALL BE PIPED TO FLOOR DRAINS, FUNNELS OR FIXED AIR GAP FITTINGS, THROUGH AIR GAP OR TO A SINK DRAIN TAILPIECE.
35. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ELBOWS, TEES, DROPS, AND MISCELLANEOUS PIPING DUE TO ELEVATION CHANGES, OBSTRUCTIONS, COORDINATION WITH OTHER TRADES, ETC. TO INSTALL A COMPLETE, FUNCTIONING, PLUMBING SYSTEM.

PLUMBING SYSTEMS SEISMIC NOTES

PROVIDE SEISMIC RESTRAINTS PER THE INTERNATIONAL BUILDING CODE, SECTION 1610. SEISMIC RESTRAINTS ARE REQUIRED FOR ALL PIPING EXCEPT FOR THE FOLLOWING INSTANCES:

A. PIPING SUSPENDED BY INDIVIDUAL HANGERS 12" OR LESS IN LENGTH FROM TOP OF THE PIPE TO THE SUPPORTING STRUCTURE.

B. PIPING IN BOILER AND MECHANICAL ROOMS WHICH HAS LESS THAN 1-1/INCHES IN DIAMETER.

C. PIPING IN OTHER AREAS WHICH HAS LESS THAN 2-1" DIAMETER.

SEISMIC RESTRAINTS ARE REQUIRED FOR ALL GAS (INCLUDING ROOF) AND HAZARDOUS PIPING - NO EXCEPTIONS.

PLUMBING LEGEND

SYMBOL	DESCRIPTION
SAN	SOIL OR WASTE ABOVE FLOOR OR GRADE
SAN	SOIL OR WASTE BELOW FLOOR OR GRADE
PD	PUMPED DISCHARGED WASTE PIPING
ST	STORM PIPING ABOVE FLOOR OR GRADE
ST	STORM PIPING BELOW FLOOR OR GRADE
AD	AUXILIARY (SECONDARY) STORM PIPING ABOVE FLOOR OR GRADE
KW	KITCHEN WASTE BELOW FLOOR OR GRADE
CD	CONDENSATE DRAIN PIPING
V	VENT PIPING
– –	COLD WATER PIPING
– –	HOT WATER PIPING 110°F TEMPERATURE
140°F	HOT WATER PIPING 140°F TEMPERATURE
– – –	HOT WATER RECIRCULATION PIPING
140°F	HOT WATER RECIRCULATION PIPING
G	GAS PIPING
TP	TRAP PRIMER PIPING
	PIPING DIRECTION OF FLOW
	HT - HEAT TRACED PIPE
	PIPING RISER UP
	PIPING RISER DOWN
	BRANCH/BOTTOM CONNECTION
	CLEANOUT/CLEANOUT WALL PLATE
	CLEANOUT DECKPLATE
	TRAP
	BALL VALVE
	BUTTERFLY VALVE
	CHECK VALVE
	UNION
	CAP ON END OF PIPE
	TRAP PRIMER VALVE
	GAS COCK
	GAS PRESSURE REGULATOR
	GAS SOLENOID VALVE
	POINT OF CONNECTION
FD	FLOOR DRAIN
RD	ROOF DRAIN
ARD	AUXILIARY ROOF DRAIN (SECONDARY)
	VESTIBULE DRAIN (VD)
HWRP	HOT WATER RECIRCULATING PUMP
	BACKFLOW PREVENTER
	BALANCING VALVE
	TEMPERING VALVE

NOTE: NOT ALL SYMBOLS MAY APPLY OR APPEAR ON FLOOR PLANS

FIXTURE CONNECTION SCHEDULE

MARK	DESCRIPTION	MINIMUM PIPE SIZES (INCHES)				
		G	CW	HW	W	V
WC-HC, WC	WATER CLOSET	-	1	-	4	2
LAV	LAVATORY	-	1/2	1/2	1-1/2	1-1/2
UR	URINAL	-	3/4	-	2	1-1/2
SK-HC	SINK	-	1/2	1/2	1-1/2	1-1/2
MS	MOP SINK	-	3/4	3/4	3	2
SH-HC, SH	SHOWER	-	1/2	1/2	2	1-1/2
WH	WALL HYDRANT	-	3/4	-	-	-
HB	HOSE BIBB	-	3/4	-	-	-
EWC	ELECTRIC WATER COOLER	-	1/2	-	1-1/2	1-1/2
WSH	CLOTHES WASHER	-	1/2	1/2	2	1-1/2
DW	DISHWASHER (BY DIV. 11452)	-	1/2	-	1-1/2	1-1/2

HOSE BIBBS

PROVIDE (6) EXTERIOR TYPE HOSE BIBBS. NON- FREEZE TYPE INSIDE LOCKED BOX. FOR EXACT LOCATION REFER TO ARCHITECTURAL DRAWINGS

PLUMBING SHEET INDEX

SHEET NUMBER	SHEET NAME
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P-1.3	FIRST FLOOR CEILING PLUMBING PLAN - PART A
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P-2.1	SECOND FLOOR PLUMBING PALN - PART B
P-2.2	PLUMBING RISER DIAGRAM
P-2.5	PLUMBING ROOF PLAN
P-3.0	PLUMBING DETAILS
P-3.1	PLUMBING DETAILS

POOL BONDING NOTE

ALL METALLIC PARTS PIPING,FITTINGS, ETC. WITHIN THE POOL AREA SHALL BE BONDED IN COMPLIANCE WITH (NEC ARTICLE 680.26) UNLESS OTHERWISE NOTED. ALL PLUMBING WORK INSIDE POOL AREA MUST BE COORDINATED WITH POOL SUPPLIER/CONTRACTOR PRIOR TO START WORK.

NOTES

1. PROVIDE ISOLATION VALVES FOR ALL BRANCH GAS AND WATER PIPING CONNECTED TO MAINS FOR SHUT DOWN AND MAINTENANCE, SERVICEABILITY.
2. COORDINATE ALL OVERFLOW STORM SYSTEM TERMINATION ELEVATION AND LOCATION WITH ARCHITECT IN FIELD PRIOR TO START CONSTRUCTION.
3. PROVIDE ISOLATION VALVES FOR ALL GAS AND DOMESTIC WATER BRANCH PIPING.
4. PROVIDE OVERFLOW DRAIN PANS FOR ALL WASHER MACHINES COORDINATE SIZE WITH ARCHITECT PRIOR TO START WORK.

QA+M architecture
QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

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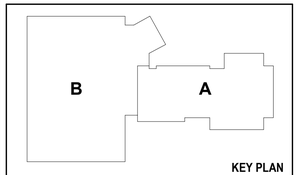

KEY PLAN

DEVELOPMENT OF:

WINDHAM SENIOR & COMMUNITY CENTER

WILLIMANTIC, CONNECTICUT

Project #: 1762

1	ADDENDUM 1	10/02/2019

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SEPTEMBER 9, 2019

PLUMBING NOTES & LEGENDS

P-0.1

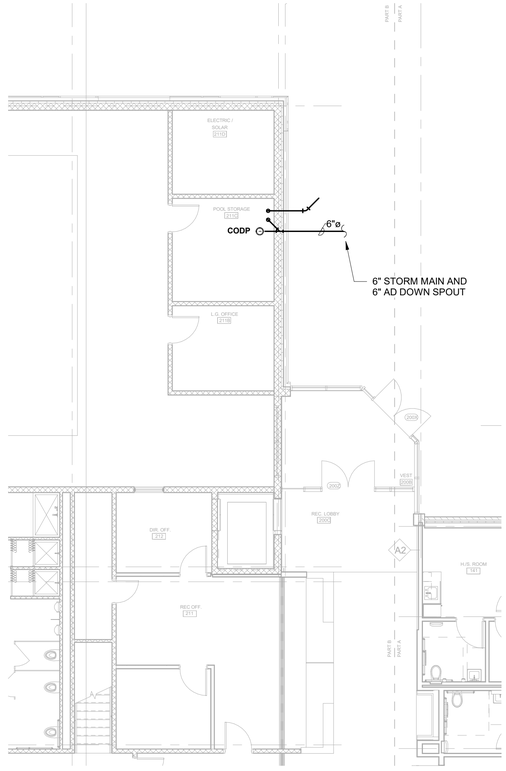
PLUMBING FIXTURE/EQUIPMENT SCHEDULE

SYMBOL	MARK	MFR	MODEL	DESCRIPTION
	SK-1	CHICAGO WADE	ARB-2435-A-6R-T 631-GN2AE35ABCP 0.5 GPM FLOW 5740 SOLIDS INTERCEPTOR	TOP MOUNT LARGE ART SINK; SINGLE BOWL UNIT, #14 GAUGE, TYPE 304 (18-8). STAINLESS STEEL SCRUB-UP SINK WITH 1-3/4" RADIUS VERTICAL AND HORIZONTAL COVED CORNERS. 1-1/2" ROLLED RIM. FULL LENGTH 6" HIGH BACKSPLASH. EXPOSED SURFACES ARE HAND BLENDED TO A UNIFORM LUSTROUS SATIN FINISH. UNDERSIDE IS SOUND DEADENED. FURNISHED WITH WALL HANGER AND STAINLESS STEEL SUPPORT BRACKETS. CHROME PLATED MIXING FAUCET WITH 6" WRIST BLADE HANDLES, SWING 5" HIGH GOOSENECK SPOUT, VANDAL-RESISTANT, ANTI-HOSE AERATOR. DRAIN: LK18B. STAINLESS STEEL PERFORATED STRAINER GRID. 1-1/2" O.D. X 4" STAINLESS STEEL TAILPIECE. (ROOM # 132 B)
	SK-2	ELKAY ELKAY WADE	ECTSRAD25226TB6 LKB721C FAUCET, LK723 VALVE 0.5 GPM FLOW 5740 SOLIDS INTERCEPTOR	UNDER MOUNT ADA COMPLIANT SINK; CROSSTOWN 18 GAUGE, #18 GAUGE, TYPE 304 STAINLESS STEEL WITH 5/32" RAISED RIM AND 2-1/2" HIGH BACKSPLASH. COMPARTMENT HAS 1-3/4" RADIUS VERTICAL AND HORIZONTAL COVED CORNERS. 2-1/2" APRON AT FRONT AND BOTH SIDES. EXPOSED SURFACES ARE HAND BLENDED TO A UNIFORM SATIN LUSTER FINISH. REAR CENTERED OUTLET. DRAIN OPENING 1-5/8". UNDERSIDE IS SOUND DEADENED. FURNISHED WITH INTEGRAL STAINLESS STEEL SUPPORT BRACKETS AND SEPARATE WALL HANGER. MEETS ADA REQUIREMENTS. LK723 ANTI-SCALD THERMOSTATIC MIXING VALVE WITH NICKEL-PLATED BRASS BODY 1/2" SWT INLETS AND OUTLET CONNECTIONS, CHECK VALVES ON INLETS AND A MIXED TEMPERATURE RANGE OF 80° - 120°F. CERTIFIED UNDER ASSE 1016.
	BFP	WATTS	LF909	UL/FM APPROVED AUTOMATICALLY OPERATING ASSEMBLY OF PRESSURE DIFFERENTIAL RELIEF VALVE, LOCATED BETWEEN TWO POSITIVE SEATING CHECK VALVES, EQUIPPED WITH INLET STRAINER, BRONZE BODY CONSTRUCTION; NPT BODY CONNECTIONS AND OS&Y GATE VALVE SHUT-OFFS.
	BH	HUBBELL	J39.39R	KITCHEN WATER HEATER, ELECTRIC, 9.9 KW, 208V, 40 AMPS, 3 PHASE. PROVIDE FLEXIBLE INSULATING JACKET SYSTEM. 184 GPH RECOVERY AT 20° TEMPERATURE RISE. FURNISH WITH FLOOR MOUNTING HARDWARE & SHOCK ABSORBER.
	CODP	WADE	8000Z-1-75	EXTERIOR SPACES & PARKING AREAS - EXTRA HEAVY DUTY, CAST IRON BODY w/CAST IRON THREADED PLUG
	CODP	WADE	8000-1-75	INTERIOR SPACES - DUCO CAST IRON BODY w/CAST BRONZE TAMPER THREADED PLUG
	DN	WADE	3940-NH-SS	DOWNSPOUT NOZZLE WITH STAINLESS STEEL BIRD/RODENT SCREEN.
	DHW1 DHW2	PVI WESSELS LAWLER PVI VENT KIT	60 L 130 A-GCML TTA-42, 805 PI 5045B	DOMESTIC WATER HEATER, GAS FIRED STORAGE TANK. 33-3/4" DIAMETER, 80-3/4" O.A. LENGTH, PROVIDE FLEXIBLE INSULATING JACKET SYSTEM. 130 GALLON STORAGE TANK, 600 MBH INPUT, 691 GPH RECOVERY @ 100' RISE. FURNISH WITH EXPANSION TANK. WITH CONDENSATE NEUTRALIZER, HEAT TRANSFER PRODUCTS MFG. MODEL N1100 - TYPICAL OF 2. INTAKE AND VENTING: PVC, REFER TO HVAC DRAWINGS AND SPECIFICATIONS.
	EWC-HC	ELKAY	LVRCHDTL8SC E2H20 51300C FILTER	DUAL UNIT, FRONT PUSH BAR CONTROLS. HEAVY DUTY, 18 GAUGE VANDAL RESISTANT, CONCEALED ARM FLOOR CARRIER. CAST BRASS P-TRAP WITH CLEANOUT PLUG, LOOSE KEY SUPPLY STOP. MOUNT AT ACCESSIBLE HEIGHT PER ARCHITECTURAL PLANS. FURNISH WITH CANE SKIRT AND BOTTLE FILLER. SEE DWG. G-001.
	FFD (KITCHEN)	WADE	9698-316 9704	STAINLESS STEEL, 12" SQUARE FLOOR DRAIN WITH 8" DEEP ROUNDED SUMP, STAINLESS STEEL SUSPENDED SEDIMENT BUCKET AND 8-INCH ELONGATED FUNNEL.
	FD	WADE	1100-STD6-27	TOILET/SHOWERS: CAST IRON BODY DRAIN w/ROUND NICKEL BRONZE ADJUSTABLE STRAINER HEAD, SEDIMENT BUCKET AND VANDAL-PROOF SCREWS
	FD	WADE	1314-27	MECHANICAL ROOMS: CAST IRON BODY DRAIN w/ROUND CAST IRON ADJUSTABLE STRAINER HEAD, SEDIMENT BUCKET AND VANDAL-PROOF SCREWS. PROVIDE WITH BACKWATER VALVE & PROSET TG-23 TRAP PRIMER INSERT.
	FD (KITCHEN)	WADE	9100	STAINLESS STEEL, 12" SQUARE FLOOR DRAIN WITH 8" DEEP ROUNDED SUMP AND STAINLESS STEEL SUSPENDED SEDIMENT BUCKET.
	FS (KITCHEN)	WADE	9100	STAINLESS STEEL, 12" SQUARE FLOOR DRAIN WITH 10" DEEP ROUNDED SUMP, STAINLESS STEEL SUSPENDED SEDIMENT BUCKET AND HINGED HALF GRATE.
	HB	WADE	8709-89	3/4" INLET, PROVIDES POSITIVE NON-FREEZE WITH INTEGRAL VACUUM BREAKER. THE STAINLESS STEEL RECESSED BOX CONCEALS THE NOZZLE AND OPERATING MECHANISM. THE LOCKING COVER PREVENTS UNAUTHORIZED USE.
	HT	RAYCHEM	XL-TRACE 5XL-1	5 WATTS PER FOOT, 277V. SYSTEM CONTROLLED BY AN AMBIENT SENSING THERMOSTAT #AMC-55 SET AT 40 F.
	HWRP	BELL & GOSSETT	PR AB	HOT WATER RECIRCULATION PUMP, ALL BRONZE BODY IN-LINE CIRCULATOR, OVERLOAD PROTECTION, PUMP RATED FOR 14 GPM @ 15' TOTAL HEAD. AQ-34 AQUASTAT, SET TO 105°F. 120V-1⌀ 1/6 HP.
	LAV1-HC FAUCET	KOHLER SYMMONS	GREENWICH, K2032 S-60-G-H-FR LEVER HANDLE 0.5 GPM FLOW	VITREOUS CHINA, WALL HUNG, w/4"CENTERS, P-TRAP, K-7601 LOOSE KEY STOP ANGLE SUPPLIES, K-9010 CAST BRASS P-TRAP W/ CLEANOUT, K-9015 WASTE NIPPLE WITH ESCUTCHEON & WADE 400 CHAIR CARRIER. INSULATE PIPING w/TRUEBRO LAV-SHIELD 2018. MOUNT AT ACCESSIBLE HEIGHT PER ARCHITECTURAL DWG. G-001.
	LAV3-HC	BRADLEY	FL-3H,3L-TMA-LSD	MULTI-LEVEL DECK WITH THREE LAVATORIES, SOLID SURFACE TOP AND LAVATORY BOWLS, HEAVY GAUGE, STAINLESS STEEL MOUNTING BRACKETS AND THREE BATTERY-OPERATED FAUCETS DESCRIBED BELOW. TRAP AND TRANSITION COVERS TO ENCLOSE THE FOLLOWING FTTINGS: OFFSET DRAIN; P-TRAP; CONTINUOUS WASTE WITH END OUTLET; FLEXIBLE STAINLESS STEEL SUPPLY CONNECTIONS; AND ASSE 1070 NAVIGATOR THERMOSTATIC MIXING VALVE WITH STOP VALVES. FLOW RATE: 0.5 GPM. COLOR BY ARCHITECT W/TANKLESS HEATER. SEE MOUNT AT ACCESSIBLE HEIGHT PER ARCHITECTURAL DWG. G-001.
	LAV2-SS FAUCET	WILLOUGHBY	HS-1014-96-HC-DMS-DMB-PML2-MA2-4CC-EB-PT-LWE-OV-LW2	FIXTURE SHALL BE FABRICATED FROM 14 GA., TYPE 304 STAINLESS STEEL. THE CONSTRUCTION SHALL BE ALL WELDED, WITH EXPOSED STAINLESS SURFACES POLISHED TO A #4 SATIN FINISH. STANDARD LAVATORY SHALL INCLUDE: - RECTANGULAR-SHAPED BOWL, 14-1/2" X 9-1/2" X 5-1/2" DEEP - FAST DRAIN WITH AIR VENT - ELBOW WASTE (1-1/2" F.I.P.) - SELF-DRAINING SOAP DISH MOUNT AT ACCESSIBLE HEIGHT PER ARCHITECTURAL DWG. A-500.
	MSK	FIAT	MSB 36X24	MOP SINK MOLDED STONE RECEPTOR WITH CAST BRASS DRAIN BODY, STAINLESS STEEL DOME STRAINER-LINT BASKET, VINYL BUMPER GUARD; T&S B665 CC-BST-MRS SUPPLY FITTING, VACUUM BREAKER, BUCKET HOOK, HOSE END SPOUT, MALE IPS INLETS, FIAT 832 HOSE, BRACKET.
	RD	FROET	100C4LP-90, 100C6LP-90	BI-FUNCTIONAL ROOF DRAIN WITH ADJUSTABLE EXTENSION, FINISHING RING AND DECK CLAMP. LARGE SUMP ROOF DRAIN CAST IRON ROOF DRAIN BODY WITH 15" DIAMETER ANCHOR FLANGE, WATERPROOFING MEMBRANE CLAMP RINGS WITH INTEGRAL GRAVEL STOP AND CAST IRON DOME STRAINERS.
	SA	WADE	4480	PISTON OPERATED WATER HAMMER ARRESTOR WITH STAINLESS STEEL, ALL WELDED, NITROGEN CHARGED, NESTED BELLOWS TYPE, 350 PSI MAX OPENING PRESSURE.
	SH	BRADLEY	WS-SX15-TMV-LHV-RSD-VS LHV-LBJ-ST-SB-GB 1.5 GPM W/LEVER HANDLE	RECESS MOUNTED, MODULAR, STAINLESS STEEL BARRIER-FREE SHOWER (FLOORS, WALLS AND TOPS BY OTHERS), 2" CAST BRASS DRAIN WITH CHROME PLATED STRAINER; WITH THERMOSTATIC MIXING VALVE, INTEGRAL SERVICE STOPS, SHOWER HEAD ANCHOR PLATE AND LEVER HANDLE. SEE DWG. G-001. SHOWER PANEL IS 18 GAUGE TYPE 304 STAINLESS STEEL. ALL OTHER EXPOSED PARTS ARE STAINLESS STEEL OR CHROME-PLATED BRASS. VALVE BODIES ARE BRASS CASTING. SUPPLY INLETS ARE FEXIBLE STAINLESS STEEL HOSES. STANDARD EQUIPMENT FLOW CONTROL: 1.5 GPM. SHOWER PANEL SHOWER PANEL CONSTRUCTED OF 18 GAUGE STAINLESS STEEL. STAINLESS STEEL SOAP TRAY MOUNTED TO PANEL. SHOWERHEAD STANDARD FIXED DIRECTION, ADJUSTABLE SPRAY SHOWERHEAD. SUPPLY INLETS ARE FLEXIBLE, STAINLESS STEEL HOSES WITH 1/2" NPT CONNECTIONS. INLETS ARE ACCESSIBLE THROUGH THE BACK OF THE SHOWER.
	SH-HC HEAD/ VALVE	BRADLEY	HN200-S15-TMV-VL,VR,-RSS-LHV-LBJ-ST-SB-GB 1.5 GPM W/LEVER HANDLE	RECESS MOUNTED, MODULAR, STAINLESS STEEL BARRIER-FREE SHOWER (FLOORS, WALLS AND TOPS BY OTHERS), 2" CAST BRASS DRAIN WITH CHROME PLATED STRAINER; WITH THERMOSTATIC MIXING VALVE, INTEGRAL SERVICE STOPS, SHOWER HEAD ANCHOR PLATE AND LEVER HANDLE. SEE DWG. G-001.
	SK-HC FAUCET	ELKAY CHICAGO	LRAD1918 432 LEVER HANDLE 0.5 GPM FLOW	HANDICAP ACCESSIBLE SINK; 18 GAUGE, TYPE 316 STAINLESS STEEL, 19"x18" LONG X 6" DEEP OFFSET TO THE REAR AND LEFT OR RIGHT, TWO-HOLE FAUCET DRILLING, WITH LKAD-35 BASKET STRAINER AND OFFSET DRAIN REAR/RIGHT OR LEFT TAILPIECE ASSEMBLY; 8" SINGLE LEVER HANDLE, COUNTER MOUNTED FAUCET. PROVIDE "TRUEBRO" INSULATION KIT ON WASTE AND SUPPLIES. MOUNT AT ACCESSIBLE HEIGHT PER ARCHITECTURAL DRAWINGS AND SPECIFICATIONS. (R00M #141, ROOM # 132A)
	TMV	CHICAGO	131CR CFAB	THERMOSTATIC MIXING VALVE.
	TP	WADE	4405	TRAP PRIMER INSERT, AN ELASTOMERIC, NORMALLY CLOSED TRAP GUARD DEVICE UTILIZES A NORMALLY CLOSED SEAL TO PREVENT EVAPORATION OF THE TRAP SEAL AND ALSO PROTECT AGAINST SEWER GASES FROM BACKING UP INTO HABITABLE AREAS. IT OPENS WITH FLUID AND ALLOWS LIQUID DRAINAGE TO FLOW THROUGH INTO THE BUILDING DRAIN.
	TP-P	WADE	4402	POOL TRAP PRIMER, PRESSURE DROP ACTIVATED BRASS TRAP RPIMER VALVE WITH EPDM SEALS, INTEGRAL AIR GAP AND 1/2" NPT THREADED CONNECTIONS. BODY: TYPE 360 BRASS, O-RINGS: EPDM E70, SEAL: DOW #7 SILICONE, SCREEN: 304 S/S #60 MESH.
	UR	KOHLER SLOAN	K-4904-ET .125 GPF, #811	VITREOUS CHINA URINAL, WHITE, WALL HUNG, 2" I.P.S. OUTLET. CONCEALED, ELECTRONIC, CHROME TOP SPUD FLUSH VALVE w/ANGLE STOP, VACUUM BREAKER, WALL & SPUD FLANGES. WADE 400 CARRIER. MOUNT AT HEIGHT PER ARCHITECTURAL DRAWINGS AND SPECIFICATIONS.
	UR-HC	KOHLER SLOAN	K-4904-ET .125 GPF, #811	VITREOUS CHINA URINAL, WHITE, WALL HUNG, 2" I.P.S. OUTLET. CONCEALED, ELECTRONIC, CHROME TOP SPUD FLUSH VALVE w/ANGLE STOP, VACUUM BREAKER, WALL & SPUD FLANGES. WADE 400 CARRIER. MOUNT AT ADA ACCESSIBLE HEIGHT PER ARCHITECTURAL DRAWINGS AND SPECIFICATIONS.
	WC FLUSH	KOHLER SLOAN	K-4325, 1.28 GPF 1.28 GPF, #811	VITREOUS CHINA WALL HUNG WATER CLOSET, ELONGATED BOWL, SIPHON JET, TOP SPUD, CONCEALED, HYDROPOWER, SELF GENERATING,1.28 GALLON FLUSH w/SOLID PLASTIC OPEN FRONT SEAT. CONCEALED, BACK SPUD FLUSH VALVE w/ANGLE STOP, VACUUM BREAKER, WALL & SPUD FLANGES. WADE 330 CHAIR CARRIER. MOUNT AT
	WC-HC FLUSH	KOHLER SLOAN	K-4325 1.28 GPF, #811	VITREOUS CHINA WALL HUNG WATER CLOSET, ELONGATED BOWL, SIPHON JET, TOP SPUD, CONCEALED, HYDROPOWER, SELF GENERATING,1.28 GALLON FLUSH w/SOLID PLASTIC OPEN FRONT SEAT. CONCEALED, BACK SPUD FLUSH VALVE w/ANGLE STOP, VACUUM BREAKER, WALL & SPUD FLANGES. WADE 330 CHAIR CARRIER. MOUNT AT ADA HEIGHT ACCESSIBLE AS PER ARCHITECTURAL DRAWINGS AND SPECIFICATIONS.
	WCO	WADE	8304-8590	DUCO CAST IRON BODY w/CAST BRONZE TAMPER THREADED PLUG AND STAINLESS STEEL ROUND COVER
	WH	WADE	8700	FREEZELESS PROOF, FLUSH MOUNTED WALL BOX WITH BACKFLOW PREVENTER
M	WMTR	HERSEY CO.	MVR-160	WATER METER, BRONZE OUTER CASE CHAMBER, MAGNETIC DRIVE, POSITIVE DISPLACEMENT ROTATING DISC TYPE, SELF-LUBRICATING REGISTER HERMETICALLY SEALED BETWEEN GLASS DOME AND METAL HOUSING.
	PRV	WATTS	2300	BRONZE BODY NON-CORROSIVE INTERNAL PARTS, BUILT-IN THERMAL EXPANSION BY-PASS RENEWABLE SEAT, DISC AND DIAPHRAGM, STRAINER WITH STAINLESS STEEL SCREEN, ADJUSTABLE 25 TO 75 PSI REDUCED PRESSURE RANGE SUITABLE FOR 300 PSI INLET WATER PRESSURE; WATTS 223S WITH SEALED CAGE CONSTRUCTION.

NOTE:
MANUFACTURES LISTED ARE DESIGN BASED MODEL. REFER TO PLUMBING SPECIFICATIONS FOR EQUALS.
THE DRAWINGS AND SPECIFICATIONS ARE DIVIDED INTO SECTIONS TO MEET THE NEEDS OF THE ARCHITECT, THE ENGINEERS AND THE DESIGN CONSULTANTS. THEY ARE NOT PREPARED INSTRUCTIONS TO THE CONTRACTOR FOR HOW TO BUY OUT OR SUBCONTRACT THE WORK. THE CONTRACTOR IS RESPONSIBLE FOR ALL THE

WORK DESCRIBED IN THE CONTRACT DOCUMENTS, REGARDLESS OF WHERE IT IS SHOWN. FOR EXAMPLE, ELECTRICAL WORK MAY BE SHOWN ON "FP" DRAWINGS AS WELL AS ON "M" DRAWINGS AND "E" DRAWINGS. MISCELLANEOUS METALS AND STRUCTURAL MAY BE SHOWN ON "A" DRAWINGS AS WELL AS ON "S" DRAWINGS. STRUCTURAL SUPPORTS ARE REQUIRED BY THE "FP" DRAWINGS, TO AVOID OMITTING ANY COMPONENT OF THE PROJECT, REFER TO ALL THE CONTRACT DRAWINGS IN THEIR ENTIRETY.

ALL ADA ACCESSIBLE WALL HUNG EXPOSED LAVATORIES OR SINKS SHALL BE PROVIDED WITH UNDER SINK PIPING COVERS - TRUE BRO LAV GUARD OR APPROVED EQUAL. COORDINATE WITH ARCHITECT PRIOR TO START WORK.
1



1 P-0.2 PLUMBING ALT #4
1/8" = 1'-0"

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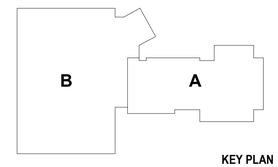


KEY PLAN

DEVELOPMENT OF:

WINDHAM SENIOR & COMMUNITY CENTER

WILLIMANTIC, CONNECTICUT
Project #: 1762

1	ADDENDUM 1	10/02/2019

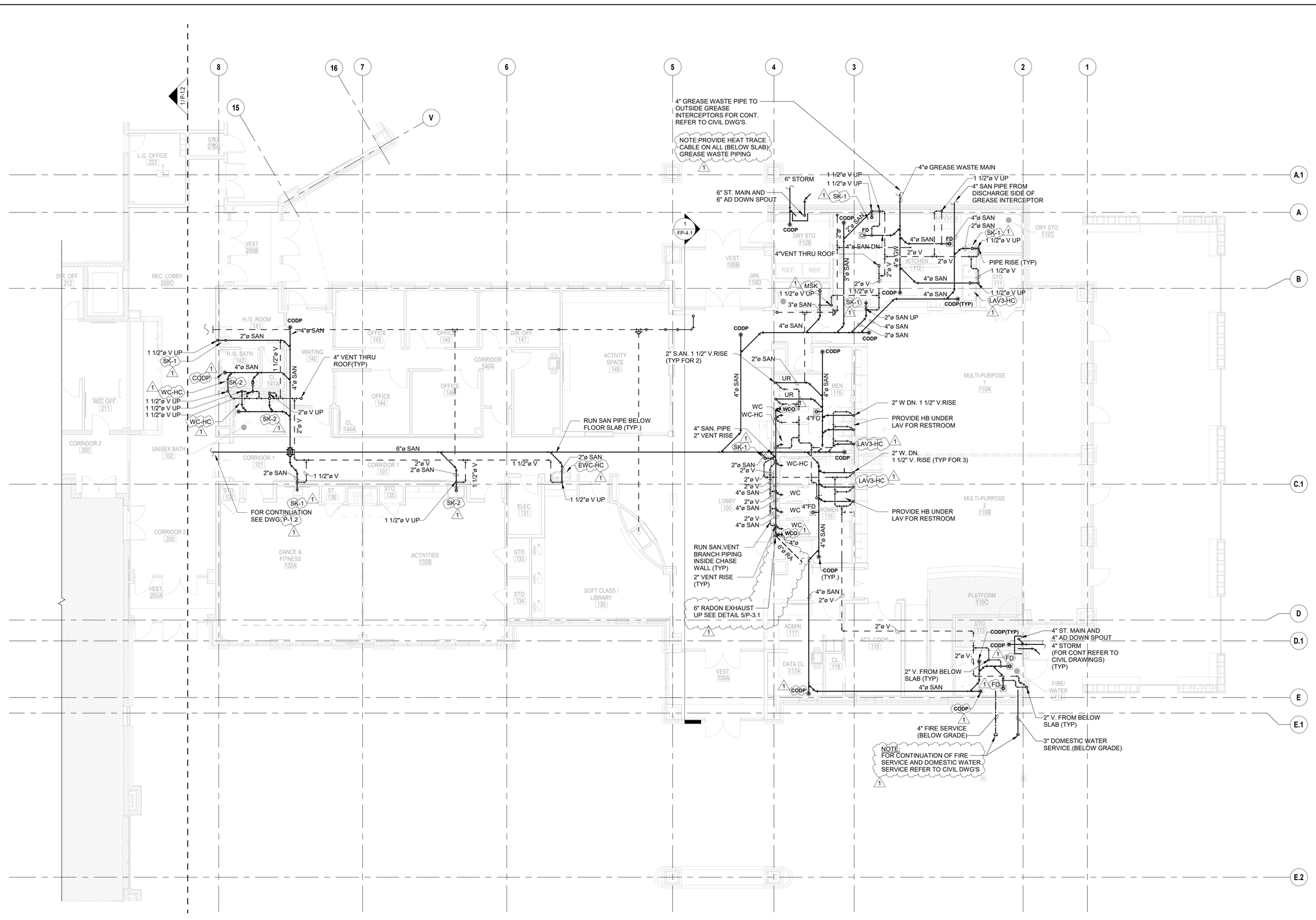
Revisions

Issue Dates:

CONSTRUCTION BID
SEPTEMBER 9, 2019

PLUMBING SCHEDULES

P-0.2



1 FIRST FLOOR PLUMBING PLAN - PART A
P-1.1 1/8" = 1'-0"

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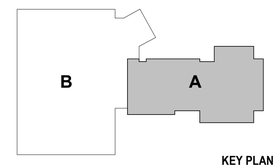

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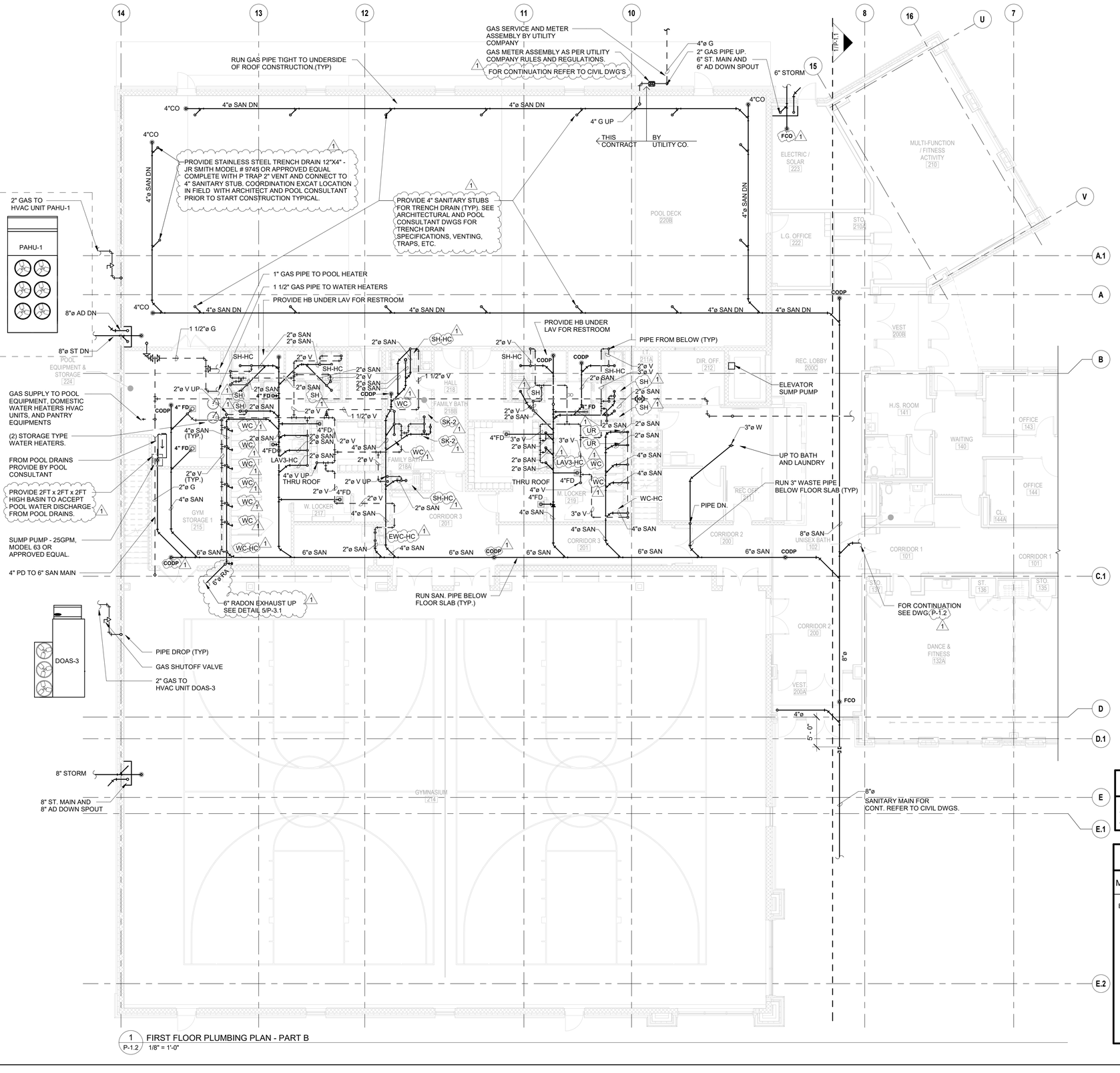
FIRST FLOOR PLUMBING PLAN - PART A

P-1.1



1 FIRST FLOOR PLUMBING PLAN - PART B
P-1.2 1/8" = 1'-0"

POOL DISCHARGE WATER NOTE

IN COMPLIANCE WITH CT.STATE REGULATIONS,OWNER MUST ENSURE THAT THE MAX. POOL DISCHARGE WATER FLOW IS 20 GALLONS PER MINUTE AT ALL TIMES

ELEVAOR SUMP PUMP SCHEDULE

MARK	MFR	MODEL	DESCRIPTION
ESP1	HYDROMATIC	OSP33A1	ELEVATOR SUMP PUMP-CAST IRON PUMP WITH PROTECTIVE CAST WITH PROTECTIVE EPOXY COATING, SCREENED INTAKE, NON-CLOG PUMPING HEAD AND IMPELLER, 1/3 HP MOTOR, PUMP SHALL BE UL LISTED. SWITCH: AUTOMATIC DIAPHRAGM PRESSURE SWITCH ENCLOSED IN A NYLON HOUSING, APPROXIMATE ON/OFF LEVELS ON 4"-7", OFF 1"-3", POWER CORD: TEN FOOT CORD WITH 3-PRONG GROUDING TYPE PLUG (115V). SPECIFICATIONS: HORSEPOWER: 1/2, VOLTS: 115, HEARTZ: 60, 1 PHASE, AMPS: 7.8, WEIGHT: 50 LBS APPROVED MFRS HYDROMATIC, ZOELLER, BELL & GOSSETT, OR APPROVED EQUAL

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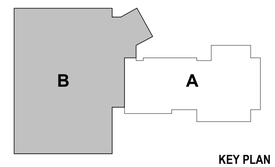

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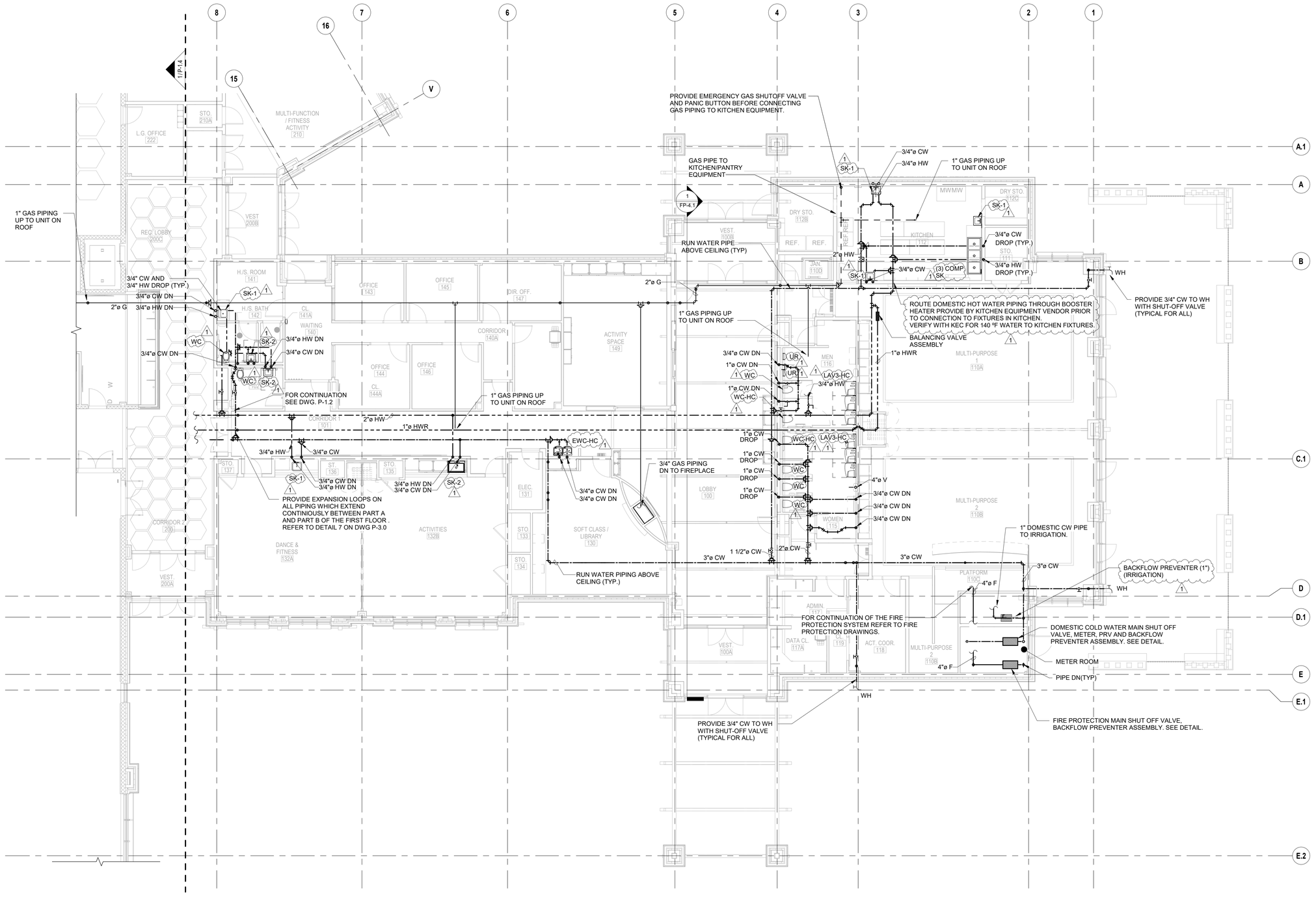
FIRST FLOOR PLUMBING PLAN - PART B

P-1.2



1 P-1.3 FIRST FLOOR CEILING PLAN PLUMBING - PART A
1/8" = 1'-0"

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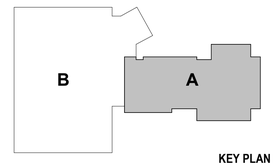

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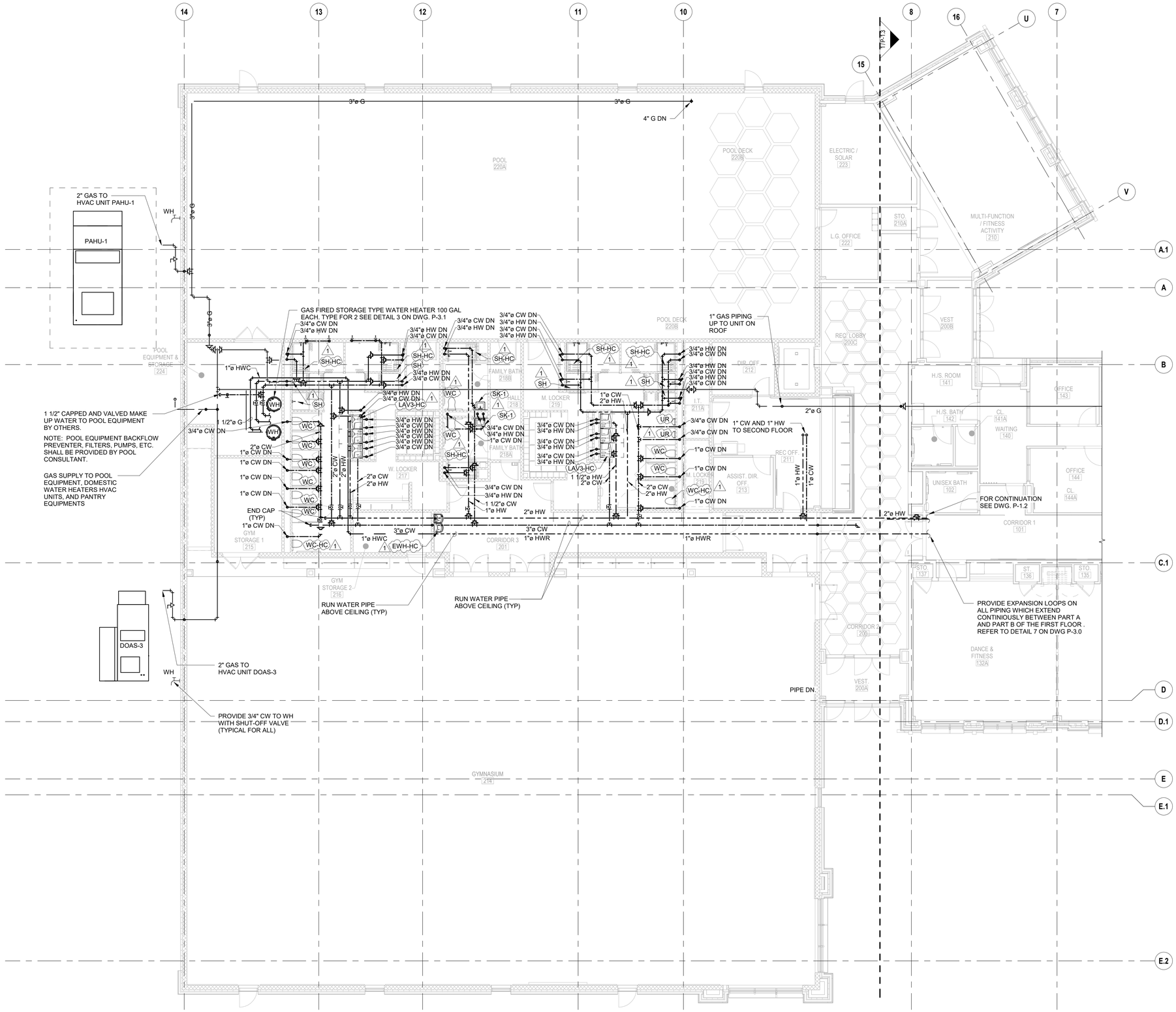
FIRST FLOOR CEILING PLUMBING PLAN - PART A

P-1.3



1 P-1.4 FIRST FLOOR CEILING PLAN PLUMBING - PART B
1/8" = 1'-0"

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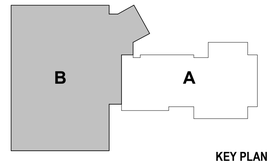

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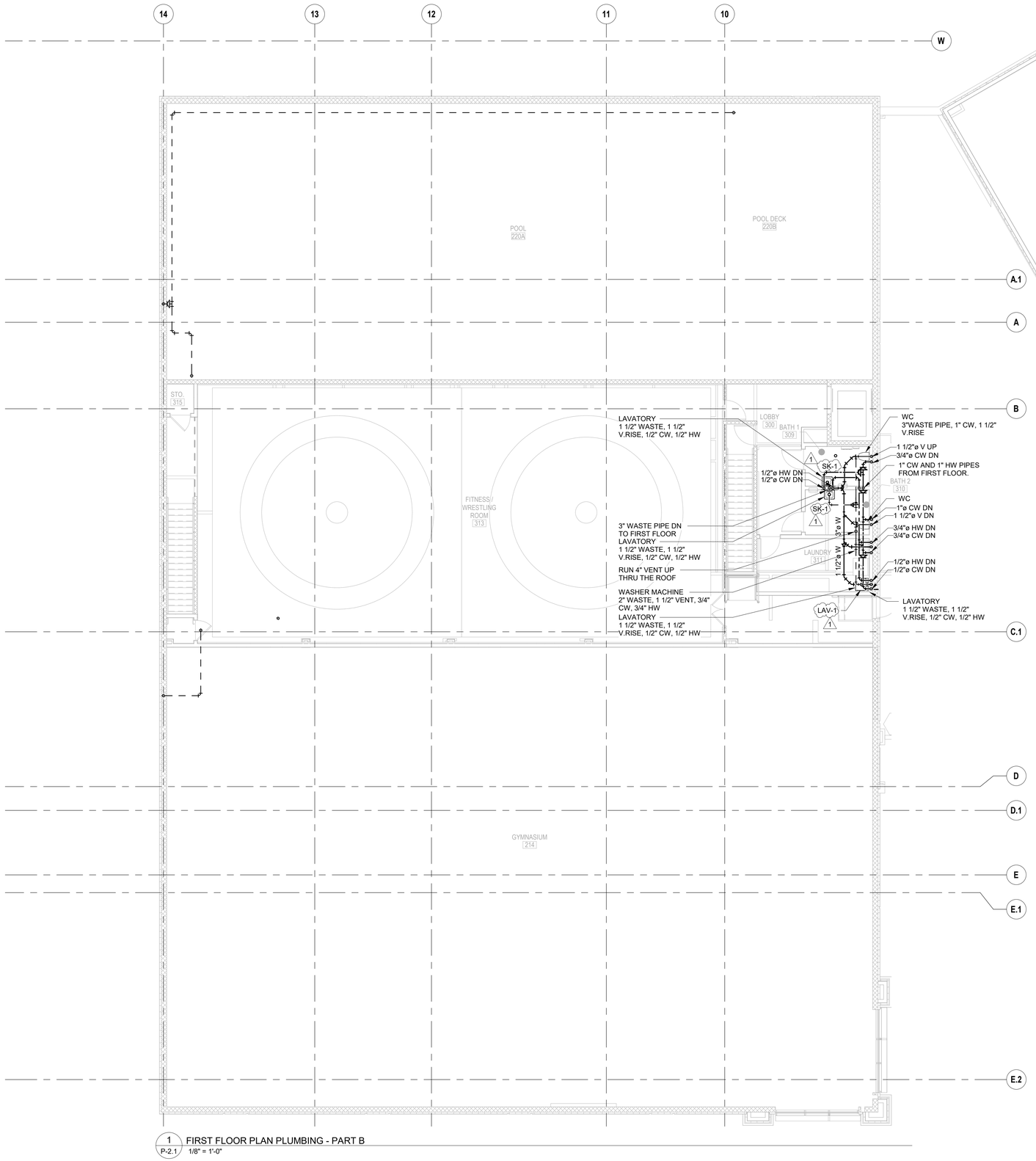
FIRST FLOOR CEILING PLUMBING PLAN - PART B

P-1.4



1 P-2.1 FIRST FLOOR PLAN PLUMBING - PART B
1/8" = 1'-0"

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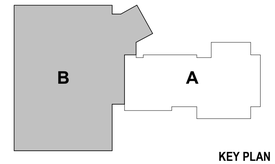

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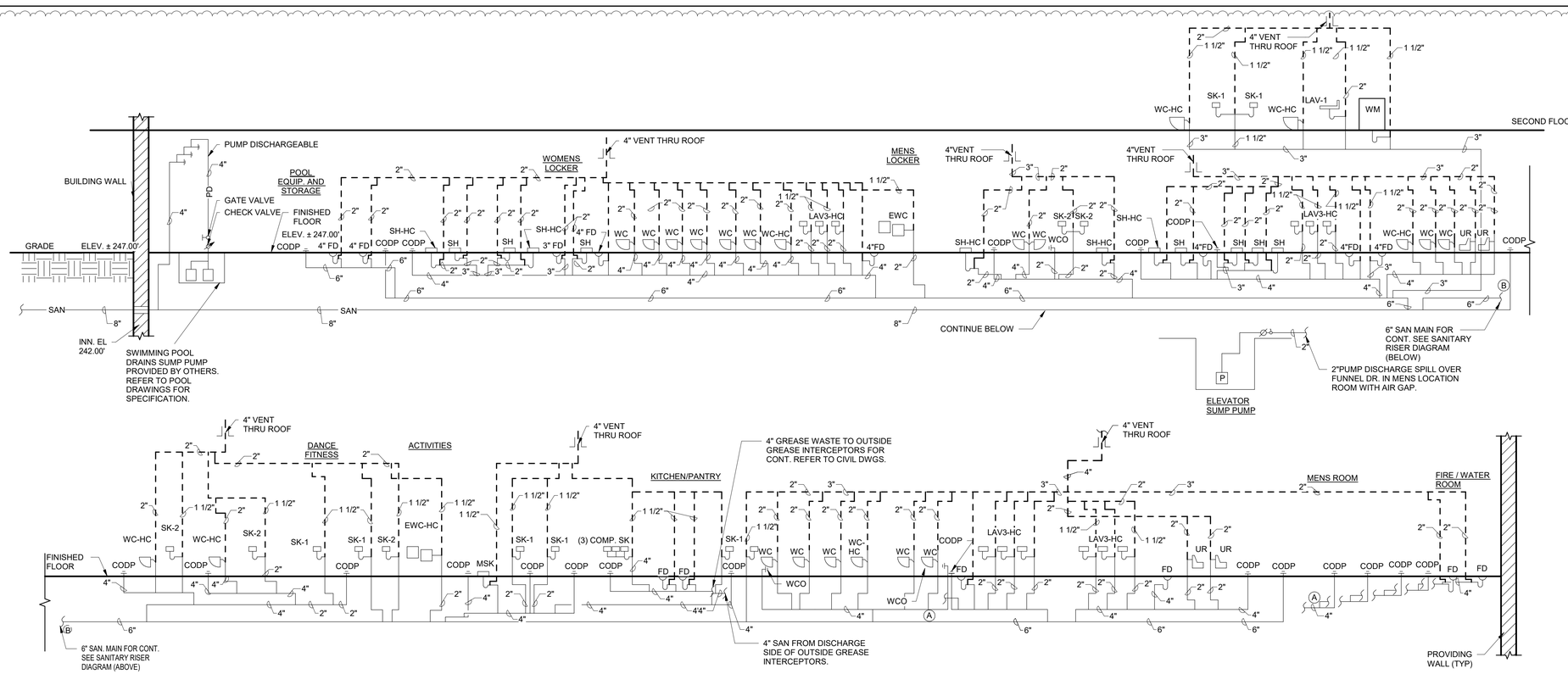
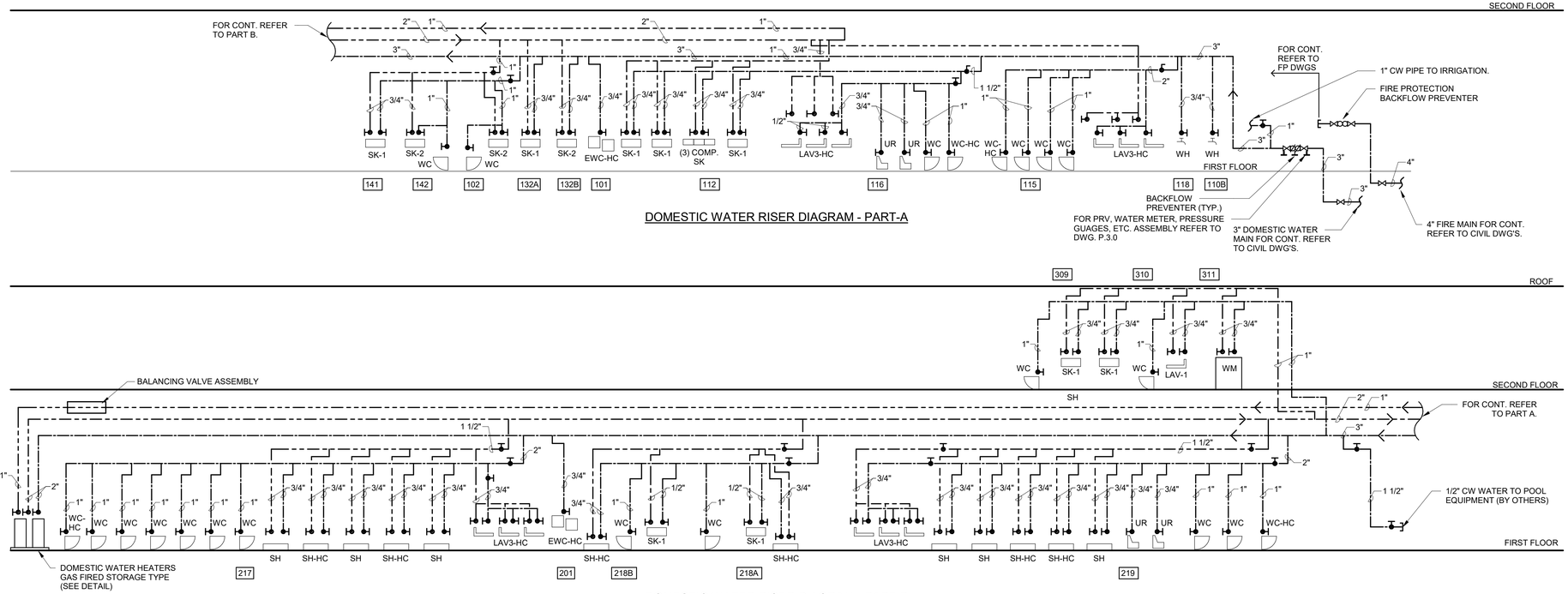
SECOND FLOOR PLUMBING PALN - PART B

P-2.1



1 SANITARY RISER DIAGRAM
P-2.2 NO SCALE



2 DOMESTIC WATER RISER DIAGRAM
P-2.2 N.T.S.

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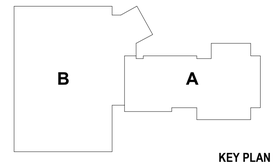

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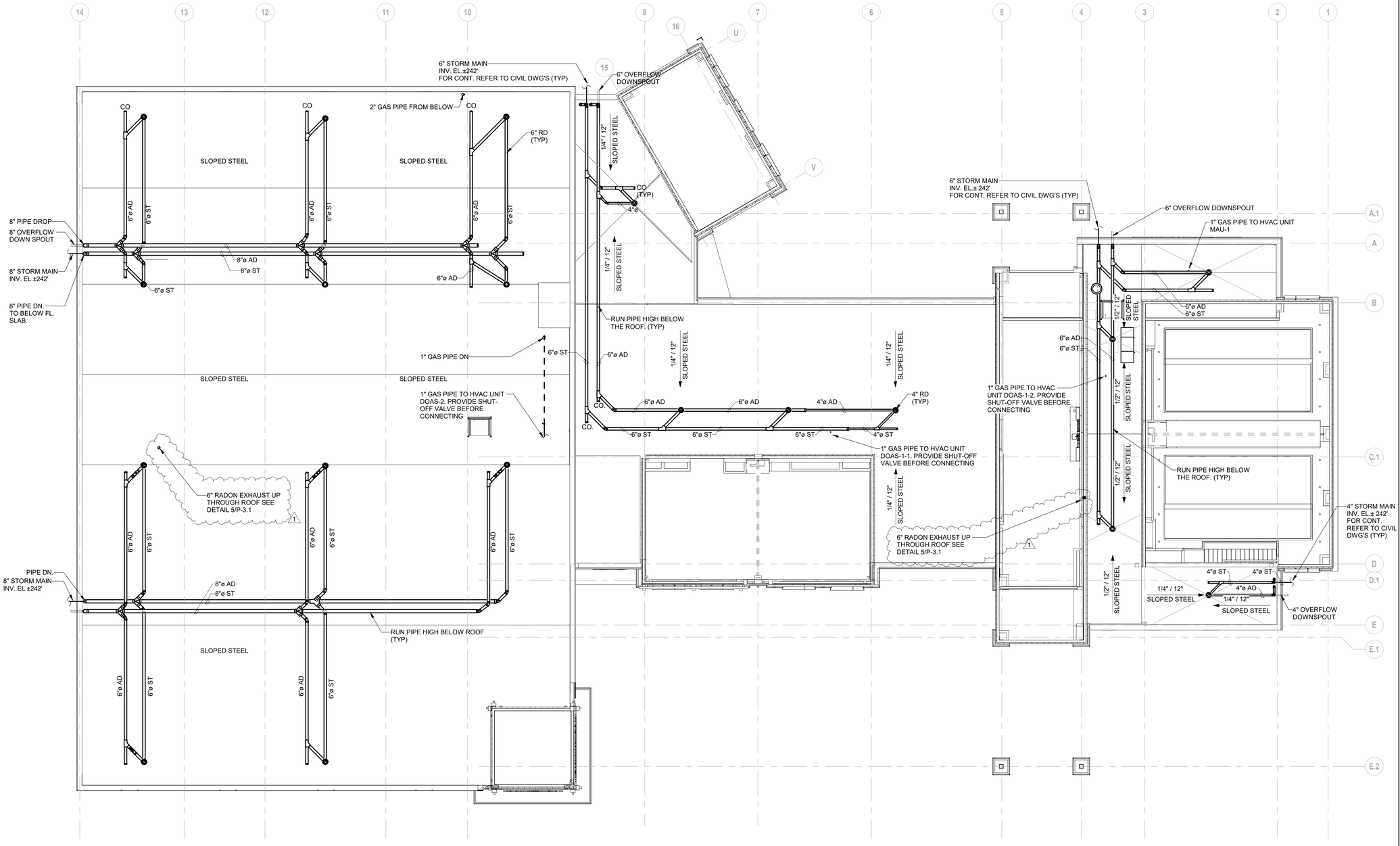
PLUMBING RISER DIAGRAM

P-2.2

GENERAL NOTES :

ALL AREAS WITH GUTTERS AND LEADERS SHALL SPILL ONTO THE MAIN ROOF.FOR LOCATION AND SIZING OF ALL GUTTERS AND LEADERS REFER TO ARCHITECTURAL DRAWINGS.



1 PLUMBING ROOF PLAN
P-2.5 3/32" = 1'-0"

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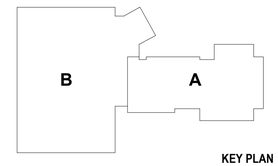

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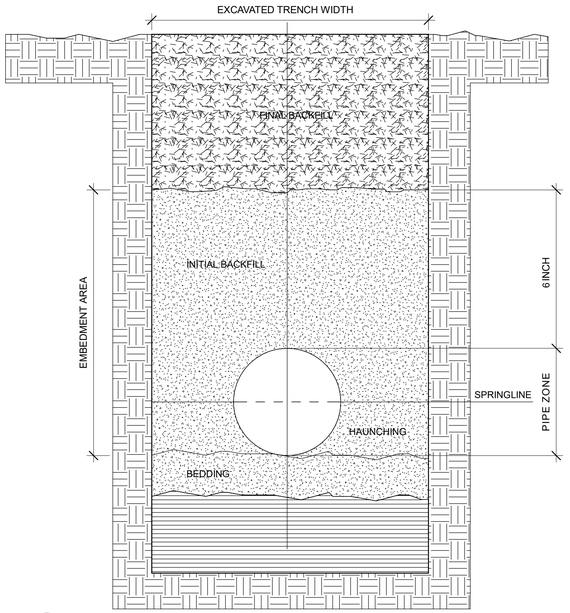
PLUMBING ROOF PLAN

P-2.5



1 P-3.1 UNDERGROUND PVC PIPE
NTS

PLASTIC PIPE SHOULD ALWAYS BE BURIED IN STRICT ACCORDANCE WITH THE ASTM STANDARD RELEVANT TO THE TYPE OF PLASTIC PIPING BEING INSTALLED. THOSE STANDARDS ARE:

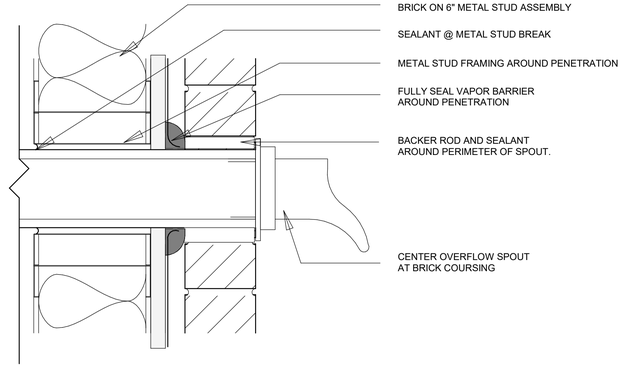
ASTM D2321 STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY-FLOW APPLICATIONS.

ASTM D2774 STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PRESSURE PIPING.

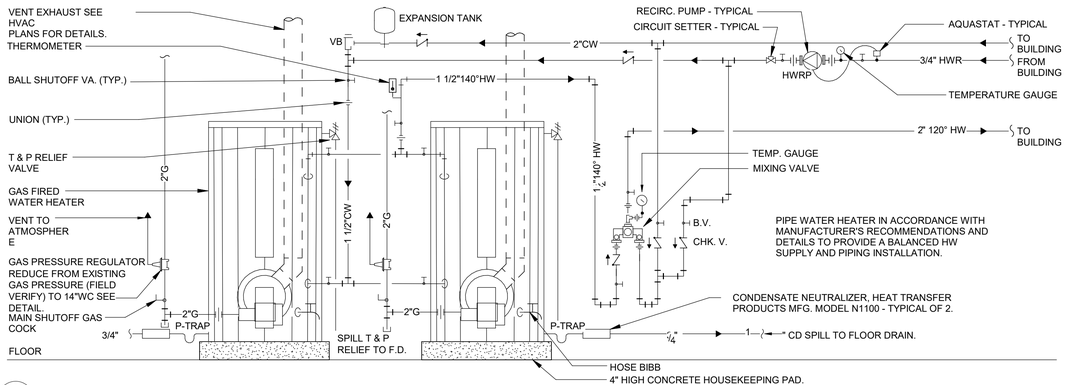
NOTE: IN ADDITION TO THESE STANDARDS, PIPE SHOULD ALWAYS BE INSTALLED IN ACCORDANCE WITH ALL LOCAL CODE REQUIREMENTS.

RECOMMENDATIONS FOR UNDERGROUND INSTALLATION OF PLASTIC DRAINAGE PIPE:

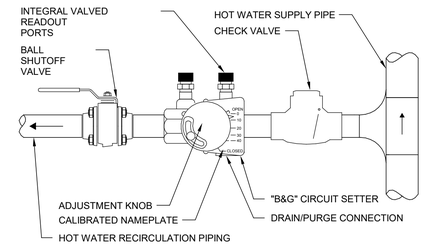
1. THE MINIMUM WIDTH OF THE TRENCH SHOULD BE THE PIPE OD (OUTSIDE DIAMETER) PLUS 16 INCHES OR THE PIPE OUTSIDE DIAMETER TIMES 1.25 PLUS 12 INCHES. THIS WILL ALLOW ADEQUATE ROOM FOR JOINING THE PIPE, SNAKING THE PIPE IN THE TRENCH TO ALLOW FOR EXPANSION AND CONTRACTION WHERE APPROPRIATE AND SPACE FOR BACK FILLING AND COMPACTION OF BACKFILL. THE SPACE BETWEEN THE PIPE AND TRENCH WALL MUST BE WIDER THAN THE COMPACTION EQUIPMENT USED TO COMPACT THE BACKFILL.
2. PROVIDE A MINIMUM OF 4 INCHES OF FIRM, STABLE AND UNIFORM BEDDING MATERIAL IN THE TRENCH BOTTOM. IF ROCK OR UNYIELDING MATERIAL IS ENCOUNTERED, A MINIMUM OF 6 INCHES OF BEDDING SHALL BE USED. BLOCKING SHOULD NOT BE USED TO CHANGE PIPE GRADE OR THE INTERMITTENTLY SUPPORT PIPE OVER LOW SECTIONS IN THE TRENCH.
3. THE PIPE SHOULD BE SURROUNDED WITH AN AGGREGATE MATERIAL WHICH CAN BE EASILY WORKED AROUND THE SIDES OF THE PIPE. BACKFILLING SHOULD BE PERFORMED IN LAYERS OF 6 INCHES WITH EACH LAYER BEING SUFFICIENTLY COMPACTED TO 85% TO 95% COMPACTION.
4. A MECHANICAL TAMPER IS RECOMMENDED FOR COMPACTING SAND AND GRAVEL. THESE MATERIALS CONTAIN FINE-GRAINS, SUCH AS SILT AND CLAY. IF A TAMPER IS NOT AVAILABLE, COMPACTING SHOULD BE DONE BY HAND.
5. THE TRENCH SHOULD BE COMPLETELY FILLED. THE BACKFILL SHOULD BE PLACED AND SPREAD IN UNIFORM LAYERS TO PREVENT ANY UNFILLED SPACES OR VOIDS. LARGE ROCKS, STONES, FROZEN CLODS, OR OTHER LARGE DEBRIS SHOULD BE REMOVED. STONE BACKFILL SHALL PASS THROUGH AN 1-1/2" SIEVE. ROCK SIZE SHOULD BE ABOUT ONE-TENTH OF THE PIPE O UTSIDE DIAMETER. HEAVY TAMPERS OR ROLLING EQUIPMENT SHOULD ONLY BE USED TO CONSOLIDATE THE FINAL BACKFILL.
6. TO PREVENT DAMAGE TO THE PIPE AND DISTURBANCE TO PIPE EMBEDMENT, A MINIMUM DEPTH OF BACKFILL ABOVE THE PIPE SHOULD BE MAINTAINED. PIPE SHOULD ALWAYS BE INSTALLED BELOW THE FROST LEVEL. TYPICALLY, IT IS NOT ADVISABLE TO ALLOW VEHICULAR TRAFFIC OR HEAVY CONSTRUCTION EQUIPMENT TO TRAVERSE THE PIPE TRENCH.



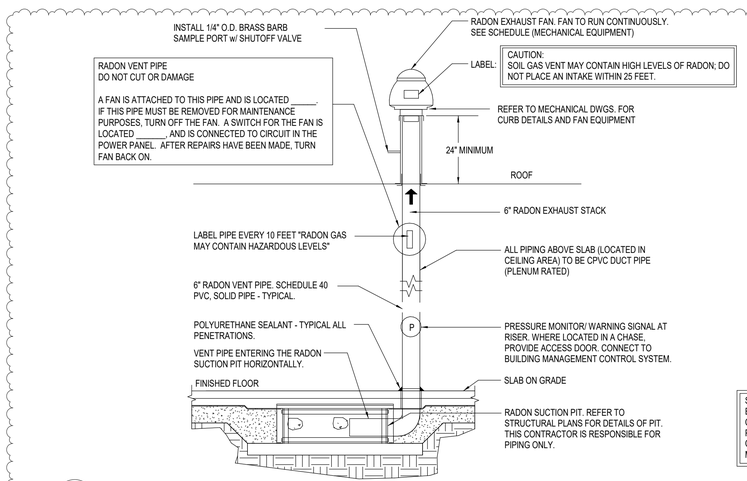
2 P-3.1 OWERFLOW DOWN SPOUT
NTS



3 P-3.1 DUAL WATER HEATER
NTS



4 P-3.1 BALANCE ASSEMBLY
NTS



GENERAL NOTES RADON SYSTEM:

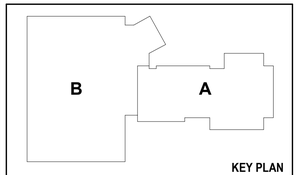
1. RADON SUCTION PIPE SHALL BE CENTRALLY LOCATED AS SHOWN.
2. DO NOT LOCATE SUCTION PIT NEAR SUBSLAB BARRIERS OR NEAR UNSEALED OPENINGS THROUGH THE SLAB.
3. VENT PIPE SHALL ENTER THE RADON SUCTION PIT HORIZONTALLY.
4. RUN VENT PIPE UNDER THE SLAB AND EXIT THE SUBSLAB IN THE GENERAL LOCATION INDICATED IN THE PLANS.
5. PROVIDE PRESSURE MONITOR/WARNING SIGNAL AT RISER. WHERE LOCATED IN A CHASE, PROVIDE ACCESS DOOR.
6. HORIZONTAL PIPE RUNS IN CEILING MUST PITCH A MINIMUM OF 1/8"/FT. BACK TO THE RADON SUCTION PIT.
7. SUBBASE SHALL CONFORM TO STATE OF CONN. DOT FORM 816, SECTION M.03, ARTICLE M.03.01, PARAGRAPH 2. COMPACT TO 95± MAX DRY DENSITY IN ACCORDANCE WITH ASTM D1557. PLACE BACKFILL IN MAXIMUM 8" DEEP LAYERS.
8. CONTRACTOR TO CONFIRM PROPER OPERATION OF SYSTEM AFTER INSTALLATION BY DRILLING 10 (1/2"Ø) HOLES THROUGH SLAB @ EVENLY SPACED LOCATIONS REPRESENTING THE AREA COVERED BY EACH SUCTION PIT. PRESSURES SHALL BE MEASURED @ EACH HOLE BY USING MICROMANOMETER OR SIMILAR DEVICE WITH RADON SYSTEM OFF. CONTRACTOR TO REPEAT MEASUREMENTS WITH SYSTEM ON. A MINIMUM -0.002 in. WATER COLUMN (WC) IS REQUIRED @ ALL TEST HOLES.
9. ALL PVC PIPING SECTIONS TO BE CONNECTED USING PVC CEMENT (LOW VOC's).
10. REFER TO ENV. DWGS. AND MECHANICAL & PLUMBING DWGS. FOR MORE INFORMATION ON RADON SYSTEM, GW VENTILATION SYSTEM, LINER INSTALLATION AND CRUSHED STONE REQUIREMENTS.
11. CONTRACTOR TO CONFIRM RADON LEVELS IN BUILDING FOLLOWING COMPLETION OF SYSTEM BY COLLECTING 20 SAMPLE TUBES AND TAKING PASSIVE READINGS (SYSTEM OFF FOR 3 DAYS PRIOR). CONTRACTOR TO REPEAT PROCESS 3 DAYS FOLLOWING INITIAL TESTS w/ RADON SYSTEM OPERATING FOR 3 DAYS PRIOR TO TEST. SAMPLE MEDIA IS AVAILABLE FROM COMMERCIAL DISTRIBUTOR STORES. SAMPLE LOCATIONS SHOULD BE EVENLY DISTRIBUTED THROUGHOUT BUILDING ON 1ST FLOOR CEILING AREA (APPROX. 9' ABOVE FLOOR). SUBMIT TEST RESULTS TO ENGINEER FOR REVIEW & APPROVAL.

SCOPE OF WORK:
ENTIRE RADON SYSTEM IS SHOWN FOR CLARITY. PLUMBING CONTRACTOR IS RESPONSIBLE FOR PIPING SYSTEM PORTION. OTHER TRADES ARE RESPONSIBLE FOR FANS, CONCRETE, ETC AS DIRECTED BY THE CONSTRUCTION MANAGER.

5 P-3.1 RADON EVACUATION VENTING PIPING DIAGRAM
NTS

QA+M architecture
QuinnBerryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

NOT FOR CONSTRUCTION ISSUED FOR REVIEW ONLY



KEY PLAN

DEVELOPMENT OF:
WINDHAM SENIOR & COMMUNITY CENTER
WILLIMANTIC, CONNECTICUT
Project #: 1762

1	ADDENDUM 1	10/02/2019

Revisions

Issue Dates:

CONSTRUCTION BID
SEPTEMBER 9, 2019

PLUMBING DETAILS

P-3.1