

ADDENDUM NO.: 2
 DATE OF CMR ADDENDUM: 1/15/2014

**Notice of Construction Manager-at-Risk (CMR)
 Addendum
 on behalf of the
 CT Department of Administrative Services,
 Division of Construction Services (DCS)**

Project Name:	Renovations and Additions to Emmett O'Brien Technical High School
Project Location:	141 Prindle Avenue, Ansonia, Connecticut
CT DCS Project Number:	BI-RT-844-CMR

The Construction Manager-at-Risk (CMR) is issuing a **Notice of CMR Addendum** for this State of CT Department of Administrative Services, Division of Construction Services (DCS) Project. Specific Addendum Information is available as noted below. If you have any questions, please contact the CMR as noted below.

CMR Information:

CMR Firm:	The Fusco Corporation
Address:	777 Long Wharf Drive, New Haven, CT
Contact Name:	Michael Tyler, Director of Purchasing
Contact Phone Number:	203.777.7451
Contact Email Address:	mt Tyler@fusco.com

Addendum Information is available as follows:

CMR Website and/or FTP Site:	http://www.construction.com http://CProjects.com
Printing Company:	Joseph Merritt & Company, 60 Hamilton Street, New Haven, CT 06511

Addendum #2 addresses questions raised by bidders, provides the updated requirements for storm water management during construction and supplies the site logistics plan that was not part of the original bid document package

Copies: DCS Project Manager (joel.baranowski@ct.gov) DCS Process Management (randy.daigle@ct.gov)
 DCS Process Management (peter.babey@ct.gov)



ADDENDUM NO. 2

January 15, 2014

**Renovations and Additions to
Emmett O'Brien Technical High School
141 Prindle Avenue
ANSONIA, CONNECTICUT
Project # BI-RT-844-CM-R**

BIDS DUE Wednesday, JANUARY 29, 2014 before 3:00PM

***Pre-Bid RFI DEADLINE Wednesday, JANUARY 22, 2014
before 2:00PM***

This document consists of SEVEN (7) page plus the following Attachments:

- REQUEST FOR INFORMATION (RFI) REPORT- Project #BI-RT-844, dated 1.15.14, 25 pages
 - *Bidders note the followings RFIs will be addressed in Addendum No. 3*
 - *RFI No. - .0037,.0039..0044.0047.0054,.0055 &.0067.*
- Sketches issued as attachments to RFI responses.
 - Civil/Site
 - SKC-003-RFI# .0034
 - Architectural
 - SKAF-001-RFI#.0019
 - SKAF-002-RFI#.0019

- SKAF-003-RFI#.0019
- SKAF-004-RFI#.0019
- SKAF-005-RFI#.0019
- MEP
 - SKP-001-RFI#.0005
 - SKP-002-RFI#.0005
 - SKP-003-RFI#.0049
 - SKM-001-RFI#.0015
 - SKM-002-RFI#.0017
- Project Manual Volume 00 Front End Documents
 - Document 00 01 10 Table of Contents dated 1.15.14, 3 pages
 - Document 00 01 60 Instruction to Bidders, dated 1.15.14, 8 pages
 - Document 00 03 50-4 Notification to Bidders-CHRO, dated 9.17.07, 6 pages
 - Document 00 04 12-A DAS Update(Bid) Statement, dated 9.24.07, 2 pages **SAMPLE ONLY- BIDDERS TO OBTAIN FROM DAS**
 - Document 00 09 35-1 Site Logistics Plan Phase 1
 - Document 00 09 35-2 Site Logistics Plan Phase 2
 - Document 00 09 35-3 Site Logistics Plan Phase 3 & 4B
 - Document 00 09 36 Temporary Storm Water Control, 1 page
 - Document 00 09 50 Bid Forms A,B,C,D,E,&F, 7 pages
- Drummey, Rosane and Anderson, Inc. "DESIGN TEAM MODIFICATIONS TO CONTRACT DOCUMENTS, dated 1.15.14, 225 pages.

NOTICE TO BIDDERS:

THE FOLLOWING BID FORMS (Items 1-14) are to be submitted with your bid:

I. Bid Forms – The Bid Forms included in the Bid Documents must be used and **all required information and documents must be included and submitted in triplicate.**

1. Bid Forms A through F (Document 000950)
2. Bid Bond (Document A310)
3. Form of Surety (Document 000315)
4. Non-Collusion Affidavit of Prime Bidder (Document 000320)
5. Statement of Bidders Qualifications AIA Document A305 (Document 000412C)
6. Certification of Bidder Regarding Equal Employment Opportunity (Document 000360)
7. Contractors Wage Certification Form (Document 000847)
8. Project Labor Agreement Letter of Assent (**contained within PLA**) Submit only Pp 40 & 41 with bid.
9. Department of Administrative Services (DAS) "Contractor Prequalification Certificate and Update Statement- **Obtained by Bidder from CT DAS**
10. Notification to Bidders (Document 00330)
11. Contract Compliance Data Form (Document 00340)

12. Contractor's Minority Business Enterprises Utilization Form (Document 000350-3)
13. Notification to Bidders –CHRO (Document 000350-4)
14. Certification as to Corporate Principal (Document 00370)

II. Dwgs. M1.1.3.D., ED1.1.D, ED1.1.E, ED1.1F, ED1.2B & ED1.2C Were not initially issued by Joseph Merritt prior to Jan 7, 2014. As of Jan 7, 2014 this issue has been corrected. Any plan holders prior to this date please ensure you have received these documents. McGraw Hill, CProjects or Fusco FTP site were not affected by this oversight.

BID PACKAGE SCOPE CLARIFICATIONS- ADDENDUM No. 2

1.1 Final Construction Cleaning

1. No Clarifications issued in this Addendum

1.2 Watchman Services

1. No Clarifications issued in this Addendum

2.0 Demolition & Abatement

1. Include all costs to obtain a demolition permit for work associated in the removal of existing 6 Bay Garage from the Town of Ansonia. REF: Bid Package Scope Clarifications Item 26.

3.0 Cast-In – Place Concrete

1. Area D- Existing Boiler/Mechanical Room- Bidders are to include in their bid existing foundation infill where existing underground Hydroneumatic Tank is scheduled to be removed from its opening in the existing foundation. Approximate Size – 8ft diameter x 16” wall thickness. Earthwork by others.

4.0 Masonry & Precast

1. No Clarifications issued in this Addendum

5.0 Structural Steel & Metal Decking

1. Clarification ALLOWANCE #1 Bidders to carry a LUMP SUM \$25,000.00 for work described under this allowance in the Bid Package Documents.

5.1 Metal Fabrications

1. Furnish and install Miscellaneous steel required for Light Cove REF :Detail 10,11,& 14/A5.4.1

6.0 General Trades

1. The General Trades Contractor will furnish Construction Fire Extinguishers during construction in accordance with applicable regulations having jurisdiction. All trades are responsible for furnishing its own Fire Extinguishers for HOT WORK.
2. Provide field weld for Hollow Metal Frame splice joints as required.
- 3.

6.1 Architectural Millwork & Lab

1. No Clarifications issued in this Addendum

7.0 Roofing

1. Roofing Trade contractor furnish pitch boxes/equipment supports for Roof Mounted Condensing Units for Kitchen Equipment as noted on DWG F.3. Roofing Contractor shall secure equipment to equipment supports.
2. ADDED SCOPE: ADD- Specification Section 084523 Translucent Panel Skylight System. ADD SCOPE ITEM 20.) Furnish all materials, equipment and labor to complete installation of Translucent Skylight System. This shall include Translucent Glazing at Canopy.

07.1 Metal Wall & Roof Panels

1. No Clarifications issued in this Addendum

7.02 Fire Stopping

1. No Clarifications issued in this Addendum

8.0 Glass and Glazing

1. Remove from Bid Package work associated with Translucent Panel Skylight System including Translucent Panel system at Canopy only.

8.1 Door, Frames, & Hardware

2. No Clarifications issued in this Addendum

8.2 Special Doors

1. No Clarifications issued in this Addendum

9.0 Ceramic and Quarry Tile

1. No Clarifications issued in this Addendum

9.1 Terrazzo Flooring

1. No Clarifications issued in this Addendum

9.2 Wood Flooring

1. No Clarifications issued in this Addendum

9.3 Athletic & Resilient Floors

1. No Clarifications issued in this Addendum

9.4 Special Flooring

1. No Clarifications issued in this Addendum

9.5 Acoustical Ceilings

1. No Clarifications issued in this Addendum

9.6 Painting & Fireproofing

1. No Clarifications issued in this Addendum

10.0 Signage

1. No Clarifications issued in this Addendum

10.1 Toilet Compartment and Accessories

1. No Clarifications issued in this Addendum

10.2 Lockers and Benches

1. No Clarifications issued in this Addendum

11.0 Food Service Equipment

1. No Clarifications issued in this Addendum

12.0 Window Treatments

1. Roller shades are to be used at all "**exterior**" windows, curtainwalls and storefronts except at noted exclusions per Section 12 24 13. Per Section 12 21 16, vertical blinds are for "**interior**" glazing and only for "**exterior**" glazing at the "designated office areas." An Example of "**exterior**" use of vertical blinds would be on curtainwall elevations A, B, & D on drawing A6.4. Notice the horizontal dimension line that states "Furnish and install vertical blinds full length at this curtainwall location-refer to wall sections for heights." An Example of "**interior**" use of vertical blinds would be Borrowed Light Frame Type 14 on Drawing A6.2.3 or interior Storefront SF6 on Drawing A6.2.6.

13.0 Temporary Modular Classrooms

1. Furnish refuse removal (dumpsters) from site for all work under this scope.

- 2. State of Connecticut Education Fund Fee (PERMITS)** – The Electrical Contractor, Mechanical Contractor and Sprinkler Contractor shall be responsible to pay for the State of **Connecticut Education Fund Fee (.24 / 1000)** when applying for applicable permits.

21.0 Fire Suppression

22.0 Plumbing & HVAC

- 1. State of Connecticut Education Fund Fee (PERMITS)** – The Electrical Contractor, Mechanical Contractor and Sprinkler Contractor shall be responsible to pay for the State of **Connecticut Education Fund Fee (.24 / 1000)** when applying for applicable permits.

26.0 Electrical

- 1. State of Connecticut Education Fund Fee (PERMITS)** – The Electrical Contractor, Mechanical Contractor and Sprinkler Contractor shall be responsible to pay for the State of **Connecticut Education Fund Fee (.24 / 1000)** when applying for applicable permits.
- 2. Furnish pull rope for Primary Utility pulls i.e. electrical/voice/data in lieu of pull string**
- 3. Scope Item 6) Underground Ducts and Utility Structures: CLARIFICATION- BP #26 will install conduits, grounding, etc.. to complete this work. BP#31.0 will perform all earth work for this scope.**

26.1 Site Lighting

- 1. State of Connecticut Education Fund Fee (PERMITS)** – The Electrical Contractor, Mechanical Contractor and Sprinkler Contractor shall be responsible to pay for the State of **Connecticut Education Fund Fee (.24 / 1000)** when applying for applicable permits.

31.0 Site Work

- 1. Refer to Project Manual Volume 00 Document 000936" Temporary Storm Water Control" (issued in Addendum #2) for requirements applicable to this bid package.**
- 2. Furnish all labor equipment and materials to complete Geothermal Well System including but not limited underground piping into E-Building. REF: Partial Plumbing Site Plan Dwg. 1/P2.1.5. 5foot outside Building Line Rule will not be applicable to this portion of work.**
- 3. Complete all excavation, backfill, bedding and compaction for installation of Site Utilities to E-Building. Bid Packages 22.0 Plumbing & HVAC and 26.0 Electrical shall furnish all labor and**

materials for new utilities to E Building from Existing Building. REF : Partial Plumbing Site Plan Dwg. 1/P2.1.5

4. Scope Item # 10 Radon Pit Removal Systems: Include in bid all work associated to complete “radon pits”.
5. Scope Item #15 Site Security: In addition to the requirements in the bid packages bidders are to include the following temporary fence quantities:
 - Phase 1 700 L.F. 2 – 20 foot gates
 - Phase 2 700 L.F 2 -20 foot gates
 - Phase 3/4 1000 L.F 2- 20 foot gates

It is the intent to utilize the existing property fencing during each construction phase to be removed prior to final site grading (topsoil). Temporary fencing shall be comprised of a combination of post driven/stanchion base chain link material which will be dictated by the project needs and site conditions. Final locations of fencing will be as directed by Construction Manager's Field Superintendent.

6. Scope Item #19 Underground Ducts and Utility Structure: CLARIFICATION Installation of electrical conduit shall be by Electrical Bid Packages

31.2 Landscaping

1. No Clarifications issued in this Addendum

31.4 Ford Street Athletic Fields.

1. Refer to Project Manual Volume 00 Document 000936 ” Temporary Storm Water Control” (issued in Addendum #2) for requirements applicable to this bid package.

END OF ADDENDUM NO. 2

**Renovations and Additions to
Emmett O'Brien Technical High School
141 Prindle Avenue, Ansonia CT
Project # BI-RT-844-CM-R**

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

Project # BI-RT-844

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
.001	Test RFI Description	Fusco Corporation, Inc	Drumme y Rosane Anderson, Inc.	12/18/2013	12/25/2013	12/18/2013		Architectural
To Company		Attention				Author Company		Author by
Drumme y Rosane Anderson, Inc.		Wilson Rodriguez				Drumme y Rosane Anderson, Inc.		Vladimir Lyubetsky
Question				Answer				
This is the question. Please advise .				Please refer to this and that.				
.002	Bid Extension	Fusco Corporation, Inc	Drumme y Rosane Anderson, Inc.	01/02/2014	01/09/2014	01/03/2014		Architectural
To Company		Attention				Author Company		Author by
Fusco Corporation, Inc		Mel Strauss				Fusco Corporation, Inc		Mel Strauss
Question				Answer				
Due to the Holidays Do you fore see any extension of the Bid Date				At this time it is not likely that the bid will be extended. Mel Strauss Fusco Corp. 1.2.14				
.003	Food Service Equipment	Fusco Corporation, Inc	Drumme y Rosane Anderson, Inc.	01/03/2014	01/10/2014	01/07/2014		Food Service
To Company		Attention				Author Company		Author by
Drumme y Rosane Anderson, Inc.		Vladimir Lyubetsky				Fusco Corporation, Inc		Mel Strauss
Question				Answer				

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Project # BI-RT-844

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
-------	---------	----------------	----------------	--------------	------------	-----------	----------	----------

On the equipment schedule- it goes up to item #105 and the written specification only go up to the item #104. Please advise what is needed

Section 11 40 00, FOOD SERVICE EQUIPMENT

Article 2.4, ADD Item No.105 after Item No.104 per the following:

"105 ICE MACHINE WITH STORAGE BIN

Make & Model:

Scotsman #CME256AS-1F, with #HTB350 Storage Bin; Hoshizaki; Manitowoc; or equal.

Dimensions:

30"W x 24"D x 27" mounted on bin unit 30"W x 31-1/2"D x 29.5"H.

Power:

1/2 H.P., 120V/60C/1 phase.

Description:

Provide modular ice cube machine with all standard construction, features and accessories, with production capacity of 307 lbs. of ice per 24 hours at 70°F air temperature. Control system shall monitor and control machine functions to ensure consistent ice production. Evaporator shall be hot tin dipped, molecularly bonded plate. Rust free polyethylene base shall be insulated with 1-1/2" foam. Unit shall be protected with Aqua Armor, which is a silver-based anti-microbial compound used to reduce growth of bacteria, microorganisms, algae and slime. Provide ice machine with filtration system."

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations**Project # BI-RT-844**

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
.004	HVAC Controls	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/03/2014	01/10/2014	01/08/2014		
To Company		Attention		Author Company			Author by	

Question

Please review attached RFI No. 1,2,3 from Johnson Controls and advise

Answer

We take no exception to listing Johnson Controls as acceptable manufacturers. Specifications shall be revised as follows:

JC#1: At Specification Sections 230900 and 230923; at paragraph 2.01, Add Johnson Controls to the list of manufacturers.

JC#2: At Specification Section 236313; at paragraphs 2.01 and 2.02, Add Johnson Controls to the list of manufacturers.

JC#3: At Specification Section 238106; at paragraph 2.01, Add Johnson Controls to the list of manufacturers.

Brian D. Wetzel
CES

.005	Plumbing	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/03/2014	01/10/2014	01/08/2014		MEP
To Company		Attention		Author Company			Author by	
Consulting Engineering Services, Inc		Brian Wetzel		Fusco Corporation, Inc			Mel Strauss	

Question

See attached RFI regarding plumbing systems and advise.

Answer

#1. On drawing P1.1.1.B #1, new waste and vent piping shall be provided, refer to SKP-001.
On drawing P1.1.2.B #1, new waste and vent piping shall be provided, refer to SKP-002.

#2. The piping in question serves the girls locker rooms and new fixtures in the admin addition.

Jesse VanCamp
CES

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Project # BI-RT-844

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
.006	Storefront System	Fusco Corporation, Inc	Drumme y Rosane Anderson, Inc.	01/06/2014	01/13/2014	01/14/2014		Architectural
To Company		Attention		Author Company		Author by		
Drumme y Rosane Anderson, Inc.		Vladimir Lyubetsky		Fusco Corporation, Inc		Mel Strauss		
Question				Answer				
Spec Section 2.2B specifies an EFCO 403T storefront system. This is a 2'x4 1/2" center system. DWG A6.27 details a front set system. DWG A6.28 details an EFCO S-960 system 6" deep. Also butt glazed verticle shown on Detail 11/A6.2.7 is not available with the 403 system. Please clarify which storefront system is to be used.				Specifications will be modified in Addendum. Sarah Roth DRA Architects				
.007	Finish Hardware Installation	Fusco Corporation, Inc	Drumme y Rosane Anderson, Inc.	01/06/2014	01/13/2014	01/07/2014		Architectural
To Company		Attention		Author Company		Author by		
Fusco Corporation, Inc		Mel Strauss		Fusco Corporation, Inc		Mel Strauss		
Question				Answer				
Scope Item #12 states this Bid Package installs hardware furnished by BP #8.1. Scope Item #18 states this bid package is to furnish hardware. Which is Correct?				"Bid Package #8.0 shall install all finish hardware for its Scope of Work. Finish hardware will be furnished only by BP #8.1 Doors, Frames and Hardware. Mel Strauss Fusco Corp. 1.6.14"				
.008	Glass and Glazing	Fusco Corporation, Inc	Drumme y Rosane Anderson, Inc.	01/06/2014	01/13/2014	01/13/2014		Architectural
To Company		Attention		Author Company		Author by		
Drumme y Rosane Anderson, Inc.		Vladimir Lyubetsky		Fusco Corporation, Inc		Mel Strauss		
Question				Answer				

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

Project # BI-RT-844

141 Prindle Avenue
 Ansonia, CT 06401-2500
 Main Phone Number 203.732.1800

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
-------	---------	----------------	----------------	--------------	------------	-----------	----------	----------

1. DWG A6.2.6 states all exterior glass to be Type GX1. Type GX1 is Viracon VE6-2-M is Section 085113(2.2). Insulated glass speciefec is Section 088100 2.5 is VE-6-85. Is VE 6-2M used only at the windows and VE6-85 used at the curtain wall?

2. Section 084413 page 8 shows interior glass Types G1-G4. A6.2.7 does not show a G3. Please advise.

3. Glass Legend shows a Type GX2 twice. Please claify.

Response to question No.1
 The description of Storefront glass types can be found in Section 084113, Article 2.2.
 The description of Curtainwall glass types can be found in Section 084413, Article 2.2.
 The description of Window glass types can be found in Section 085113 & 085114.

Response to question No.2
 Question #2 is unclear.

Storefront glass types on dwg. A6.2.6 is coordinated with specification section 08 41 13.
 Curtainwall glass types on dwg. A6.4.1 is coordinated with specification section 08 44 13.

Response to question No.3

On drawing A6.4.1, Overall Curtain Walls, REVISE the Curtainwall Glass Type Legend per the following:

REVISE glass type designation "GX2," related to Operable Glass Vent Section at Glass Art Work, to READ "GXA."

.009	Doors and Frames	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/06/2014	01/13/2014	01/13/2014		Architectural
------	------------------	------------------------	-------------------------------	------------	------------	------------	--	---------------

To Company	Attention	Author Company	Author by
Drummey Rosane Anderson, Inc.	Vladimir Lyubetsky	Fusco Corporation, Inc	Mel Strauss

<u>Question</u>	<u>Answer</u>
-----------------	---------------

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

Project # BI-RT-844

**141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800**

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
.0010	Finish Hardware							Architectural
To Company		Attention		Author Company		Author by		
Fusco Corporation, Inc		Mel Strauss		Fusco Corporation, Inc		Mel Strauss		
Question				Answer				
Please advise if Corbin Russwin is an acceptable manufacturer for Locks and Exit Devices.				Based on Specification Section 08 71 00 Part 2 Products/ 2.01 MANUFACTURERS Corbin Russwin is not an acceptable manufacturer to the Awarding Authority. Mel Strauss Fusco Corp 1.6.14				
.0011		Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/06/2014	01/13/2014	01/07/2014		MEP
To Company		Attention		Author Company		Author by		
Fusco Corporation, Inc		Mel Strauss		Fusco Corporation, Inc		Mel Strauss		
Question				Answer				
Please clarify Plumbing and HVAC demo procedure BP #22 scope item #4 states that BP #22 is responsible to remove and dispose of all plumbing and HVAC installatons, yet below tiems a-c references identify cut, cap and drop. Please review and advise.				BP #22 Plumbing & HVAC is to cut, cap and drop installations. BP #2 Demolition and Hazardous Material Abatement wll remove debris from building to refuse containers. Mel Strauss, Fusco Corp. 1.6.14.				

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Project # BI-RT-844

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
.0012	MEP	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/06/2014	01/13/2014	01/08/2014		MEP

To Company

Consulting Engineering Services, Inc

Attention

Brian Wetzel

Author Company

Fusco Corporation, Inc

Author by

Mel Strauss

Question

Spec Section 22 34 00 is tagged Fuel Fired Domestic Water Heaters, but it appears to be the air compressor spec. Please advise.

Answer

The spec section 22 34 00 will be renumbered via addendum.
Jesse VanCamp
CES

.0013	Groove Pipe & Fitting	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/06/2014	01/13/2014	01/08/2014		MEP
-------	-----------------------	------------------------	-------------------------------	------------	------------	------------	--	-----

To Company

Consulting Engineering Services, Inc

Attention

Brian Wetzel

Author Company

Fusco Corporation, Inc

Author by

Mel Strauss

Question

Please confirm that grooved pipe and fitting are an acceptable joining method under the base bid on the hot water heating system.

Answer

Yes, this method of joining piping is allowed and is currently specified.
Refer to Specification Section 23 21 16, paragraph 2,01, subparagraph E.

Brian D. Wetzel
CES

.0014	Temporary RTU	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/06/2014	01/13/2014	01/07/2014		MEP
-------	---------------	------------------------	-------------------------------	------------	------------	------------	--	-----

To Company

Fusco Corporation, Inc

Attention

Mel Strauss

Author Company

Fusco Corporation, Inc

Author by

Mel Strauss

Question

Does the temporary RTU and associated piping work on DWG MEP1.1.2 fall under the temporary heat allowance? Please review and advise.

Answer

Temporary RTU and associated piping work on DWG MEP1.1.2 is part of base bid and will not be charged against temporary heat allowance. Mel Strauss, Fusco Corp 1.6.14.

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Project # BI-RT-844

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
-------	---------	----------------	----------------	--------------	------------	-----------	----------	----------

.0015	MEP Pipe Sizes	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/06/2014	01/13/2014	01/08/2014		MEP
-------	----------------	------------------------	-------------------------------	------------	------------	------------	--	-----

To Company

Consulting Engineering Services, Inc

Attention

Brian Wetzel

Author Company

Fusco Corporation, Inc

Author by

Mel Strauss

Question

DWG MP1.12B the heating mains go from 3" to 2", on DWG MP1.12C the same mains are shown as 2-1/2". Please review as I believe the mains should be 2" and the 2-1/2" symbol is in error.

Answer

DWG MP1.1.2C is correct. Refer to the attached Sketch SK-M001 for revisions to DWG MP1.1.2B.

Brian D. Wetzel
CES

.0016	Front End Documents	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/06/2014	01/13/2014	01/07/2014		
-------	---------------------	------------------------	-------------------------------	------------	------------	------------	--	--

To Company

Fusco Corporation, Inc

Attention

Mel Strauss

Author Company

Fusco Corporation, Inc

Author by

Mel Strauss

Question

Project Labor Agreement letter of assent 00 08 50-3 and notification to bidders - CHRO 00 03 50-4, that are required with the bid appear to be missing from the front end documents.

Answer

These documents will be issued by Addendum and will also include Document 00 04 12A DAS Update (Bid) Statement. Mel Strauss, Fusco Corp. 1.6.14

.0017	Heat Pipe Sizes	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/06/2014	01/13/2014	01/08/2014		MEP
-------	-----------------	------------------------	-------------------------------	------------	------------	------------	--	-----

To Company

Consulting Engineering Services, Inc

Attention

Brian Wetzel

Author Company

Fusco Corporation, Inc

Author by

Mel Strauss

Question

DWG MP1.10D shows (2) 4" heating hot water supplies and (2) 4" heating hot water returns leaving the Boiler Room. DWG M1.2.1D shows (2) 4" Supplies and (1) 6" return. Please review and advise.

Answer

DWG MP1.1.0D is correct. Refer to the attached Sketch SKM-002 for revisions to DWG M1.2.1D.

Brian D. Wetzel
CES

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

Project # BI-RT-844

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
.0018	Skylight Dimensions	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/07/2014	01/14/2014	01/08/2014		Architectural

To Company
Drummey Rosane Anderson, Inc.

Attention
Vladimir Lyubetsky

Author Company
Fusco Corporation, Inc

Author by
Mel Strauss

Question

Please provide overall dimensions for 3 new skylights and pitch.

Answer

Information provided by DRA is to be used for Basis of Bid only. Verification of Final dimensions and coordination is the responsibility of the Bid Package Contractor. Mel Strauss, Fusco Corp 1.7.14
Approximate dimensions for each skylight is 26' x 4'6", slope/pitch shall be 33,33 degrees. All dimensions must be verified in field by the Bid Package Contractor prior to the shop drawing submittals.
DRA Architects

.0019	Ceramic Tile Color	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/07/2014	01/14/2014	01/08/2014		Architectural
-------	--------------------	------------------------	-------------------------------	------------	------------	------------	--	---------------

To Company
Drummey Rosane Anderson, Inc.

Attention
Vladimir Lyubetsky

Author Company
Fusco Corporation, Inc

Author by
Mel Strauss

Question

Please clarify on elevations showing tile patterns what the field tile color is going to be. As this will effect pricing.

Answer

Refer to SKAF #s 001,002,003,004, & 005 furnished by DRA for elevations and color selections. Mel Strauss, Fusco Corp. 1.8.14

.0020	Duct Work Clarifications	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/07/2014	01/14/2014	01/10/2014		MEP
-------	--------------------------	------------------------	-------------------------------	------------	------------	------------	--	-----

To Company
Consulting Engineering Services, Inc

Attention
Brian Wetzel

Author Company
Fusco Corporation, Inc

Author by
Mel Strauss

Question

Answer

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Project # BI-RT-844

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
-------	---------	----------------	----------------	--------------	------------	-----------	----------	----------

1.Mechanical Renovation Note #17 calls for exposed ductwork in Classrooms to be double wall. Should the shop thery rooms with no ceilings be considered classrooms and recieve double wall duct?

Yankee RFI #1: Yes.

2.Mechanical Renovation Note #15 calls for supply and return duct from the units to the VAVs to be internally lined. there are no retun boxes. What should be lined on the return side fo the system. Some untis show ligin on the return side while others do not. Should the round duct to the inlets of the VAVs also be lined, making them double wall? Please confirm that all the supply up to the VAVs is lined as the dwgs do not show liner the whole way.

Yankee RFI #2:

For all equipment scheduled on the Air Handling Unit Schedule on Drawing M3.1.3:

- For units served by VAV boxes: At the supply air ductwork, provide 1 ½" thick duct insulation liner from the outlet of each unit to the inlet of each VAV box (exterior insulation is not necessary where duct liner is installed). Return air ductwork shall be provided with 1" thick duct insulation liner from each unit's connection for the first 50 feet of ductwork away from each unit's connection; including branch ductwork.
- For units not served by VAV boxes: At the supply air ductwork, provide 1 ½" thick duct insulation liner from the outlet of each unit for the first 50 feet of ductwork away from each unit's connection including branch ductwork (exterior insulation is not necessary where duct liner is installed). Return air ductwork shall be provided with 1" thick duct insulation liner from each unit's connection for the first 50 feet of ductwork away from each unit's connection including branch ductwork.
- At Locations where double wall ductwork is to be installed, duct insulation liner shall not be required.

For MAU-1 and MAU-2: At the supply air ductwork, provide 1 ½" thick duct insulation liner from the outlet of each unit for the first 20 feet of ductwork away from the unit's connection including branch ductwork (exterior insulation is not necessary where duct liner is installed). Return air ductwork shall be provided with 1" thick duct insulation liner from each unit's connection for the first 20 feet of ductwork away from each unit's connection including branch ductwork .

Brian D. Wetzel
CES

.0021	Front End Documents	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/07/2014	01/14/2014	01/07/2014		Architectural
-------	---------------------	------------------------	-------------------------------	------------	------------	------------	--	---------------

To Company	Attention
------------	-----------

Fusco Corporation, Inc Mel Strauss

Author Company	Author by
----------------	-----------

Fusco Corporation, Inc Mel Strauss

Question

.....In addition to missing Documents in Instruction of Bidders to be issued in Addendum We will also require Docu 00000770 Contractors Compliance Certificate and Document 000412d Bidder Info.

Answer

Bid Documents required to be submitted with Bids will be addressed in a future Addendum. Document 000770 Contractors Compliance Certificate is to be provided by Bidder through DAS. This is not a document issued by the CMR. Mel Strauss, Fusco Corp 1.7.14

.0022	Concrete Slab on Grade	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/07/2014	01/14/2014	01/08/2014		Structural
-------	------------------------	------------------------	-------------------------------	------------	------------	------------	--	------------

To Company	Attention
------------	-----------

Fusco Corporation, Inc Mel Strauss

Author Company	Author by
----------------	-----------

Fusco Corporation, Inc Mel Strauss

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Project # BI-RT-844

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
Question					Answer			
Supplemental Scope of Work Item #39 Is the saw cutting, removal, excavation and backfill by others?					With regardst to trenching for MEP work in existing building work is to be executed as follows: Sawing cutting/removal and disposal is to be performed by BP #2.0 Demolition Excavation, bedding, backfill and compaction is to be performed by BP 31.0 Site Work Replacement of concrete slab is to be performed by BP #3.0 Cast in Place Concrete Mel Strauss, Fusco Corp 1.7.14			
.0023	Concrete Stair Pans	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/07/2014	01/14/2014	01/08/2014		Architectural
To Company		Attention		Author Company		Author by		
Fusco Corporation, Inc		Mel Strauss		Fusco Corporation, Inc		Mel Strauss		
Question					Answer			
Supplemental Scope of Work Item 19 It appears General Trades Contractor has all of the OSHA protection items. Item 19.c.v mentions stair pan tread wood infills. This is also included in concrete scope					Bid Package #6.0 General Trades is responsible to furnish and install stair pan temporary wood infills. Bid Package #3.0 Cast in Place Concrete is responsible to remove, dispose of and sufficiently clean stair pans to complete its work. Mel Strauss, Fusco Corp. 1.7.14			
.0024	Missing MEP Specifications	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/07/2014	01/14/2014	01/08/2014		MEP
To Company		Attention		Author Company		Author by		
Consulting Engineering Services, Inc		Brian Wetzal		Fusco Corporation, Inc		Mel Strauss		
Question					Answer			
1. Please provide specification for Air Compressor System and the pipe/fitting materials. 2. Please provide specification for pipe and fitting required fro the forced sanitary piping					EPH#9: Refer to specification section 22 34 00 for compressed air system specification. This section will be relabeled via an addendum. EPH#10: Refer to section 22 10 00: 2.02 for pipe and fitting for use in the forced sanitary system. Jesse VanCamp CES			
.0025	Concrete Footing Schedule	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/07/2014	01/14/2014	01/08/2014		Structural
To Company		Attention		Author Company		Author by		
Szewczek Associates Consulting Engineers		Peter C. Celella		Fusco Corporation, Inc		Mel Strauss		
Question					Answer			
At Column Location G.2-32.5 The footing called out is F-3.0. F-3.0 does not appear in the footing Schedule (DWG S-1-0A).					Footing F3.0 is to be 3'-0" x 3'-0"x 1'-4" Thick, Reinforced with 3 - #6, Each Way, Bottom. Peter Celella Csewczak Associates			

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

Project # BI-RT-844

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
.0026	CMU Haunch	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/08/2014	01/15/2014	01/08/2014		Structural
To Company		Attention					Author Company	
Szewczek Associates Consulting Engineers		Peter C. Celella					Fusco Corporation, Inc Mel Strauss	
Question				Answer				
In our Scope of Work under "Clarifications" Item a.5 it indicates that we are to use the haunch detail for CMU in lieu of the footing detail. I also see in the documents that drilling and grouting of CMU dowels is not permitted. We all know that trying to hold CMU dowels in a haunch and have them be correct is not very good. The best method for this detail is to have the mason contractor drill and grout these dowels once the first course of block has been installed. This has been a generally accepted method. Please advise if this method can be approved.				The proposed method of drilling and grouting CMU dowels is structurally acceptable. Peter Celella Szewczak Associates				
.0027	Storm Manhole TF	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/08/2014	01/15/2014	01/15/2014		Civil
To Company		Attention					Author Company	
URS Corporation		Fraser Walsh					Fusco Corporation, Inc Mel Strauss	
Question				Answer				
There is no TOP of FRAME elevation for #19 Storm Manhole at 31+97.50. Please provide				Please use elevation 409.2 for storm Manhole #19. (Top of Frame). URS Corp. - Fraser Walsh				
.0028	Sliding Accordion Fire Door	Fusco Corporation, Inc		01/13/2014	01/20/2014			Architectural
To Company		Attention					Author Company	
Fusco Corporation, Inc		Mel Strauss					Fusco Corporation, Inc Mel Strauss	
Question				Answer				
Are the Options found in Spec Section 08 35 13 on page 7 are, in fact required? L. Vision Panel N. LCD Door Status display O. Air pressure Resistance to .15 These will all ADD cost to the door and are not required for this application.				Yes- Contractor to submit bid based on project specifications. Mel Strauss, Fusco Corp. 1.13.14				
.0030	Project Labor Agreement	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/08/2014	01/15/2014	01/08/2014		
To Company		Attention					Author Company	
Fusco Corporation, Inc		Mel Strauss					Fusco Corporation, Inc Mel Strauss	
Question				Answer				
Are the M/WBE and SBE Bid Packages subject to the requirements of the Project Labor Agreement (PLA).				"All contractors performing work on-site are to agree to be bound to the PLA. There is no carve-out for MBE/SBE set aside packages." Mel Strauss, Fusco Corp. 1.8.14				
.0031	Electrical Panels	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/09/2014	01/16/2014	01/13/2014		MEP

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

Project # BI-RT-844

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
-------	---------	----------------	----------------	--------------	------------	-----------	----------	----------

To Company	Attention	Author Company	Author by
Consulting Engineering Services, Inc	Brian Wetzel	Fusco Corporation, Inc	Mel Strauss

Question

Dwg E2.1.5 shows a panel SP-7A which is not shown on riser Dwg. E2.1.1. Please clarify.

Answer

Response to question #1
The Motor Circuit Schedule on drawing E2.1.6 will be re-issued by Addendum to clarify.

Response to question #2
Delete Panel SP-7A from the Panelboard Schedule on drawing E2.1.5.

Response to question #3
Correct, cabling and equipment will be by others.

.0032	Telecom & Security	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/14/2014	01/21/2014	01/14/2014		Security
-------	--------------------	------------------------	-------------------------------	------------	------------	------------	--	----------

To Company	Attention	Author Company	Author by
Fusco Corporation, Inc	Mel Strauss	Fusco Corporation, Inc	Mel Strauss

Question

Please verify that the electrical contractor is only responsible to carry backboxes and conduit stubs for the telecom and security portion of the project and that cabling and equipment shall be by others.

Answer

Response to question #3
Correct, cabling and equipment will be by others. **Per RFI .0033 CES Response dated, 1.10.14 Mel Strauss, Fusco Corp. 1.14.14**

We believe Fusco is referencing RFI .0031. - DRA Architects 1/14/2014

Correct, RFI .0031 CES Response dated, 1.10.14 Mel Strauss, Fusco Corp. 1.14.14

.0033	Motor Starters, VFDs and Disconnects	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/14/2014	01/21/2014	01/14/2014		MEP
-------	--------------------------------------	------------------------	-------------------------------	------------	------------	------------	--	-----

To Company	Attention	Author Company	Author by
Fusco Corporation, Inc	Mel Strauss	Fusco Corporation, Inc	Mel Strauss

Question

Since the Dwgs do not clearly show which contracotr is responsible to include motor starters, VFDs and Disconnects. please clarify who is to furnish these for the mechanical equipment. Item #12 in the electrical bid package states that these are to be provided by the contractor providing the equipment, Dwg E2.1.6 sort of contradicts that.

Answer

Response to question #1
The Motor Circuit Schedule on drawing E2.1.6 will be re-issued by Addendum to clarify.

Per RFI .0033 CES Response dated, 1.10.14 Mel Strauss, Fusco Corp. 1.14.14

We believe that Fusco is referencing RFI .0031, DRA Architects 1/14/2014

Correct, RFI .0033 CES Response dated, 1.10.14 Mel Strauss, Fusco Corp. 1.14.14

.0034	Underground Detention System	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/08/2014	01/15/2014	01/13/2014		Civil / Sitework
-------	------------------------------	------------------------	-------------------------------	------------	------------	------------	--	------------------

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

Project # BI-RT-844

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
To Company		Attention				Author Company		Author by
.0035	Kitchen Grease Waste	Fusco Corporation, Inc	Drumme Rosane Anderson, Inc.	01/08/2014	01/15/2014	01/08/2014		MEP
		URS Corporation				Fusco Corporation, Inc		Mel Strauss
Question				Answer				
On sheet C5 states the underground Detention Systems -East is 4,013 SFT. Taking the information on the Detail Sheet (C-13) the SFT area does not work out. Trying to scale or count the number of pieces to be installed does not work out. Without correct information this can casue the contractor to not have enough material cost if we are to assume the Square Foot information is correct.				Refer to the attached Sketch SKC-003 for revisions to site DWG C-5.				
				Fraser Walsh URS				
To Company		Attention				Author Company		Author by
		Consulting Engineering Services, Inc				Fusco Corporation, Inc		Mel Strauss
		Brian Wetzel						
Question				Answer				
Is the kitchen grease waste required to be heat traced?				No, the grease waste piping is not required to be heat traced.				
				Jesse VanCamp CES				
To Company		Attention				Author Company		Author by
.0036	Site Logistics Plan	Fusco Corporation, Inc	Drumme Rosane Anderson, Inc.	01/10/2014	01/17/2014	01/10/2014		Sitework
		Fusco Corporation, Inc				Fusco Corporation, Inc		Mel Strauss
Question				Answer				
Site Logistics Plan appears to be missing from the Bid Documents. Please provide				Preliminary Site Logistics Dwg will be issued in Addendum. Mel Strauss, Fusco Corp. 1.10.14				
To Company		Attention				Author Company		Author by
.0037	Site Grading	Fusco Corporation, Inc		01/10/2014	01/17/2014			Sitework
		URS Corporation				Fusco Corporation, Inc		Mel Strauss
		Fraser Walsh						
Question				Answer				
There are discrepancies between grading plan and enlarged grading plans. The grading at the entrance circle does not work. It goes from 409.8 to 409 and then back up. The entire area does not tie into the rest of the site or with the building area. It seems as if there should be an added drainage structure in this area, or that the grade should be raised, which would lead to a step/ramp at the entrance of the building. Pleas clarify the grading around the entrance circle.								

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Project # BI-RT-844

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
.0038	Art Work Glazing	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/10/2014	01/17/2014	01/10/2014		Architectural

To Company

Fusco Corporation, Inc

Attention

Mel Strauss

Author Company

Fusco Corporation, Inc

Author by

Mel Strauss

Question

Glass Legend Type GX2 states "Provide laminated glass for artist work.

A.) Confirm Art Work is by Others

B.) The inner lite of the GX2 is laminated Lite. Do we supply only this lite or the complete insulated unit?

Answer

A.) Art work is by others. BP #8.0 is responsible to coordinate its work with Art Work supplier (Artist).

B.) BP #8.0 is to supply complete insulated unit. BP #8.0 is responsible to coordinate its work with Art Work supplier (Artist).

Mel Strauss, Fusco Corp. 1.10.14

.0039	Site Grading	Fusco Corporation, Inc		01/10/2014	01/17/2014			Sitework
-------	--------------	------------------------	--	------------	------------	--	--	----------

To Company

URS Corporation

Attention

Fraser Walsh

Author Company

Fusco Corporation, Inc

Author by

Mel Strauss

Question

There area discrepancies between the grading elevations and some of the Utility frame elevations given. Storm utility structures 6,9, and 45 are dependent on the grading around the entrance circle (RFI#3-PMWEB #.0037). SW MH 45 is currently 3ft above proposed grade. The underground detention frame elevation given is 398.00 +/- which is roughly 3.5' below the proposed grade. Are these tops designed to be covered? Sanitary MH5 and 5A are shown to be about 1.5ft above proposed grade. Please clarify frame elevations for these structures.

Answer

.0040	23 83 00 Equipment manufacturers	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/10/2014	01/17/2014	01/14/2014		MEP
-------	----------------------------------	------------------------	-------------------------------	------------	------------	------------	--	-----

To Company

Consulting Engineering Services, Inc

Attention

Brian Wetzel

Author Company

Fusco Corporation, Inc

Author by

Mel Strauss

Question

Would the following manufacturers to (sic) considered approved equals?

- 1.) 23 83 00- 2.02 CUH Rittling
 - 2.) 23 83 00- 2.01 UH Rittling
 - 3.) 23 83 00- 2.05 RCP Airtite
 - 4.) 23 83 00- 2.03 FTR Rittling
- Please review and advise.

Answer

We take no exception to listing Rittling and Airtite as acceptable manufacturers. Specifications shall be revised as follows:

1. At Specification Sections 238300; at paragraph 2.02, Add Rittling to the list of manufacturers.
2. At Specification Sections 238300; at paragraph 2.01, Add Rittling to the list of manufacturers.
3. At Specification Sections 238300; at paragraph 2.05, Add Airtite to the list of manufacturers.
4. At Specification Sections 238300; at paragraph 2.03, Add Rittling to the list of manufacturers.

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

141 Prindle Avenue
 Ansonia, CT 06401-2500
 Main Phone Number 203.732.1800

Project # BI-RT-844

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
.0041	Structural Steel	Fusco Corporation, Inc		01/13/2014	01/20/2014			Structural
To Company		Attention		Author Company		Author by		
Szewczek Associates Consulting Engineers		Peter C. Celella		Fusco Corporation, Inc		Mel Strauss		

Question

Please provide a section cut of NOTE #1 on DWG S-2.0.H.

Answer

.0042	Temperature Controls	Fusco Corporation, Inc	Drummeey Rosane Anderson, Inc.	01/13/2014	01/20/2014	01/15/2014		MEP
To Company		Attention		Author Company		Author by		
Consulting Engineering Services, Inc		Brian Wetzel		Fusco Corporation, Inc		Mel Strauss		

Question

Section -230900 Part 2 Products Section 2.01 lists several manufactures Can you please consider adding Distech and/or Siemens Talon by Connecticut Temperature Controls, LLC. CTC is a full service energy management, temperature controls and system integration company that provides complete building management systems (design, installation, commissioning, service and support) to our customers located throughout the State of Connecticut and Western Massachusetts. CTC has been in business for 15 years and is a leader in providing open DDC systems in the Commercial / Industrial market. CTC is authorized as a Siemens Solution Partner and a Distech Controls Integrator for the Tridium based open Siemens Talon and Distech EC-Net AX product lines. EC-Net AX and Talon are both BACnet listed and LONMARK certified and fully meet the requirements under the control specifications.

We take no exception to listing CTC Controls as acceptable manufacturers. Specifications shall be revised as follows:

At Specification Sections 230900 and 230923; at paragraph 2.01, Add Connecticut Temperature Controls (CTC) to the list of manufacturers.

Brian D. Wetzel - CES

.0043	Casework	Fusco Corporation, Inc		01/14/2014	01/21/2014			Architectural
To Company		Attention		Author Company		Author by		
Drummeey Rosane Anderson, Inc.		Vladimir Lyubetsky		Fusco Corporation, Inc		Mel Strauss		

Question

- 1.) What BP and Spec section covers sinks? Keynotes as SS-4 as shown on dwg EQ.7. SS-4 is not shown on any sink schedule on the EQ or Plumbing dwgs.
- 2.) Casework Elevations SC-15 thru SC-18 and HC-01 thru HC-08 area shown on DWG EQ.7. However elevation descriptions in Spec Section 116000 only has descriptions for SC-01 thru SC-14 Please clarify.
- 3.) Please Clarify what BP & Spec Section covers the appliances on Dwg EQ.7.

1.) Sink Type SS-4 is an Epoxy Resin Sink per detail at the bottom of dwg EQ.7 (Durcon #A-55). Sink to be furnished and installed in epoxy tops by BP # 6.1 Millwork and Lab Casework. Mel Strauss , Fusco Corp. 1.14.14

4.) Bidder Question:
 Both referenced spec sections (116000 & 123213) cover wood casement. However the construction is specified differently. Can the same construction be used for both spec sections?
 Response:

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Project # BI-RT-844

Tel: 203.732.1800

Fax: DPWP00001060073

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

Project # BI-RT-844

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
.0048	Building Phasing Plan	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/14/2014	01/21/2014	01/14/2014		Architectural
To Company		Attention					Author Company	
Fusco Corporation, Inc		Mel Strauss					Fusco Corporation, Inc Mel Strauss	
Question					Answer			
Where can I find the phasing plan showing the (5) Phases?					Phasing Plan is in Volume 00 of the Project Manual Section 00 09 26. Mel Strauss, Fusco Corp. 1.14.14			
.0049	Fuel Oil Storage Tank	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/14/2014	01/21/2014	01/15/2014		MEP
To Company		Attention					Author Company	
Consulting Engineering Services, Inc		Brian Wetzel					Fusco Corporation, Inc Mel Strauss	
Question					Answer			
1.) Who provides Fuel Oil Storage Tank? 2.) DWG P2.1.5 Detail #1 Please provide size of Fuel Oil Storage Tank.					1.) Fuel Oil Storage tank will be furnished and installed by BP # #22 Plumbing and HVAC. Mel Strauss, Fusco Corp. 1.14.14 2.) Refer to attached sketch SKP-003 for information regarding the Fuel Oil Storage Tank. - Jesse VanCamp, Consulting Engineering Services, 1/15/2014.			
.0050	Geothermal Well	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/15/2014	01/22/2014	01/15/2014		MEP
To Company		Attention					Author Company	
Fusco Corporation, Inc		Mel Strauss					Fusco Corporation, Inc Mel Strauss	
Question					Answer			
Who scope is Geothermal well and associated piping under?					<p>Bid Package 31.0 Sitework shall furnish all labor equipment and materials to complete Geothermal Well System including but not limited underground piping into E-Building. REF: Partial Plumbing Site Plan Dwg. 1/P2.1.5.</p> <p>5foot outside Building Line Rule will not be applicable to this portion of work.</p>			
.0051	Retainage Release	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/14/2014	01/21/2014	01/14/2014		MEP
To Company		Attention					Author Company	
Fusco Corporation, Inc		Mel Strauss					Fusco Corporation, Inc Mel Strauss	
Question					Answer			
Will retainage at the completion of each phase?					Retainage will be released in accordance with Project Manual Volume 00 Section 00 09 10 Standard Form of Agreement Between Owner and Construction Manager-At-Risk, Article 7.1.8, page 23 of 33. Mel Strauss, Fusco Corp. 1.14.14			
.0052	Construction Phasing	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/14/2014	01/21/2014	01/15/2014		Structural

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

Project # BI-RT-844

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
To Company		Attention			Author Company		Author by	
Fusco Corporation, Inc		Mel Strauss			Fusco Corporation, Inc		Mel Strauss	
Question					Answer			
Building Phasing Document (00 09 26) shows phase 1A and PHase 5 (col lines 29-31) being constructed at separate times. Is it possible to erect the structural steel for both phases at the same time as this is all new structural framing?					Refer to Section 00 09 30 Project Schedule Activity ID A1060. It is the intent for these areas to be completed together. Phase 5 is an enabling phase to create temporary class room space. Mel Strauss, Fusco Corp. 1.14.14.			
.0053	Metal Panel	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/14/2014	01/21/2014	01/15/2014		Architectural
To Company		Attention			Author Company		Author by	
Drummey Rosane Anderson, Inc.		Vladimir Lyubetsky			Fusco Corporation, Inc		Mel Strauss	
Question					Answer			
1.) Has it been decided if the Metal Panesl will be bid as a stand-alone or within another trade package.					1.) Metal Panels will be bid as a stand alone package. Bid Package # 7.1 Metal Wall Panels. Mel Strauss, Fusco Corp. 1.14.14.			
2.) On DWG A2.1.4 ther is an elevation between columns S&T indicated as 26g-East Elevation @ Carpentry. We can't find where this elevation occurs. Please advise.					2.) DELETE exterior elevation 26g which is entitled "East Elevation @ Carpentry." - DRA Architects, 1/15/2014			
.0054	Structural Steel DWG S-1.0E							Structural
To Company		Attention			Author Company		Author by	
Szewczek Associates Consulting Engineers		Peter C. Celella			Fusco Corporation, Inc		Mel Strauss	
Question					Answer			
In Between Col Line e3A and e5 near eL ther is a comment that says "See Note 29". There is no note 29 on dwg (S-10A). Please provide. (Note is not on DWG S-1.0.A stops at 28- MLS)								
.0055	Structural Steel	Fusco Corporation, Inc		01/14/2014	01/21/2014			Structural
To Company		Attention			Author Company		Author by	
Szewczek Associates Consulting Engineers		Peter C. Celella			Fusco Corporation, Inc		Mel Strauss	
Question					Answer			
1.) Please confirm if there is any Architecturally exposed structural steel (AESS) and if there is please confirm type of primer.								
2.) Pelse provide a detail/sketch of the C15x33.9 channels bolted to the walls near col lines P-30 to M-30.								

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

Project # BI-RT-844

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
.0056	Structural Steel	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/14/2014	01/21/2014	01/15/2014		Structural
To Company		Attention		Author Company		Author by		
Fusco Corporation, Inc		Mel Strauss		Fusco Corporation, Inc		Mel Strauss		
Question				Answer				
1.) Please clarify what phase the canopy is in.				1.) Structural Steel for Canopy Construction will be completed in Phase 2.				
2.) Please confirm that the Access Hatches and frames for the tunnel access are by others and are not part of the structural steel package et.el....				2.) Access Hatches are furnished and installed by BP 6.0 General Trades.				
				Mel Strauss, Fusco Corp. 1.14.14.				
.0057	CHRO Requirements	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/14/2014	01/21/2014	01/15/2014		Structural
To Company		Attention		Author Company		Author by		
Fusco Corporation, Inc		Mel Strauss		Fusco Corporation, Inc		Mel Strauss		
Question				Answer				
Please confirm that the material costs for this project can be excluded from the required MBE Percentages, As tehre are no MBE suppliers available for structrual steel and metal deck.				No. The S/MWBE requirements administered by CHRO cannot be waived or modified during the bidding process. It is expected that all successful bidders upon award will put forth and document a 'Best Good Faith Effort' in meeting all such requirements.				
				Mel Strauss, Fusco Corp. 1.14.14				
.0058	Tunnel Access	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/14/2014	01/21/2014	01/15/2014		MEP
To Company		Attention		Author Company		Author by		
Fusco Corporation, Inc		Mel Strauss		Fusco Corporation, Inc		Mel Strauss		
Question				Answer				
During the walk thru I noticed that the access hatches to the tunnel are approximately 3'x4', this size would require demolished piping and new piping to be cut in smaller lengths Has cutting a large opening in the floor been considered to allow easier access?				No. Due to structural concerns opening the floor at tunnel locations is not advisable. Mel Strauss, Fusco Corp. 1.14.14				
.0059	Alternates and Unit Prices	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/14/2014	01/21/2014	01/15/2014		Structural
To Company		Attention		Author Company		Author by		
Fusco Corporation, Inc		Mel Strauss		Fusco Corporation, Inc		Mel Strauss		
Question				Answer				
Bid Form "C" Alternates, and "F" Unit Prices. lease provide a Isit and description of the Alternates and Unit Prices for this Project. There are no spec. sections provided for these items.				There currently are no "Alternates" or "Unit Prices" applicable to Bid Package 5.0 Structural Steel and Metal Decking.				
				Mel Strauss, Fusco Corp. 1.14.14				

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

Project # BI-RT-844

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
.0060	Roofing	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/15/2014	01/22/2014	01/15/2014		Architectural
To Company		Attention					Author Company	
Fusco Corporation, Inc		Mel Strauss					Fusco Corporation, Inc Mel Strauss	
Question					Answer			
Sepc Section 075323 pg 5 of 15 Item 1.9 A. Is the Bulding Factory Mutual Insured? If so there are different performance requirements for the roofing application.					The intent of the specifications was to incorporate Factory Mutual recommendations and requirements as part of Section 07 53 23. Refer to the Specifications for information. Additional field testing requirements will be issued as part of Addendum #2. DRA Architects 1/15/2014			

.0061	Temporary Toilet Facilities	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/15/2014	01/22/2014	01/15/2014		Sitework
To Company		Attention					Author Company	
Fusco Corporation, Inc		Mel Strauss					Fusco Corporation, Inc Mel Strauss	
Question					Answer			
Bid Package 31.0 Work Item #10 Temporary Toilets.					CLARIFICATION: BID PACKAGE 31.0 Bidders- include in bid the following for Temporary Toilet Facilities: 10 Units for General use, 2 Lockable Units for Female Use for a total of 12 Units/Month for a duration of 30 Months. As stated in Bid Package this is to include two weekly cleanings. Month to month count may vary to accomodate work force but will not exceed overall total units / month ratio prescribed above. BID PACKAGE 31.4 FORD St Athletic Fields is still required to furnish Temp. Toilet Facilities for its work at the Ford Street Site. Mel Strauss, Fusco Corp, 1.15.14			

.0062	Bldg E Utilities	Fusco Corporation, Inc	Drummey Rosane Anderson, Inc.	01/15/2014	01/22/2014	01/15/2014		Sitework
To Company		Attention					Author Company	
Fusco Corporation, Inc		Mel Strauss					Fusco Corporation, Inc Mel Strauss	
Question					Answer			
1.) DWG P2.1.5 E Building: Our scope has us installing the Piping 5' outside the foundation wall. Clarifications A.4: the 1-1/2" H&C and 1" Gas Piping running to E Building. Would this be installed by the Site Contractor/					1.) Bid Package 31.0 Site Work will perform all excavation, backfill, bedding and compaction for installation of Site Utilities to E-Building. Bid Packages 22.0 Plumbing & HVAC and 26.0 Electrical shall furnish all labor and materials for new utilities to E Building from Existing Building. 5foot outside Building Line Rule will not be applicable to this portion of work.			

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

Project # BI-RT-844

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Tel: 203.732.1800

Fax: DPWP00001060073

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

Project # BI-RT-844

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Tel: 203.732.1800

Fax: DPWP00001060073

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

Project # BI-RT-844

**141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800**

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
.0071	Flow /Tamper Switches & Fire Alarm Vendor	Fusco Corporation, Inc		01/15/2014	01/22/2014			MEP
To Company		Attention		Author Company		Author by		
Consulting Engineering Services, Inc		Brian Wetzel		Fusco Corporation, Inc		Mel Strauss		
Question					Answer			
<p>1.) Please delineate the scope of work pertaining to the site lighting to be completed by electrical contractor.</p> <p>2.) Also delineate the scope of work to be completed by electrical contractor on site drawing SU1.1.1 as some of these fixtures shown are under the canopy and its not clear who furnishes these.</p> <p>3.) What are the requirements for the permit fee. Do we carry education fee?</p>					<p>1.) Site Lighting Scope is outlined in BP 26.1 Site Lighting. Mel Strauss, Fusco Corp. 1.15.14</p> <p>2.) Any light fixtures attached to Building Structure including Canopy are to be completed by BP 26.0 Electrical. Mel Strauss, Fusco Corp. 1.15.14</p> <p>3.) State of CT Education FEE is applicable to this project. Bidders are to carry cost of this FEE in their Bids as applicable. The state building inspector must levy a code training and education fee on state building permit applications, and local building officials must levy a fee on local applications (CGS §§ 29-252a & 29-263). Refer to Project Manual Vol 00 Section 000945 Supplemental Scope of Work, Article 4. Mel Strauss, Fusco Corp. 1.15.14</p>			
.0072	Site Retaining Wall	Fusco Corporation, Inc		01/15/2014	01/22/2014			Civil / Sitework
To Company		Attention		Author Company		Author by		
Fusco Corporation, Inc		Mel Strauss		Fusco Corporation, Inc		Mel Strauss		
Question					Answer			
<p>1.) There does not seem to be any flow or tamper switches shown on drawings even though it's a sprinklered building. I need to know where these are for fire alarm purposes. Where would I find these as the FP, plumbing or HVAC drawings do not depict them?</p> <p>2.) Also, who is the existing fire alarm vendor for this building. I know the riser states Notifier, but we will need to bring in the existing vendor during the demo phases.</p>					<p>1.) Flow /Tamper switches are indicated on DWG FP.2.2.1 Details 1 & 2. - DRA/CES PLEASE ADVISE IF THIS IS THE EXTENT OF DEVICES REQUIRED Mel Strauss, Fusco Corp. 1.15.14</p> <p>2.) Contact info for existing Fire Alarm Vendor will be furnished to successful Bidder upon award of this work. Mel Strauss, Fusco Corp. 1.15.14</p>			
<p>Do the retaining walls belong to the Site Contractor?</p>					<p>Retaining Walls depicted and detailed on the Site/Civil Dwgs to be completed by BP #31 Sitework. Retaining Walls depicted and detailed on Structural Dwgs if shown to be completed by BP 3.0 Cast in Place Concrete. BP #31 Will perform all earthwork required for retaining walls completed by BP3.0. Mel Strauss, Fusco Corp. 1.15.14</p>			

Request For Information

Summary Log of All RFIs

Emmett OBrien THS - Renovations

141 Prindle Avenue
Ansonia, CT 06401-2500
Main Phone Number 203.732.1800

Project # BI-RT-844

Tel: 203.732.1800

Fax: DPWP00001060073

RFI #	Subject	Author Company	Answer Company	Date Created	Date Req'd	Date Resp	CSI Code	Category
.0073	Sitework	Fusco Corporation, Inc		01/15/2014	01/22/2014			Sitework

To Company

Fusco Corporation, Inc

Attention

Mel Strauss

Author Company

Fusco Corporation, Inc

Author by

Mel Strauss

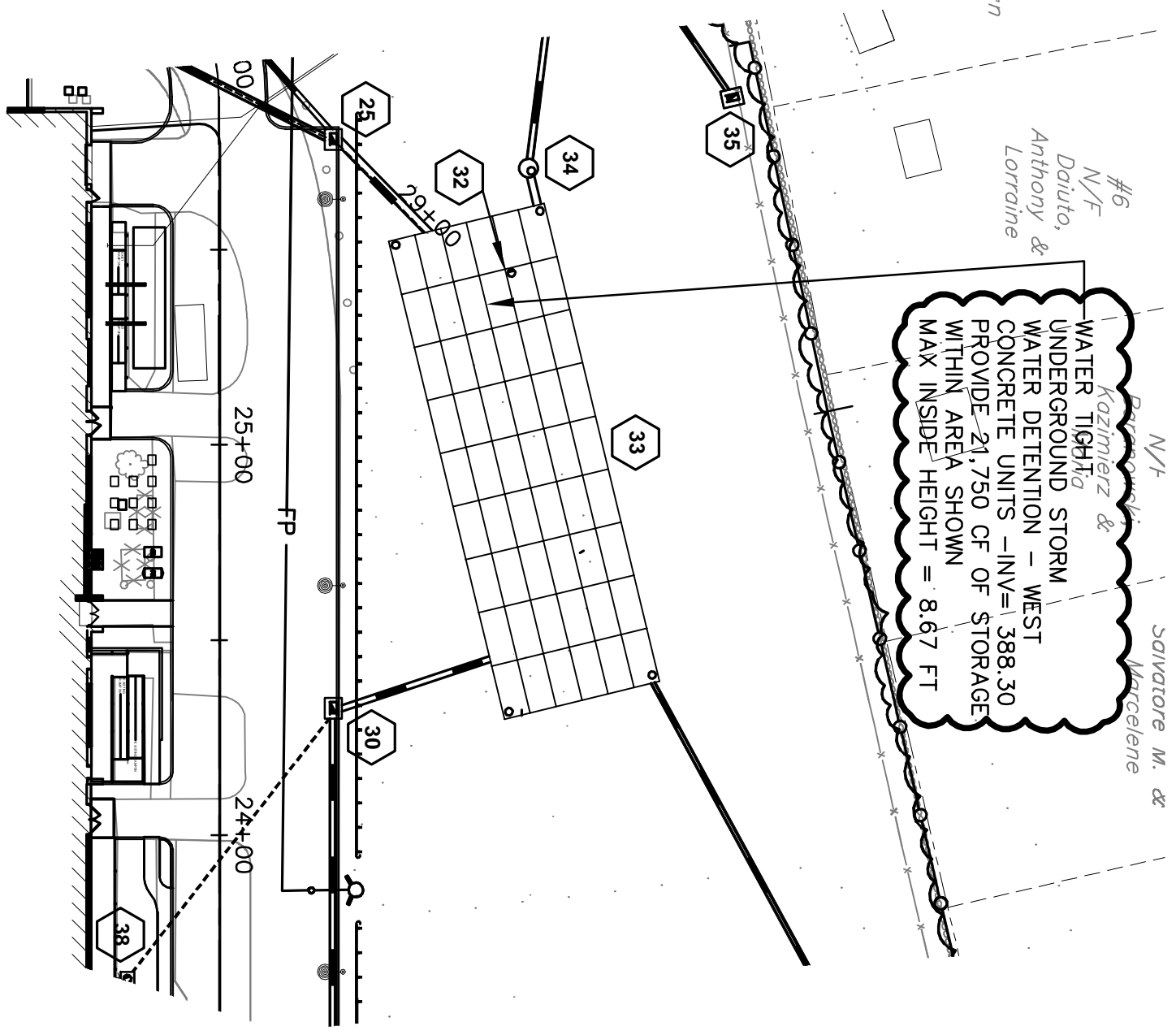
Question

- 1.) DWG L1.1 shows a modular concrete block wall (6/L5.1) north of the Plumbing Shop. Is it correct that you want this type of wall at this location. Will require grading information for this wall.....
- 2.) Dwg L3.3 shows E/L5.1 (Heavy Duty Concrete) lower right side of Automotive Area Enlargement. This isn't showing the complete area which is described on Dwg L1.1. Can you provide a detail for this area?
- 3.) Dwg L1.1 indicates Heavy Duty Concrete at Dust Collector Area. Need info for expansion joints, dowels...

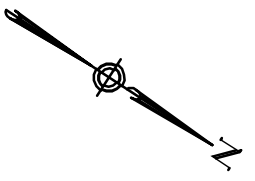
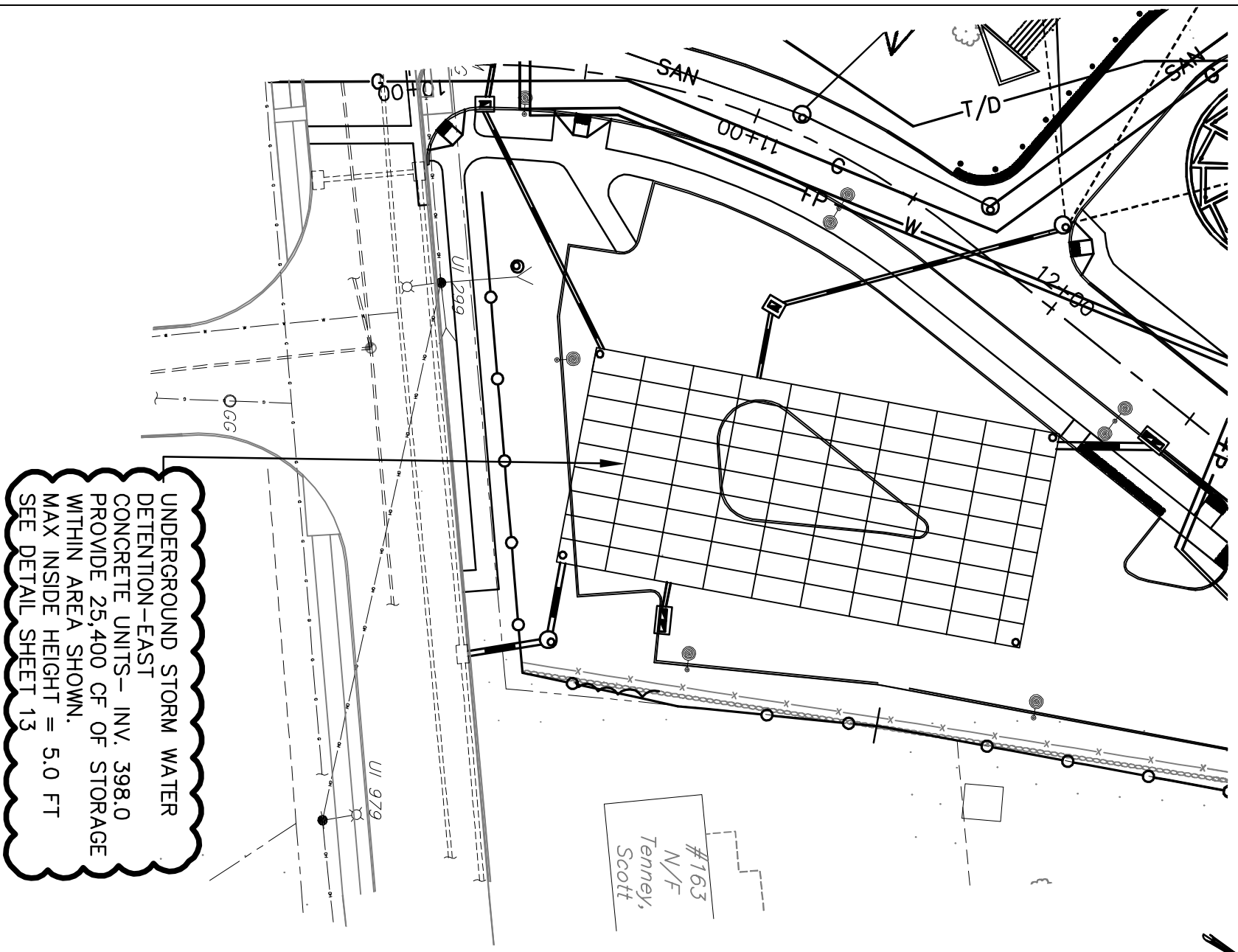
Answer

- 1.) Bidders are instructed to submit pricing on this work per the bid documents. Final Grading information can be furnished after bid award. There is sufficient grading information for bidding purposed. Mel Strauss, Fusco Corp. 1.15.14.
- 2.) General pattern is indicated on detail and should be continued for the extent of Heavy Duty Concrete. Mel Strauss, Fusco Corp. 1.15.14.
- 3.) Information is provided on DWG L3.3 , Detail 1. and Detail E/L5.1. Mel Strauss, Fusco Corp. 1.15.14.

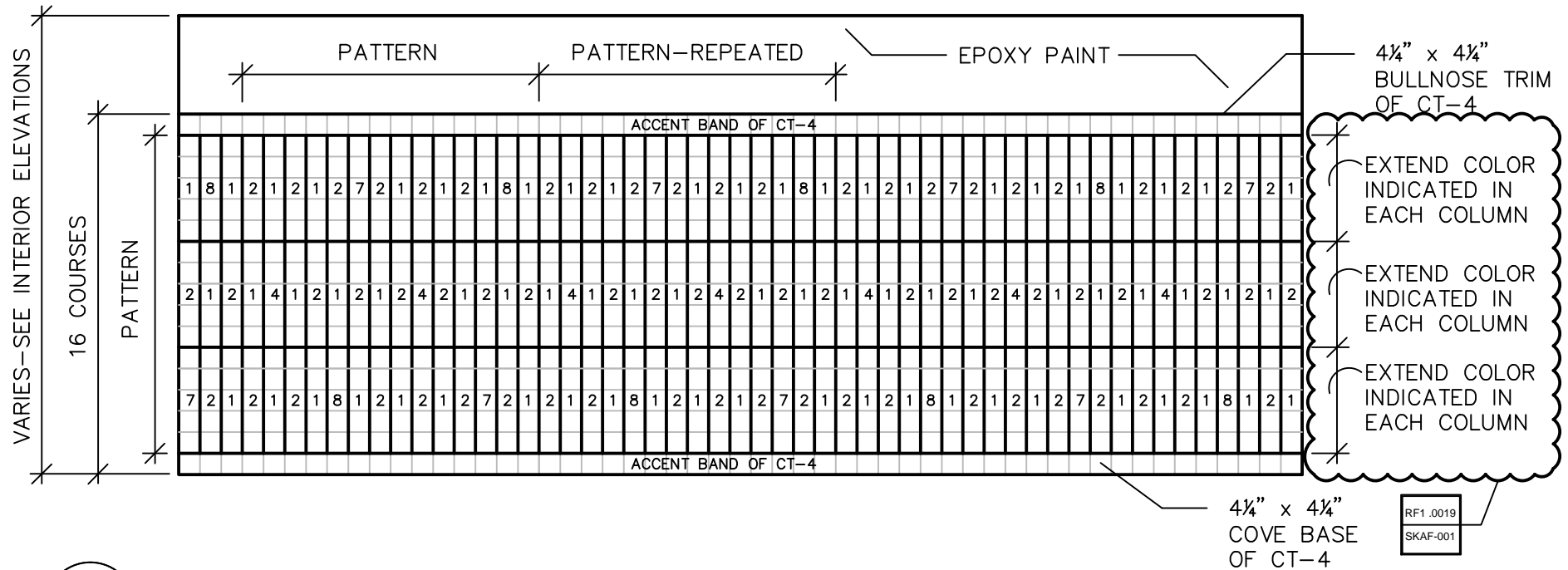
WEST DETENTION



EAST DETENTION



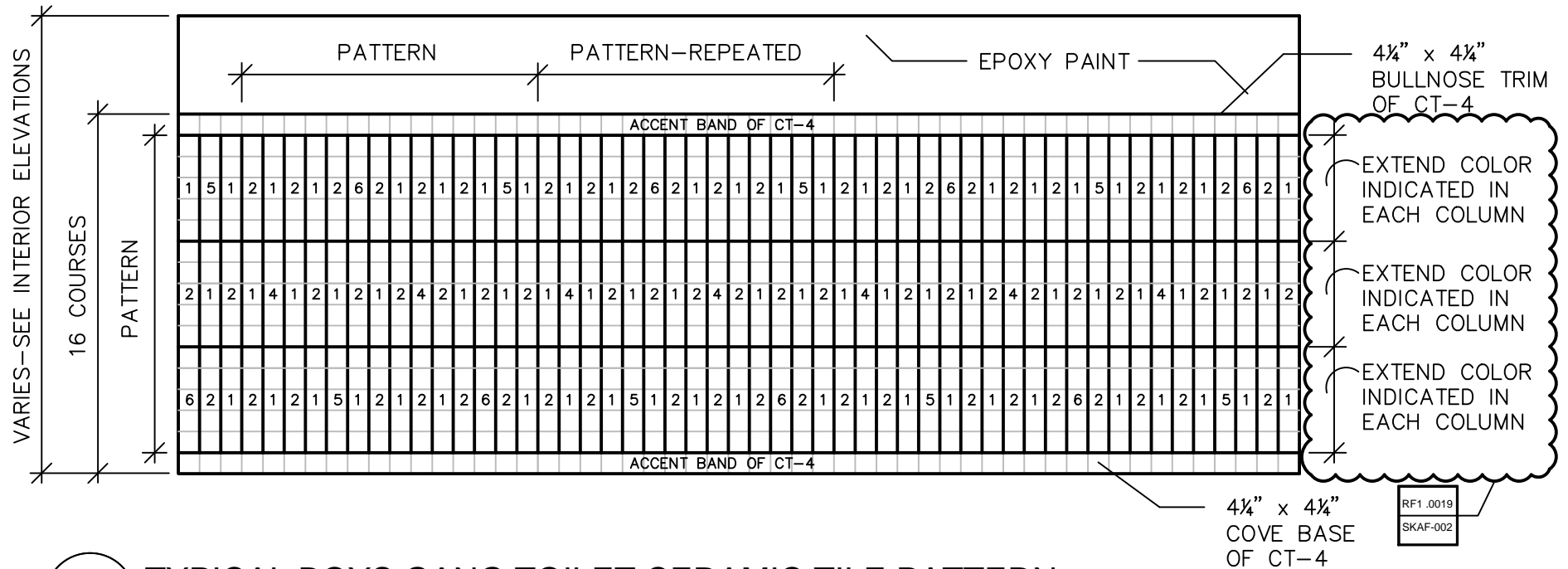
- AMERICAN OLEAN CERAMIC TILE LEGEND:**
 CT-1 = ICE WHITE #0025
 CT-2 = GLOSS ALMOND #Q012
 CT-3 = GLOSS LIGHT SMOKE #0042
 CT-4 = GLOSS BLACK #0049
 CT-5 = SUMMER RAIN #0081
 CT-6 = SAPPHIRE SKY #0070
 CT-7 = POMEGRANATE #Q072
 CT-8 = GRAPE SODA #Q079
 CT-9 = SHAMROCK GREEN #Q073
 CT-10 = LEMON ZEST #Q075
 CT-11 = MUSHROOM #0038
 CT-12 = STORM GRAY #0040



17 TYPICAL GIRLS GANG TOILET CERAMIC TILE PATTERN
 3/8"=1'-0"

AMERICAN OLEAN CERAMIC TILE LEGEND:

- CT-1 = ICE WHITE #0025
- CT-2 = GLOSS ALMOND #Q012
- CT-3 = GLOSS LIGHT SMOKE #0042
- CT-4 = GLOSS BLACK #0049
- CT-5 = SUMMER RAIN #0081
- CT-6 = SAPPHIRE SKY #0070
- CT-7 = POMEGRANATE #Q072
- CT-8 = GRAPE SODA #Q079
- CT-9 = SHAMROCK GREEN #Q073
- CT-10 = LEMON ZEST #Q075
- CT-11 = MUSHROOM #0038
- CT-12 = STORM GRAY #0040



18

TYPICAL BOYS GANG TOILET CERAMIC TILE PATTERN

3/8"=1'-0"

D•R•A
 Drummey Rosane Anderson, Inc.
 Studio 205
 225 Oakland Road
 South Windsor, CT 06074
 860-644-8300

Emmett O'Brien Technical High School, Ansonia, Connecticut

TYPICAL BOYS GANG TOILET CERAMIC TILE PATTERN

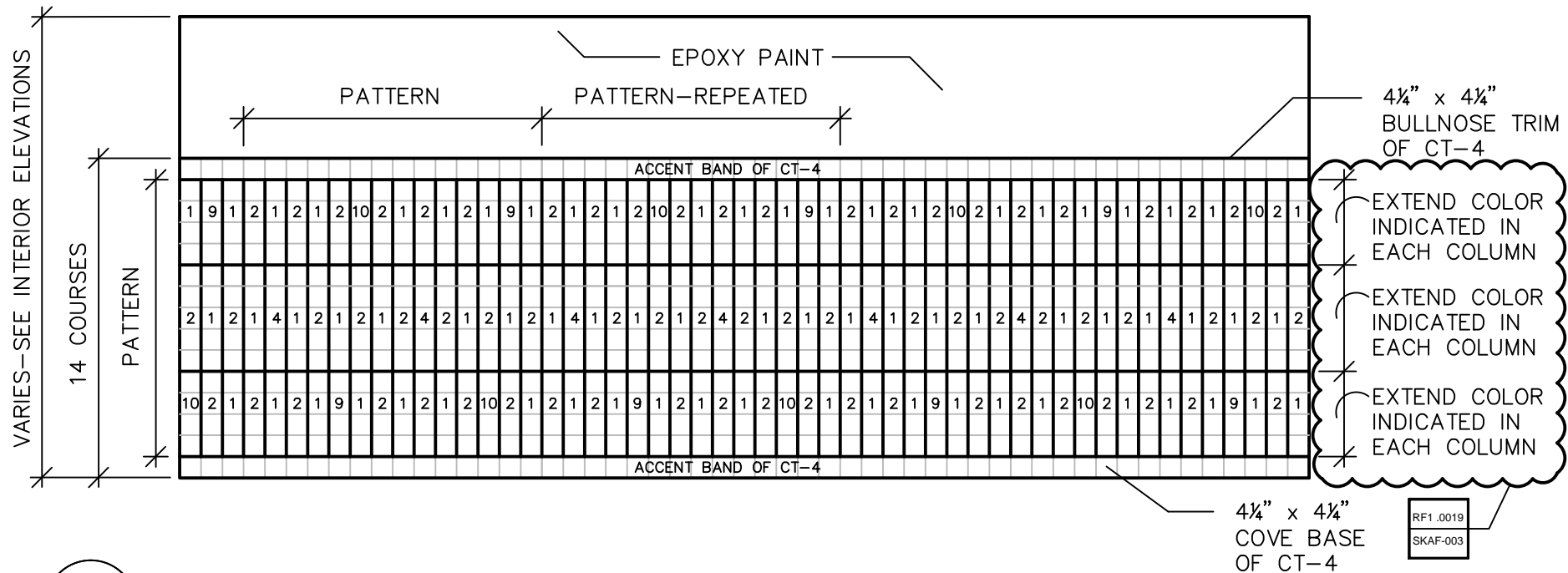
SCALE | AS NOTED
 DRAWN BY | DRA
 DCS No. | BI-RT-844-CMR
 DATE | JAN. 07, 2014

REF. DWG #AF2.1.2
 RFI #.0019

SKAF-002

AMERICAN OLEAN CERAMIC TILE LEGEND:

- CT-1 = ICE WHITE #0025
- CT-2 = GLOSS ALMOND #Q012
- CT-3 = GLOSS LIGHT SMOKE #0042
- CT-4 = GLOSS BLACK #0049
- CT-5 = SUMMER RAIN #0081
- CT-6 = SAPPHIRE SKY #0070
- CT-7 = POMEGRANATE #Q072
- CT-8 = GRAPE SODA #Q079
- CT-9 = SHAMROCK GREEN #Q073
- CT-10 = LEMON ZEST #Q075
- CT-11 = MUSHROOM #0038
- CT-12 = STORM GRAY #0040



15 TYPICAL LOCKER ROOM CERAMIC TILE PATTERN
3/8"=1'-0"

D·R·A
 Drummey Rosane Anderson, Inc.
 Studio 205
 225 Oakland Road
 South Windsor, CT 06074
 860-644-8300

Emmett O'Brien Technical High School, Ansonia, Connecticut

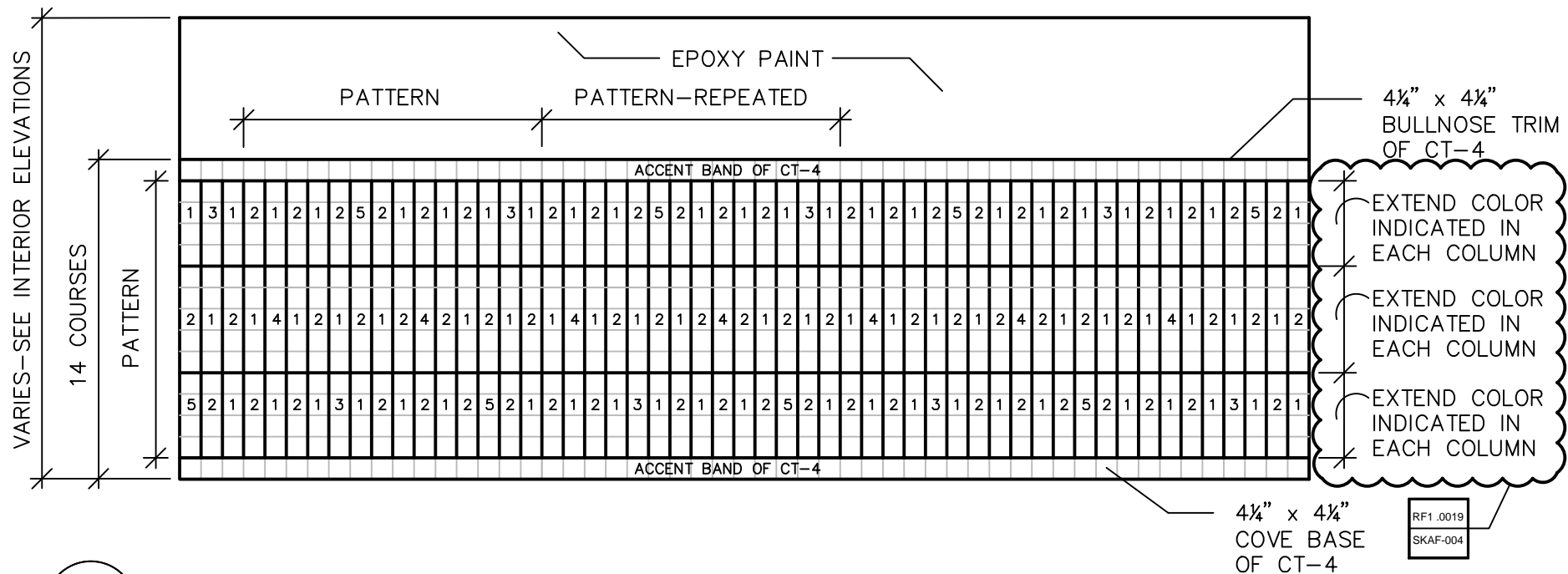
TYPICAL LOCKER ROOM CERAMIC TILE PATTERN

SCALE | AS NOTED
 DRAWN BY | DRA
 DCS No. | BI-RT-844-CMR
 DATE | JAN. 07, 2014

REF. DWG #AF2.1.2
 RFI #.0019

SKAF-003

- AMERICAN OLEAN CERAMIC TILE LEGEND:**
 CT-1 = ICE WHITE #0025
 CT-2 = GLOSS ALMOND #Q012
 CT-3 = GLOSS LIGHT SMOKE #0042
 CT-4 = GLOSS BLACK #0049
 CT-5 = SUMMER RAIN #0081
 CT-6 = SAPPHIRE SKY #0070
 CT-7 = POMEGRANATE #Q072
 CT-8 = GRAPE SODA #Q079
 CT-9 = SHAMROCK GREEN #Q073
 CT-10 = LEMON ZEST #Q075
 CT-11 = MUSHROOM #0038
 CT-12 = STORM GRAY #0040



14 TYPICAL SINGLE TOILET CERAMIC TILE PATTERN
 3/8"=1'-0"

D•R•A
 Drummey Rosane Anderson, Inc.
 Studio 205
 225 Oakland Road
 South Windsor, CT 06074
 860-644-8300

Emmett O'Brien Technical High School, Ansonia, Connecticut

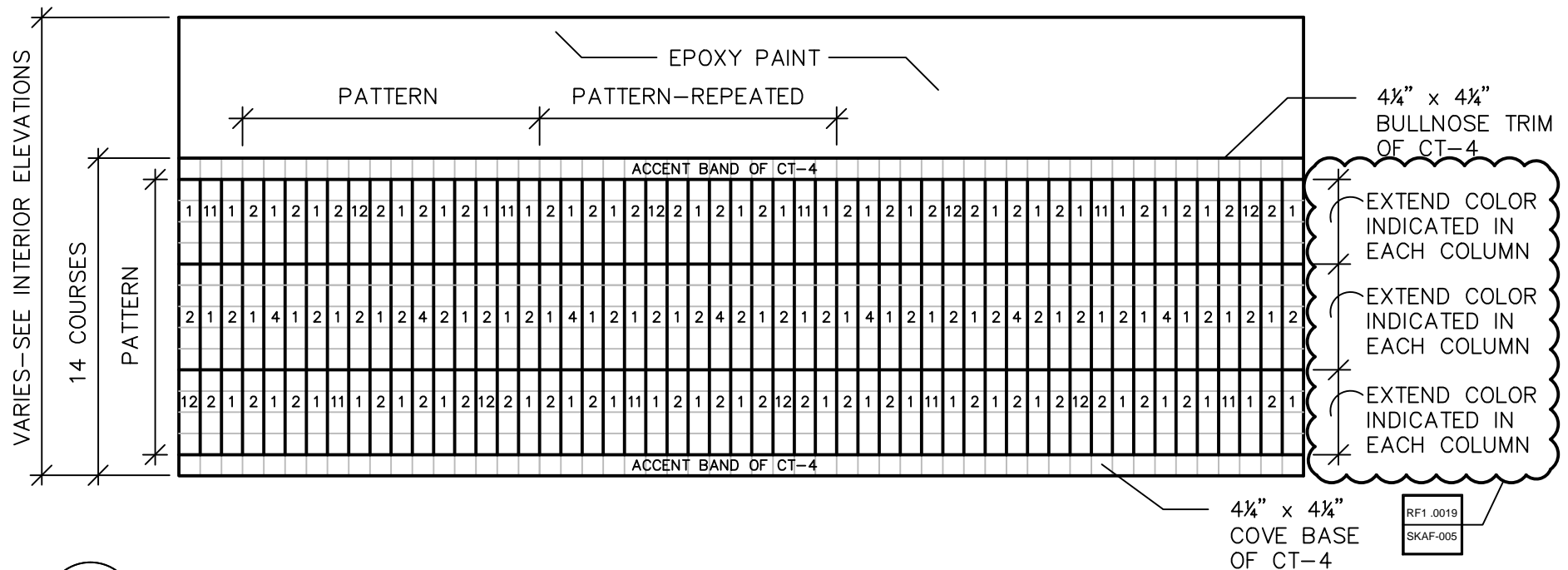
TYPICAL SINGLE TOILET CERAMIC TILE PATTERN

SCALE | AS NOTED
 DRAWN BY | DRA
 DCS No. | BI-RT-844-CMR
 DATE | JAN. 07, 2014

REF. DWG #AF2.1.2
 RFI #.0019

SKAF-004

- AMERICAN OLEAN CERAMIC TILE LEGEND:**
 CT-1 = ICE WHITE #0025
 CT-2 = GLOSS ALMOND #Q012
 CT-3 = GLOSS LIGHT SMOKE #0042
 CT-4 = GLOSS BLACK #0049
 CT-5 = SUMMER RAIN #0081
 CT-6 = SAPPHIRE SKY #0070
 CT-7 = POMEGRANATE #Q072
 CT-8 = GRAPE SODA #Q079
 CT-9 = SHAMROCK GREEN #Q073
 CT-10 = LEMON ZEST #Q075
 CT-11 = MUSHROOM #0038
 CT-12 = STORM GRAY #0040



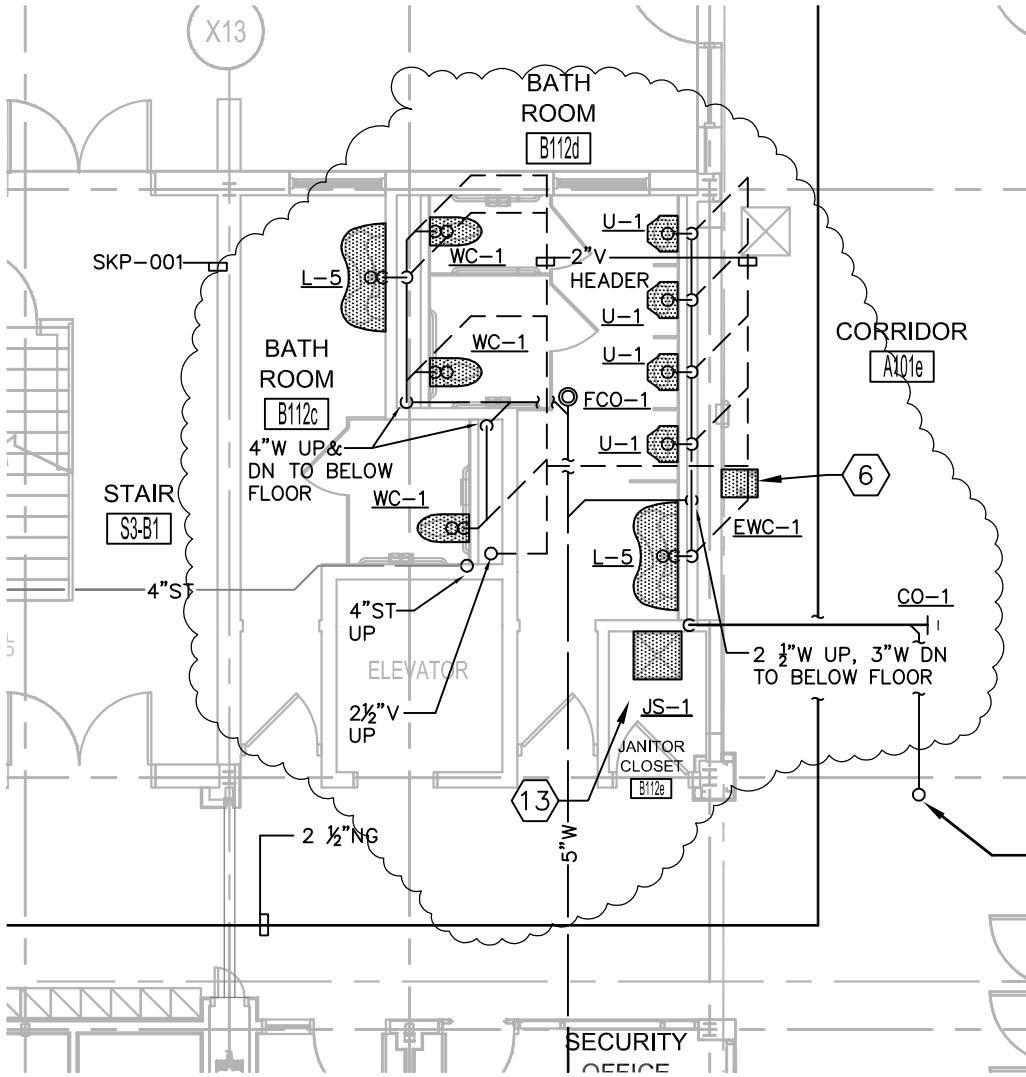
16 TYPICAL SHOP TOILET CERAMIC TILE PATTERN
 3/8"=1'-0"

D·R·A Drummey Rosane Anderson, Inc.
 Studio 205
 225 Oakland Road
 South Windsor, CT 06074
 860-644-8300

Emmett O'Brien Technical High School, Ansonia, Connecticut
TYPICAL SHOP TOILET CERAMIC TILE PATTERN

SCALE | AS NOTED
 DRAWN BY | DRA
 DCS No. | BI-RT-844-CMR
 DATE | JAN. 07, 2014

REF. DWG #AF2.1.2
 RFI #.0019
SKAF-005



1 **FIRST FLOOR PLUMBING PLAN-AREA B**
 SCALE: 1/8" = 1'0"

REF. DWG: P1.1.1.B
 RFI # .005

SKP-001

SCALE | 1/8" = 1'-0"

DRAWN BY | DRA

DCS No. | BI-RT-844-CMR

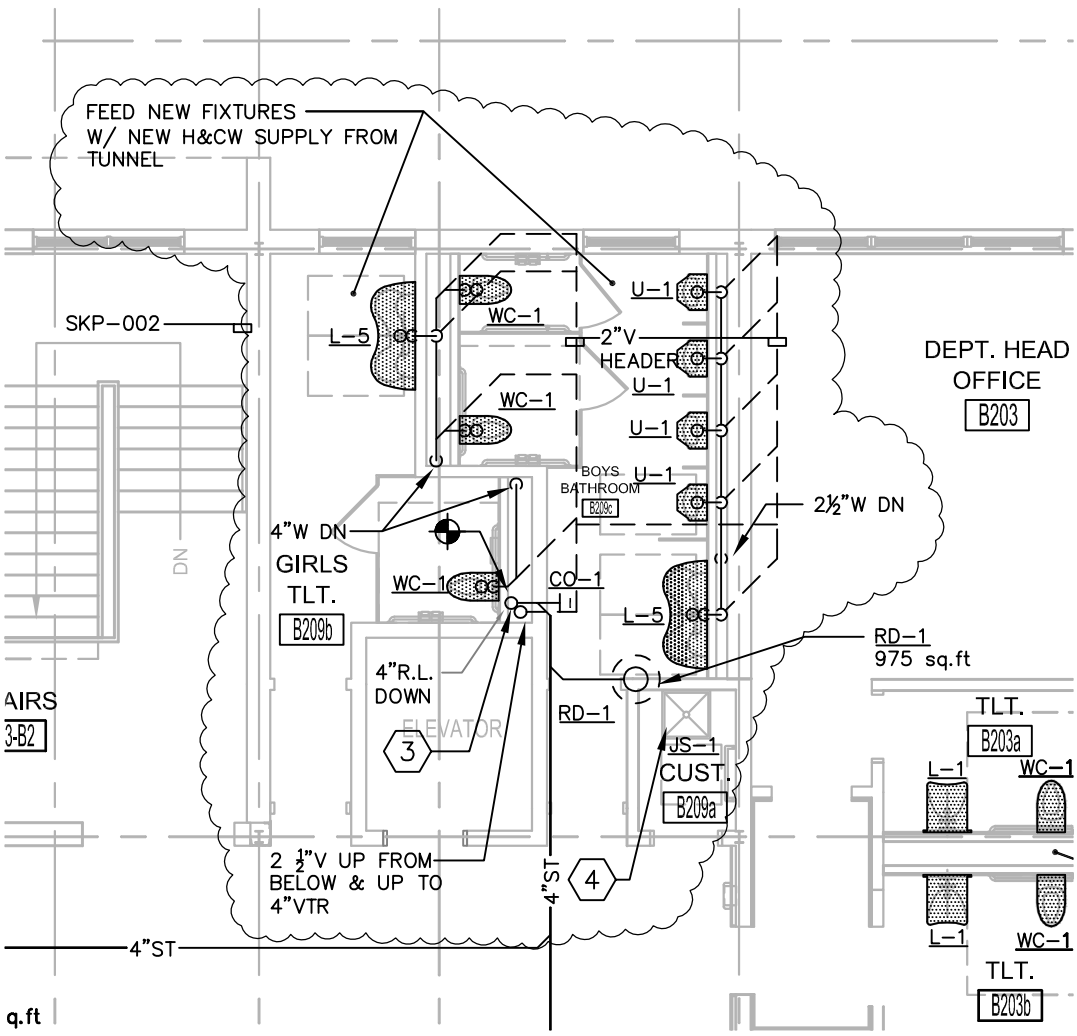
DATE | JAN. 8, 2014

Emmett O'Brien Technical High School, Ansonia, Connecticut

PARTIAL FIRST FLOOR PLUMBING PLAN-AREA B

D·R·A
 Drummey Rosane Anderson, Inc.

Studio 205
 225 Oakland Road
 South Windsor, CT 06074
 860-644-8300



1 SECOND FLOOR PLUMBING PLAN-AREA B
SCALE: 1/8" = 1'0"

LOW GRADE PROPANE PIPE SHALL BE POLYETHYLENE BURNED FOR PROPANE AND FOR BURIAL. SEE DETAIL 2 THIS

NG SIMILAR TO RED INNER PIPE, 3" SECTION TO THE ON TO THE HE FUEL OIL PUMP OR CABLE THE . PROVIDE CONNECTION TO SECTION TO THE IIS SHEET.

FUEL OIL STORAGE TANK, 300 GALLON, HIGHLAND TANK ABOVE GROUND HORIZONTAL DOUBLE WALL STEEL, UL-142 LISTED, 12" HIGH STRUCTURAL STEEL SUPPORTS, EXTERIOR POLYURETHANE COAT - COLOR SELECTABLE BY ARCHITECT, WITH LEVEL SENSING SYSTEM AND LEAK SENSING SYSTEM. PROVIDE THE FOLLOWING OPENING: 1" THREADED OPENING AT THE END OF THE TANK TOWARDS THE BOTTOM, FILL OPENING ON TOP, VENT OPENING ON TOP WITH VENT CAP, LEVEL MONITORING OPENING ON TOP, (2) SPARE OPENINGS ON TOP WITH CAPS, AND AN OPENING FOR THE INTERSTITIAL SPACE LEAK SENSOR. LEAK SENSING SYSTEM CONTROL PANEL SHALL HAVE A REMOTE VISUAL AND AUDIBLE ALARM. THE ALARM SHALL HAVE A PUSHBUTTON TO SILENCE THE AUDIBLE ALARM WITHOUT SHUTTING OFF THE VISUAL ALARM. INPUTS FOR THE TANK INTERSTITIAL SPACE LEAK SENSOR, THE BELOW GRADE OIL PIPE SPACE LEAK SENSOR, THE FUEL OIL SET PAN LEAK SENSOR, AND THE FUEL OIL DAY TANK CONTAINMENT SENSOR. LEAK SENSING SYSTEM SHALL ALSO HAVE AUXILIARY CONTACTS FOR CONNECTION TO THE BAS.

MOUNT THE LEAK SENSING SYSTEM CONTROL PANEL AND THE LEVEL SENSING SYSTEM CONTROL PANEL IN THE HVAC SHOP ON THE MEZZANINE ADJACENT TO THE FUEL OIL DAY TANK. LOCATED THE REMOTE VISUAL AND AUDIBLE ALARM ADJACENT TO EMERGENCY SHUT-OFF PUSH BUTTON FOR THE GAS AND FUEL OIL SYSTEMS. INSTALL A COMPLETE AND OPERABLE LEVEL SENSING SYSTEM AND A COMPLETE AND OPERABLE LEAK DETECTION SYSTEM INCLUDING THE (4) LEAK SENSORS INDICATED ABOVE.

SKP-003

PROPANE TANK, WITH REGULATOR AND SHUT-OFF VALVE. COORDINATE WITH THE OWNER'S PROPANE SUPPLIER.

UNDERGROUND

THE CONTRACTOR IS TO BE FURNISHABLE CABLE TELEVISION COMPANY, COMPANY, WATER AND SEWER WITHIN THE AREA PRIOR TO F. CONTRACTOR IS REQUIRED TO FILL HOLES OR DRIVING POSTS REG. LINE OR ON PRIVATE PROPERTY AND LOCATION OF ANY UNDERGROUND. WWW.CALL811.COM FOR STATE :

PROPANE PIPING SHALL BE STEEL ABOVE GRADE

HVAC SHOP E103

MACHINE SHOP F101

1 PARTIAL PLUMBING SITE PLAN
SCALE: NTS

REF. DWG: P2.1.5
RFI # .0049

SKP-003

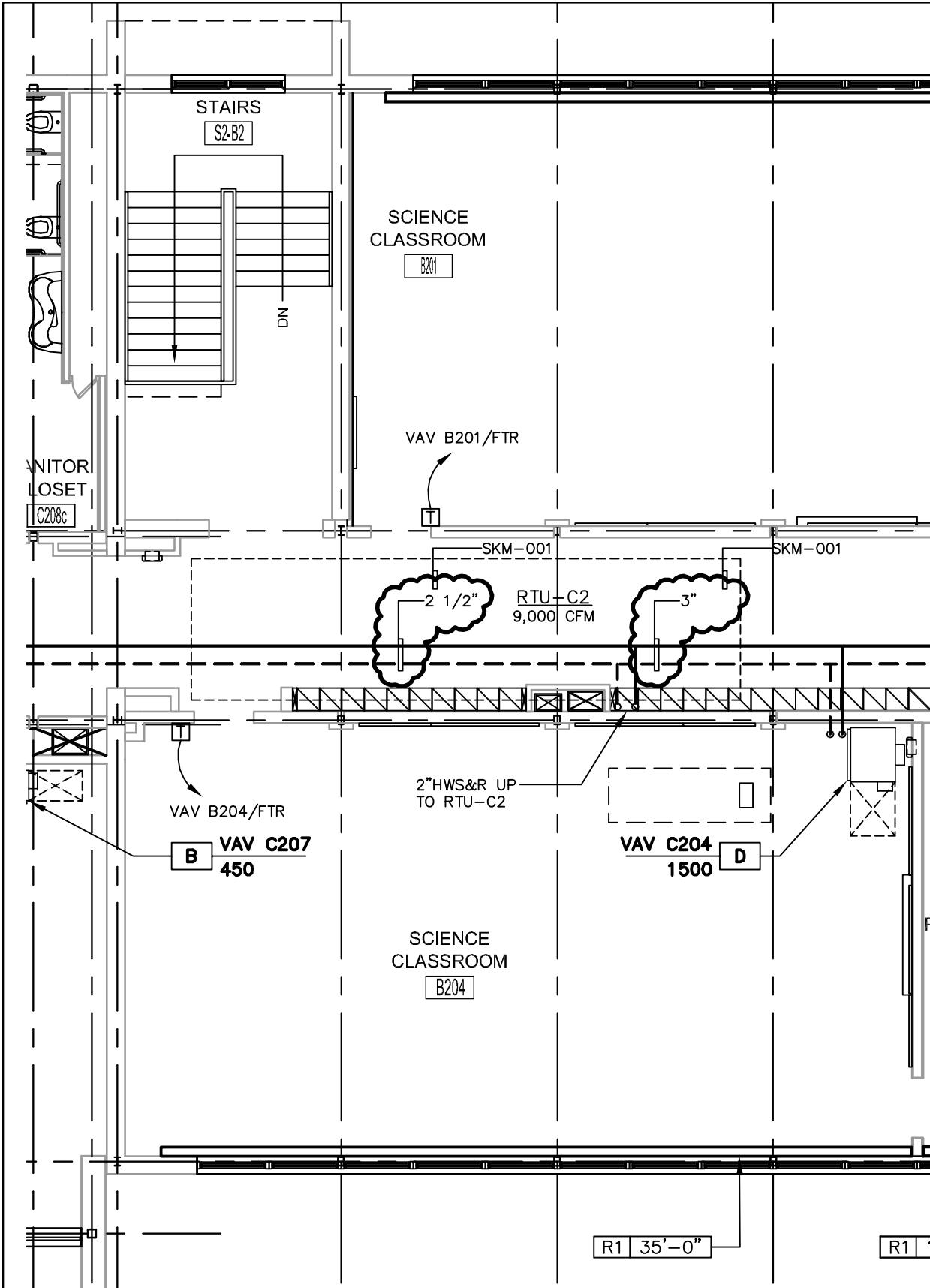
SCALE | NTS
DRAWN BY | DRA

DCS No. | BI-RT-844-CMR
DATE | JAN. 15, 2014

Emmett O'Brien Technical High School, Ansonia, Connecticut

PARTIAL PLUMBING SITE PLAN

D.R.A
Drumrey Rosane Anderson, Inc.
Studio 205
225 Oakland Road
South Windsor, CT 06074
860-644-8300



REF. DWG: MP1.1.2B
RFI # 0015

SKM-001

SCALE | 1/8" = 1'-0"
DRAWN BY | DRA

DCS No. | BI-RT-844-CMR
DATE | JAN. XX, 2014

Emmett O'Brien Technical High School, Ansonia, Connecticut

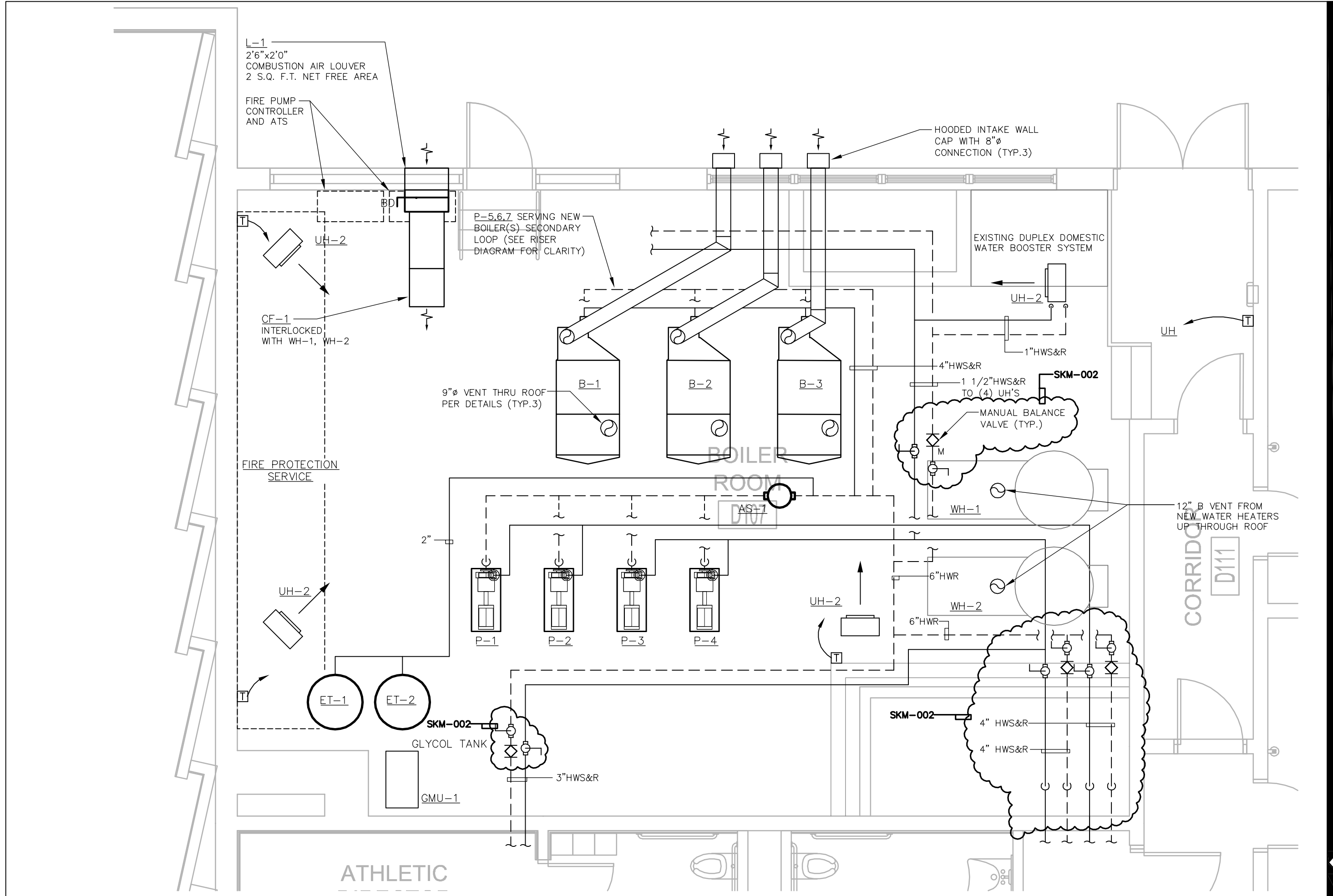
SECOND FLOOR MECHANICAL PIPING PLAN - AREA B

D.R.A. Drummey Rosane Anderson, Inc.

Studio 205
225 Oakland Road
South Windsor, CT 06074
860-644-8300

1 SECOND FLOOR MECHANICAL PIPING PLAN-AREA B

SCALE: 1/8" = 1'0"



D·R·A Drummey Rosane Anderson, Inc. Studio 205 225 Oakland Road South Windsor, CT 06074 860-644-8300	Emmett O'Brien Technical High School, Ansonia, Connecticut		REF. DWG: M1-2-1D RFI # 0017
	BOILER ROOM MECHANICAL PLAN - AREA D		SCALE 1/4" = 1'-0" DRAWN BY DRA DCS No. BI-RT-844-CMR DATE JAN. 08, 2014

ADDENDUM No. 2 January 15, 2014

TABLE OF CONTENTS – Front End Documents -

INTRODUCTORY INFORMATION

Document 000101	Project Manual Cover
Document 000110	Table of Contents

PROCUREMENT REQUIREMENTS

Document 000150	Invitation to Bid
Document 000160	Instructions to Bidders AIA Document
Document 000200	Bidder Request for Information Form
Document 000310	Bid Security Form AIA Document A310 - "Bid Bond"
Document 000315	Form of Surety Guaranty
Document 000320	Non-Collusion Affidavit of Prime Bidder
Document 000330	Notification to Bidders
Document 000340	Contract Compliance Data Form
Document 000346	Minority Business Enterprise Resource
Document 000350-3	Contractor Minority Business Enterprises
Document 000350-4	Notification to Bidders – CHRO Document issued in Addendum #2
Document 000360	Certification of Bidder Regarding Equal Employment Opportunity
Document 000370	Certificate as to Corporate Principal
Document 000412A	DAS Update (Bid) Statement Obtained by Bidder from CT DAS
Document 000412C	Statement of Bidders Qualifications AIA Document A305-1986
Document 000840	Wage Rates and Statement of Compliance
Document 000845	Wage Rate Requirements CT Department of Labor Prevailing Wage Rates
Document 000847	Wage Certification Form
Document 000850	Project Labor Agreement (PLA)
Document 000860	Tax Exempt Certificate

CONTRACTING REQUIREMENTS

Document 000900	Subcontract Agreement Form Exhibit A Subcontract Documents Exhibit B Scope of Work Exhibit C Final Lien Waiver and Release Exhibit D Partial Lien Waiver and Release Exhibit E Construction Schedule Exhibit F Rider A – Special Conditions Exhibit G Insurance Requirements
Document 000910	Standard Form of Agreement and General Conditions of the Contract

Document 000920 Performance and Payment Bond Form
AIA Document A312 2010 – “Performance Bond and Payment Bond”

Document 000926 Phasing Plan

Document 000930 Project Schedule

Document 000935-1 Site Logistics Plan Phase 1
Document 000935-2 Site Logistics Plan Phase 2
Document 000935-3 Site Logistics Plan Phase 3 & 4

Document 000936 Temporary Storm Water Control – Issued in Addendum No. 2

Document 000940 Exhibit B Scope of Work:

Bid Package 1.1 Document 000940.1.1 Scope of Work 1.1 - Final Cleaning (M/WBE)
Bid Package 1.2 Document 000940.1.2 Scope of Work 1.2 - Watchman Services (M/WBE)
Bid Package 2.0 Document 000940.2.0 Scope of Work 2.0 -Demolition, Abatement
Bid Package 3.0 Document 000940.3.0 Scope of Work 3.0 – Concrete
Bid Package 4.1 Document 000940.4.0 Scope of Work 4.1- Masonry & Precast
Bid Package 5.0 Document 000940.5.0 Scope of Work 5.0 - Structural Steel & Metal Decking
Bid Package 5.1 Document 000940.5.1 Scope of Work 5.1 – Metal Fabrications (M/WBE)
Bid Package 6.0 Document 000940.6.0 Scope of Work 6.0 – General Trades
Bid Package 6.1 Document 000940.6.1 Scope of Work 6.1 – Architectural Millwork
Bid Package 7.0 Document 000940.7.0 Scope of Work 7.0 – Roofing
Bid Package 7.1 Document 000940.7.1 Scope of Work 7.1 – Metal Wall Panels
Bid Package 7.2 Document 000940.7.2 Scope of Work 7.2 – Fire Stopping (M/WBE)
Bid Package 8.0 Document 000940.8.0 Scope of Work 8.0 – Windows, Glazing & Storefronts
Bid Package 8.1 Document 000940.8.1 Scope of Work 8.1 – Doors, Frames and Hardware
Bid Package 8.2 Document 000940.8.2 Scope of Work 8.2 – Special Doors
Bid Package 9.0 Document 000940.9.0 Scope of Work 9.0 – Ceramic & Quarry Tile (SBE)
Bid Package 9.1 Document 000940.9.1 Scope of Work 9.1 – Terrazzo Flooring (SBE)
Bid Package 9.2 Document 000940.9.2 Scope of Work 9.2 – Wood Flooring (SBE)
Bid Package 9.3 Document 000940.9.3 Scope of Work 9.3 – Athletic and Resilient Floors (SBE)
Bid Package 9.4 Document 000940.9.4 Scope of Work 9.4 – Special Flooring (SBE)
Bid Package 9.5 Document 000940.9.5 Scope of Work 9.5 – Acoustical Ceiling (SBE)
Bid Package 9.6 Document 000940.9.6 Scope of Work 9.6 – Painting & Fireproofing (M/WBE)
Bid Package 10.0 Document 000940.10.0 Scope of Work 10.0 – Signage (SBE)
Bid Package 10.1 Document 000940.10.1 Scope of Work 10.1 – Toilet Compartments and Accessories (SBE)
Bid Package 10.2 Document 000940.10.2 Scope of Work 10.2 – Lockers (SBE)
Bid Package 11.0 Document 000940.11.0 Scope of Work 11.0 – Food Service Equipment
Bid Package 11.1 Document 000940.11.1 Scope of Work 11.1 – Industrial Shop Equipment
Bid Package 12.0 Document 000940.12.0 Scope of Work 12.0 – Window Treatments (SBE)
Bib Package 13.0 Document 000940.13.0 Scope of Work 13.0 – Temporary Modular Classrooms
Bid Package 21.0 Document 000940.21.0 Scope of Work 21.0 – Fire Suppression (SBE)
Bid Package 22.0 Document 000940.22.0 Scope of Work 22.0 – Plumbing & HVAC
Bid Package 26.0 Document 000940.26.0 Scope of Work 26.0 – Electrical
Bid Package 26.1 Document 000940.26.1 Scope of Work 26.1 – Site Lighting (M/WBE)
Bid Package 31.0 Document 000940.31.0 Scope of Work 31.0 – Site Work
Bid Package 31.1 Document 000940.31.1 Scope of Work 31.1 – Fences & Gates (SBE)
Bid Package 31.2 Document 000940.31.2 Scope of Work 31.2 – Landscaping (M/WBE)

Bid Package 31.3 Document 000940.31.3 Scope of Work 31.2 - Ford Street Athletic Fields (SBE)

Document 000945 Supplemental Scope of Work

Document 000950 Bid Forms A, B, C, D, E, F

END OF TABLE OF CONTENTS

INSTRUCTIONS TO BIDDERS
ADDENDUM #2
January 15, 2014

**Additions & Renovations to Emmett O'Brien Technical
High School**
141 Prindle Avenue Ansonia, Connecticut
Project No. BI-RT-844-CMR

1 USE OF BID FORMS

These Contract Documents include a complete set of bidding and agreement forms which are for the convenience of bidders and are to be detached from the Contract Documents, filled out, and executed. All required Bid Forms shall be submitted in triplicate.

2 QUESTIONS AND ADDENDA

No oral statement shall be effective to waive, change or otherwise modify any provision of the Contract Documents, and no bidder shall rely on any alleged oral statement. Every question relating to the Contract Documents shall be made in writing to the Fusco Corporation, 555 Long Wharf Drive, New Haven, CT 06511. Any inquiry received seven or more days prior to the date fixed for opening of bids will be given consideration. Answers to questions will be in the form of one or more Addenda to the Contract Documents and when issued will be on file at the Fusco Corporation at least four days before Bids are opened. In addition, all Addenda will be mailed and/or faxed to each person who has purchased a full set of Contract Documents, but it shall be the Bidder's responsibility to make inquiry as to, and to obtain, the Addenda issued, if any. All such Addenda shall become part of Contract and each Bidder shall be bound by such Addenda, whether or not received by the Bidder.

3 INSPECTION ON SITE

Each Bidder should visit the site of the proposed work and fully acquaint itself with the existing conditions there relating to construction and labor, and should fully inform itself as to the facilities involved, the difficulties and restrictions attending the performance of the Contract. The Bidder should thoroughly examine and familiarize itself with the Drawings, Technical Specifications and all other Contract Documents. The Contractor by the execution of the Contract shall in no way be relieved of any obligation under it due to its failure to receive or examine any form or legal instrument or to visit the site and acquaint itself with the conditions there existing and the Fusco Corporation will reject any claim based on the facts regarding which it should have been on notice.

4 ALTERNATE BIDS

No alternate bids will be considered unless alternate bids are specifically requested.

5 BIDS

A. Each bid must be submitted on the bid forms provided within the specifications. All blank spaces must be filled in as noted in ink. Bids must give the prices proposed both in words and figures and no changes shall be made in the forms or in the items mentioned therein. Erasure and other changes in the bid must be explained or noted over the initials of the bidder. In the event of any discrepancy between the written amounts and the figures, the written amounts shall govern.

B. The bidder shall sign its bid in the blank space provided for this purpose. If the bid is made by a partnership, or corporation, the name and address of the partnership or corporation shall be indicated, together with the names and addresses of the partners or officers. If the bid is made by a partnership, it must be acknowledged by one of the partners; if made by a corporation, by one of the officers.

C. Any Bidder may elect to submit a proposal combining a number of Bid Packages if the amount of the proposal offers the Town of Ansonia a cost reduction. This combined packaged "Offer" will be valid only if the Bidder submits an offer for each package involved. Bidder may offer this combined package proposal by submitting it, on his or her business letterhead, as an added page to each Bid Package.

D. The Fusco Corporation reserves the right to not accept any combined package, even if the combined packaged offers a cost reduction.

6 BIDDERS SHALL FURNISH WITH THEIR BIDS THE FOLLOWING:

1. Bid Forms A through F (Document 000950)
2. Bid Bond (Document A310)
3. Form of Surety (Document 000315)
4. Non-Collusion Affidavit of Prime Bidder (Document 000320)
5. Statement of Bidders Qualifications AIA Document A305 (Document 000412C)
6. Certification of Bidder Regarding Equal Employment Opportunity (Document 000360)
7. Contractors Wage Certification Form (Document 000847)
8. Project Labor Agreement Letter of Assent (**contained within PLA**) Submit only Pp 40 & 41 with bid.
9. Department of Administrative Services (DAS) "Contractor Prequalification Certificate and Update Statement- **Obtained by Bidder from CT DAS**
10. Notification to Bidders (Document 00330)
11. Contract Compliance Data Form (Document 00340)
12. Contractor's Minority Business Enterprises Utilization Form (Document 000350-3)
13. Notification to Bidders –CHRO (Document 000350-4)
14. Certification as to Corporate Principal (Document 00370)

A. The information required under (1) to (15), inclusive, shall be furnished on the forms included in the specifications, IN TRIPLICATE and shall be subject to all requirements of the General Conditions, Project Conditions, the Specifications and Drawings.

B. The Bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this Contract must submit a certification regarding Equal Employment Opportunity, similar to that submitted by the bidder. Approval of the subcontractor award cannot be given by Fusco Corporation unless and until the proposed subcontractor has submitted the certification and/or other evidence that it has fully complied with any reporting requirements to which it is or was subject.

Although the bidder is not required to attach such certification by proposed subcontractors to its bid, the bidder is herein advised of this requirement so that appropriate action can be taken to prevent subsequent delay in subcontract awards.

C. Fusco Corporation will consider informal any bid not prepared and submitted in accordance with the provisions hereof, and may at its option waive any informalities or defects, or accept or reject any and all bids. Any bid received after the time, date and place specified shall not be considered. Bidders are solely responsible for ensuing timely delivery. No bidder may withdraw, cancel, or modify a bid within ninety (90) days after the actual date of the opening thereof.

D. The Fusco Corporation is Authorized to waive minor irregularities which it considers in the best interest of the Project, provided the reasons for any such waiver are stated in writing by the Fusco Corporation and made a part of the contract file.

7 BID BOND

A. The bid must be accompanied by a bid bond which shall not be less than specified in the Invitation to Bid.

The bid bond shall be secured by a guaranty or surety company authorized and qualified to do business in the State of Connecticut and listed in the latest issue of the U.S. Treasury Circular 570. The amount of such bid bond shall be within the maximum amount specified within the Bid Documents. Bids may be considered non-responsive unless accompanied by the required guaranty. Cash deposits will not be accepted. The bid bond shall insure the execution of the Agreement and the furnishing of the surety bond or bonds by the successful bidder, as required by the Contract Documents.

B. Revised bids submitted before the opening of the bids, whether forwarded by mail or telegram, if representing an increase in excess of two percent (2%) of the original bid, must have the bid guaranty adjusted accordingly; otherwise the Bid will not be considered.

C. Bid bonds of successful bidders, will be returned as soon as practicable after the opening of the bids.

8 COLLUSIVE AGREEMENT

Each bidder submitting a bid to the Fusco Corporation for any portion of the work contemplated by the documents on which bidding is based, shall execute and attach there to an affidavit substantially in the form herein provided, to the effect that it has not colluded with any other person, firm or corporation in regard to any bid submitted.

9 STATEMENT OF BIDDER'S QUALIFICATIONS

Each bidder shall submit on the form furnished for that purpose (a copy of which is included in the specifications), a statement of the bidder's qualifications, their experience record in constructing the type of improvements embraced in the Contract, and organization and equipment available for the work contemplated; and, when specifically requested by Fusco Corporation, shall also submit a detailed financial statement. The Fusco Corporation shall have the right to take such steps as it deems necessary to determine the responsibility, qualifications, and ability of the bidder to perform its obligations under the Contract and the bidder shall furnish the Fusco Corporation all such information and data for this purpose as it may request. The right is reserved to reject any bid where an investigation of the available evidence or information does not satisfy the Fusco Corporation that the bidder is responsible or qualified to carry out properly the terms of the Contract. The determination of a bidder's responsibility and qualifications shall be within the sole and exclusive discretion of the Fusco Corporation.

10 CORRECTIONS

Erasures or other changes in the Bids must be noted over the signature of the bidder and received by The Fusco Corporation prior to the date and time set for receipt of bids.

11 TIME FOR RECEIVING BIDS

A. Bids received prior to the advertised hour of opening will be securely kept sealed. The representative of Fusco Corporation whose duty it is to open them will decide when the specified time has arrived, and no bid received thereafter will be considered, except that when a bid arrives in the mail after the time fixed for opening, but before the reading of all other bids is completed, and it is shown to the satisfaction of the Fusco Corporation that the non-arrival on time was due solely to delay in the mails for which the bidder was not responsible, such bid will be received and considered.

B. Bidders are cautioned that while facsimile modification of bids may be received as provided above, such modifications, if not explicit and if in any sense subject to misrepresentations, shall make the bid so modified or amended, subject to rejection.

12 OPENING OF BIDS

At the time and place fixed for the opening of bids, the Fusco Corporation will cause to be opened and publicly read aloud every bid received within the time set for receiving bids, irrespective of any irregularities therein. Bidders and other persons properly interested may be present, in person or by representative.

13 WITHDRAWAL OF BIDS

Bids may be withdrawn on written or facsimile request dispatched by the bidder and received by the Fusco Corporation prior to the time for the bid opening; provided, that the written confirmation of any facsimile withdrawal over the signature of the bidder shall be placed in the mail and postmarked prior to the time set for bid opening. The bid guaranty of any bidder withdrawing its bid in accordance with the foregoing conditions will be returned promptly.

14 AWARD OF CONTRACT; REJECTION OF BIDS

A. The Contract will be awarded within ninety (90) days after the date of the bid opening, to the responsible qualified bidder submitting the lowest bid complying with the conditions of the Invitation for Bids and the Instructions to Bidders. The bidder to whom the award is made will be notified at the earliest possible date. The Fusco Corporation, however, reserves the right to accept or reject all or any part of a bid, reject all bids or to waive any informalities or defects in submitted bid documents whenever such rejection or waiver is in its interest.

B. The Fusco Corporation reserves the right to consider as unqualified to do the work required by these Contract Documents any bidder who does not habitually perform with its own forces the major portion of the work involved in construction of the improvements in these Contract Documents.

C. The Fusco Corporation will not award the Contract to any contractor who is, at the time of the award ineligible for such Contract under the provisions of any applicable regulations issued by the Secretary of Labor, United States Department of Labor, or is not qualified under applicable State and local laws and regulations.

D. The Contract will require the completion of work in accordance with the Contract Documents.

E. The Fusco Corporation and the State of Connecticut reserve the right to reject any and all bids or to waive any informalities, irregularities, or technical defects in the Bids. Fusco Corporation may make any investigations as they deem necessary to determine the ability of Bidder to perform the work, and Bidders shall furnish the Fusco Corporation all such information and data for this purpose as the Fusco Corporation may require. Fusco Corporation reserves the right to reject any or all bids, without stating reasons therefore, and to waive any informality in the bidding and to make awards in accordance applicable competitive bidding statutes and laws.

15 EXECUTION OF AGREEMENT, PERFORMANCE, LABOR AND MATERIAL BOND.

A. Subsequent to the notice of award and within ten (10) days after the prescribed forms are presented for signature, the successful bidder shall execute and deliver to the Fusco Corporation the Agreement in the form included in the Contract Documents, in such number of copies as the Fusco Corporation shall require.

B. Having satisfied all conditions of award as set forth elsewhere in these documents, the successful bidder shall, within the period specified in paragraph "A" above, furnish a surety bond in a penal sum not less than the amount of the Contract as awarded, as security for the faithful performance of the Contract, and a labor and material bond for payment of all persons, firms or corporations to whom the Contractor may become legally indebted for labor, materials, tools, equipment, or services of any nature including utility and transportation services, employed or used by him in performing the work. Such bonds shall be in the same form as those included in the Contract Documents and shall bear the same date, or a date subsequent to that of the Agreement. These bonds shall be signed and issued by a guaranty or surety company satisfactory to the Fusco Corporation, authorized and qualified to do

business in the State of Connecticut, and listed in the latest issue of the U.S. Treasury Circular 570 and having an AM Best rating of A- or higher, and the penal sum of any such bond shall be within the maximum specified for such company in said Circular 570. The current power of attorney for the person who signs for any surety company shall be attached to such bonds.

C. The failure of the successful bidder to execute such Agreement and to supply the required bonds or submit the insurance certificates and/or policies required in the Contract documents within ten (10) days after the prescribed forms are presented for signature, or within such extended period as the Fusco Corporation grants based upon reasons determined sufficient by the Fusco Corporation, shall constitute a default and the bidder's bid bond or guaranty shall be forfeited to the Fusco Corporation as liquidated damages. The Fusco Corporation may either award the Contract to the next lowest responsible bidder or re-advertise for bids, and may charge against the defaulting bidder the difference between the amount of the bid and the amount for which a Contract for the work is subsequently executed, irrespective of whether the favorable Bid is received by re-advertising, the defaulting bidder shall have no claim against the Fusco Corporation for a refund.

D. Payment and Performance Bonds shall be named The Fusco Corporation and the State of Connecticut obligee.

16 WAGES AND SALARIES

A. Attention of the bidders is particularly directed to the requirements concerning the payment of not less than the prevailing wage and benefit rate specified in the Contract Documents, and the classification of employees. The successful bidder will be required to execute any and all documents required by the State of Connecticut with respect to the payment of prevailing wages. Labor rates are also governed by a Project Labor Agreement attached within the contract documents. Pursuant to Connecticut General Statutes Section 31-56b (d), any bidder who does not agree to abide by the conditions of the Project Labor Agreement shall not be regarded as a responsible qualified bidder.

B. The rate of pay set forth in the Contract Documents is the minimum to be paid during the life of the Contract. It is therefore, the responsibility of the bidders to inform themselves as to local labor conditions, such as the length of work day and the work week, overtime compensation, health and welfare contributions, labor supply and prospective changes and adjustments of rates.

17 EQUAL EMPLOYMENT OPPORTUNITY

Attention of bidders is particularly called to the requirements for insuring that employees and applicants for employment are not discriminated against because of their race, creed, color or national origin or physical handicap.

18 TAXES

Bids should not include federal excise or state sales taxes. The State of Connecticut is exempt pursuant to Connecticut General Statutes Section 12-412.

19 UTILIZATION OF MINORITY, DISADVANTAGED, AND WOMEN BUSINESS ENTERPRISES

The following requested information is for the sole purpose of gathering statistical information.

Prior to award of this Contract and in a period not more than thirty (30) days after bid opening, the contractor must furnish the following information for each small Minority, and Women Business Enterprise the bidder will use:

1. The name, address, and contact person for each small Minority or Women business Enterprise the bidder will use.
2. The nature of the work to be undertaken by each small Minority or Women business Enterprise.
3. The dollar amount of the work to be undertaken by the small Minority or Women business Enterprise.

The Contractor agrees for itself and its subcontractors, to facilitate and encourage the employment of small minority, and women owned businesses in the construction project.

20 SUBCONTRACTORS

If a bidder intends to subcontract any portion of its scope of work, then such bidder shall include in its bid the names of all proposed subcontractors and sub-subcontractors (See Bid Form 'E'). The Construction Manager will reply in writing to the bidders stating whether the Construction Manager has an objection to any proposed subcontractor or sub-subcontractor. In the event the Construction Manager objects to any proposed subcontractor or sub-subcontractor and requests a substitution, the bidder shall submit a substitute prior to award. Construction Manager may request that the subcontractor or sub-subcontractor furnish performance and payment bonds covering the faithful performance of the Contract. In no case shall the bidder be entitled to an adjustment of its bid price as a result of the Construction Manager's objection to a proposed subcontractor or sub-subcontractor, or the cost of requested performance or payment bonds.

The Construction Manager reserves the right to reject any and all bids on the basis of unacceptable proposed subcontractors or sub-subcontractors, failure to identify all proposed subcontractors or sub-subcontractors, or failure to furnish requested performance or payment bonds.

Whether a proposed subcontractor or sub-subcontractor is acceptable shall be determined by Construction Manager in its sole and exclusive discretion.

The Construction Manager also reserves the right to reject any and all bids on the basis of a bidder's inability to establish to the satisfaction of the Construction Manager that the bidder and or a proposed subcontractor or sub-subcontractor has the manpower and resources available to it to satisfy the time durations and milestones established by the Construction Manager in the Project Schedule.

21 PROJECT AFFIRMATIVE ACTION AND M/WBE'S/AA REQUIREMENTS

Also, no less than the State of Connecticut Department of Labor prevailing minimum salaries and wages as listed in the Project Manual and updated annually shall be paid on this project. Certified payrolls shall be required and submitted weekly on the form provided in the Project Manual. Additionally the Contractor shall submit Monthly Employment Utilization Reports to the Construction Manager concurrent with the Applications and Certifications for Payment.

With respect to the value of its work on the Project as reflected by this Subcontract price and approved change orders, Subcontractor shall participate and comply with all contract compliance rules, regulations, workforce requirements, and contract compliance programs of the Connecticut Commission on Human Rights and Responsibilities ("CHRO"), including, but not limited to, Sections 46a-68j-21 through 43 inclusive of the CHRO state regulations. In addition, Subcontractor shall meet or exceed the minimum SBE/MBE goals of 25% DAS certified Small Business Enterprises ("SBE") and of that amount, 25% who are also DAS certified Minority Business Enterprises ("MBE"), or 6.25% of the total Subcontract value. In addition, any SBE contractor must self-perform greater than or equal to 30% of the work with their own forces.

Subcontractors shall make all good faith efforts to achieve participation as workers on the Project of (i) **7.5%** residents of Ansonia and the Naugatuck Valley labor market; (ii) **10%** minorities; (iii) **5%** females; and (iv) **5%** veterans.

In addition, each awarded bid contractor must submit on a monthly basis a fully executed Monthly Utilization Report. This report is a specific employment utilization form summarizing the information from your submitted certified payroll reports.

In additional to your company's and your subcontractor's/vender's certified payroll reports this monthly utilization report must be included with the submission of your company's pencil requisition to Fusco Corporation.

End of Section

**COMMISSION ON HUMAN RIGHTS AND OPPORTUNITIES
CONTRACT COMPLIANCE REGULATIONS
NOTIFICATION TO BIDDERS**

(Revised 09/17/07)

The contract to be awarded is subject to contract compliance requirements mandated by Sections 4a-60 and 4a-60a of the Connecticut General Statutes; and, when the awarding agency is the State, Sections 46a-71(d) and 46a-81i(d) of the Connecticut General Statutes. There are Contract Compliance Regulations codified at Section 46a-68j-21 through 43 of the Regulations of Connecticut State Agencies, which establish a procedure for awarding all contracts covered by Sections 4a-60 and 46a-71(d) of the Connecticut General Statutes.

According to Section 46a-68j-30(9) of the Contract Compliance Regulations, every agency awarding a contract subject to the contract compliance requirements has an obligation to "aggressively solicit the participation of legitimate minority business enterprises as bidders, contractors, subcontractors and suppliers of materials." "Minority business enterprise" is defined in Section 4a-60 of the Connecticut General Statutes as a business wherein fifty-one percent or more of the capital stock, or assets belong to a person or persons: "(1) Who are active in daily affairs of the enterprise; (2) who have the power to direct the management and policies of the enterprise; and (3) who are members of a minority, as such term is defined in subsection (a) of Section 32-9n." "Minority" groups are defined in Section 32-9n of the Connecticut General Statutes as "(1) Black Americans . . . (2) Hispanic Americans . . . (3) persons who have origins in the Iberian Peninsula . . . (4) Women . . . (5) Asian Pacific Americans and Pacific Islanders; (6) American Indians . . ." An individual with a disability is also a minority business enterprise as provided by Section 4a-60g of the Connecticut General Statutes. The above definitions apply to the contract compliance requirements by virtue of Section 46a-68j-21(11) of the Contract Compliance Regulations.

The awarding agency will consider the following factors when reviewing the bidder's qualifications under the contract compliance requirements:

- (a) the bidder's success in implementing an affirmative action plan;
- (b) the bidder's success in developing an apprenticeship program complying with Sections 46a-68-1 to 46a-68-17 of the Administrative Regulations of Connecticut State Agencies, inclusive;
- (c) the bidder's promise to develop and implement a successful affirmative action plan;
- (d) the bidder's submission of employment statistics contained in the "Employment Information Form", indicating that the composition of its workforce is at or near parity when compared to the racial and sexual composition of the workforce in the relevant labor market area; and
- (e) the bidder's promise to set aside a portion of the contract for legitimate minority business enterprises. See Section 46a-68j-30(10)(E) of the Contract Compliance Regulations.

INSTRUCTIONS AND OTHER INFORMATION

The following BIDDER CONTRACT COMPLIANCE MONITORING REPORT must be completed in full, signed, and submitted with the bid for this contract. The contract awarding agency and the Commission on Human Rights and Opportunities will use the information contained thereon to determine the bidders compliance to Sections 4a-60 and 4a-60a CONN. GEN. STAT., and Sections 46a-68j-23 of the Regulations of Connecticut State Agencies regarding equal employment opportunity, and the bidder's good faith efforts to include minority business enterprises as subcontractors and suppliers for the work of the contract.

1) Definition of Small Contractor

Section 4a-60g CONN. GEN. STAT. defines a small contractor as a company that has been doing business under the same management and control and has maintained its principal place of business in Connecticut for a one year period immediately prior to its application for certification under this section, had gross revenues not exceeding ten million dollars in the most recently completed fiscal year, and at least fifty-one percent of the ownership of which is held by a person or persons who are active in the daily affairs of the company, and have the power to direct the management and policies of the company, except that a nonprofit corporation shall be construed to be a small contractor if such nonprofit corporation meets the requirements of subparagraphs (A) and (B) of subdivision 4a-60g CONN. GEN. STAT.

2) Description of Job Categories (as used in Part IV Bidder Employment Information) (Page 2)

MANAGEMENT: Managers plan, organize, direct, and control the major functions of an organization through subordinates who are at the managerial or supervisory level. They make policy decisions and set objectives for the company or departments. They are not usually directly involved in production or providing services. Examples include top executives, public relations managers, managers of operations specialties (such as financial, human resources, or purchasing managers), and construction and engineering managers.

BUSINESS AND FINANCIAL OPERATIONS: These occupations include managers and professionals who work with the financial aspects of the business. These occupations include accountants and auditors, purchasing agents, management analysts, labor relations specialists, and budget, credit, and financial analysts.

MARKETING AND SALES: Occupations related to the act or process of buying and selling products and/or services such as sales engineer, retail sales workers and sales representatives including wholesale.

LEGAL OCCUPATIONS: In-House Counsel who is charged with providing legal advice and services in regards to legal issues that may arise during the course of standard business practices. This category also includes assistive legal occupations such as paralegals, legal assistants.

COMPUTER SPECIALISTS: Professionals responsible for the computer operations within a company are grouped in this category. Examples of job titles in this category include computer programmers, software engineers, database administrators, computer scientists, systems analysts, and computer support specialists.

ARCHITECTURE AND ENGINEERING: Occupations related to architecture, surveying, engineering, and drafting are included in this category. Some of the job titles in this category include electrical and electronic engineers, surveyors, architects, drafters, mechanical engineers, materials engineers, mapping technicians, and civil engineers.

OFFICE AND ADMINISTRATIVE SUPPORT: All clerical-type work is included in this category. These jobs involve the preparing, transcribing, and preserving of written communications and records; collecting accounts; gathering and distributing information; operating office machines and electronic data processing equipment; and distributing mail. Job titles listed in this category include telephone operators, bill and account collectors, customer service representatives, dispatchers, secretaries and administrative assistants, computer operators and clerks (such as payroll, shipping, stock, mail and file).

BUILDING AND GROUNDS CLEANING AND MAINTENANCE: This category includes occupations involving landscaping, housekeeping, and janitorial services. Job titles found in this category include supervisors of landscaping or housekeeping, janitors, maids, grounds maintenance workers, and pest control workers.

CONSTRUCTION AND EXTRACTION: This category includes construction trades and related occupations. Job titles found in this category include boilermakers, masons (all types), carpenters, construction laborers, electricians, plumbers (and related trades), roofers, sheet metal workers, elevator installers, hazardous materials removal workers, paperhangers, and painters. Paving, surfacing, and tamping equipment operators; drywall and ceiling tile installers; and carpet, floor and tile installers and finishers are also included in this category. First line supervisors, foremen, and helpers in these trades are also grouped in this category..

INSTALLATION, MAINTENANCE AND REPAIR: Occupations involving the installation, maintenance, and repair of equipment are included in this group. Examples of job titles found here are heating, ac, and refrigeration mechanics and installers; telecommunication line installers and repairers; heavy vehicle and mobile equipment service technicians and mechanics; small engine mechanics; security and fire alarm systems installers; electric/electronic repair, industrial, utility and transportation equipment; millwrights; riggers; and manufactured building and mobile home installers. First line supervisors, foremen, and helpers for these jobs are also included in the category.

MATERIAL MOVING WORKERS: The job titles included in this group are Crane and tower operators; dredge, excavating, and lading machine operators; hoist and winch operators; industrial truck and tractor operators; cleaners of vehicles and equipment; laborers and freight, stock, and material movers, hand; machine feeders and offbearers; packers and packagers, hand; pumping station operators; refuse and recyclable material collectors; and miscellaneous material moving workers.

PRODUCTION WORKERS: The job titles included in this category are chemical production machine setters, operators and tenders; crushing/grinding workers; cutting workers; inspectors, testers sorters, samplers, weighers; precious stone/metal workers; painting workers; cementing/gluing machine operators and tenders; etchers/engravers; molders, shapers and casters except for metal and plastic; and production workers.

3) Definition of Racial and Ethnic Terms (as used in Part IV Bidder Employment Information) (Page 3)

<p>White (not of Hispanic Origin)- All persons having origins in any of the original peoples of Europe, North Africa, or the Middle East.</p> <p>Black(not of Hispanic Origin)- All persons having origins in any of the Black racial groups of Africa.</p> <p>Hispanic- All persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.</p>	<p>Asian or Pacific Islander- All persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands. This area includes China, India, Japan, Korea, the Philippine Islands, and Samoa.</p> <p>American Indian or Alaskan Native- All persons having origins in any of the original peoples of North America, and who maintain cultural identification through tribal affiliation or community recognition.</p>
---	---

BIDDER CONTRACT COMPLIANCE MONITORING REPORT

PART I - Bidder Information

<p>Company Name Street Address City & State Chief Executive</p>	<p>Bidder Federal Employer Identification Number _____ Or Social Security Number _____</p>
<p>Major Business Activity (brief description)</p>	<p>Bidder Identification (response optional/definitions on page 1)</p> <p>-Bidder is a small contractor. Yes__ No__ -Bidder is a minority business enterprise Yes__ No__ (If yes, check ownership category) Black__ Hispanic__ Asian American__ American Indian/Alaskan Native__ Iberian Peninsula__ Individual(s) with a Physical Disability__ Female__</p>
<p>Bidder Parent Company (if any)</p>	<p>- Bidder is certified as above by State of CT Yes__ No__</p>
<p>Other Locations in Ct. (if any)</p>	

PART II - Bidder Nondiscrimination Policies and Procedures

<p>1. Does your company have a written Affirmative Action/Equal Employment Opportunity statement posted on company bulletin boards? Yes__ No__</p>	<p>7. Do all of your company contracts and purchase orders contain non-discrimination statements as required by Sections 4a-60 & 4a-60a Conn. Gen. Stat.? Yes__ No__</p>
<p>2. Does your company have the state-mandated sexual harassment prevention in the workplace policy posted on company bulletin boards? Yes__ No__</p>	<p>8. Do you, upon request, provide reasonable accommodation to employees, or applicants for employment, who have physical or mental disability? Yes__ No__</p>
<p>3. Do you notify all recruitment sources in writing of your company's Affirmative Action/Equal Employment Opportunity employment policy? Yes__ No__</p>	<p>9. Does your company have a mandatory retirement age for all employees? Yes__ No__</p>
<p>4. Do your company advertisements contain a written statement that you are an Affirmative Action/Equal Opportunity Employer? Yes__ No__</p>	<p>10. If your company has 50 or more employees, have you provided at least two (2) hours of sexual harassment training to all of your supervisors? Yes__ No__ NA__</p>
<p>5. Do you notify the Ct. State Employment Service of all employment openings with your company? Yes__ No__</p>	<p>11. If your company has apprenticeship programs, do they meet the Affirmative Action/Equal Employment Opportunity requirements of the apprenticeship standards of the Ct. Dept. of Labor? Yes__ No__ NA__</p>
<p>6. Does your company have a collective bargaining agreement with workers? Yes__ No__</p> <p>6a. If yes, do the collective bargaining agreements contain non-discrimination clauses covering all workers? Yes__ No__</p> <p>6b. Have you notified each union in writing of your commitments under the nondiscrimination requirements of contracts with the state of Ct? Yes__ No__</p>	<p>12. Does your company have a written affirmative action Plan? Yes__ No__ If no, please explain.</p> <p>13. Is there a person in your company who is responsible for equal employment opportunity? Yes__ No__ If yes, give name and phone number.</p>

Part III - Bidder Subcontracting Practices

1. Will the work of this contract include subcontractors or suppliers? Yes__ No__

1a. If yes, please list all subcontractors and suppliers and report if they are a small contractor and/or a minority business enterprise. (defined on page 1 / use additional sheet if necessary)

1b. Will the work of this contract require additional subcontractors or suppliers other than those identified in 1a. above?

Yes__ No__

PART IV - Bidder Employment Information

Date:

JOB CATEGORY *	OVERALL TOTALS	WHITE (not of Hispanic origin)		BLACK (not of Hispanic origin)		HISPANIC		ASIAN or PACIFIC ISLANDER		AMERICAN INDIAN or ALASKAN NATIVE	
		Male	Female	Male	Female	Male	Female	Male	Female	male	female
Management											
Business & Financial Ops											
Marketing & Sales											
Legal Occupations											
Computer Specialists											
Architecture/Engineering											
Office & Admin Support											
Bldg/ Grounds Cleaning/Maintenance											
Construction & Extraction											
Installation, Maintenance & Repair											
Material Moving Workers											
Production Occupations											
TOTALS ABOVE											
Total One Year Ago											
FORMAL ON THE JOB TRAINEES (ENTER FIGURES FOR THE SAME CATEGORIES AS ARE SHOWN ABOVE)											
Apprentices											
Trainees											

*NOTE: JOB CATEGORIES CAN BE CHANGED OR ADDED TO (EX. SALES CAN BE ADDED OR REPLACE A CATEGORY NOT USED IN YOUR COMPANY)

PART V - Bidder Hiring and Recruitment Practices

1. Which of the following recruitment sources are used by you? (Check yes or no, and report percent used)				2. Check (X) any of the below listed requirements that you use as a hiring qualification (X)	3. Describe below any other practices or actions that you take which show that you hire, train, and promote employees without discrimination
SOURCE	YES	NO	% of applicants provided by source		
State Employment Service				Work Experience	
Private Employment Agencies				Ability to Speak or Write English	
Schools and Colleges				Written Tests	
Newspaper Advertisement				High School Diploma	
Walk Ins				College Degree	
Present Employees				Union Membership	
Labor Organizations				Personal Recommendation	
Minority/Community Organizations				Height or Weight	
Others (please identify)				Car Ownership	
				Arrest Record	
				Wage Garnishments	

Certification (Read this form and check your statements on it CAREFULLY before signing). I certify that the statements made by me on this BIDDER CONTRACT COMPLIANCE MONITORING REPORT are complete and true to the best of my knowledge and belief, and are made in good faith. I understand that if I knowingly make any misstatements of facts, I am subject to be declared in non-compliance with Section 4a-60, 4a-60a, and related sections of the CONN. GEN. STAT.

(Signature)	(Title)	(Date Signed)	(Telephone)
-------------	---------	---------------	-------------



State of Connecticut
 Department of Administrative Services (DAS) Contractor Prequalification
Update (Bid) Statement
 (Statement to be included with the bid)

Connecticut General Statute §4a-100 and Connecticut General Statute §4b-91

Each bid submitted for a contract shall include a copy of a prequalification certificate issued by the Commissioner of Administrative Services. The bid shall also be accompanied by an update bid statement in such form as the Commissioner of Administrative Services prescribes. The form for such update bid statement shall provide space for information regarding all projects completed by the bidder since the date the bidder's prequalification certificate was issued or renewed, all projects the bidder currently has under contract, including the percentage of work on such projects not completed, the names and qualifications of the personnel who will have supervisory responsibility for the performance of the contract, any significant changes in the bidder's financial position or ownership structure since the date the certificate was issued or renewed, any changes in the contractor's qualification status, and such other relevant information as the Commissioner of Administrative Services prescribes. Any bid submitted without a copy of the prequalification certificate and an update bid statement shall be invalid. Any public agency that accepts a bid submitted without a copy of such prequalification certificate and an update bid statement, as required by this section, may become ineligible for the receipt of funds related to such bid.

Name of Project that company is bidding on:

Project Number:

Name of Company:

FEIN:

Company Address:

Prequalification Contact:

Date of Prequalification with the DAS:

Single Limit:

Telephone Number:

Aggregate Work Capacity (AWC):

* Remaining Aggregate Work Capacity:

* This amount equals your company's AWC minus the Total \$ Amount of Work Remaining.

Please list all of your company's BONDED PROJECTS (BOTH PUBLIC AND PRIVATE) WHICH WERE 100% COMPLETED SINCE THE DATE YOUR PREQUALIFICATION WAS ISSUED OR RENEWED: (Please add additional page(s) if required)

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

Please list all of your company's BONDED PROJECTS (BOTH PUBLIC AND PRIVATE) CURRENTLY UNDER CONTRACT:
 (Please add additional page(s) if required. Please total the Work Remaining column)

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

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

Individual Name	Title of Individual

Have there been any changes in your company's financial condition or business organization, which might affect your company's ability to successfully complete this contract?

Yes No

If yes, please explain:

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

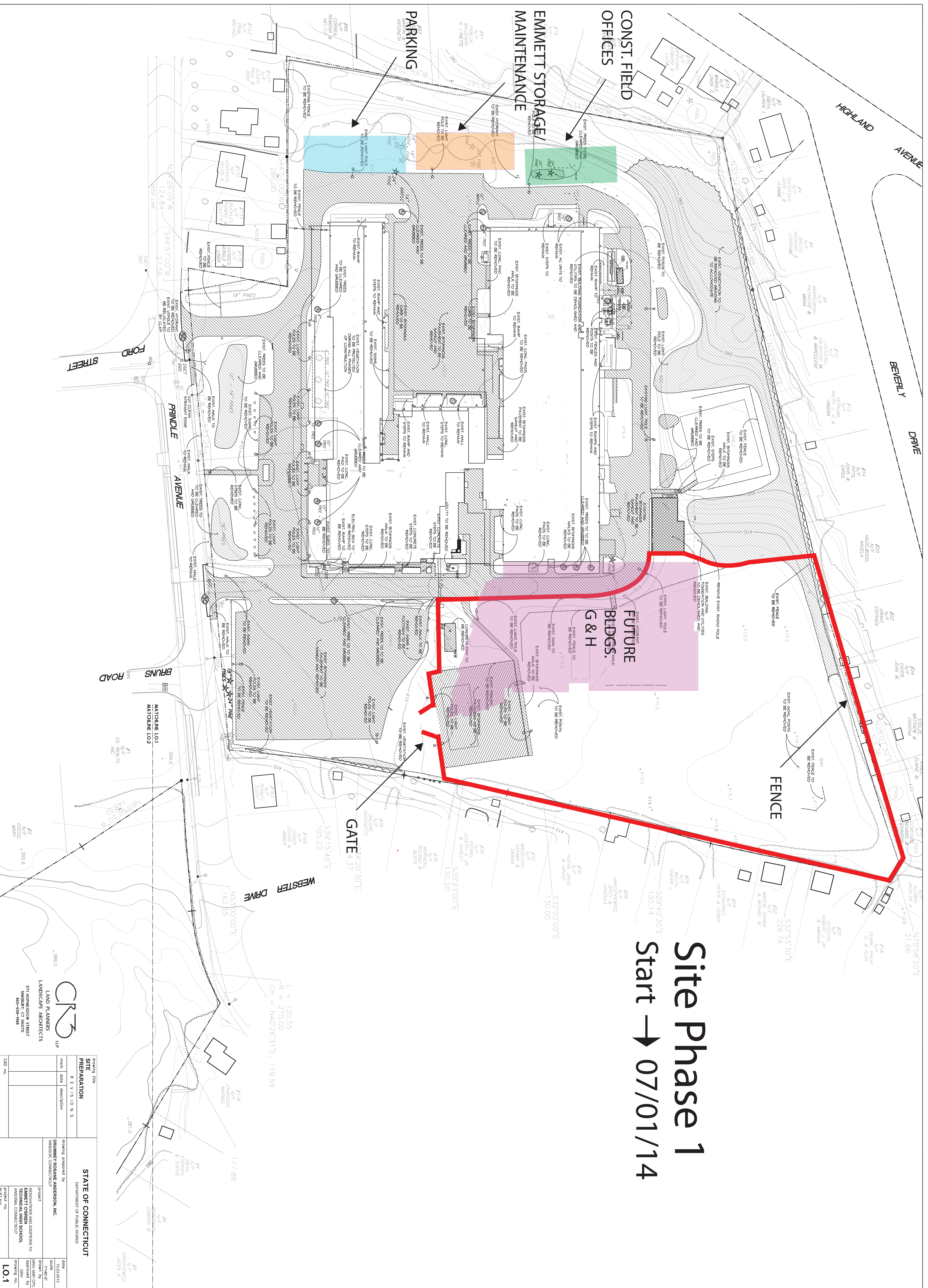
Signature _____

Date _____



Site Phase 1

Start → 07/01/14



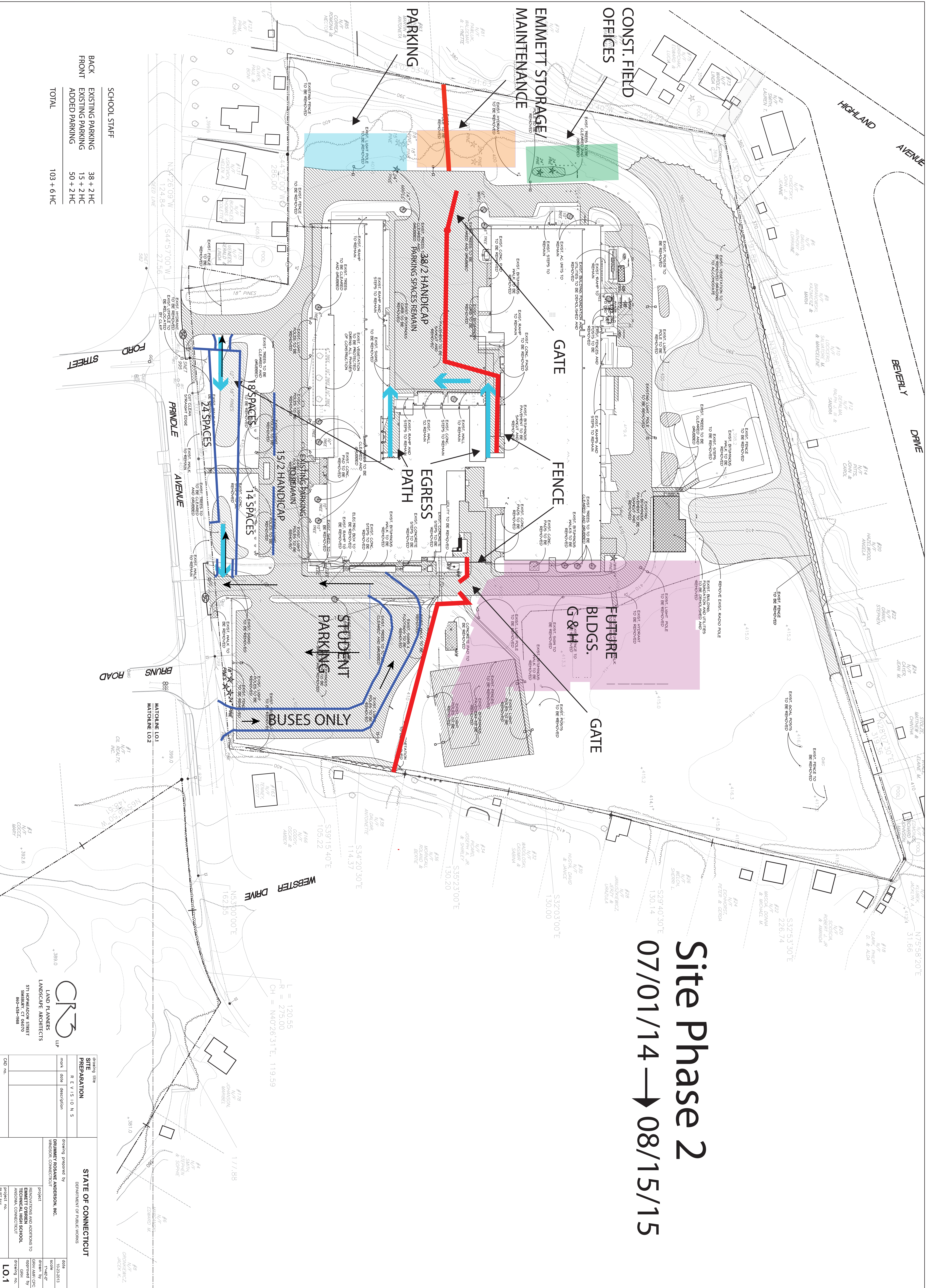
L = 120.55
 R = 275.00
 CH = N40°26'31"E, 119.59

DRAWING TITLE		STATE OF CONNECTICUT	
SITE PREPARATION		DEPARTMENT OF PUBLIC WORKS	
DATE	SCALE	DRAWN BY	CHECKED BY
07/01/14	1/8" = 1'-0"	DRUMMETT, ROSANNE ANDERSON, INC.	EMMETT O'BRIEN
PROJECT	PROJECT NO.	DATE	SCALE
RENOVATIONS AND ADDITIONS TO FUTURE GSH	BR1344	07/01/14	1/8" = 1'-0"
PROJECT NO.	BR1344	DATE	SCALE
BR1344	BR1344	07/01/14	1/8" = 1'-0"

CR3 LP
 LAND PLANNERS
 LANDSCAPE ARCHITECTS
 571 WASHINGTON STREET
 SHELTON, CT 06470
 860-638-1938

Site Phase 2

07/01/14 → 08/15/15



SCHOOL STAFF

BACK	EXISTING PARKING	38 + 2 HC
FRONT	EXISTING PARKING	15 + 2 HC
	ADDED PARKING	50 + 2 HC
TOTAL		103 + 6 HC

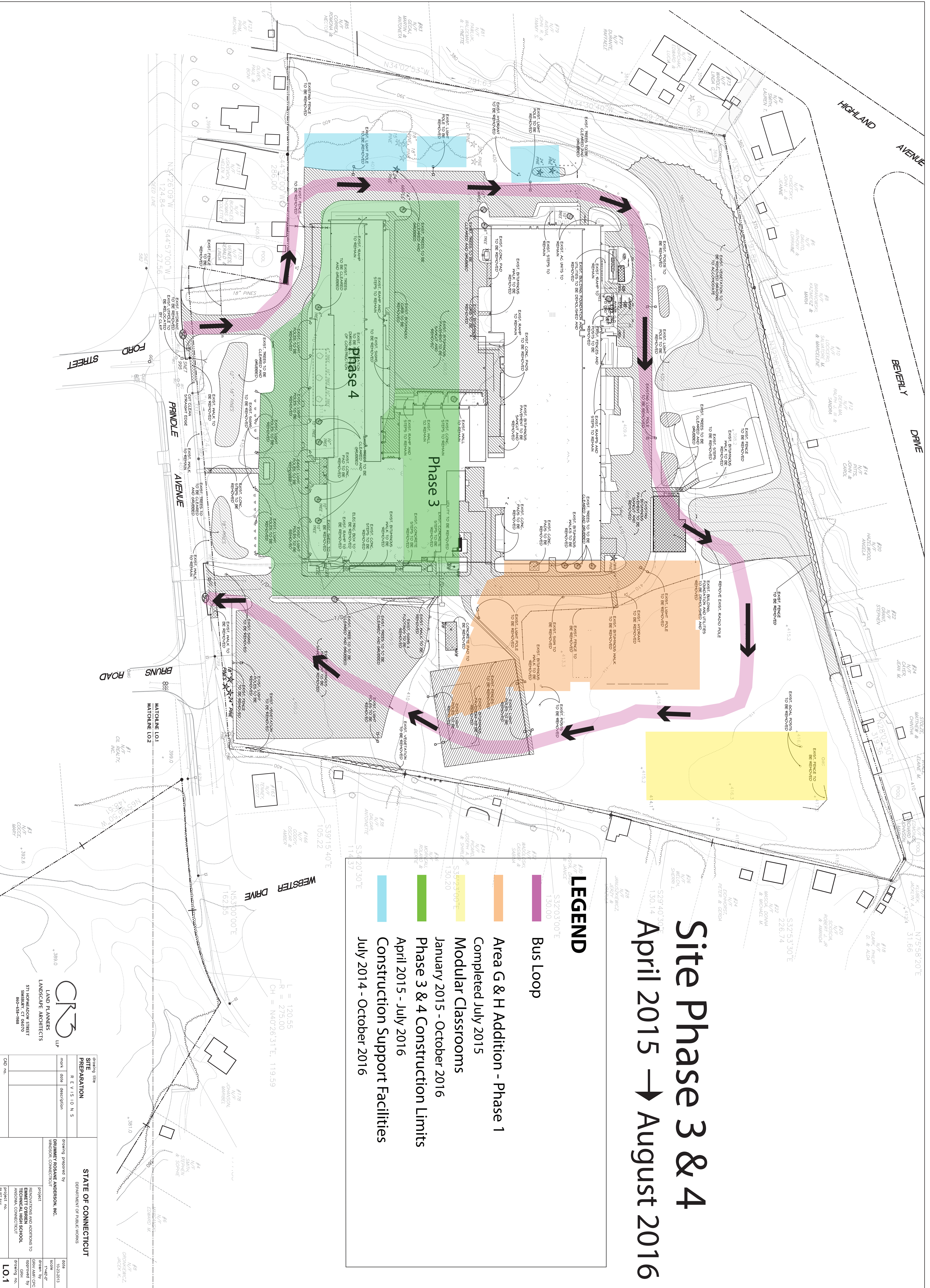
DRAWING TITLE		STATE OF CONNECTICUT	
SITE PREPARATION		DEPARTMENT OF PUBLIC WORKS	
DATE	SCALE	DRAWN BY	CHECKED BY
07/01/14	1/8" = 1'-0"	DRUMMETT, ROSANNE ANDERSON, INC.	EMMETT O'BRIEN
PROJECT DESCRIPTION		RENOVATIONS AND ADDITIONS TO	
LANDSCAPE ARCHITECTS		EMMETT O'BRIEN	
571 WASHINGTON STREET		SANDBRIDGE, CT 06070	
860-638-1938		PROJECT NO. BR1344	
DRAWING NO. LO 1		DRAWING NO. BR1344	

Site Phase 3 & 4

April 2015 → August 2016

LEGEND

- Area G & H Addition - Phase 1
Completed July 2015
- Modular Classrooms
January 2015 - October 2016
- Phase 3 & 4 Construction Limits
April 2015 - July 2016
- Construction Support Facilities
July 2014 - October 2016
- Bus Loop



CR3
LAND PLANNERS
LANDSCAPE ARCHITECTS
571 WASHINGTON STREET
SANDBRIDGE, CT 06070
860-638-1938

DATE	10/23/2013
SCALE	1"=40'
DRAWN BY	EMMETT O'BRIEN
CHECKED BY	OSIR
DRAWING NO.	LO1

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC WORKS

DATE	10/23/2013
SCALE	1"=40'
DRAWN BY	EMMETT O'BRIEN
CHECKED BY	OSIR
DRAWING NO.	LO1

00 09 36 TEMPORARY STORM WATER CONTROL

- A. Related Documents:** Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B.** Assume responsibility for storm water pollution control by completing and submitting to the Connecticut Department of Energy and Environmental Protection (DEEP) a "General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities" (DEEP-WPED-GP-015) registration and the Stormwater Pollution Control Plan (SPCP); and conform to the general permit requirements. The Contractor shall serve as the Developer, Permittee, Registrant, and Applicant, as the case may be.
- C.** The Contractor shall submit to DEEP the general permit registration form and the SPCP at least sixty (60) days prior to the commencement of activity involving total soil disturbance area of one (1) to twenty (20) acres or ninety (90) days prior to the commencement of activity involving a total soil disturbance area greater than twenty (20) acres. The Contractor shall submit the registration and SPCP to DEEP prior to Contract Award and within the applicable timeframes listed above. The Owner shall be responsible for the registration fee.
- D.** Conform to the SPCP included in the Contract Documents or use another plan, prepared at the Contractor's expense, which has been approved by the Owner and the DEEP.
- E.** The "General Permit for the Discharge of Stormwater and Dewatering Wastewater from Construction Activities" "draft" registration and SPCP are attached to the technical Section 312005 Sedimentation and Erosion Control.
- F.** At the completion of the construction project, the Contractor shall submit to the DEEP a "Notice of Termination" (DEEP-PED-NOT-015) per the general permit. Concurrent with this Notice of Termination, the Contractor shall submit a "License Transfer Form" (DEEP-APP-006) to DEEP transferring the registration to the Agency.

The Contractor shall be responsible for preparing and obtaining the necessary information and signatures for the License Transfer Form. The proposed transferee (new registrant) shall be the Agency. The new billing contact shall be the Owner. The Owner shall be responsible for the transfer fee.
- G.** Prior to submitting the Notice of Termination, the Contractor shall submit to the Agency copies of the SPCP, all reports required by the general permit, all inspection records, and records of all data used to complete the registration for the general permit.
- H.** For sites involving total soil disturbance of less than one (1) acre, the Contractor shall be responsible for sediment and erosion control and utilize best management practices as identified in the "2002 Connecticut Guidelines for Soil Erosion and Sediment Control" (DEEP Bulletin 34), as amended, and any sediment and erosion control plans prepared for the project.

END OF SECTION

Bid Form "A"
Proposal Form

Emmett O'Brien Technical High School
141 Prindle Avenue
Ansonia, Connecticut
Project No. BI-RT-844-CMR

Bid Package No. _____

Bid Submitted by:

Company Name

Street Address

City, State & Zip Code

Contact

(_____) . (_____) (_____) . (_____)
Telephone No *Fax No.*

The undersigned, having familiarized themselves with the existing conditions of the, but is not limited to, the project area affecting the cost of the work, and with the Contract Documents (which includes Invitation to Bid, Bid Form, Bid Bond, Instructions to Bidders, Non-Collusion Affidavit, Addenda, General Conditions, Project Conditions, Technical Specifications, Drawings as listed in the Schedule of Drawings, and form of Surety Bond) hereby proposes to furnish all machinery, tools, appurtenances, equipment, and services, including utility and transportation services required to construct and complete the work, all in accordance with the above listed Documents, and submits herewith in conformity with the project manual and subsequent addenda, the following bid:

The total amount of the Bid as computed by the undersigned Bidder is (in words):

Dollars and Cents

(and figures) \$ _____

The Fusco Corporation reserves the right to make the award on the basis of the above Base Bid.

In submitting this Bid, the Bidder understands that the Fusco Corporation reserves the right to accept or reject all or any part of this bid, to reject any and all bids, or to waive any informalities, irregularities, or technical defect in submitted bids. The Bidder also understands that the Fusco Corporation reserves the right to accept any, all, or none of the Alternates, which may be listed above, and may accept Alternates in any order at Fusco Corporation's sole discretion. The Bidder agrees to perform the work of each accepted Alternate for the sum quoted above for each, and to include such accepted Alternates in the Contract for Construction.

If written notice of the acceptance of this Bid and any or all of the Alternates is mailed, telegraphed, or otherwise delivered to the undersigned within ninety (90) days after the opening of the Bid, or at any time thereafter before the Bid is withdrawn, the undersigned agrees to sign the Subcontract, and to furnish the required bonds within ten (10) days after the Subcontract is presented to them for signature.

Bid Bond:

The undersigned herewith submits security equal to ten percent (10%) of the Base Bid, the sum of: _____ dollars and no cents
\$ _____

This security shall be the sole and exclusive property of the Fusco Corporation as liquidated damages to the City, if the undersigned fails to execute a Contract in conformity with the accompanying forms, after due date notification therefore in the Contract Documents.

Bidders shall furnish with their bids (in triplicate) the following:

1. Bid Forms A through F (Document 000950)
2. Bid Bond (Document A310)
3. Form of Surety (Document 000315)
4. Non-Collusion Affidavit of Prime Bidder (Document 000320)
5. Statement of Bidders Qualifications AIA Document A305 (Document 000412C)
6. Certification of Bidder Regarding Equal Employment Opportunity (Document 000360)
7. Contractors Wage Certification Form (Document 000847)
8. Project Labor Agreement Letter of Assent (**contained within PLA**) Submit only Pages 40 & 41 with bid.
9. Department of Administrative Services (DAS) "Contractor Prequalification Certificate and Update Statement- **Obtained by Bidder from CT DAS**
10. Notification to Bidders (Document 00330)
11. Contract Compliance Data Form (Document 00340)
12. Contractor's Minority Business Enterprises Utilization Form (Document 000350-3)
13. Notification to Bidders –CHRO (Document 000350-4)
14. Certification as to Corporate Principal (Document 00370)

Addenda:

The Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Date received	Signature

Bidder's Official Name and Address:

Company Name

Street Address

City, State & Zip Code

Contact Name:

Signature

Title

Date

Bid Form "B"

Labor Rates Emmett O'Brien Technical High School 141 Prindle Avenue Ansonia, Connecticut Project No. BI-RT-844-CMR

Labor Rates

The following Labor Rates shall apply when Changes in your Scope Work are requested by the Owner/Construction Manager per the General Conditions of the Contract for Construction, where Unit Prices are not applicable and a Lump Sum Cost proposal cannot be agreed upon. The labor rate shall only include those categories as listed below plus the allowable percentage for Overhead and Profit. Trade-related equipment, hand tools and power tools, normally supplied with the labor, shall not be included in the Labor Rate. The Overhead and Profit is defined as all other incidental costs, Main Office Expenses, Main/Field Office Staffing, Project Management, Supervision, Insurances, Travel Expenses, etc.

Item	Other	Laborer	Oper. Engineer	Carp.	Mason	Iron Worker	Plumb.	Elect.
Base Rate								
Benefits								
F.I.C.A.								
St. Umemp.								
Fed. Umemp.								
Gen. Liab.								
Wrkrs.Comp.								
Subtotal								

Bid Form "C"
Alternates

Emmett O'Brien Technical High School
141 Prindle Avenue
Ansonia, Connecticut
Project No. BI-RT-844-CMR

All Bidders shall include within his or her Bid any additional costs associated with the Alternates as listed below and in the Specifications. Should an Alternate not apply to your Scope of Work, indicate so on the Bid Form provided.

ALTERNATE BIDS

This Subcontractor shall include with the Bid the Alternates as listed in the Specifications (as applicable).

Bid Form "D"

Allowances

Emmett O'Brien Technical High School
141 Prindle Avenue
Ansonia, Connecticut
Project No. BI-RT-844-CMR

All Bidders shall include within the bid price the applicable Bid Allowances listed below. Should an Allowance not apply to your Scope of Work, indicate so on the Bid Form provided.

Allowances shall appear as a line item on the Contractor's Schedule of Values. The allowance amount covers the cost of the Contractor's labor/material/equipment delivered to the project plus all taxes less any trade discounts to which the contractor may be entitled with respect to the item of work. The Contractor's costs for supervision (non-working foreman), overhead, profit and other administrative expenses with respect to the allowance item are included in the base contract amount - not in the allowance amount.

All increases to an Allowance shall be by Change Order. Any unused portion of an allowance shall be returned to the Owner by deduct Change Order.

Bid Form "E" Proposed Subcontractor Listing

Emmett O'Brien Technical High School
141 Prindle Avenue
Ansonia, Connecticut
Project No. BI-RT-844-CMR

This form shall be filled out by each bidder. Attach additional sheets if necessary.

Subcontractor Name And Address	Trade	Contract Amount	Certificate Type (SBE, MBE, WBE,)	
				S/M/WBE (25%):

Construction Manager and Owner reserve the right to disapprove any proposed Subcontractor without prejudice.

Bid Form "F"
Unit Prices
Emmett O'Brien Technical High School
141 Prindle Avenue
Ansonia, Connecticut
Project No. BI-RT-844-CMR

The Contractor shall include within his or her Bid the Unit Prices as listed in the Specifications. Should a Unit Price not apply to your Scope of Work, indicate so on the Bid Form provided. Unit prices shall include all necessary labor, material, equipment, cost for delivery; installation; machinery; insurance; applicable taxes; overhead; and profit. Unit prices values as listed shall apply to both additions and deletions. Any and all adjustments to the Contract shall be made via Change Order. No adjustments for Overhead; Profit; Supervision and the like will be allowed.

See Specification Section 01 20 00 Contract Considerations - CMR

Construction Manager and Owner reserve the right to request breakdowns of unit prices and review and approve unit prices prior to inclusion in the Subcontract.



CT Project No.: BI-RT-844-CM-R

**Renovations and Additions to
Emmett O'Brien Technical High School**
Ansonia, CT

Design Team Modifications to Contract Documents To be Issued as a part of Addendum No.2

January 15, 2014

The original Specifications and Drawings dated October 23, 2013 and Addendum No.1 dated January 13, 2014 for the above-captioned project are amended as stated in this document. Note that responses to Bidder Request for Information (RFI's) for the above-captioned project amend the original Specifications and Drawings. This document consists of 9 (nine) pages, plus the following attachments.

ATTACHMENTS

PROJECT MANUAL

Section 07 53 23a, FM Global Property Loss Prevention Data Sheets 1-52, Field Verification of Roof Wind Uplift Resistance	(24 pages)
Section 13 34 25, Detached Modular Lunchroom Building (At High Meadows Site)	(10 pages)
Section 13 34 25a, Diagrammatic Floor Plan	(1 page)
Section 13 34 25b, Site Plan Location Diagram	(1 page)
Section 21 13 13, Wet-Pipe Sprinkler Systems	(17 pages)
Section 22 04 00, General Conditions for Plumbing Trades	(19 pages)
Section 22 05 00, Common Work Results for Plumbing	(3 pages)
Section 22 05 16, Expansion Fittings and Loops for Plumbing Piping	(5 pages)
Section 22 05 29, Hangers and Supports for Plumbing Piping and Equipment	(11 pages)
Section 22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment	(11 pages)
Section 22 05 53, Identification for Plumbing Piping and Equipment	(5 pages)
Section 22 07 00, Plumbing Insulation	(10 pages)
Section 22 12 00, Facility Potable-Water Storage Tanks	(5 pages)
Section 22 15 00, General Service Compressed Air System	(9 pages)
Section 22 34 00, Fuel-Fired Domestic Water Heaters	(7 pages)
Section 26 20 00a, Panelboard Schedules	(57 pages)
Section 32 80 00, Performance Irrigation System	(6 pages)
SITE DRAWINGS	
L5.14 IRRIGATION SYSTEM	(1 page)
ELECTRICAL DRAWINGS	
E2.1.5, E2.1.6 and E4.1.1	(3 pages)

CIVIL SKETCHES SKC-001	(1 page)
MECHANICAL SKETCHES SKM-003 thru SKM-007	(5 pages)
ELECTRICAL SKETCHES SKE-001 thru SKE-005	(5 pages)

AMENDMENTS TO PROJECT MANUAL

ADD 2-001 Section 00 01 10, TABLE OF CONTENTS

Page 5, INSERT new line after Section 07 53 23 as follows:

“Section 07 53 23a, FM Global Property Loss Prevention Data Sheets 1-52,
Field Verification of Roof Wind Uplift Resistance”

Page 8, INSERT new lines after Section 13 34 23 as follows:

“Section 13 34 25, Detached Modular Lunchroom Building (At High Meadows
Site)
Section 13 34 25a, Diagrammatic Floor Plan
Section 13 34 25b, Site Plan Location Diagram”

Page 9, INSERT new lines before Section 22 08 00 as follows:

“22 04 00, General Conditions for Plumbing Trades
22 05 00, Common Work Results for Plumbing
22 05 16, Expansion Fittings and Loops for Plumbing Piping
22 05 29, Hangers and Supports for Plumbing Piping and Equipment
22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment
22 05 53, Identification for Plumbing Piping and Equipment
22 07 00, Plumbing Insulation

Page 9, INSERT new lines after Section 22 12 00 as follows:

22 15 00, General Service Compressed Air System

Page 10, INSERT new lines after Section 26 20 00 as follows:

Section 26 20 00a, Panelboard Schedules

Page 12, INSERT new line after Section 32 32 19 as follows:

‘32 80 00, Performance Irrigation System”

ADD 2-002 Section 00 01 15, LIST OF DRAWING SHEET - CMR

Page 1, Under the Site drawing list ADD the following after drawing L5.13:

“L5.14 IRRIGATION SYSTEM.”

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

ADD 2-003 Section 07 53 23, FULLY-ADHERED EPDM ROOFING SYSTEM

Page 2, Article 1.4, Paragraph A, Sub-Paragraph 1, INSERT the following sub-sub paragraph after "c":

"d. 1-52: FM Global Property Loss Prevention Data Sheets 1-52, Field Verification of Roof Wind Uplift Resistance"

ADD 2-004 Section 07 53 23, FULLY-ADHERED EPDM ROOFING SYSTEM

Page 2, Article 1.5, Paragraph A, Sub-Paragraph 5, ADD the following Sub-Paragraphs as follows:

"Submit the following:

- a. Assembly Number: RoofNav Approval number of proposed roofing assembly.
- b. Scenario: Configurations of the roof assembly.
- c. Contractor Package: Report for proposed roof design, containing summary of roof configuration, securement details, safety information, and installation guidelines.
- d. FM global Form X2688 application for acceptance of roofing system.

ADD 2-005 Section 07 53 23, FULLY-ADHERED EPDM ROOFING SYSTEM

Page 4, Article 1.7, Paragraph G, DELETE text in its entirety and replace with the following:

"G. FM I-52 Uplift Test: Section 07 53 23 Sub-Contractor shall test installed roof membrane for resistance to wind uplift in accordance with FM Global Property Loss Prevention Data Sheet 1-52 (latest edition). Test each roof area and roof level. Conduct not less than the minimum number of required tests."

ADD 2-006 Section 07 53 23, FULLY-ADHERED EPDM ROOFING SYSTEM

Page 13, Article 3.7, Paragraph D, ADD sub-paragraph 2 as follows:

- "2. Testing Agency: **Contractor shall** engage a qualified independent testing agency to perform the following testing:
 - a. Field Uplift Testing: Perform the minimum number of test, in each roof area and roof level, required by FM Global Property Loss Prevention Data Sheet 1-52 which is attached to this Section.

ADD 2-007 Section 07 53 23, FULLY-ADHERED EPDM ROOFING SYSTEM

INSERT Attachment "Section 07 53 23a, FM Global Property Loss Prevention Data Sheets 1-52, Field Verification of Roof Wind Uplift Resistance" at the end of this Section.

DIVISION 08 – OPENINGS

ADD 2-008 SECTION 08 41 13 - ALUMINUM FRAMED STOREFRONTS AND ENTRANCES

Page 1, Article 1.2, Paragraph A, INSERT the words "pre-engineered and factory-fabricated" after the word "install" in the 1st line.

Page 2, Article 1.4, Paragraph C, DELETE the words "Use 20.0 psf (960 Pa) as a minimum."

Pages 2 & 3, Article 1.4, Paragraph C, Sub-Paragraph 1, DELETE Sub-sub-paragraphs a through c in their entirety and REPLACE them with the following:

- "a. Field: 20.9 psf inward pressure, 22.6 psf outward pressure
- b. Corner: 20.9.2 psf inward pressure, 27.8 psf outward pressure"

Page 4, Article 1.7, Paragraph A, REVISE Subparagraph 10 to read:
"2003 International Building Code Portion of the 2005 State Building Code, State of Connecticut".

Page 4, Article 1.8, Paragraph A, Subparagraph 2, INSERT the new sub-subparagraph as follows:

- "a. Shop drawings shall include Manufacturer's notarized affidavit certifying that:
- 1). The engineering, fabrication, and anchoring details of the storefront and entrance system meets or exceeds all applicable structural load requirements stipulated in the CT building codes.
 - 2). The system conforms to applicable FM Global requirements."

ADD 2-009

SECTION 08 41 13 - ALUMINUM FRAMED STOREFRONTS AND ENTRANCES

Page 5, Article 2.1, Paragraph B, REVISE subparagraphs 1 thru 3 in their entirety to read:

"1. Storefronts:

- a. For exterior application: Integrated flush structural silicon exterior glazed, stick fabricated system with thermal break and 1" insulated glass equal to "EnCore" as manufactured by Kawneer; or equal as approved by Architect. Vertical and horizontal framing members shall be of shear block construction and have a nominal dimension of 1-3/4 inch face width by 6 inch total depth.
 - 1). Front glass plane.
 - 2). Flush glazed from either inside or outside.
 - 3). Shear block.
 - 4). Structural silicone glazed (SSG).
 - a). Structural Silicone: shall be manufacturer's standard high strength silicone sealant / adhesive engineered to be compatible with substrates and to withstand movement, loads and to meet the performance requirements.
 - b). Colors shall be reviewed and approved by Architect. Colors: Interior - clear; exterior - black.
 - 5). Thermal break via. Polymer glazing clip.
- b. For interior application over 10'-0" in vertical span: Non-thermal, integrated flush structural silicon exterior glazed, stick fabricated system with 1/4" single-pan glass equal to "EnCore" as manufactured by Kawneer; or equal or as approved by Architect. Vertical and horizontal framing members shall be of shear block construction and have a nominal dimension of 1-3/4 inch face width by 6 inch total depth.
 - 1). Front glass plane.
 - 2). Flush glazed from either inside or outside
 - 3). Shear block.
 - 4). Structural silicone glazed (SSG).
 - a). Structural Silicone: shall be manufacturer's standard product engineered to withstand the loads and to meet the performance requirements."

- b). Colors shall be reviewed and approved by Architect.
Colors: Interior - clear; exterior – black.
- 5). Thermal break via. Polymer glazing clip.
- c. For interior application up to 10'-0" in vertical span: Non-thermal, structural silicon glazed "TriFab VG450" as manufactured by Kawneer; or equal or as approved by Architect. Vertical and horizontal framing members shall be of shear block construction and have a nominal dimension of 2 inch face width by 4-1/2 inch total depth.
 - 1). Front glass plane.
 - 2). Flush glazed from either inside or outside.
 - 3). Structural silicone glazed (SSG).
- 2. Entrances:
 - a. For exterior application: "560 Insulclad" thermal entrances by Kawneer; or equal as approved by Architect.
 - b. For interior application: "500 Tuffline" by Kawneer; or equal as approved by Architect."

ADD 2-010 SECTION 08 44 13 – GLAZED ALUMINUM CURTAINWALL

Page 1, Article 1.2, Paragraph A, INSERT the words "pre-engineered and factory-fabricated" after the word "install" in the 1st line.

Page 1, Article 1.3, Paragraph A, DELETE Subparagraph 9 in its entirety.

Page 5, Article 1.8, Paragraph A, Subparagraph 2, INSERT the new sub-subparagraph as follows:

- "a. Shop drawings shall include engineering calculations and certification sealed and stamped by a qualified professional engineer registered in the State of Connecticut certifying that:
 - 1). The engineering, fabrication, and installation of the storefront and entrance system meets or exceeds all applicable structural load requirements stipulated in the CT building codes.
 - 2). The system conforms to applicable FM Global requirements."

ADD 2-011 SECTION 08 44 13 – GLAZED ALUMINUM CURTAINWALL

Page 6, Article 2.1, REVISE Paragraph B to read:

- "B. basis of Design: "1600 Wall System 1 / System 2" as manufactured by Kawneer; or equal as approved by Architect.
 - 1. System 1 for horizontal applications, as indicated: Outside glazed captured curtain wall.
 - 2. System 2 for vertical applications, as indicated: Outside glazed structural silicone glazed curtain wall.
 - 3. Concealed fastener joinery with smooth, monolithic appearance.
 - 4. Shear block fabrication method.
 - 5. Provide corner and splayed mullions.
 - 6. Structural silicone glazed (SSG).
 - a). Structural Silicone: shall be manufacturer's standard high strength silicone sealant / adhesive engineered to be compatible with substrates and to withstand movement, loads and to meet the performance requirements.
 - b). Colors shall be reviewed and approved by Architect.
Colors: exterior – black.
 - 7. Silicone compatible glazing materials for long lasting seal.
 - 8. Small and large missile impact and cycle tested.
 - 9. Integrates with windows and vents by same Manufacturer, as indicated."

ADD 2-012 SECTION 08 44 13 – GLAZED ALUMINUM CURTAINWALL

Page 6, Article 2.2, Paragraph A, INSERT the following new subparagraphs:

- “2. Member Wall Thickness: Each framing member shall have a wall thickness sufficient to meet the specified structural requirements.
3. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of curtain wall members are nominal and in compliance with AA Aluminum Standards and Data.”

Page 9, Article 2.2 (FABRICATION),REVISE Paragraph D and associated subparagraph to read:

“D. Project-Out Vent Windows:

1. Project-out vent windows shall be integral part of curtain wall system manufactured by the same manufacturer with matching finish; equivalent to “GLASSvent” as manufactured by Kawneer and having the following minimum features:
 - a. No exterior framing sightline buildup.
 - b. Performance tested for a Class and Grade of AW-90.
 - c. Thermally improved flush vent design.
 - d. Structural silicone glazed (SSG).
 - e. Cast white bronze locking hardware.
 - f. Concealed stainless steel 4-bar hinges.”

Page 10, Article 2.7, Paragraph A, INSERT the following new subparagraphs:

- “3. Fasteners: Where exposed, shall be Stainless Steel.
4. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.”

Page 10, Article 2.7, INSERT the following new paragraphs:

- “I. Gaskets: Glazing gaskets shall comply with ASTM C 864 and be extruded of a silicone compatible EPDM rubber that provides for silicone adhesion.
- J. Thermal Barrier: Thermal separator shall be extruded of a silicone compatible elastomer that provides for silicone adhesion.
- K. Structural Silicone: shall be manufacturer’s standard high strength silicone sealant / adhesive engineered to be compatible with substrates and to withstand movement, loads and to meet the performance requirements.”

DIVISION 11 – FIXED CASEWORK AND EQUIPMENT

ADD 2-013 Section 11 60 00, FIXED CASEWORK AND EQUIPMENT

Page 13, Article 2.8, ADD “SC-15” after “SC-14” per the following:

“SC- GOGGLE CABINET FIVE (5) REQUIRED

Dimensions: 24-1/2”W x 9-1/2”D x 32”H.

Description: Assembly shall consist of the following components:

1-Safety Goggle Cabinet, constructed of heavy gauge steel with baked white enamel finish and vandal-resistant locking double doors. Equipped with rack to hold up to forty (40) pairs of safety goggles (not included). Built-in germicidal lamp fully shielded to prevent accidental exposure from front. Automatic timer shall control sanitizing period. Provide 7’-6”L grounded plug and cord.

Dimensions: 24-1/2”W x 9-1/2”D x 32”H.”

DIVISION 13 – SPECIAL CONSTRUCTION

ADD 2-014 Section 13 34 25, DETACHED MODULAR LUNCH ROOM AT HIGH MEADOWS SITE

INSERT attached new Section 23 34 25 and Attachments 23 34 25a & 23 34 25b.

DIVISION 21 – FIRE SUPPRESSION

- ADD 1-015 Section 21 13 13, WET-PIPE SPRINKLER SYSTEMS**
DELETE this section in its entirety and REPLACE with attached "Section 21 13 13, Wet-Pipe Sprinkler Systems."

DIVISION 22 – PLUMBING

- ADD 2-016 Section 22 04 00, GENERAL CONDITIONS FOR PLUMBING TRADES**
INSERT attached new Section 22 04 00.
- ADD 2-017 Section 22 05 00, COMMON WORK RESULTS FOR PLUMBING**
INSERT attached new Section 22 05 00.
- ADD 2-018 Section 22 05 16, EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING**
INSERT attached new Section 22 05 16.
- ADD 2-019 Section 22 05 29, HANGERS & SUPPORTS FOR PLUMBING PIPING & EQUIPMENT**
INSERT attached new Section 22 05 29.
- ADD 2-020 Section 22 05 48, VIBRATION & SEISMIC CONTROLS FOR PLUMBING PIPING & EQUIPMENT**
INSERT attached new Section 22 05 48.
- ADD 2-021 Section 22 05 53, IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**
INSERT attached new Section 22 05 53.
- ADD 2-022 Section 22 07 00, PLUMBING INSULATION**
INSERT attached new Section 22 07 00.
- ADD 2-023 Section 22 12 00, FACILITY POTABLE-WATER STORAGE TANKS**
DELETE this section in its entirety and REPLACE with attached "Section 22 12 00, Facility Potable-Water Storage Tanks."
- ADD 2-024 Section 22 15 00, GENERAL SERVICE COMPRESSED AIR SYSTEM**
INSERT attached new Section 22 15 00.
- ADD 2-025 Section 22 34 00, FUEL-FIRED DOMESTIC WATER HEATERS**
DELETE this section in its entirety and REPLACE with attached "Section 22 34 00, Fuel-Fired Domestic Water Heaters."

DIVISION 26 – ELECTRICAL

- ADD 2-026 SECTION 26 20 00, LOW-VOLTAGE ELECTRICAL TRANSMISSION**
INSERT Attachment 1, 26 20 00a, Panelboard Schedules, at the end of this section. Schedule is issued for information.

DIVISION 32 – PERFORMANCE IRRIGATION SYSTEM

- ADD 2-027 Section 32 80 00, PERFORMANCE IRRIGATION SYSTEM**
INSERT attached new Section 32 80 00 after Section 32 32 19.

AMENDMENTS TO DRAWINGS

- ADD 2-028 INFO.1 – INFORMATION SHEET 1**
Under the Site drawing list ADD the following after drawing L5.13:
“L5.14 IRRIGATION SYSTEM.”
- ADD 2-029 C4.1 – SITE UTILITY PLAN – FORD**
REVISE fencing around track per attached sketch SKC-001.
- ADD 2-030 A1.0.3 – PARTITION TYPES**
ADD General Note No.13 and 14 as follows:
“13. Where non-fire rated GWB partitions abut or align with fire rated GWB partitions, the construction of the rated partition shall be uninterrupted.

14. All smoke partitions, which are indentified on the Code Analysis drawings, shall be constructed as necessary to meet the State of Connecticut code requirements for Smoke Partitions.”
- ADD 2-031 A2.1.4 – PARTIAL EXTERIOR ELEVATION**
Elevation 26b: ADD the following note to right of column line bubble “S”:
“For continuation of this elevation refer to elevation 26g on drawing A2.1.4, entitled “East Elevation @ Storage.”
- ADD 2-032 A6.2.1 – Door Schedule**
Door B109d: Change frame material to “AL.”

Door D101-a: Change door type/material to “AL/WD.”

Door D104-c: Change frame material to “AL.”
- ADD 2-033 A6.5.3 – OVERALL WINDOW TYPES**
On the Window Glass Types Legend REVISE the following:

Delete the word “G1” and replace with “GX1.”
Delete the word “G3” and replace with “GX3.”
- ADD 2-034 P1.1.1G – FIRST FLOOR PLUMBING PIPING PLAN – AREA G**
ADD a cleanout (CO-1) at every FS – 1 and FLD - 1 that is located on a line which is more than 3 ft. in length from the trunk or branch line which it discharges into.
- ADD 2-035 P1.1.1H – FIRST FLOOR PLUMBING PIPING PLAN – AREA H**
ADD a cleanout (CO-1) at every FS – 1 and FLD - 1 that is located on a line which is more than 3 ft. in length from the trunk or branch line which it discharges into.
- ADD 2-036 MP1.1.0B – TUNNEL PIPING PLAN – AREA B**
REVISE drawing per the attached Sketch SKM-003
- ADD 2-037 MP1.1.1A – FIRST FLOOR MECHANICAL PIPING PLAN – AREA A**
REVISE drawing per the attached Sketch SKM-004
- ADD 2-038 MP1.1.1D – FIRST FLOOR MECHANICAL PIPING PLAN – AREA D**
REVISE drawing per the attached Sketch SKM-005
- ADD 2-040 MP1.1.2B – SECOND FLOOR MECHANICAL PIPING PLAN – AREA B**
REVISE drawing per the attached Sketch SKM-006

- ADD 2-041 M3.1.3 – MECHANICAL SCHEDULES**
1. REVISE drawing per the attached Sketch SKM-007
2. At AHU Schedule, Add General Note #1: All units shall be provided with motor starters, disconnect switches and single point power connection. Where shown on the control diagrams, VFD's shall be provided with the units. For listing of units with VFD's, refer to Mechanical Temperature Control Diagrams.
- ADD 2-042 EP1.1.1B – FIRST FLOOR POWER PLAN – AREA B**
REVISE drawing per the attached Sketch SKE-005
- ADD 2-043 EP1.1.1E – FIRST FLOOR POWER PLAN – AREA E**
REVISE drawing per the attached Sketch SKE-003
- ADD 2-044 EP1.1.1F – FIRST FLOOR POWER PLAN – AREA F**
REVISE drawing per the attached Sketches SKE-001 & SKE-002
- ADD 2-045 EP1.1.1H – FIRST FLOOR POWER PLAN – AREA H**
REVISE drawing per the attached Sketch SKE-004
- ADD 2-046 E2.1.5 – ELECTRICAL RISER AND SCHEDULE**
DELETE this drawing in its entirety and REPLACE with attached drawing E2.1.5.
- ADD 2-047 E2.1.6 – ELECTRICAL MOTOR CIRCUIT SCHEDULE**
DELETE this drawing in its entirety and REPLACE with attached drawing E2.1.6.
- ADD 2-048 E4.1.1 – ELECTRICAL KITCHEN PLAN**
DELETE this drawing in its entirety and REPLACE with attached drawing E4.1.1.

END OF ADDENDUM NO. 2

FIELD VERIFICATION OF ROOF WIND UPLIFT RESISTANCE

FM Global clients must contact the local FM Global office before beginning uplift testing or any roofing work.

Table of Contents

	Page
1.0 SCOPE	3
1.1 Changes	3
2.0 LOSS PREVENTION RECOMMENDATIONS	3
2.1 Introduction	3
2.1.1 General	4
2.1.2 Negative Pressure Test	6
2.1.3 Bonded Uplift Test	8
2.1.4 Visual Construction Observation (VCO)	8
3.0 SUPPORT FOR RECOMMENDATIONS	9
3.1 Background Information	9
3.2 Loss History	9
3.3 Negative Pressure Test	9
3.3.1 Mechanically Fastened Roof Coverings	13
3.4 Bonded Uplift Test	13
3.4.1 Preparation of Test Panel	14
3.4.2 Bonded Uplift Test Procedure	14
3.5 Visual Construction Observation (VCO)	17
4.0 REFERENCES	18
4.1 FM Global	18
4.2 Other	19
APPENDIX A GLOSSARY OF TERMS	19
APPENDIX B DOCUMENT REVISION HISTORY	19
APPENDIX C CONTRACTOR'S MATERIALS	20
C.1 Proposed Contract Wording for Uplift Testing:	20
C.2 Application for Acceptance of Roofing System (Form X2688)	21

List of Figures

Fig. 1. Uplift test location example: nine sections with roof areas up to 60,000 ft ² (6,000 m ²) (each ■- approximate test locations)	6
Fig. 2. Crease in single-ply roof cover while subjected to uplift pressure	7
Fig. 3. Crease in single-ply roof cover while subjected to uplift pressure	7
Fig. 4. Crack in underside of cover board at fastener and beneath where crease was visible in the single-ply roof cover	8
Fig. 5. Negative pressure test apparatus (schematic) with water manometer	10
Fig. 6. Suggested screw locations	14
Fig. 7. Bonded uplift test	15

List of Tables

Table 1. Recommended Tests for Various Roof Systems	4
Table 2. Passing Uplift Test Pressures for Enclosed Low-Slope Buildings ¹	5
Table 3. Minimum Number of Negative Pressure Tests	6
Table 4. Conversion From Pressure to Depth of Water	10



1-52 Field Verification of Roof Wind Uplift Resistance

Table 5. Maximum Recommended Deflection for Adhered Covers on Wide Rib Steel Deck Roofs Before the Sample is Considered Suspect	12
Table 6. Typical Scale Readings for 4 ft ² (1.2 m ²) Test Panel That Weighs 15 lbs (6.8 kg)	16

1.0 SCOPE

This data sheet describes two methods of field testing above-deck roofing assemblies to determine if there is adequate wind resistance. It also provides alternative visual construction observation guidelines. Confirmation of acceptable wind uplift resistance on completed roof systems is critical in hurricane-prone regions. Field testing may also be used where inferior construction is suspected (or known to be present) or where a partial blow-off has occurred. Field tests are not applicable to metal panel roofs (standing seam and through fastened), ballasted roofs, or mechanically fastened covers with fasteners spaced more than 2 ft (0.6 m) apart in either direction.

1.1 Changes

July 2012. The following changes were made:

- A. The option to provide visual construction observation (VCO) in lieu of conducting field uplift tests was added. The title of this document was revised to reflect this change.
- B. The number of tests recommended when using the bonded pull test was increased to account for the smaller sample area.
- C. The recommended field test safety factor was reduced from 1.5 to 1.25.
- D. The deflection limit for thin, mechanically fastened cover boards was increased.
- E. Additional pass/fail criteria were provided.

2.0 LOSS PREVENTION RECOMMENDATIONS

2.1 Introduction

In regions that are both (a) prone to hurricanes, typhoons, or tropical cyclones (see Appendix A for definitions), and (b) located where design wind-speeds are greater or equal to 100 mph (45 m/s), ensure one of the following is done for new above-deck roofing assemblies (including those that are re-roofed or re-covered, if construction is compatible) for all FM Global client locations:

- A. Satisfactory completion of uplift tests in accordance with 2.1.1 and 2.1.2 or 2.1.3.
- B. Visual construction observation (VCO) in accordance with 2.1.4 and 3.5.

If uplift tests are performed, ensure testing requirements are included in the building contract to determine that the wind uplift performance for the test areas meets the specifications in this data sheet. Ensure testing is witnessed by the owner's representative.

Record the results of uplift tests or VCO on FM Global Form X2688, *Application for Acceptance of Roofing Systems*, which must be maintained on file and forwarded to the FM Global local servicing office. See Appendix C for a copy of the certificate and suggested contract wording. Have a roofing professional present to repair the test areas and return the roof area to a watertight condition should any of the tests fail.

Exception: New roof covers (single-ply, or multi-ply with a mechanically fastened base sheet) that are mechanically fastened directly to the decks listed below, provided the roof cover fastener spacing is verified to be adequate. Verification may be made by visual identification or nondestructive examination (e.g., metal detection). This exception applies only to the following deck types:

- minimum 22 ga (0.295 in.; 0.75 mm) steel deck
- wood deck
- cementitious wood fiber deck
- structural concrete with a minimum ultimate compressive strength (f_c) of 2500 psi (17.4 mPa)
- lightweight insulating concrete (LWIC), only if the roof cover fastener completely penetrates the LWIC and engages minimum 22 ga. (0.0295 in., 0.75 mm) steel form deck.

Table 1 provides guidance regarding various roof systems that are practical to test and for which testing is recommended.

Table 1. Recommended Tests for Various Roof Systems

Type of Test or Analysis/ Roof Type	MF SP, MF BUR ² or MF Mod Bit ² to deck other than LWIC	MF SP ¹ , MF BUR ² or Mod Bit ² to LWIC	FA SP, BUR or Mod Bit w/MF insulation	FA BUR or Mod Bit w/FA insul.	FA SP w/FA insul.	Metal Roofs	Ballasted See DS 1-29
Negative Pressure Test	DNA	R ¹	R	R	R	DNA	DNA
Bonded Uplift Test	DNA	NR	NR	R	R	DNA	DNA

1. Fastener spacing does not exceed 2 ft (0.6 m) in both directions.
 2. Base sheet is mechanically attached and upper plies are adhered.
- MF – mechanically fastened
 FA – fully adhered
 SP – single-ply membrane
 Mod Bit – modified bitumen roof cover
 Metal Roofs – standing seam (concealed clip securement) or lap seam (through fastened)
- R – recommended
 NR – not recommended
 BUR – built-up roof
 DNA – does not apply

2.1.1 General

2.1.1.1 The negative pressure test generally is more desirable than the bonded uplift test because it is potentially nondestructive. It is not to be used directly on porous surfaces because the test requires an airtight seal between the test apparatus and the roof covering.

2.1.1.2 Negative pressure uplift tests may be conducted on totally adhered built-up roofs (BUR), modified bitumen (mod bit), or single-ply membranes. They can only be performed on mechanically attached base sheets, or reinforced single plies with membrane fasteners spaced no more than 2 ft (0.6 m) on center in either direction.

2.1.1.3 Neither the negative pressure test nor the bonded uplift test can be used on ballasted roofs or metal-panel roofs. The bonded pull test is not recommended where any type of mechanically fastened cover or insulation is used.

2.1.1.4 Ensure roof adhesives cure according to the manufacturer’s instructions. Cold adhesives normally require 28 days to cure to the strength obtained during FM Approvals testing, which allows a maximum 28-day cure time. These may acquire additional strength after 28 days and it is acceptable to conduct uplift testing after 28 days.

2.1.1.5 Conduct tests only when the roof surface temperature is between 40 and 100°F (5 and 43°C). Do not add anti-freeze to the manometer’s water solution (if applicable) on cold weather days, or food coloring to facilitate level reading, because the change in specific gravity will alter the manometer’s readings.

2.1.1.6 Ensure repair procedures are in accordance with Data Sheets 1-30, *Repair of Wind Damaged Roof Systems*; 1-28, *Wind Design*; and 1-29, *Roof Deck Securement and Above-Deck Roof Components*.

2.1.1.7 To prevent water damage to insulation, promptly patch and make watertight all failed test areas.

2.1.1.8 Determine the needed design wind pressure using the [RoofNav Rating Calculator](#) or [Data Sheet 1-28, Table 6](#) and [Tables 3, 4, or 5](#) (depending on the surface roughness) to determine the field, perimeter, and corner design pressures. Multiply those numbers by a safety factor of 1.25 to determine the needed passing uplift test pressure (U_p) for the field, perimeter, and corner areas. (Note that for low roof slopes and a minimum 3 ft [0.9 m] parapet around the entire outside edge of the roof, the passing uplift test pressure used for the building corners is the same as that for the perimeter.)

Except where otherwise noted, passing is based on successfully withstanding the equivalent of the design pressure for the respective area of the roof times a safety factor of **1.25 for a period of 1 minute**. Note that Table 2 is intended to allow ease of application. In some cases its use may be overly conservative; consequently, refer to footnote 1 and examples 1 and 2.

Table 2. Passing Uplift Test Pressures for Enclosed Low-Slope Buildings¹

FM Global Roof Wind Rating (field of the roof)	Passing Uplift Test Pressures (U ¹)					
	Field of the Roof		Roof Perimeter		Roof Corners	
	lbf/ft ²	kPa	lbf/ft ²	kPa	lbf/ft ²	kPa
60	38	1.8	64	3.1	96	4.6
75	47	2.2	79	3.8	119	5.7
90	56	2.7	94	4.5	142	6.8
105	66	3.1	111	5.3	167	8.0
120	75	3.6	126	6.0	189	9.0
135	84	4.0	141	6.8	213	10.2
150	94	4.5	158	7.6	238	11.4
165	103	4.9	173	8.3	261	12.5
180	113	5.4	190	9.1	286	13.7
195	122	5.8	205	9.8	309	14.8
210	131	6.3	220	10.5	331	15.9

¹ For design pressures that fall between or above the ratings above, the passing uplift test pressure is equal to 125% of the design wind uplift pressure for the field, perimeter, and corners of the roof as calculated using DS 1-28. The above passing uplift test pressures for the perimeter and corners are for enclosed buildings with gable roofs (without overhangs) with low slopes and eave roof heights less than or equal to 60 ft (27.4 m).

Example No. 1

An enclosed, low slope roof is less than 60 ft (18 m) high and has a **field of roof design pressure of 45 psf**. The **needed test pressures are 56 psf, 94 psf, and 142 psf**, respectively for the field, perimeter and corner areas. This is in accordance with Table 2, and equals the recommended design pressures in each roof area times a field safety factor of 1.25.

Example No. 2

An enclosed, low slope roof is less than 60 ft (18 m) high has a **field of roof design pressure of 38 psf**. Because it is in the low end of its range of design pressures for the field of the roof in Table 2 above, it is acceptable to determine the needed test pressures by multiplying the design pressure by the respective pressure coefficients. **The recommended test pressure for the field of the roof is 48 psf** or 1.25 times the recommended design pressure there. **The normalized pressure coefficients in this situation are 1.68 and 2.53 for the perimeter and corners, respectively**. This results in a needed **wind uplift test pressures of 81 psf and 122 psf for the perimeter and corners, respectively**. This is effectively a form of interpolation of Table 2, and results in a field safety factor of 1.25.

2.1.1.9 Use Table 3 to determine the minimum number of **negative pressure tests**. Perform two tests in the field, two tests in the perimeter, and one test in the corner of each roof area (NOT per building). (See Figure 1 and Appendix A). Perimeters and corners are only tested when the roof area terminates along an outside edge, not when interior roof areas (of approximately equal height) terminate against another roof area at the same elevation. Only two field tests are required for an interior roof area.

Table 3. Minimum Number of Negative Pressure Tests

Roof Area (A, ft ² or m ²)	Minimum No. of Tests
A ≤ 10,000 (1,000)	3 (1 F, 1 P, 1 C)
10,000 (1,000) < A ≤ 60,000 (6,000)	5 (2 F, 2 P, 1 C)
A > 60,000 (6,000) or multiple adjoining roof areas	See Section 2.1.1.9 and Figure 1

Where F = field of roof. P = perimeter of roof. C = corner of roof

Refer to DS 1-28, *Roof Design Outward Pressure Multipliers for Roof Zones 1, 2 and 3*, to determine perimeter and corner widths.

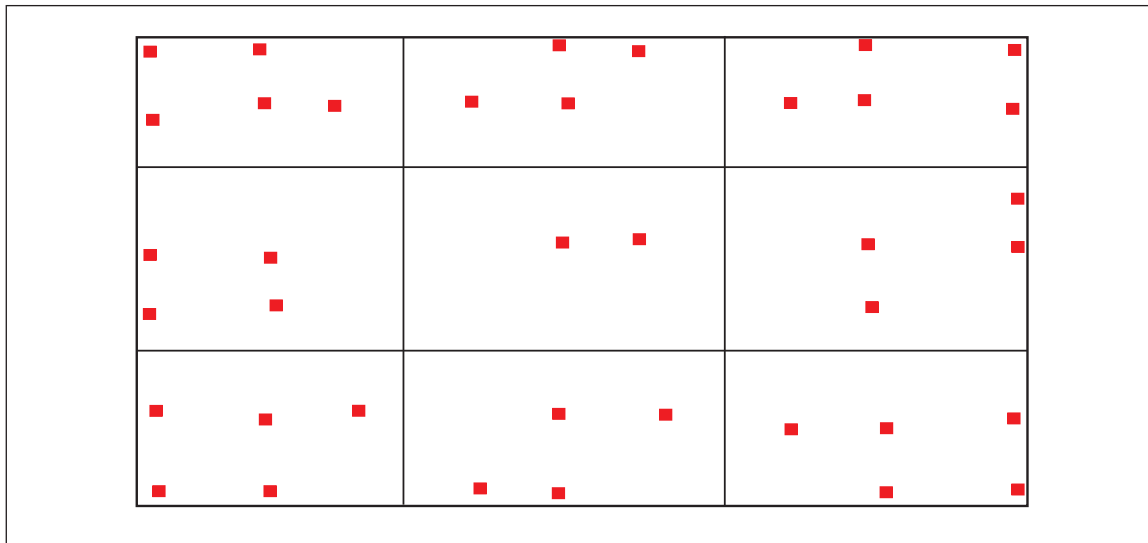


Fig. 1. Uplift test location example: nine sections with roof areas up to 60,000 ft² (6,000 m²) (each ■ - approximate test locations)

See Appendix A for definition of “roof area.”

2.1.2 Negative Pressure Test

2.1.2.1 Ensure the vacuum pump and dome has sufficient capacity to create the negative pressures required per Table 1 or its footnote 1. It must be equipped with controls to maintain a constant negative pressure at each test increment. The manometer, when used, also acts as a safety device to prevent negative pressure that could cause the dome to collapse.

2.1.2.2 Conduct negative pressure tests in accordance with Section 3.3.

2.1.2.3 Locate the test site between supporting beams or joists (where practical), except when testing roofs on pre-cast concrete roof decks, in which case locate the test site over the joints in the pre-cast concrete deck.

2.1.2.4 Place the deflection bar in the center of the dome.

2.1.2.5 For built-up roof coverings, when tests are to be made on a granule, gravel, or slag-covered roof, the first step is to sweep away any loose surfacing material from the test area and from a 1 ft (0.3 m) wide area around the perimeter of the test area. This will prevent pump damage and aid in sealing. Pour a compatible sealant such as asphalt or coal tar pitch (whichever is on the existing roof), not to exceed 0.5 in. (13 mm) in thickness, over the perimeter of the test area to make a smooth surface that will allow contact between the apparatus and roof and, therefore, the drawing of negative pressure. When the roof is smooth, the existing surface usually is tight enough to draw a vacuum without the pouring. However, if the surface is “alligatored”, blistered, or otherwise rough, the bitumen layer will be necessary.

2.1.2.6 For single-ply membranes, remove any sand or small granules adhered to the top surface in the area of the seal. Sweep away loose material from the entire test area. The test apparatus will cross over lap joints or splice edges, creating void areas at the edge of the lap that must be sealed by the foam strip.

2.1.2.7 Consider the test to be a failure if a crease forms (see Figs. 2 and 3) during the test on the roof cover surface before the design wind pressure has been held (safety factor = 1.0). Experience indicates this reflects that a crack has formed in the insulation or cover board (see Fig. 4) below the crease in the roof cover.

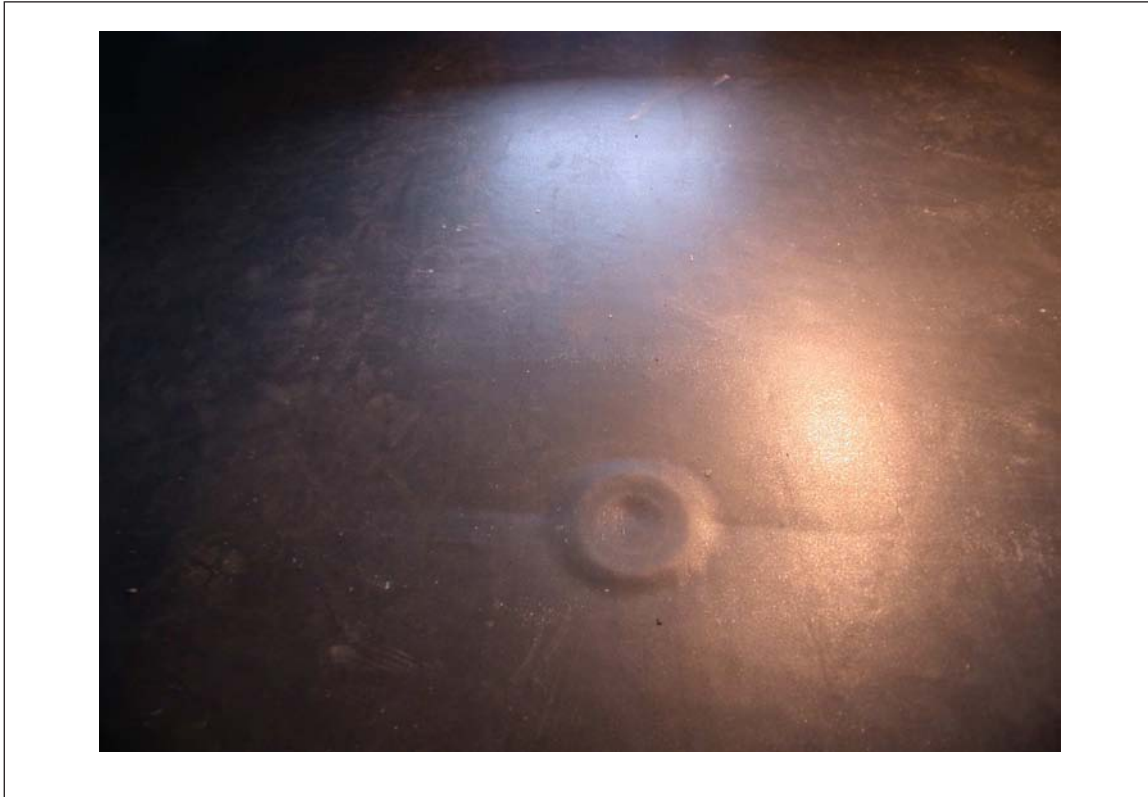


Fig. 2. Crease in single-ply roof cover while subjected to uplift pressure



Fig. 3. Crease in single-ply roof cover while subjected to uplift pressure



Fig. 4. Crack in underside of cover board at fastener and beneath where crease was visible in the single-ply roof cover

2.1.3 Bonded Uplift Test

2.1.3.1 The bonded uplift test is not valid if the insulation, base sheet, or membrane is secured with mechanical fasteners. Do not perform this test when roof slope exceeds 1.2°.

2.1.3.2 Conduct bonded uplift tests and record data in accordance with Section 3.4.

2.1.3.3 For proper surface preparation, sweep the test area when the roof has a smooth surface.

For roofs with gravel or slag surfaces, do the following

- Sweep the test area.
- If necessary to maintain a seal, pour a thin layer of asphalt or coal tar around the perimeter of the test area.
- Remove stones with a shovel, being careful not to disturb the adhesive bond of the insulation and roof covering.

2.1.3.4 Conduct four times as many bonded uplift tests (BPT) as recommended by Table 3, Figure 1 and Recommendation 2.1.9 to account for the smaller test sample area than that recommended for the negative pressure test (NPT). The four BPT samples should be prepared in close proximity to each other, taking into consideration that a complete cut needs to be made down to the top of the deck around the entire perimeter of the sample, and the required bearing points for the tripod legs. This allows testing of the same approximate sample area as in the NPT, and minimizes the area requiring repair after.

2.1.4 Visual Construction Observation (VCO)

2.1.4 Use full-time visual construction observation (VCO) during roof system installations as an alternative to performing field wind uplift testing for verification of adequate wind resistance.

Terminate the use of all noncompliant material or workmanship practices immediately, and replace or repair all noncompliant installation areas as needed. Document all noncompliance issues as well as related corrective measures in the daily construction report.

Follow guidelines in Section 3.5.

3.0 SUPPORT FOR RECOMMENDATIONS

3.1 Background Information

Performing these tests can identify inferior roofs that might be damaged by wind with resulting water damage to building contents and possible interruption to business. Do not substitute uplift testing for built-in quality. Ensure the roof system is designed to be wind-resistant, and the construction work is performed by a professional roofing contractor who employs quality-control measures that guarantee the system is installed as intended.

Whether tests are to be run on new roofs, or simply because the construction is unknown, passing criteria is based on 62.5% of the intended wind rating (e.g., for a Class 1-90 rating, the minimum test pressure, U_1 , to pass is 56 lbf/ft² [2.7 kPa] for the field of the roof, with higher pressures for the perimeter and corner areas due to the higher uplift pressures experienced in those areas).

The ability of the roof deck and edge conditions to resist wind uplift are also critical but uplift testing does not accurately evaluate the uplift resistance of the roof deck or edge securement, such as flashing, coping, etc. Lifting of metal edge flashing and coping and subsequent lifting and progressive membrane peeling is the most common cause of membrane loss. See Data Sheet 1-29, *Roof Deck Securement and Above-Deck Roof Components*, for proper deck securement, the *Approval Guide*, an online resource of FM Approvals and DS 1-49, *Perimeter Flashing*, for proper flashing securement.

3.2 Loss History

An extensive loss history exists on failures of roof systems due to wind forces. Since the majority of roof deficiencies leading to wind uplift failures are not readily visible on completed roofs, the uplift testing and roof cuts are offered as an evaluation tool.

3.3 Negative Pressure Test

The test apparatus (Fig. 5) includes a chamber 5 by 5 ft (1.5 by 1.5 m) sufficiently strong to withstand the necessary negative pressure without collapsing. The chamber is dome-shaped and of rigid acrylic plastic, fiberglass-reinforced plastic (FRP), or aluminum construction with polycarbonate view windows. The type of material and thickness will vary depending on the intended capacity of the apparatus. It is generally manufactured in two or four equal segments for ease in transporting it to and from the roof. The segments are provided with flanges so the units can be secured together. The flanges also act as structural ribs. A rubber gasket is provided to seal between the segments. One segment of the dome has a hole, usually 1.6 in. (41 mm) in diameter, to accommodate the vacuum pump, and another hole to accommodate a water or electric manometer. The dome has a bottom flange to set on the roof surface, and this flange is equipped with a flexible foam strip to seal the dome to the roof surface.

Note: Various manometer arrangements and higher calibrations are available. A deflection bar and gauge are placed on the roof surface prior to assembly of the dome (the bar and gauge are not needed when the roof covering is a spot-attached, or mechanically fastened type).

When provided, water manometers are made of clear plastic and generally calibrated to indicate negative pressures of 15 lbf/ft² (0.72 kPa), 22.5 lbf/ft² (1.08 kPa), 30 lbf/ft² (1.44 kPa), 45 lbf/ft² (2.16 kPa), etc. The manometer is equipped with a flexible tube to connect to the plastic dome. When the liquid is water, each 30 lbf/ft² (1.44 kPa) of negative pressure is equivalent to a vertical distance on the manometer water column of 5.77 in. (147 mm). (Inches of water required to pass equals lbf/ft² required to pass multiplied by 0.1924)

Maximum pressure of this equipment varies depending on the exact make, but goes up to approximately 340 lbf/ft² (16.28 kPa).

The vertical distance of the water column is the difference between the elevation of the two water columns and not the distance of one column from the original 0 set point. To convert other levels of water in a manometer, refer to Table 4.

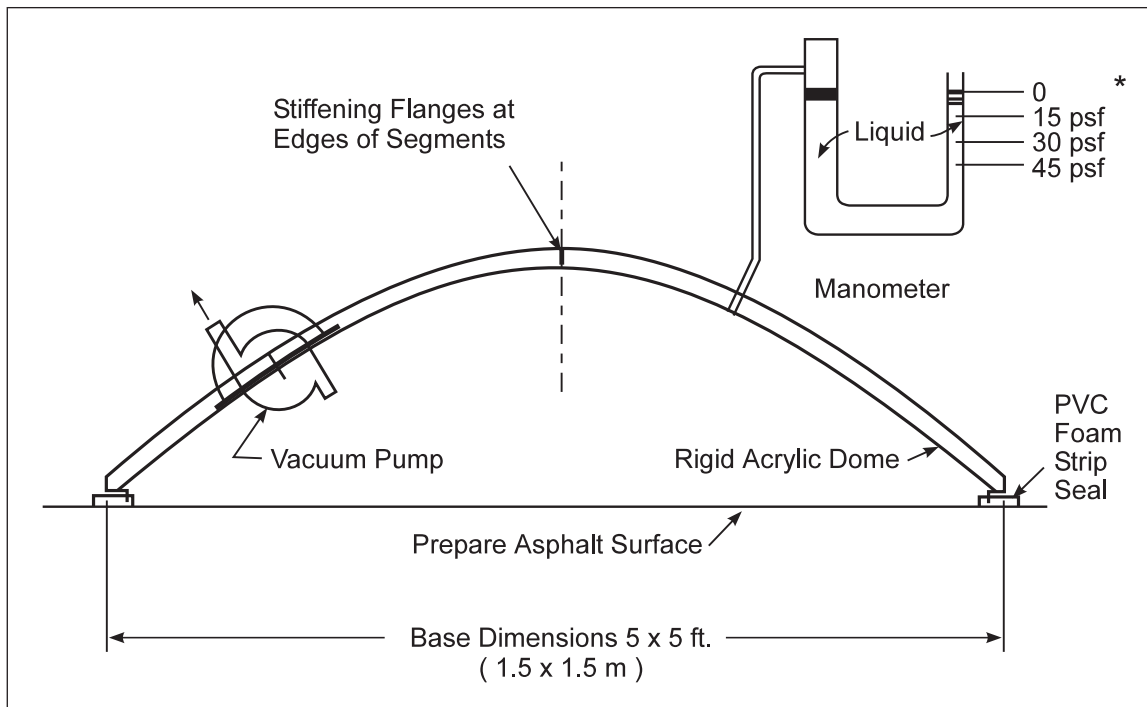


Fig. 5. Negative pressure test apparatus (schematic) with water manometer

Table 4. Conversion From Pressure to Depth of Water

WIND UPLIFT CALCULATIONS			
1 lbf/in. ² = 144 lbf/ft ²			
1 in. water = 25.4 mm water = 5.2 lbf/ft ² = 0.25 kPa			
0.1924 in. of water = 1 lbs/ft ²			
lbf/ft ²	kPa	in. H ₂ O	mm H ₂ O
15.0	0.7	2.9	73.7
22.5	1.1	4.3	109.2
30.0	1.4	5.8	147.3
37.5	1.8	7.2	182.9
45.0	2.2	8.7	221.0
52.5	2.5	10.1	256.5
60.0	2.9	11.5	292.1
67.5	3.2	13.0	330.2
75.0	3.6	14.4	365.8
82.5	4.0	15.9	403.9
90.0	4.3	17.3	439.4
97.5	4.7	18.8	477.5
105.0	5.0	20.2	513.1
112.5	5.4	21.6	548.6
120.0	5.7	23.1	586.7
127.5	6.1	24.5	622.3
135.0	6.5	26.0	660.4
142.5	6.8	27.4	696.0
150.0	7.2	28.9	734.1
157.5	7.5	30.3	769.6
165.0	7.9	31.7	805.2
172.5	8.3	33.2	843.3
180.0	8.6	34.6	878.8
187.5	9.0	36.1	916.9
195.0	9.3	37.5	952.5

WIND UPLIFT CALCULATIONS			
1 lbf/in. ² = 144 lbf/ft ²			
1 in. water = 25.4 mm water = 5.2 lbf/ft ² = 0.25 kPa			
0.1924 in. of water = 1 lbs/ft ²			
lbf/ft ²	kPa	in. H ₂ O	mm H ₂ O
202.5	9.7	39.0	990.6
210.0	10.1	40.4	1026.2
217.5	10.4	41.8	1061.7
225.0	10.8	43.3	1099.8
232.5	11.1	44.7	1135.4
240.0	11.5	46.2	1173.5
247.5	11.9	47.6	1209.0
255.0	12.2	49.1	1247.1
262.5	12.6	50.5	1282.7
270.0	12.9	51.9	1318.3
277.5	13.3	53.4	1356.4
285.0	13.6	54.8	1391.9
292.5	14.0	56.3	1430.0
300.0	14.4	57.7	1465.6
307.5	14.7	59.2	1503.7
315.0	15.1	60.6	1539.2
322.5	15.4	62.0	1574.8
330.0	15.8	63.5	1612.9
337.5	16.2	64.9	1648.5
345.0	16.5	66.4	1686.6
352.5	16.9	67.8	1722.1
360.0	17.2	69.3	1760.2
367.5	17.6	70.7	1795.8
375.0	18.0	72.2	1833.9
382.5	18.3	73.6	1869.4
390.0	18.7	75.0	1905.0
397.5	19.0	76.5	1943.1
405.0	19.4	77.9	1978.7

Place the assembled dome on top of the prepared roof surface located between supporting beams or joists, when practical. Clean all dust, dirt, and loose granules from the area. Make sure the apparatus encompasses at least one lap joint.

When using a water manometer, attach the flexible hose to the dome and fill the manometer with water to the zero calibration level or to a plus or minus calibration level. Place the vacuum pump over the hole provided in the dome. Check that the bypass valve on the pump is open, then start the pump. Be sure the dome is in complete contact with the surface to allow the necessary negative pressure to be drawn. Applying water under the foam strip will facilitate sealing.

Raise the pressure level to 15 lbf/ft² (0.72 kPa) and hold for 1 minute. Then raise in increments of 7.5 lbf/ft² (0.36 kPa) and hold for 1 minute at the end of each increment. When the passing uplift test pressure (U_p) is reached, the roof passes the test if that pressure is held for 1 minute with no separation within the roof covering, or separation of the roof covering from the roof deck or insulation, and deflection is within the parameters stated below. In the event of failure, record the previous pressure that was successfully held for 1 minute (this represents the actual uplift strength of the roof covering).

When a vacuum is drawn on the covering, most roof decks will exhibit a very small upward deflection that will increase with each load increment.

Observers not directly involved in operating the test equipment should not stand immediately adjacent to the test area. Also, it is imperative that there be no walking near the test area between the time the deflection gauge has been zeroed out and the test is complete. For example, if someone stands immediately adjacent to the center of the test area while the gauge is being zeroed out, then moves away from that area before the test is complete, the deflection gauge reading may be unrealistically high. In contrast, if someone is initially

standing away from the test area, but later walks immediately adjacent to the center of the test area after the gauge was zeroed out, it can cause the deflection gauge reading to be unrealistically low.

Laboratory tests have revealed that some improperly adhered roof assemblies may not show obvious signs of ballooning and failure, but will experience considerable deflection (see Section 3.3.1). Field testing of successful roof samples typically results in negligible deflection.

Interpreting Test Results

- If all test results indicate that all measured deflections are within the maximum recommended in this data sheet, the roof is acceptable from a wind uplift performance perspective.
- Areas where measured deflections exceed the maximum recommended in this data sheet deflection are suspect; and during testing these areas are sometimes accompanied by a noise at the time of failure. For these areas, carefully cut out the above-deck assembly down to the deck to determine if failure did occur. If no failure is evident, the roof is acceptable from a wind uplift performance perspective.
- If failure is verified from a roof cut visual inspection as described above, the roof area tested does not pass the test. Identify the mode of failure, any construction details that are not in accordance with FM Approvals or FM Global data sheets, and other obvious defects.
- It is not uncommon for some field areas to pass and some field areas to fail. For single-ply membranes adhered to mechanically fastened insulation, when test results vary within the same test pressure requirement attempt to visually identify different insulation fastener densities and / or patterns between the two areas which exhibit different uplift performance. If certain areas clearly are similar to the areas that passed, while others are clearly similar to the areas that failed, the former areas are acceptable from a wind uplift performance perspective; the other areas are not. For example, say the north and south sections of a new roof were installed on two different days by two different crews. All tests conducted on the north section passed, while all those conducted on the south section failed. Close inspection reveals that the area per insulation fastener was adequate for the north side, but was 50% greater on the south side. Conclusion: the north section is acceptable and the south section must be repaired.
- In cases, where some tests passed and other failed, additional tests may be conducted to limit the areas needing added securement.
- Provide retrofit securement enhancements for areas that failed the test.

The test is considered a failure if the cover suddenly balloons. The test is considered suspect if the gauge shows excessive deflection. Reasonable deflection is generally limited to 0.25 in. (6 mm), except as noted in Table 4. Where a mechanically fastened roof cover is tested, deflection need not be monitored. If localized deflection seems excessive, continue the test until the needed test pressures are held for one minute or obvious failure has occurred. **In either case**, the tested roof section must be carefully cut out down to the deck to determine if failure has occurred and what caused the failure. The sample should be removed carefully to help ascertain what the initial failure mode was.

Where the deck is wide rib steel (see DS 1-29) and the test pressure exceeds 60 psf (2.88 kPa), additional upward deflection may be allowed at the rate of an added 1/4 in. (6.5 mm) of deflection for each added 60 psf (2.88 kPa) of test pressure (see Table 5). If intermediate or narrow rib deck is used, the allowable deflection shown in Table 5 may be doubled, up to a maximum of 2 in. (50 mm).

Table 5. Maximum Recommended Deflection for Adhered Covers on Wide Rib Steel Deck Roofs Before the Sample is Considered Suspect

Test Pressure, psf (kPa)	Maximum Deflection, in. (mm)
P ≤ 60 (2.88)	1/4 or 0.25 (6.5)
60 < P ≤ 120 (5.76)	1/2 or 0.50 (13)
120 < P ≤ 180 (8.64)	3/4 or 0.75 (19)
180 < P ≤ 225 (10.8)	15/16 or 0.94 (24)

- Where the roof cover is mechanically attached, deflection need not be measured.
- Where a thin (e.g., 1/2 in. (12.7 mm) cover board or flexible (e.g., glass fiber), mechanically attached insulation is used, a maximum deflection of **2 in. (50 mm) should be used to determine if the test sample**

is considered suspect. Where a thin topping board is adhered to a substrate immediately below using ribbons of adhesive, a maximum deflection of 1 in. (25 mm) should be used to determine if the test sample is considered suspect.

Possible reasons for failure:

- The inadequately adhered roof covering separated from lower cover layers (if applicable) or from the insulation, or any other subsequent adhered intersection.
- The top facing of the insulation or cover board delaminated, or the core of the board separated.
- The insulation board separated from the deck (possibly breaking the insulation).
- One or more fasteners pulled out of the deck, or the insulation board fracture around the stress plate.

Upward deflections can be determined by careful observation of the test gauge. Due to the high sensitivity of these gauges, hold the final pressure increment for one minute and then release it slowly so revolutions can be counted as the pressure returns to zero.

Deflection gauges should preferably be capable of measuring up to 2 in. (50 mm) of deflection. Some deflection gauges show a maximum of 1 in. (25.4 mm) deflection, and in those cases, when the gauge indicates a 1 in. (25.4 mm) deflection, the potential deflection may be greater.

ASTM E-907, *Standard Test Method for Field Testing Uplift Resistance of Adhered Membrane Roofing Systems*, is frequently referenced by contractors conducting uplift tests. This standard allows a 1 in. (25.4 mm) deflection.

3.3.1 Mechanically Fastened Roof Coverings

Mechanically attached single-ply membranes normally will balloon between supports when subjected to uplift pressures. Consequently, it is usually impractical to use a deflection gauge with such an assembly; visual observations must be made.

When fasteners are located in rows and only at laps in the membrane, with or without a batten-type strip, neither type of conventional uplift test will yield satisfactory results. Proper uplift can be simulated only by testing the full membrane freespan on both sides of the fastener row. Row spacing is normally too wide to accommodate this criterion.

When fasteners do not exceed 2 ft (600 mm) in either direction, select a typical square or rectangular fastening pattern. In the case of membranes attached to stress plates or fastener plates beneath, the spots of attachment can readily be found because they are smooth and flat. The negative pressure apparatus may be used on these membranes provided at least one fastener is tested at its full fastener-to-fastener span in all directions. This is possible only when spacing in both directions is 2 ft (600 mm) or less. This allows one fastener to be centered beneath the apparatus with the entire membrane span contributing to the uplift in normal fashion. Criteria for failure is either pull-out of the fasteners or tearing of the cover around fastener stress plates or batten bars before the passing uplift test pressure is held for one minute.

3.4 Bonded Uplift Test

The following articles are sufficient for four bonded uplift tests.

Materials

- 1 sheet of plywood, 4 ft × 8 ft × 3/4 in. (1.2 m × 2.4 m × 18 mm), 5 ply, APA Rated Exposure 1, Grade A-D
- 48 wood screws, 1 1/4 in. (32 mm) long, No. 12 round head
- 4 eyebolts, 1/2 in. (13 mm), 3 in. (75 mm) of thread, with nuts and washers
- Adhesive: 1 keg (100 lb [45 kg]) of steep asphalt, or coal tar pitch, or appropriate adhesive
- Insulation and roofing covering for repairs

Equipment

- 1 calibrated spring scale or other measurement device with suitable force capacity
- 1 block and tackle, hand chain hoist or hydraulic lift device

- 1 tripod (or equivalent support system)
- 1 patching kettle with heating torch (for bituminous roofs)
- 1 Class B fire extinguisher

Tools

- Electric drill with $\frac{5}{8}$ and $\frac{1}{8}$ in. (16 and 3 mm) bits
- Electric sabre saw with blades
- Crosscut hand saw
- Screwdriver
- Adjustable open-end wrench, 8 or 10 in. (200 or 250 mm)
- Ruler and linoleum knife
- Broom, shovel (square-end, preferably for gravel-surfaced covers), and asphalt mop (if applicable)

3.4.1 Preparation of Test Panel

1. Cut the piece of plywood into 2 x 2 ft (0.6 x 0.6 m) squares.
2. Fasten two squares together to form one 2 ft x 2 ft x 1 $\frac{1}{2}$ in. (0.6 m x 0.6 m x 38 mm) panel by drilling twelve $\frac{1}{8}$ in. (3 mm) holes and using wood screws. Figure 6 shows suggested screw locations.

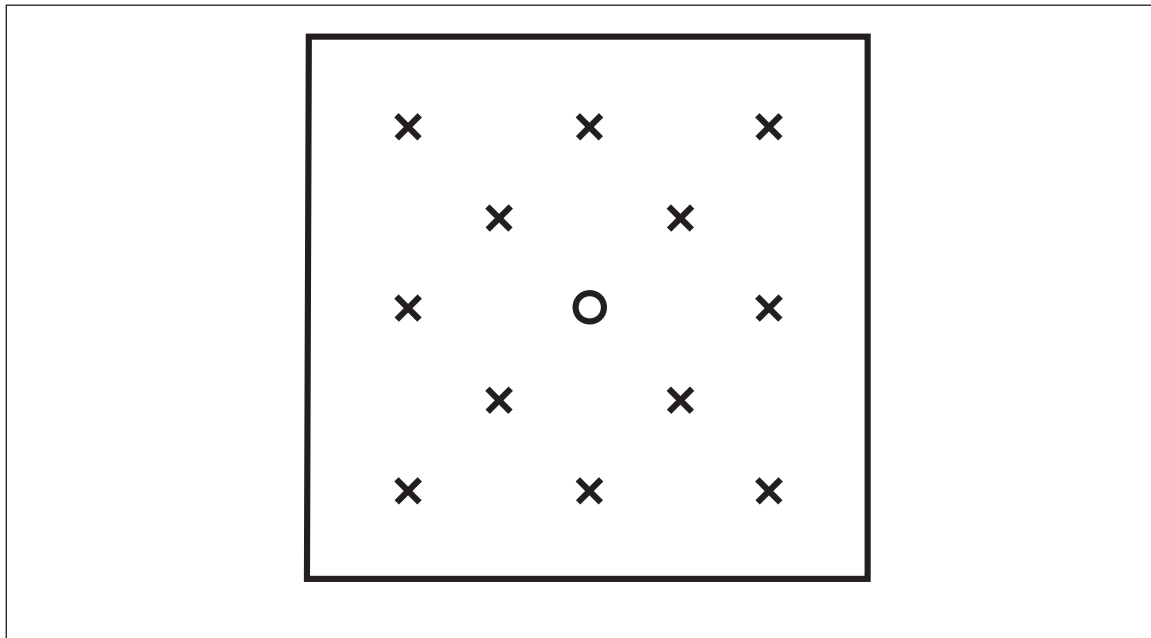


Fig. 6. Suggested screw locations

3. Drill a $\frac{5}{8}$ in. (16 mm) hole in the center of the test panel through both pieces of plywood.
4. Connect one of the eyebolts to the test panel with a nut and washer.
5. Suspend the test panel with an eyebolt from the calibrated spring scale and record the weight (W). The weight may vary from about 15 lb (6.8 kg) to 18 lb (8.2 kg).

3.4.2 Bonded Uplift Test Procedure

The following guidelines are provided for the bonded uplift test:



Fig. 7. Bonded uplift test

- Cut an indentation in the center of the roof covering of the test area to accommodate the nut and washer of the eyebolt.
- Place adhesive on top of the test surface. Apply a flood coat of hot steep asphalt to the test surface when roofing bitumen is asphalt (coal tar pitch when that material is used), or other compatible adhesive for single-ply covers.
- Place the test panel in the hot bitumen to ensure complete contact.
- Allow a curing period for the test panel, dependant on the type of adhesive used. (Two hours for hot asphalt; 48 hours for coal tar pitch.)
- Cut a 2 to 3 in. (51 to 76 mm) wide strip through the roof covering and insulation (if applicable) around the test panel, all the way down to the top of the roof deck. Do not stand on the panel while cutting, and avoid walking on it.
- Set up the tripod with attached block and tackle over the test panel. The lift must be perpendicular to the plane of the roof deck.
- Connect one end of the scale to the test panel, the other to the block and tackle. The scale also may be connected to the top of the tripod.
- Determine the passing uplift test pressure (U_1) as described in section 2.1.1.8.

Determine the passing scale reading for the required passing uplift test pressure (U_1).

$$\text{Passing scale reading (lbs/kg)} = U_1 \text{ (psf/kPa)} * \text{AREA (ft}^2\text{/m}^2\text{)} + W \text{ (lbs/kg)}$$

- Apply uplift force to roof holding at each increment for 1 minute. When reading the load scale, consider the test panel area and weight (W). The example in Table 6 are based on a 4 ft² (1.2 m²) panel that weighs 15 lbs (6.8 kg). For this case, the scale reading equals $4 U_1 + 15$ lbs (6.8 kg).

Table 6. Typical Scale Readings for 4 ft² (1.2 m²) Test Panel That Weighs 15 lbs (6.8 kg)

Uplift Test Pressure		Scale Reading	
lbf/ft ²	(kPa)	lb	(kg)
15.0	(0.7)	75	(34)
22.5	(1.1)	105	(48)
30.0	(1.4)	135	(61)
37.5	(1.8)	165	(75)
45.0	(2.2)	195	(88)
52.5	2.5	225	102
60.0	2.9	255	116
67.5	3.2	285	129
75.0	3.6	315	143
82.5	4.0	345	156
90.0	4.3	375	170
97.5	4.7	405	184
105.0	5.0	435	197
112.5	5.4	465	211
120.0	5.7	495	225
127.5	6.1	525	238
135.0	6.5	555	252
142.5	6.8	585	265
150.0	7.2	615	279
157.5	7.5	645	293
165.0	7.9	675	306
172.5	8.3	705	320
180.0	8.6	735	333
187.5	9.0	765	347
195.0	9.3	795	361
202.5	9.7	825	374
210.0	10.1	855	388
217.5	10.4	885	401
225.0	10.8	915	415
232.5	11.1	945	429
240.0	11.5	975	442
247.5	11.9	1005	456
255.0	12.2	1035	469
262.5	12.6	1065	483
270.0	12.9	1095	497
277.5	13.3	1125	510
285.0	13.6	1155	524
292.5	14.0	1185	538
300.0	14.4	1215	551
307.5	14.7	1245	565
315.0	15.1	1275	578
322.5	15.4	1305	592
330.0	15.8	1335	606
337.5	16.2	1365	619
345.0	16.5	1395	633
352.5	16.9	1425	646
360.0	17.2	1455	660
367.5	17.6	1485	674
375.0	18.0	1515	687
382.5	18.3	1545	701
390.0	18.7	1575	714
397.5	19.0	1605	728
405.0	19.4	1635	742

- When the next increment below U_1 has been held for one minute, increase the force to the roof until it equals U_1 .
- When the passing scale reading is reached, the roof passes the test if that pressure is held for one minute and the roof covering hasn't separated within itself or from the roof deck. If it fails before the passing scale reading is reached, record the last scale reading reached that held for one minute and calculate the equivalent uplift pressure. Uplift pressure = (scale reading – W)/test panel area. This equals the scale reading minus 15 lbs (6.8kg) divided by 4 (for a 4 ft² panel weighing 15 lbs [6.8kg]). This is the uplift strength of the roof and should be recorded on the "Contractor's Material & Uplift Test Certificate for Roof Systems" form.
- For example: If the highest scale reading was 375 lbs (170 kg) and the panel weighed 15 lbs (6.8 kg) and was 4 ft² (1.2 m²) in area, the pressure held was (375-15) lbs/4 ft² = 90 psf
- If the plywood test panel separates from the roof covering, re-adhere the panel and increase the curing period of the adhesive.

Repair procedures must be in accordance with Data Sheet 1-30, *Repair of Wind Damaged Roof Systems*, as well as Data Sheets 1-28, *Wind Design*, and 1-29, *Roof Deck Securement and Above-Deck Components*.

After the test is complete, remove all insulation and adhesive in the test area. Cut a new insulation square of the same material and thickness as that removed and secure it to the deck with compatible adhesive. Replace the covering with a similar type, providing appropriate laps.

3.5 Visual Construction Observation (VCO)

3.5.1 The following are the minimum guidelines for visual construction observation (VCO) when used as an alternative to field uplift testing.

A. The presence of, or opinions expressed by, the Construction Observer (CO) in no way relieve the design professional, roofing contractor, manufacturer, owner, or any other responsible party of their contractual obligations.

B. The information provided by the CO is for the benefit of the owner, roofing contractor, and FM Global, and no warranty of roof performance (including wind uplift resistance), expressed or implied, is offered.

C. The design professional, roofing contractor, manufacturer, or owner provide the CO with the approved RoofNav Assembly Number, FM Approval Report, contract documents, shop drawings, and other submittals or documentation as required to delineate the proposed roofing system and application parameters.

D. The contract documents become the basis of design and are to be used by the CO as the standard for construction.

E. The CO provides full-time on-site visual construction observation during roof system installation and will report on the roof construction process in an accurate and objective manner.

F. The CO is not a direct employee of the owner, design professional, or installing roof contractor of record, to avoid any conflict of interest.

G. The CO verifies that:

1. All materials used on the project conform to those listed in the FM Approved/ Accepted assembly, contain the appropriate FM Approvals labeling and meet installation guidelines of relevant FM Global Data Sheets (see Section 4.0).

2. All materials used on the project are installed in new and undamaged condition.

H. The CO observes and records the following: (observations should be made each day any of the following work is accomplished:)

1. Condition of the substrate; substrate preparation, repair, replacement, or supplemental attachment

2. Installation and attachment of any base sheet, thermal barrier or vapor barrier, including the type of fasteners or adhesive used and patterns and spacing

3. Installation and attachment of any insulation and/or cover board, including the type of fasteners or adhesive used and fastening patterns and spacing

4. Installation and attachment of any roof covering or materials that comprise the finished roof membrane, including the type of fasteners or adhesive used, fastening patterns and spacing, as well as specified material quantities, temperatures and any other measurement relative to the type of roof membrane being installed

5. Installation and detailing of roof system perimeter and penetration flashings

6. Installation, detailing, and attachment of roof-related sheet metal components

7. Installation of roof-surfacing materials

I. A report will be provided by the CO that includes both a written and photographic record of the construction project. The report will be made available to the owner, FM Global, the manufacturer, and the roofing contractor within 24 hours after each day's site visit. Documentation will include a plan that clearly identifies the location of the activities covered by the particular daily report. Documents will accurately describe the sequence of work, materials used, installation methods, condition of existing components, workmanship and noncompliance issues as well as related corrective measures..

K. The CO will provide non-biased visual construction observation services.

L. The CO will identify and disclose all relationships with any of the project entities that may create a conflict of interest.

M. The CO will have the following minimum qualifications:

1. The CO will have a thorough knowledge of the roofing system being installed, relevant industry accepted-practices, contract documents, blueprint reading, and FM Approval requirements and relevant FM Global data sheets.

2. The CO will have a thorough knowledge of the roofing system specified and the manufacturer's requirements.

3. The CO will have completed one or more of the following:

a. Certification as a registered roof consultant (RRC) by RCI, Inc. Inc.

b. Certification as a registered roof observer (RRO) by RCI, Inc.

c. For locations outside the United States where individuals with the above qualifications are not available, completion of specialized training or certification as a rooftop quality assurance observer from an industry-recognized organization

N. Performance of the visual construction observation is dependent on all parties involved in the project agreeing that the CO has the authority and obligation to identify and divulge material and workmanship practices not in compliance with the FM Approved/FM Global Accepted assembly information and any appropriate FM Global data sheet recommendations. The CO will notify the following immediately (in order of preference) of any observed noncompliant material or workmanship practices:

- Roofing contractor
- Owner
- FM Global field engineer

4.0 REFERENCES

4.1 FM Global

Data Sheet 1-28, *Wind Design*

Data Sheet 1-29, *Roof Deck Securement and Above-Deck Roof Components*

Data Sheet 1-30, *Repair of Wind Damaged Roof Systems*

RoofNav, FM Approvals software

4.2 Other

American Society for Testing and Materials (ASTM) International, Standard Test Method for Field Testing Uplift Resistance of Adhered Membrane Roofing Systems. ASTM E-907

APPENDIX A GLOSSARY OF TERMS

Construction Observer (CO): The properly qualified, unbiased consultant who is conducting the VCO.

FM Approved: Reference to “FM Approved” in this data sheet means the product or service has satisfied the criteria for Approval by FM Approvals. Refer to RoofNav for a complete listing of products and services that are FM Approved, as well as their respective ratings for wind resistance when used in combination.

Hurricane-prone regions: Areas vulnerable to hurricanes. Areas in the United States and its territories include:

1. The U.S. Atlantic Coast and Gulf of Mexico Coast, including parts of Mexico and Central America, where the basic wind speed per DS 1-28 is greater than 90 mph, and
2. Hawaii, Puerto Rico, Guam, Virgin Island, and American Samoa.

For locations outside the United States, any areas that are in a “tropical cyclone” region or “typhoon-prone” region. This includes but is not limited to parts of Australia, Bermuds, the Bahamas, Indonesia, India, Bangladesh, the Phillipines, Japan, South Korea, Hong Kong, Macau, Vietnam, and Taiwan, where the basic wind speed per DS 1-28 is greater than 90 mph.

Negative pressure: Pressure less than that of atmosphere.

Roof area: A single roof area for uplift testing is a section of roof (single composition including the same substrate that was installed at the same time) up to it’s termination point which is either the roof outside edge, an expansion joint, or a roof area divider.

Tropical cyclone-prone region: An area prone to tropical storms in which winds rotate about a center of low atmospheric pressure (clockwise in the southern hemisphere and counter-clockwise in the northern hemisphere), where the basic wind speed per DS 1-28 is greater than 90 mph (40 m/s).

Typhoon-prone region: Areas including but not limited to the Philippines, China, Taiwan, Japan, South Korea, Hong Kong, Macau, and Vietnam.

Visual construction observation (VCO): The practice of using a properly qualified consultant to continuously observe the installation of roofing components.

APPENDIX B DOCUMENT REVISION HISTORY

July 2012. The following changes were made:

- A. The option to provide visual construction observation (VCO) in lieu of conducting field uplift tests was added. The title of this document was revised to reflect this change.
- B. The number of tests recommended when using the bonded pull test was increased to account for the smaller sample area.
- C. The recommended field test safety factor was reduced from 1.5 to 1.25.
- D. The deflection limit for thin, mechanically fastened cover boards was increased.
- E. Additional pass/fail criteria were provided.

April 2009. The following was done for this revision:

- Changed wind uplift testing recommendations to exempt new roof covers that are mechanically fastened to minimum 22 ga (0.295 in.; 0.75 mm) steel, wood, or cementitious wood fiber deck or structural concrete.
- Added guidance for evaluating tests in which deflection seems excessive, but failure of the assembly is not obvious.

February 2007. This revision of the document changes the test pressure (to include perimeter and corner pressure coefficients and a safety factor = 1.5), the number of uplift tests required, and requires uplift tests for new above-deck roofing assemblies in regions that are prone to hurricanes, typhoons and tropical cyclones and where design wind speeds are at least 100 mph (45 m/s).

May 2000. The document was reorganized to provide a consistent format.

September 1999. A conversion table was added to convert psf to in. of water. Discussion on roof cuts was added for situations where testing is not practical.

February 1986. Information was added regarding the maximum fastener spacing for mechanically fastened covers for which the negative pressure test is applicable. Also, research test data was added regarding negative pressure tests with unadhered rigid insulation boards that showed excessive deflection.

August 1980. Information was added regarding the negative pressure test apparatus.

January 1978. Details for fastening existing deficient roofs were moved from this document to another data sheet.

March 1975. Examples were added.

August 1970. Document first published.

APPENDIX C CONTRACTOR'S MATERIALS

C.1 Proposed Contract Wording for Uplift Testing:

"ABC Roofing Company agrees to satisfy an uplift test of the completed roofing installation in accordance with FM Global Property Loss Prevention Data Sheet 1-52, *Field Verification of Roof Wind Uplift Resistance*. ABC Roofing Company is responsible for obtaining the most recent edition of Data Sheet 1-52 from FM Global and for supplying all labor, materials, and test equipment. Results of the tests shall be recorded and made available to FM Global. Acceptance and final payment shall be contingent upon favorable interpretation of the test results (as measured by the specifications) by FM Global."

C.2 Application for Acceptance of Roofing System (Form X2688)

APPLICATION FOR ACCEPTANCE OF ROOFING SYSTEM

CONTACT INFORMATION:

INDEX NUMBER:

ROOFING CONTRACTOR (NAME & ADDRESS)	TELEPHONE NO.:	FAX:
	E-MAIL ADDRESS:	CONTACT:
CLIENT (NAME & ADDRESS)	TELEPHONE NO.:	FAX:
	E-MAIL ADDRESS:	CONTACT:

OVERVIEW OF WORK: *(Submit 1 form per roof area)*

Building Name & Number:		
Building Dimensions: Length: <i>ft/m;</i>	Width: <i>ft/m.;</i>	Height: <i>ft/m.</i>
Roof Slope:		
Parapet Height ,max <i>(in./m):</i>	Parapet Height ,min <i>(in./m):</i>	
Type of Work:	<input type="checkbox"/> New Construction <input type="checkbox"/> Recover (New roof over existing Roofing System) <input type="checkbox"/> Reroof (New cover/remove existing roofing system to deck) <input type="checkbox"/> Other	
FM Approved RoofNav Assembly Numbers:		

ROOF SURFACING:

<input type="checkbox"/> None		
<input type="checkbox"/> Coating	(Trade Name/Application Rate)	
<input type="checkbox"/> Granules	(Application Rate)	
<input type="checkbox"/> Gravel/Slag	(Application Rate)	
<input type="checkbox"/> Ballast:	<input type="checkbox"/> Stone Size;	<input type="checkbox"/> Pavers <i>(Beveled or square edge);</i>
Ballast Weight (psf):	Field:	Perimeter: Corners: <input type="checkbox"/> Other:

ROOF COVER/MEMBRANE:

(Please provide ALL applicable details including trade name, type, number of plies, thickness, reinforced, adhesive)

<input type="checkbox"/> Panel:	<input type="checkbox"/> Through Fastened Metal <input type="checkbox"/> Standing Seam metal <input type="checkbox"/> Fibre Reinforced Plastic (FRP) <input type="checkbox"/> Other:
<input type="checkbox"/> Built Up Roofing (BUR)	
<input type="checkbox"/> Modified Bitumen	
<input type="checkbox"/> Single Ply:	<input type="checkbox"/> Adhered <input type="checkbox"/> Fastened <input type="checkbox"/> Ballasted
<input type="checkbox"/> Spray Applied	
<input type="checkbox"/> Other:	

BASE SHEET:

(Please include Trade Name, Type, Width)

<input type="checkbox"/> None	
Trade Name:	Width: <input type="checkbox"/> 36 In. <input type="checkbox"/> 1 meter (39 In.)
<input type="checkbox"/> Fastened	<input type="checkbox"/> Adhered
<input type="checkbox"/> Secured per RoofNav	OR <input type="checkbox"/> Per FM Global Loss Prevention Data Sheet 1-29
Comments:	
<input type="checkbox"/> Air Retarder	
<input type="checkbox"/> Vapor Retarder	

APPLICATION FOR ACCEPTANCE OF ROOFING SYSTEM

INSULATION

Layer	Trade Name	Thickness (In.)	Fastened	Adhered	Tapered
1. Top			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Next			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Next			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Next			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<input type="checkbox"/> Glass Fiber/Mineral Wool/Batt	<input type="checkbox"/> Facer Type/Vapor Barrier
<input type="checkbox"/> Thermal Barrier	
<input type="checkbox"/> Other:	
<input type="checkbox"/> None	

DECK:

(Please include manufacturer, type, yield strength, thickness/gage, etc.)

<input type="checkbox"/> Steel:	
<input type="checkbox"/> LWIC (Form Deck):	<input type="checkbox"/> Cementitious Wood Fiber:
<input type="checkbox"/> Concrete: <input type="checkbox"/> Pre-cast panels or <input type="checkbox"/> Cast in Place	
<input type="checkbox"/> Wood	
<input type="checkbox"/> Fiber Reinforced Cement	<input type="checkbox"/> Fiber Reinforced Plastic
<input type="checkbox"/> Gypsum: <input type="checkbox"/> Plank	<input type="checkbox"/> Poured
<input type="checkbox"/> Other:	
Comments:	

ROOF STRUCTURE (Include Size, Gage, Etc.):

<input type="checkbox"/> Purlins <input type="checkbox"/> "C" OR <input type="checkbox"/> "Z"		
<input type="checkbox"/> Joists <input type="checkbox"/> Wood OR <input type="checkbox"/> Steel		
<input type="checkbox"/> Beams <input type="checkbox"/> Wood OR <input type="checkbox"/> Steel		
<input type="checkbox"/> Other:		
Spacing: Field:	Perimeter:	Corners:
Comments:		

FASTENERS USED IN ROOF ASSEMBLY:

Roof Cover Fasteners: Trade Name:	Length:	Diameter:
Stress Plate/Batten:		
Spacing: Field: X	Perimeter: X	Corners: X
Insulation Fasteners: Trade Name:		
Type:		
Size:		
Stress Plate:		
Spacing: Field:	Perimeter:	Corners:
Deck Or Roof Panels Fasteners:		
Type:		
Trade Name:		
Length:		
Size Washer:		
If Weld: Size:	Weld:	Washer:
Deck Side Lap Fasteners: Field: X	Perimeter: X	Corners: X
Spacing: Field: X	Perimeter: X	Corners: X
Base Sheet Fasteners		
Type:		
Trade Name:		
Head Diameter:		
Length:		
Spacing: (Attached Sketches as necessary)		
Spacing Along Laps: Field:	Perimeter:	Corners:
No. Intermediate Rows: Field:	Perimeter:	Corners:
Spacing Along Intermediate Rows: Field:	Perimeter:	Corners:

APPLICATION FOR ACCEPTANCE OF ROOFING SYSTEM

PERIMETER FLASHING:

(Attach a detailed sketch of metal fascia, gravel stop, nailer, coping, etc.)

<input type="checkbox"/> FM Approved Flashing	<input type="checkbox"/> Per FM Global Loss Prevention Data Sheet 1-49
<input type="checkbox"/> Other:	Comments:

DRAINAGE:

For new construction: Has roof drainage been designed by a Qualified Engineer per FM Global Loss Prevention Data Sheet 1-54 and the local building code? <input type="checkbox"/> Yes <input type="checkbox"/> No (Attach details)
For re-roofing and recovering: will the roof drainage be changed from the original design (for example: drain inserts, drains covered or removed, new expansion joints, blocked or reduced scupper size)? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, were the changes reviewed by a Qualified Engineer? <input type="checkbox"/> Yes <input type="checkbox"/> No (Attach details)
Is secondary (emergency) roof drainage provided per FM Global Data Sheet 1-54? <input type="checkbox"/> Yes <input type="checkbox"/> No (Attach details)

Signature of Property Owner: _____

Title: _____ Date: _____

Signature of Installing Contractor: _____

Title: _____ Date: _____

FM GLOBAL OFFICE REVIEW

(Please leave blank for FM Global Office Review)

WIND:

Design Wind Speed: (mph)	Ground Terrain: <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Uplift Pressure in field: (psf)	Uplift Rating Required:
Adequate Uplift Rating Provided:	Adequate? <input type="checkbox"/> Yes <input type="checkbox"/> No

FIRE:

Internal Assembly Rating: <input type="checkbox"/> Class 1 <input type="checkbox"/> Class 2 <input type="checkbox"/> Non-Combustible	
External Fire Rating: <input type="checkbox"/> Class A <input type="checkbox"/> Class B <input type="checkbox"/> Class C <input type="checkbox"/> None	
Concealed Spaces? <input type="checkbox"/> Yes <input type="checkbox"/> No	Sprinklers below Roof? <input type="checkbox"/> Yes <input type="checkbox"/> No
Adequate? <input type="checkbox"/> Yes <input type="checkbox"/> No	

HAIL:

Hail Rating Needed? <input type="checkbox"/> SH <input type="checkbox"/> MH <input type="checkbox"/> None	Hail Rating Provided? <input type="checkbox"/> SH <input type="checkbox"/> MH <input type="checkbox"/> None
Adequate? <input type="checkbox"/> Yes <input type="checkbox"/> No	

COLLAPSE:

If standing seam, has collapse been reviewed? <input type="checkbox"/> Yes <input type="checkbox"/> No
--

COMMENTS:

Reviewed By: _____

Date: _____

APPLICATION FOR ACCEPTANCE OF ROOFING SYSTEM

FM Global Field Review:

(Leave blank for on-site review by FM Global Loss prevention Consultant):

System installed per reviewed/accepted plans? Yes No

If no, explain:

Installation witnessed by FM Global? Yes No

Uplift test needed? Yes No

(Uplift testing REQUIRED for applicable new roofs, re-roofs and recover roofs in hurricane, typhoon or tropical cyclone prone regions and where design wind speed is at least 100 mph [45 m/s] [see DS 1-28, DS 1-29, and 1-52 for more information].)

Uplift testing satisfactorily completed Yes No DNA

If yes, note pressures held for the: field _____ perimeter _____ corners _____

If no, explain and provide required and obtained uplift pressures and other details and attach to this form.

Reviewed By: _____

Date: _____

**SECTION 13 34 25
DETACHED MODULAR LUNCHROOM BUILDING
(AT HIGH MEADOWS SITE)**

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Carefully review and examine all other Contract Documents as well as field conditions for requirements therein affecting the work of this Section. Furthermore, coordinate and sequence the work of this Section with all other trades affected.

1.2 SUMMARY

- A. Provide Detached Modular Lunchroom Building (DMLB) that are pre-engineered and factory fabricated units, completely assembled, delivered and installed, including but not limited to foundations, walls, roof, floor systems, fixtures, finishes, stairs, ramps, fire suppression system, mechanical and electrical equipment specified. Finish materials for sealing and weatherproofing all joints at the connection point of each module shall be furnished and installed on the project site.
- B. The DMLB drawings and specifications shall be reviewed and approved in writing by a licensed third party agency or person to certify code compliance. This cost of certification shall be included in the base contract price. Additionally, the DMLB manufacturer shall be certified by the State of Connecticut Building Code Commission as an approved supplier of modular units.
- C. All architecture, engineering, design, materials, equipment, tools, services, labor, inspections, fees, zoning and building permits, and all other operations and costs necessary to design, engineer, fabricate, manufacture, deliver and install the DMLB shall be part of the base bid. The DMLB shall be complete and functional for safe and reliable use by the Owner for the purpose for which the DMLB are intended and specified.
- D. The DMLB Contractor must verify the exact location of all existing underground services and/or utilities, including those concealed from view. Failure to visit the site and note conditions will in no way relieve the DMLB Contractor of his/her responsibility for properly completing the work without additional cost to the Owner.
- E. The DMLB Contractor shall be responsible for providing a complete set of drawings and specifications that are in strict conformance with all State, Federal and local codes, statues and regulations in force at the time of application for State approvals and local approvals and permits.
- F. All drawings, specifications, construction and other construction documents must be in complete conformance with the requirements of the Connecticut State Department of Education, School Facilities Unit, "Construction Guidelines for School Districts and Design Professionals", most recent edition, and ANSI S12.60 - 2002. Acoustical Performance Criteria; as required to receive State approval and funding.
- G. All drawings and specifications shall bear the seal and original signature of a professional Engineer or Architect licensed to practice in the State of Connecticut, as required by the

State of Connecticut Statutes.

- H. The DMLB Contractor shall survey the site to accurately locate the DMLB.
- I. The DMLB Contractor must complete installation and obtain a Certificate of Occupancy prior to applying for payment for this portion of the Work.
- J. The DMLB Contractor must provide utility services and final connection to the DMLB at the building service entrance. The DMLB Contractor shall provide fire alarm, P/A system and sprinkler system throughout the entire DMLB. Fire alarm and P/A systems shall also be linked and incorporated into the systems for the occupied portion of the existing school buildings.
- K. The Owner will install computer network in the DMLB. DMLB Contractor to provide all conduits, junction boxes, outlets with blank covers.
- L. At the designated time, when the Owner no longer requires its use, the DMLB Contractor shall completely and legally remove the DMLB in their entirety, including but not limited to foundations and utilities serving DMLB, from the project site. The site shall be restored to its original condition. Repaving of the existing parking lot area affected by this work shall be required as part of the DMLB Contractor scope of work.

1.3 DESIGN CRITERIA – GENERAL

- A. DMLB shall be designed, fabricated, delivered, installed and constructed in strict accordance with all applicable codes, regulations and authorities including the State of Connecticut Education Department and Department of Public Works. Refer to the diagram for the dimensions of each unit.
- B. The construction of the DMLB shall be in compliance with 2003 International Building Code Portion of the 2005 State Building Code State of Connecticut, Table 601, Type 5-B Construction.
- C. Design loads for this facility shall be listed below. Local conditions may require loads to be adjusted. DMLB shall comply with the most stringent requirements.
 - 1. Floor: Live load – 100 psf.
 - 2. Roof: Live load – 45 psf.
- C. The DMLB Contractor must submit complete drawings and specifications to the Owner for review prior to commencement of fabrication. Any changes required so that the drawings or specifications conform with/to the governing regulations shall be made by the DMLB Contractor, at no additional cost to the Owner. Complete engineered drawings shall include the following:
 - 1. Site plans with survey information.
 - 2. Floor plans.
 - 3. Elevations.
 - 4. Cross sections.
 - 5. Foundation engineering and building details.
 - 6. Fire protection plans.
 - 7. Plumbing plans.
 - 8. HVAC plans.
 - 9. Electrical plans.
 - 10. A registered professional engineer in the applicable state shall seal shop drawings.
 - 11. Obtain third party approval in accordance with applicable state modular program

- and work completed by DMLB contractor.
11. Four sets of sealed plans shall be provided.

1.4 DESIGN CRITERIA - STRUCTURAL/INSULATION

- A. The floor system shall be capable of supporting a minimum of 100 pounds per square foot live load. Floor framing shall be steel joists or beams with perimeter steel frame, 5/8" thick plywood sub floor and 5/8" thick plywood underlayment.
- B. The foundation system shall be capable of supporting the weight of the building and shall extend a minimum of 48" below grade. Foundation shall be constructed of concrete footings with 3,000 PSI concrete piers or load bearing concrete masonry piers. Footings shall bear on undisturbed or virgin soil with adequate bearing capacity. If approved by the Building Official the ramps and exterior stairs may be installed on precast, pyramid shaped, concrete Post bases. Block and level system will NOT be accepted.
- C. Roof system shall be capable of supporting a minimum of 45 pounds per square foot live load, all applicable snow loads and all roof mounted equipment. Roof framing to be pre-engineered wood trusses with minimum 5/8" thick CDX plywood sheathing. Roof pitch shall be a minimum of 1/2"/foot.
- D. Exterior walls shall be constructed with a minimum of 2x4 wood studs at 16" on center.
- E. Lunchroom shall have the following thermal and STC values:
- Exterior walls: R-13 Kraft faced fiberglass insulation / STC-45 min.
Floor: R-21 Kraft faced fiberglass insulation
Roof/Ceiling: R-30 insulation / STC- 45 min.
Demising wall: STC 45 min.
- F. All applicable portions of the following codes and standards are hereby made part of this specification in their entirety, and all work shall conform to the requirements of these standards:
1. American Concrete Institute Standards and Specifications (ACI).
 2. American Institute of Steel Construction Standards and Specifications (AISC).
 3. American Society of Testing Materials (ASTM).
 4. American Society of Civil Engineers (ASCE).
 5. American National Standard; Acoustical Performance Criteria, Design Requirements and Guidelines for Schools ANSI S12.60.2002.
- G. Lunchroom building shall be constructed, tied down and adequately anchored to the foundation system in accordance with all governing codes and regulations including seismic requirements. Manufacturer shall submit a notarized affidavit signed by a Connecticut Licensed Structural Engineer certifying that the requirements for seismic loads and considerations have been incorporated for all structural, mechanical, electrical and ceiling systems.

1.5 DESIGN CRITERIA - INTERIOR

- A. Design interior to withstand the daily use by public high school students and staff.

1.6 DESIGN CRITERIA - EXTERIOR

- A. The entire perimeter of the underside of lunchroom shall be skirted with removable vented skirting which shall match the siding. All wood within 8" of finished grade shall be treated with water-borne preservatives in accordance with AWPB LP-2 for above ground

- lumber and AWPB 22 for wood in contact with the ground. Install two 24" x 36" access panels for lunchroom. Secure panel in place with removable tamper-proof screws.
- B. The exterior finish shall be 7/16" thick pre-finished hardboard siding, with reversed board and batten pattern, and vertical grooves 8" on center, maximum. All trim to match the siding.
 - C. Buildings shall have 12" wide vented soffits on two (2) sides with aluminum gutters and downspouts leading to precast concrete splash blocks at grade.
 - D. The roof system shall be Class 'A' single ply EPDM roofing system, either fully adhered or mechanically fastened to plywood sheathing. 45 mil minimum thickness membrane. Carlisle or approved equal. Roof flashing must be compatible with the roofing system installed. Installation shall be in strict conformance with the roofing manufacturers' specifications and with the National Roofing Contractors Association. Roof shall have a minimum of 1/2" pitch per foot for water run-off. Ponding will not be acceptable. Roof system shall have a 20-year unlimited Manufacturers' guarantee for water tightness covering material and workmanship on entire roof system.
 - E. All exterior doors and windows shall have full length drip caps at the head.
 - F. A wood railing and guard shall be installed along the roof edge where any rooftop equipment is located within 10 feet of the roof edge or when required by governing regulations. Railing system shall match the railings at the stairs and ramps.

1.7 DESIGN CRITERIA - DOORS & WINDOWS

- A. Exterior doors shall be 3'-0" wide by 6'-8" x 1-3/4" thick insulated, flush steel hollow metal doors, Ceco Door Products, Imperial Design or approved equal, installed in a steel hollow metal frame equipped as follows.
 - 1. Weatherstripped with bottom sweep and 5" wide aluminum threshold.
 - 2. Hinges shall be Stanley or approved equal heavy duty ball bearing hinges, primed and painted with enamel to match the doors.
 - 3. Doors shall be constructed of 18 gauge steel sheets with rigid urethane core with a minimum 'R' value of 14.0.
 - 4. Door and frame shall have factory applied, baked on rust inhibitor primer with alkyd enamel finish coat.
 - 5. All doors to have interior-mounted, LCN Smoothee or approved equal automatic, adjustable closers with rack and pinion operation sized to fit doors.
 - 6. Refer to diagram for door locations. All doors in the same room must be keyed alike and keyed to school master key system.
 - 7. All exterior doors shall have a 100 square inch glass panel with 1/2" tempered insulating glass. Bottom of glazing to be a maximum of 42" above the adjacent floor surface.
 - 8. Exterior doors to have a minimum STC rating of 48.
- B. Interior doors shall be 3'-0" wide x 6'-8" high x 1-3/4" thick, flush steel hollow metal doors, Ceco Door Products or approved equal, installed in a steel hollow metal frame equipped as follows:

1. Hinges shall be heavy duty ball bearing hinges, primed and painted with enamel to match the doors, Stanley or equal.
 2. Doors shall be constructed of 18-gauge steel sheets with rigid urethane core with a minimum 'R' value of 14.0.
 3. Door and frame shall have factory applied, baked on rust inhibitor primer with alkyd enamel finish coat.
 4. All doors to have LCN Smoothee or approved equal automatic, adjustable closers with rack and pinion operation sized to fit doors.
 5. Refer to drawings for door locations. All doors in the same room must be keyed alike and keyed to the existing school master system.
- C. Doors and frames shall be constructed in strict conformance with the specifications of the Steel Door Institute, most recent edition.
- D. Lunchroom shall have a minimum of six 4'-0" x 4'-0" Universal Aluminum Series 200 or approved equal windows. Each toilet room shall have a 2'-0" x 4'-0" Universal Aluminum Series 200 or approved equal windows. All windows shall be aluminum frame with thermal break, sliding sash, 1/2" insulating glass in neoprene gaskets, removable insect screens and locks so that they can be securely locked. Latching mechanism at lunchroom shall be ADA-compliant.
- E. Windows to meet or exceed Architectural Aluminum Manufacturer Association specification for water and air infiltration.

1.8 DESIGN CRITERIA – DECKS, STEPS, RAMPS & STAIRS

- A. The building shall have ramps, stairs and landings in conformance with all accessibility and building regulations. Ramps and stairs shall be constructed with non-arsenate pressure treated framing lumber with 5/4" x 6" Trex decking. Lumber to be treated with water-borne preservatives in accordance with AWPB LP-2 for above ground lumber and AWPB 22 for wood in contact with the ground.
- B. Ramps, stairs and landings shall be constructed to support a live load of 100 pounds per square foot. Ramps, stairs and landings must be adequately anchored to concrete or masonry foundation system with concrete footings at 48" below grade, minimum. If approved by the Building Official the exterior ramps, stairs and landings may be installed on precast, pyramid shaped, concrete post bases.
- C. Ramp shall not exceed a slope of 1" in 12" with landings at intervals required by the governing regulations. Stairs shall have closed risers, maximum of 7" high with 11" minimum treads.
- D. Stair or ramp landings and platforms shall be installed at the same level as the finished lunchroom floor with a maximum threshold height of 1/2".
- E. Stairs, ramps and landings shall have guards and 1-1/4" National Pipe Standards (NPS) diameter schedule 40 hollow galvanized steel pipe handrails on each side with extensions, anchoring, and locations to meet all governing regulations.

1.9 DESIGN CRITERIA - FINISHES & MISCELLANEOUS

- A. Interior surface of walls shall be finished with 5/8" thick type 'X' vinyl clad gypsum board, with flame Class 'A' fire rating. Install over 5/8" gypsum board of sound deadening board as required to meet or exceed ANSI S12.60.2002.
- B. All interior floors shall be covered with Armstrong Excelon 12" x 12" vinyl composition floor tile with 4" high vinyl cove base.
- C. All rooms must have identifying signs in accordance with all governing regulations, including ADA.
- D. Interior of lunchroom shall be equipped with 4'-0" x 16'-0" of whiteboard on the front wall and 4'-0" x 8'-0" of self sealing tack board on rear wall and one side wall.
- E. Minimum of 100 wall mounted coat hooks shall be provided. Coat hooks shall have rounded (not protruding) fronts to prevent harm to occupants.
- F. Ceiling shall be 2' x 4' x 5/8" white suspended acoustical ceiling tiles with square edge and white inverted tee suspension system. Mount ceiling at 8'-0" above the finished floor and install to meet all applicable codes and regulations, including all seismic requirements. Ceilings to have Class 'A' fire rating and acoustical properties in conformance with ANSI S12.60.2002; acoustical performance criteria.

1.10 DESIGN CRITERIA – FIRE SUPPRESSION SYSTEM

- A. Design, engineer, furnish and install wet pipe system hydraulically designed in accordance with NFPA 13 (2002 Edition) and all requirements of the authorities having jurisdiction. Submit a notarized affidavit signed by a fire protection engineer licensed in the State of Connecticut certifying that the system is in compliance with applicable federal and state codes. Sprinklers shall be pendant, concealed or sidewall type, quick response, 5.6K, and ordinary temperature classification.
- B. System to provide coverage for entire DMLB facility.
- C. Interface the system with existing building fire alarm system.

1.11 DESIGN CRITERIA – PLUMBING

- A. Provide plumbing fixtures and toilet accessories as required by Code, to serve 100 occupants and as indicated on the diagram floor plan. Plumbing fixtures and toilet accessories provided shall meet the accessibility requirements, including ADA.
 - 1. Provide one toilet paper holder at each toilet stall.
 - 2. Provide one paper towel dispenser and waste receptacle at each toilet room.
 - 3. Provide grab bars at each accessible toilet stall.
 - 4. Provide one steel framed mirror (18"x24") at each toilet room sink location.
 - 5. Provide one soap dispenser at each toilet room sink location.
 - 6. Provide one sanitary napkin dispenser at each girl/woman toilet room.
 - 7. Provide one coat hook at each toilet stall door.
- B. The DMLB Contractor shall be responsible for making all service connections to the adjacent existing utility lines.
- C. The DMLB Contractor shall furnish and install a 45 gallon electric hot water tank. Electric water heater shall be designed for simultaneous element operation w/ (2) 4500 Watt elements at 208V, heater shall be model DEL-50 as manufactured by AO Smith, or approved equal.

- D. The DMLB Contractor shall be responsible to provide temporary waste holding vessel for all domestic water and waste drainage. Tank(s) shall be buried, and shall have drain inlet and vent connections made up complete, and access for periodic pumping of the system(s). Provide calculations for review, for daily use, and storage capacity.

1.12 DESIGN CRITERIA - HEATING, VENTILATING & AIR-CONDITIONING

- A. For each building section, or as required to achieve performance criteria herein, furnish and install a single packaged, gas-fired, rooftop air conditioning unit complete with automatic controls. The units shall be capable of collectively providing a minimum of 2,000 CFM of treated outside air (20 CFM per occupant). The equipment shall be shipped completely factory assembled, pre-charged, piped and wired internally ready for field connections. All components must be UL Listed and all wiring must be in compliance with the National Electric Code. The manufacturer shall have all applicable parts and services readily available to the Owner in local market place where DMLB is installed.
- B. Compressor shall have a five (5) year warranty; all other components shall have a one (1) year warranty.
- C. Air distribution shall be from the bottom of the unit. Ducts shall be fiberglass duct or galvanized steel duct, with a minimum of 2" thick, 1.5 pound density fiberglass insulation or equivalent.
- D. Each unit shall be complete with a DX cooling coil and in-direct gas fired heat exchanger to meet the following criteria:
 - 1. Heat the building to maintain 70 degree F based on an outdoor temperature of 5 degree F.
 - 2. Cool the building to maintain 72 degree F based on an outdoor temperature of 95 degree F, with relative humidity maintained at 50%.
- E. Compressors shall be resiliently mounted, have overload protection, internal pressure relief and compressor crankcase heater. The refrigeration system shall have suction and liquid line service gauge ports, high pressure switch, reversing valve, and full refrigeration charge.
- F. Roof mounting frame and penetrating ductwork shall be flashed into the roof to provide a weatherproof connection.
- G. Provide exhaust fans for the toilet rooms. Exhaust flow rate shall be based on the number of fixtures x 75 cfm/fixture. Provide make-up air via transfer air ducts with fire dampers.
- H. Heating and air-conditioning unit shall be controlled by one (1) programmable, wall mounted Honeywell thermostat or equal in each lunchroom.
- I. All work shall be in conformance with applicable International Energy Code (2003 Edition) and ASHRAE Standard 90.1 Energy Efficiency Standards, current edition, as amended.

1.13 DESIGN CRITERIA - ELECTRICAL

- A. DMLB Contractor shall install new 3-phase, 4-wire, overhead electrical service to the building, from the local utilities point of connection, complete and with no exceptions. Provide meter socket, disconnecting means and all labor and materials to provide power to the modular building(s). Where overhead service is not practical or feasible, provide underground to pole, as coordinated with the utility company. Should underground be

required, provide pad for transformer if required.

- B. DMLB Contractor shall provide underground conduit(s) as required for telecommunications requirements of the building. Terminate at an internal backboard. Provide for voice, data and fire alarm connectivity.
- C. Modular building shall include a complete electrical system with a lockable circuit breaker panels. System shall be sized to properly operate all mechanical and electrical equipment, power outlets, lighting, etc. All equipment to be UL listed.
- D. Wall receptacles shall be 110/125 volt 3-wire duplex grounding receptacles with a minimum 15-amp rating with matching metal cover plates. Leviton Specification Grade or approved equal. Install quantity based on building code requirements and as illustrated on the typical floor plan.
- E. Each entrance/exit door of lunchroom shall have a tamper proof exterior wall mounted fixture with a 26-watt fluorescent lamp and a photocell. Additionally, each side of lunchroom building shall have a tamper proof exterior wall mounted fixture with a 26-watt fluorescent lamp and a photocell.
- F. Switches shall be Specification Grade motion sensor switches with matching metal cover plate.
- G. Lighting for building shall be 2' x 4' lay-in energy saving fluorescent fixtures, Lithonia, 2AVG332 complete with three (3) T8 lamps or equivalent. Install fixtures to supply a minimum of 40 footcandles at table level throughout the building.
- H. Emergency lights and illuminated LED exit signs with battery back-up shall be installed in all areas. Emergency lights to be installed at exterior of all doors.
- I. Data, public address and telephone systems shall be supplied and installed by a separate contract retained by the Owner. The DMLB Contractor shall install all conduits with pull wire to above the finished ceiling and all empty boxes.
- J. All wire used shall be copper conductor rated for 600 volts minimum.
- K. All electrical fixtures and equipment must meet or exceed the International Energy Conservation Code (2003 Edition) requirements.

1.14 WORK INCLUDED

- A. Scope of work outlined herein above in 1.2.
- B. All design, engineering, drawings, specifications and construction, as required, to properly permit, construct and install the Detached Modular Lunchroom Building.
- C. The responsibilities of the DMLB Contractor shall include but not be limited to the following:
 - 1. File construction documents as required and obtain all necessary State building permits and approvals.
 - 2. Provide all construction including exterior stairs, ramps and landings.
 - 3. Obtain a Certificate of Occupancy upon completion of construction.
- D. All work shall be completed in strict accordance with the Federal, State and local codes,

Code Enforcement Officials, the Fire Marshall, The Americans with Disabilities Act, The State Department of Public Works, The State Department of Education, and all other applicable regulations or authorities.

1.15 SUBMITTALS

- A. Prior to proceeding with the work of this specification provide the following for the Owner's review. Submit three (3) copies of all submittals.
 - 1. Samples of each colors and textures available for surface and finish.
 - 2. Manufacturers instructions indicating special surface preparation procedures, or substrate conditions requiring special attention.
 - 3. Sufficient data to demonstrate that all materials meet or exceed the specified requirements.
- B. Upon completion of construction, submit operating and maintenance manuals for all equipment, and all letters of certification as outlined above in this Specification section.

1.16 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified with a minimum of 10 years documented experience.
- B. DMLB Contractor: Adequate number of skilled workers that are thoroughly trained and experienced in the necessary crafts, who are completely familiar with the materials and methods required, for proper performance of the work specified.
- C. The DMLB Contractor and all Subcontractors shall be licensed and registered as required.

1.17 DELIVERY, STORAGE & HANDLING

- A. Deliver, store, protect and properly handle all products for prompt delivery and to protect against damage.

1.18 CERTIFICATIONS

- A. The DMLB Contractor shall submit the following Letters of Certification, signed by the Engineer or Architect of Record. Copies of these letters are included as part of this Specification:
 - 1. Acoustical Performance Certification.
 - 2. Seismic Certification for Ceiling, Structural, Mechanical and Electrical Systems.

PART 2 - PRODUCTS

2.1 Refer to Part 1 of this specification for information on pre-engineered and fabricated relocatable modular lunches.

2.2 Refer to:

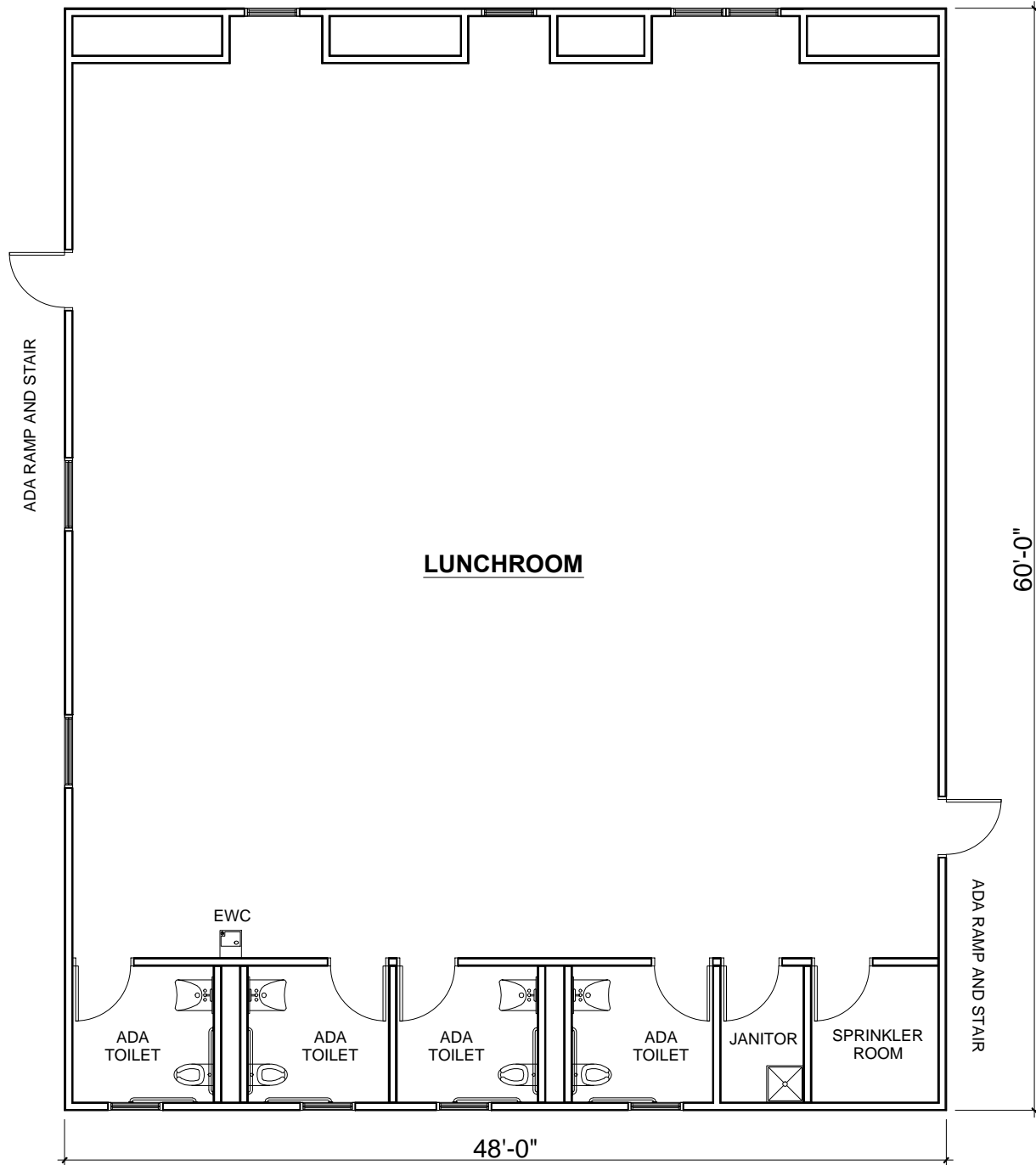
Division 3 Section "Cast-in-Place Concrete".
Division 6 Section "Misc. Rough Carpentry".
Division 7 Section "Joint Sealants".
Division 9 Section "Painting".

Division 10 Sections "Markerboards" and "Tackboards".

PART 3 - EXECUTION

- 3.1 Verify that all surfaces substrate conditions and materials are properly prepared to receive work as specified by the manufacturer. Correct conditions that will be detrimental to the proper and timely completion of the work, do not proceed until unsatisfactory conditions have been corrected.
- 3.2 DMLB Contractor shall properly maintain the site, collect all waste material, place all debris and waste in closed containers and remove from the site.
- 3.3 The DMLB Contractor shall be responsible for leaving the lunchroom broom clean and washing of all windows, upon completion of construction.
- 3.4 All items shall be installed in conformance with the respective manufacturer's specifications.
- 3.5 The DMLB Contractor must obtain a Building Permit from the Connecticut Department of Administrative Services Division of Construction Services prior to commencing work.
- 3.6 The DMLB Contractor shall disconnect and cap all utility lines servicing the DMLB, completely and legally remove and dispose the entire DMLB off site, including but not limited to, foundations, stairs, ramps, landings and other associated temporary or permanent accessories. The DMLB site shall be properly prepared to receive designated new construction and/or site improvements.

END OF SECTION



ADDENDUM # 2

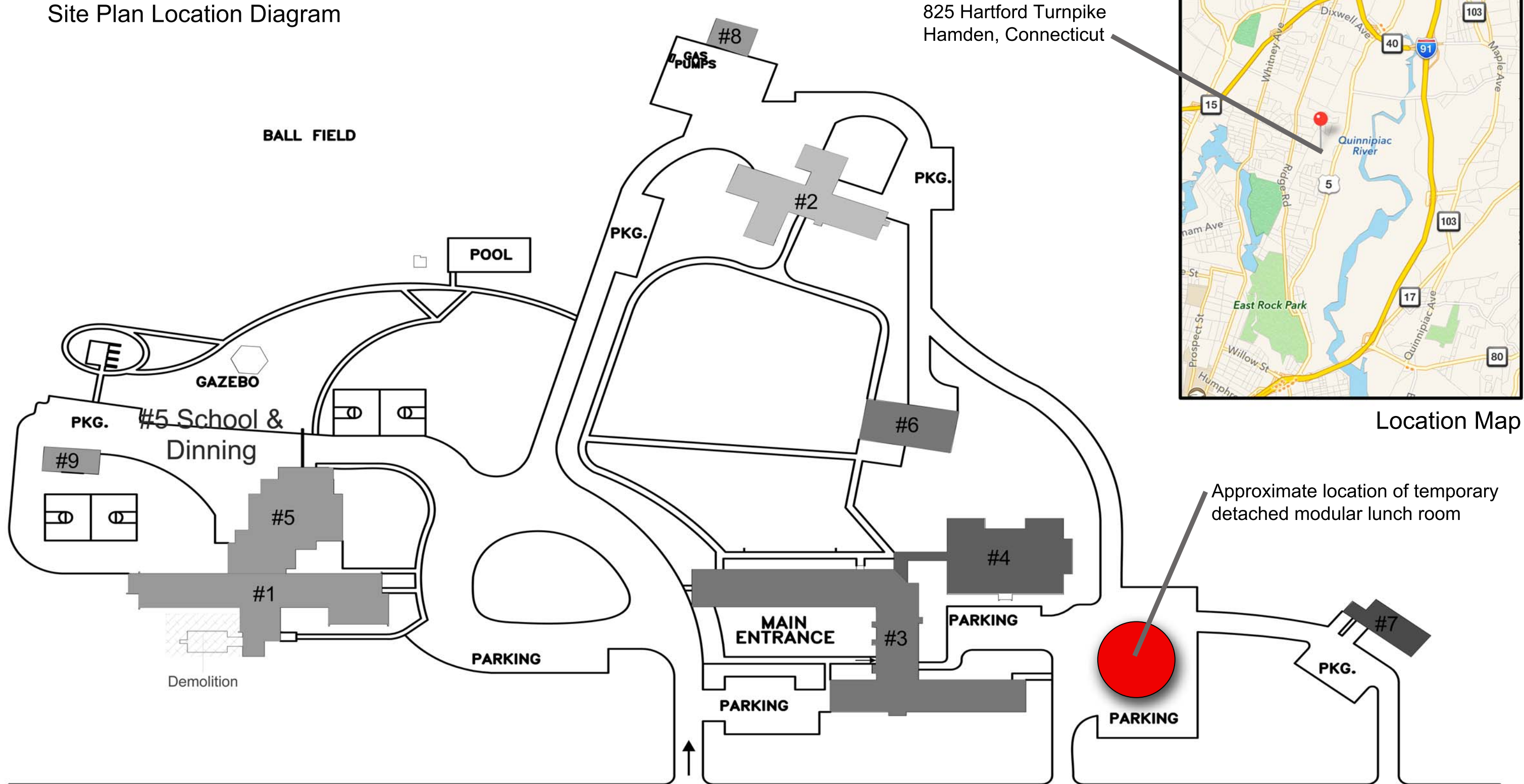
Attachment A

Specification Section 13 34 25

**Diagrammatic Floor Plan - Detached Modular
Lunch Room at High Meadows Site**

Attachment b
Section 13 34 25, Detached Modular
Lunch Room at High Meadows Site

Site Plan Location Diagram



**SECTION 21 13 13
WET-PIPE SPRINKLER SYSTEMS**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Pipe and fittings.
- B. Valves.
- C. Backflow Preventers.
- D. Wet pipe sprinkler system.
- E. System specialties.
- F. Fire department connections.
- G. System design, installation, and certification.

1.02 RELATED SECTIONS

- A. Division 2 – Sitework
- B. Division 9 - Painting.
- C. Section 23 04 00 – General Conditions for Mechanical Trades.
- D. Section 22 05 00- Common Work Results for Plumbing
- E. Section 23 05 48- Vibration Isolation and Seismic Restraints.
- F. Section 21 30 00– Fire Pumps.
- G. Division 26 – Electrical.

1.03 REFERENCES

- A. ANSI/ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
- B. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings, Class 150 and 300.
- C. ANSI/ASME B16.4 - Cast Iron Threaded Fittings, Class 125 and 250.
- D. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings.
- E. ANSI/ASME B16.9 - Factory-made Wrought Steel Butt welding Fittings.
- F. ANSI/ASME B16.11 - Forged Steel Fittings, Socket-welding and Threaded.
- G. ANSI/ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

- H. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- I. ANSI/ASME B16.25 - Butt welding Ends.
- J. ANSI/ASME B36.10 - Welded and Seamless Wrought Steel Pipe.
- K. ANSI/ASME Sec 9 - Welding and Brazing Qualifications.
- L. ANSI/ASSE 1015 – Standard for Double Check Backflow Preventer Assembly.
- M. ANSI/ASSE 1048 – Standard for Double Check Detector Assembly Backflow Preventer.
- N. ANSI/ASTM A135 - Electric-Resistance-Welded Steel Pipe.
- O. ANSI/ASTM A47 - Malleable Iron Castings.
- P. ANSI/ASME B32 - Solder Metal.
- Q. ANSI/AWS A5.8 - Brazing Filler Metal.
- R. ANSI/AWWA C110/A21.10-03 - Ductile Iron and Gray Iron Fittings.
- S. ANSI/AWWA C111 – Rubber Gasket Joints for Ductile Iron Pressure Pipe Fittings.
- T. ANSI/AWWA C151 - Ductile Iron Pipe, Centrifugally Cast.
- U. ANSI/AWWA C510 – Standard for Double Check Valve Backflow Prevention Assembly.
- V. ANSI/AWWA C606 – Standard for Grooved and Shouldered Joints.
- W. ASTM A47 – Standard for Ferritic Malleable Iron Casting.
- X. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.
- Y. ASTM A126 – Standard for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
- Z. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- AA. ASTM A536 – Standard for Ductile Iron Casting.
- BB. ASTM A795 - Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
- CC. AWS D10.9 - Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.
- DD. NFPA 13 - Installation of Sprinkler Systems.
- EE. FM - Factory Mutual Approval Guide.
- FF. UL - Fire Resistance Directory.

1.04 SYSTEM DESCRIPTION

- A. This project comprises alterations and renovations to the existing sprinkler system and additions to the existing system, as required for new building additions. The contractor shall field verify all existing conditions prior to submitting shop drawings including but not limited to, location of the existing sprinkler heads, locations and sizes of existing sprinkler piping, and available static pressure, residual pressure and flow at the base of the riser. Contractor shall make revisions to sprinkler piping as required to support the new layout of sprinkler heads, including revising sizes of existing piping.
- B. Provide a wet pipe system hydraulically designed in accordance with NFPA 13 and all requirements of the local Authority Having Jurisdiction.
- C. System to provide coverage for entire building.
- D. Provide system to NFPA Standard occupancy requirements as noted on the drawings.
- E. Hydraulic data and water supply information shall be as noted on the drawings.
- F. Interface system with building fire alarm system.
- G. The sprinkler locations and piping arrangements indicated on the contract documents are diagrammatic. It is the responsibility of the contractor to fully coordinate sprinkler and piping locations with all other trades.
- H. All sprinklers installed in a light hazard classification occupancy shall be a listed quick response type.

1.05 SUBMITTALS

- A. Submit under provisions of Division 1 and Section 23 04 00.
- B. Where the terms “authorities having jurisdiction” is used, within this Specification, it is intended to include the Insurance Underwriter and all regulatory agencies having vested interest in this project.
- C. Shop Drawings:
 - 1. Provide fire protections shop drawings drawn to a minimum scale of $\frac{1}{4}''=1'-0''$. Indicate pipe materials used, joining methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
 - 2. Provide hydraulic calculations, detailed pipe layout, hangers and supports, components and accessories. Indicate system controls.
 - 3. All sprinkler drawings and calculations shall bear the seal of a Professional Engineer licensed in the State of Connecticut. Seal and signature shall not be copied and shall be provided as an original drawing and each calculation.
 - 4. Sprinklers shall be as shown on drawings and submittals and shall be specifically identified with the applicable style or series designation as published in the appropriate agency listing or approval. Trade names or other abbreviated designations are not permitted.

- D. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- E. After successful review by the Engineer, submit sprinkler layout shop drawings, product data, hydraulic calculations to authority having jurisdiction, Fire Marshall, and Owner's insurance underwriter for approval. Submit proof of approval to Architect/Engineer.
- F. Grooved joint couplings and fittings shall be shown on shop drawings and product submittals and shall be specifically identified with the applicable Victaulic style or series designation.
- G. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and all code requirements.

1.06 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 1 and Section 23 04 00.
- B. Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.07 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 1, Section 23 04 00, and Section 23 05 00.
- B. Maintenance Instructions: Include installation instructions, spare parts lists, procedures, and treatment programs.

1.08 QUALITY ASSURANCE

- A. Workmanship and Qualifications: All materials and equipment shall be installed in accordance with NFPA and all applicable local codes and ordinances. The Sprinkler Contractor shall be state licensed to install sprinkler systems. The Sprinkler Contractor shall make sure that all work and materials conform to the requirements set forth by this Specification. Fire protection equipment shall be installed to conform to NFPA as applicable, and devices used shall be listed and approved by Underwriters laboratories (UL) and/or Factory Mutual (FM).
- B. Codes and Standards: All work shall be equal or superior to that required by codes, regulations, ordinances, and laws imposed by the jurisdictional authorities, including those of the State of Connecticut, State Fire Marshall, local ordinances and OSHA. Nothing in the Specifications permit violations of such directives, and where conflict occurs, the directive shall govern, except where superior work is specified or indicated.
- C. In addition to complying with the above codes and regulations, comply with the requirements of the following:
 - 1. NFPA Standard 13, 14, 20.
 - 2. State Building and Fire Codes.
 - 3. Local Jurisdictional Authorities.

- D. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
 - E. Valves: Bear UL and/or FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
 - F. All items of similar class shall be the products of the same manufacturer. All valves, accessory items, etc., shall be from the same source.
 - G. Maintain one copy of each applicable NFPA standard on site.
 - H. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
 - I. Installer: Company specializing in performing work of this Section with minimum five years experience.
 - J. Design sprinkler system under direct supervision of a Professional Engineer experienced in design of this Work and licensed in the State where the project is located
 - K. All items of similar class shall be the products of the same manufacturer. All valves, accessory items, etc., shall be from the same source.
- 1.09 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect and handle products to site under provisions of Division 1, Section 23 04 00, and Section 23 05 00.
 - B. Deliver and store products in shipping containers, with labeling in place.
 - C. Provide temporary protective coating on cast iron and steel valves.
 - D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
 - E. All equipment, valves, gages and etc., shall be covered and protected during the execution of the work. All equipment and piping shall be protected from freezing. Labeling to remain in place.
 - F. All unloading, hauling, and handling of materials shall be the responsibility of the Sprinkler Contractor.
 - G. The Sprinkler Contractor can obtain information on available storage space on site from the Owner when making examination of the site.
- 1.10 WARRANTY
- A. Provide a minimum of five year warranty on dry pipe system air compressor.
 - B. Provide under provision of Division 1 and Section 23 04 00.
- 1.11 EXTRA MATERIALS
- A. Furnish under provisions of Division 1 and Section 23 04 00.

- B. Provide extra sprinklers under provisions of NFPA.
- C. Provide suitable wrenches for each head type.
- D. Provide metal storage cabinet adjacent to the sprinkler riser. [in location designated].

PART 2 - PRODUCTS

2.01 BURIED PIPING

- A. Ductile Iron Pipe: ANSI/AWWA C151, cement lined.
 - 1. Fittings: ANSI/AWWA C110, standard thickness.
 - 2. Joints: ANSI/AWWA C111, rubber gasket.

2.02 ABOVE GROUND PIPING

- A. Steel Pipe: ASTM A53; Schedule 40 seamless carbon steel. Schedule 10 pipe shall be allowed for pipe sizes larger than 2" diameter when roll grooved mechanical couplings are used. Plain end joint connections shall not be used.
 - 1. Cast Iron Fittings: ANSI/ASME B16.1, flanges and flanged fittings; ANSI/ASME B16.4, screwed fittings.
 - 2. Malleable Iron Fittings: ANSI/ASME B16.3, screwed Class 300 type. Threads shall conform to ANSI/ASTM A47.
 - 3. Grooved Mechanical Fittings: ANSI A21.10/AWWA C-110 ductile iron; ASTM A536 Grade 65-45-12 ductile iron; ASTM A234 Grade WPB; or factory fabricated from carbon steel pipe conforming to ASTM A53; with grooves or shoulders designed to accept grooved end couplings. Fittings shall be of the same manufacturer as the adjoining couplings.
 - 4. Grooved Mechanical Couplings: ASTM A536 Grade 65-45-12, ductile iron housing, elastomer gasket with nuts and bolts to secure roll grooved pipe and fittings.

Fire Protection Service	Temperature Range	Gasket Recommendation
Dry Systems	Ambient	FlushSeal®, Grade EPDM, Type A
Freezer Applications	-40 °F to 0 °F	FlushSeal®, Grade L, Silicone
Water/Wet Systems	Ambient	Grade EPDM, Type A

- a. Rigid Type Couplings: Housings cast with offsetting, angle-pattern bolt pads to provide rigidity and system support and hanging in accordance with NFPA-13.
 - 1) 1-1/4" through 4": Factory assembled for direct stab installation without field disassembly. Victaulic Style 009 EZ.
 - 2) 5" through 8": Victaulic FireLock™ Style 005.
 - 3) 10" and larger: Victaulic Zero-Flex® Style 07.

- b. Flexible Type Couplings: Use in locations where vibration attenuation and stress relief are required, and for seismic considerations in accordance with the manufacturer's instructions. Victaulic Style 75.
- 5. Joints:
 - a. Grooved Mechanical Couplings: ASTM A536 Grade 65-45-12, ductile iron housing, FlushSeal® elastomer gasket with nuts and bolts to secure roll grooved pipe and fittings. Housings cast with offsetting, angle-pattern bolt pads to provide rigidity, and manufactured to connect copper tubing and fittings without flaring. Victaulic Style 606.
- B. Cast Iron Pipe: ANSI/AWWA C151.
 - 1. Fittings: ANSI/AWWA C110, standard thickness.
 - 2. Joints: ANSI/AWWA C111, rubber gasket.
 - 3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.03 VALVES – MANUFACTURERS

- A. Valves listed within this specification shall be the manufacturer and model as specified. Other acceptable manufacturers offering equivalent products include:
 - 1. Kennedy Valve Mfg. Co.
 - 2. The Fairbanks Co.
 - 3. Stockham Valves and Fittings.
 - 4. Victaulic
 - 5. Nibco.

2.04 GATE VALVES

- A. Up to and including 2 inches (50 mm):
 - 1. Kennedy Valve Mfg. Co.
 - 2. Bronze body, bronze trim, 175 pound cold water, non-shock working pressure, rising stem, handwheel, inside screw, solid wedge disc, threaded ends.
- B. Over 2 inches (50 mm):
 - 1. Acceptable Manufacturers:
 - a. Victaulic Company Series 771.
 - 2. UL listed and FMG approved, iron body, bronze trim, 175 pound cold water, non-shock working pressure. Valve shall have solid taper wedge; outside screw and yoke, rising stem; flanged bonnet with body and bonnet conforming to ASTM

A126 Class B; replaceable bronze wedge facing rings; grooved or flanged ends; and a packing assembly consisting of a cast iron gland flange, brass gland, packing, bonnet and bronze bonnet bushing. Valve shall be capable of being repacked under pressure, with valve wide open.

2.05 GLOBE VALVES

A. Up to and including 2 inches (50 mm):

1. Stockham, Model # B-16.
2. Class 125, Bronze body, bronze trim, rising stem, handwheel, inside screw, renewable composition disc, screwed ends, with back-seating capacity, repackable under pressure.

2.06 BALL VALVES

A. Up to and including 2 inches (50 mm):

1. Acceptable Manufacturers:
 - a. Victaulic Company Series 728.
2. UL listed and FMG approved, bronze two piece body, standard port, chrome plated brass ball, 316 stainless steel stem, teflon seats, brass stem nut, die-cast brass gear box with supervisory switches, threaded or grooved ends.

2.07 CHECK VALVES

A. Up to and including 2 inches (50 mm):

1. Stockham, Model # B-319Y.
2. Class 125, Bronze swing disc, screwed ends.

B. Horizontal Swing, Over 2 inches (50 mm):

1. Acceptable Manufacturers:
 - a. Victaulic Series 712.
2. 300 psi CWP, ductile iron body and coupled cap conforming to ASTM A536, Grade 65-45-12; horizontal swing, with stainless steel disc, elastomer seat, and grooved ends.
3. Class 175, cast iron body and bolted cap conforming to ASTM A126, Class B; horizontal swing, with a bronze disc or cast iron disc with bronze disc ring, and flanged ends.
4. Valve shall be capable of being refitted while the valve remains in line.

C. Spring Actuated , Over 2 inches (50 mm):

1. Victaulic Series 717.

2. 300 psi CWP, ductile iron body conforming to ASTM A536, Grade 65-45-12; vertical or horizontal check; with stainless steel spring and shaft.
 - a. 2-1/2 (65 mm) and 3 inches (75 mm): Aluminum bronze disc with disc mounted elastomer seal and PPS (Polyphenylene Sulfide) coated seat.
 - b. 4 inches (100 mm) and Larger: Elastomer coated ductile iron disc with welded-in nickel seat.

2.08 DRAIN VALVES

- A. Stockham Valves & Fittings, Model #S-214-FBR-TT.
- B. Bronze compression stop with hose thread nipple and cap.
- C. Brass ball valve with cap and chain, 3/4 inch (19 mm) hose thread.

2.09 BUTTERFLY VALVES

- A. Over 2 inches (50 mm): UL listed and FMG approved.
 1. Victaulic Valves:
 - a. Series 705W (For use with IPS steel piping.)
 - b. Series 608 (For use with copper tubing).
- B. Body:
 1. Ductile iron body, ductile iron disc with EPDM disc coating and integrally cast stem, grooved ends.
 2. Cast bronze body, ductile iron disc with EPDM disc coating and integrally cast stem, copper-tubing dimensioned grooved ends.
 3. Cast iron with resilient replaceable EPDM seat, wafer or lug ends, extended neck with 316 stainless steel stem, MSS-SP-67, 200 psi.
- C. Disc:
 1. EPDM coated ductile iron.
 2. Aluminum bronze.
- D. Operator:
 1. Notched plate lever handle or handwheel.
 2. Weatherproof actuator with supervisory switches.

2.10 UNIONS AND DIELECTRIC CONNECTIONS

- A. Unions for Pipe 2 Inches (50 mm) and Under:
 1. Ferrous Piping: 150 psig (1034 kPa) malleable iron, threaded.
 2. Copper Pipe: Bronze, soldered joints.

- B. Dielectric Connections: Union, waterway fitting, or flange with water impervious isolation barrier; Victaulic Style 47 or Watts 3000 Series or approved equal.

2.11 BACKFLOW PREVENTERS

- A. Manufacturers:
 - 1. Ames.
 - 2. Watts
 - 3. Zurn
 - 4. Febco
- B. Double Check Valve Assembly: ANSI/ASSE 1015, AWWA C510; bronze body; two independently operating, spring loaded check valves, assembly with two gate valves, strainer, and test cocks. Watts 709 or approved equal.
- C. Double Check Detector Check Valve Assemblies: ANSI/ASSE 1048, AWWA C510; bronze body; two independently operating, spring loaded check valves; metered bypass; assembled with two gate valves, strainer, test cocks. Watts 709RPDA or approved equal.
- D. Double Check Valve Assemblies: ANSI/ASSE 1015, AWWA C510; bronze body; two independently operating, spring loaded check valves; assembled with two butterfly valves, strainer, test cocks. Watts 757-BFG or approved equal.
- E. Double Check Detector Check Valve Assemblies: ANSI/ASSE 1048, AWWA C510; bronze body; two independently operating, spring loaded check valves; metered bypass; assembled with two butterfly valves, strainer, test cocks. Watts 757DCDA-BFG or approved equal.

2.12 SPRINKLERS

- A. Manufacturers:
 - 1. Viking Corp.
 - 2. Victaulic.
 - 3. Tyco.
- B. All sprinklers shall be adjustable, glass bulb, automatic sprinklers with ½ inch orifice and 5.6 K-factor unless noted otherwise. Type of sprinkler head shall be as indicated on the plans and in accordance with the following.
- C. Sprinkler bodies shall be die-cast brass, with hex shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation.
- D. Unless noted otherwise, ordinary temperature rated sprinkler heads shall be used throughout the building.
- E. Where sprinklers will be installed in close proximity to heat sources and special locations, as identified in NFPA 13, temperature ratings shall be in accordance with the requirements of NFPA 13.

- F. Where plans call for extended coverage sprinkler heads coordinate coverage requirements with required pressure and K-factor.
- G. Spare Sprinklers: The Sprinkler Contractor shall furnish spare automatic sprinklers in accordance with the requirements of NFPA for stock of extra sprinklers. The sprinklers shall be packed in a suitable container and shall be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed. The Sprinkler Contractor shall furnish no less than two special sprinkler wrenches, or at least one wrench for each container or sprinkler box, whichever is greater.
- H. In areas where sprinkler heads are subject to physical damage, provide sprinkler guard assembly over head, finish to match sprinkler finish. This shall include but not limited to the following locations.
1. Heads in elevator shafts
 2. Heads under lower rakes of stairways
 3. Heads in electrical rooms, boiler rooms and other mechanical rooms.
 4. Heads installed 7'-0" or less above finished floors.
 5. Heads in gymnasium/fitness center areas.
- I. Sprinklers shall be in accordance with the following table.

Sprinkler Type	Sprinkler Finish	Manufacturer/Model Number
Pendant Type Sprinklers	Chrome plated finish with chrome plated surface escutcheon	Victaulic Model V2707.
Upright Type Sprinklers	Brass finish.	Victaulic Model V2703.
Semi-recessed Pendant Type Sprinklers	Chrome plated finish with chrome plated, adjustable semi-recessed escutcheon.	Victaulic Model V2707.
Concealed Type Sprinklers	Brass finish with factory painted white cover plate.	Victaulic Model V3801.
Sidewall Type Sprinklers	Chrome plated finish with chrome plated, adjustable, semi-recessed escutcheon.	Victaulic Model V2709.
Quick-response Pendant and Upright Type Sprinklers	Chrome plated finish with chrome plated, adjustable, semi-recessed escutcheon.	Victaulic Model V2708 and V2704.
Quick-response Sidewall Type Sprinklers	Chrome plated finish with chrome plated, adjustable, semi-recessed escutcheon.	Victaulic Model V2710.
Sprinkler Type	Sprinkler Finish	Manufacturer/Model Number
Quick-response Concealed Type	Brass finish with factory painted white cover plate.	Victaulic Model V3802.

Sprinklers		
Dry Pendant Type Sprinklers	Chrome plated finish with chrome plated, adjustable, semi-recessed escutcheon.	Victaulic Model V3607.
Dry Horizontal Sidewall Type Sprinklers	Chrome plated finish with chrome plated, adjustable, semi-recessed escutcheon.	Victaulic Model V3609.
Quick-response Dry Pendant Type Sprinklers	Chrome plated finish with chrome plated, adjustable, semi-recessed escutcheon.	Victaulic Model V3608.
Quick-response Dry Horizontal Sidewall Type Sprinklers	Chrome plated finish with chrome plated, adjustable, semi-recessed escutcheon.	Victaulic Model V3610.

2.13 ALARM VALVES

A. Manufacturers:

1. Viking Corp.
2. Reliable.
3. Tyco

B. Wet Pipe Alarm Valve:

1. Check type valve with brass seat ring, Teflon coated HR steel clapper with EPDM seal to automatically actuate electrically and hydraulically operated alarms, with pressure retard chamber and variable pressure trim. Valve internal components shall be replaceable without removing valve from the installed position. Valve shall be Model J-1 as manufactured by Viking Corporation or engineer approved equal.
2. Provide Viking Model C-1 retard chamber as part of wet alarm valve trim to allow for pressure fluctuations. Provide all other trim as recommended by the manufacturer.
3. Alarm check valve assembly shall allow discharge of one or more sprinklers to activate electric and hydraulic alarms.

2.14 SPECIALTIES

A. Manufacturers:

1. Potter Co.
2. Potter-Roemer.
3. Viking

4. System Sensor

- B. Electric Alarm: Electrically operated red enameled [chrome plated] gong with pressure alarm switch, 120 volt with weatherproof back box.
- C. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two form C contacts; rated 10 amp at 120 volt.
- D. Valve Tamper Supervisory Switch: Two form C contacts; rated 10 amp at 120 volt. UL listed and FM approved. Up to 2" – Potter Model PCVS-1. Over 2" switch shall be Potter Model OSYSU-2.
- E. Pressure Switch: ½ inch male pressure connection to alarm valve riser and actuated by any flow of water in excess of one sprinkler. Maximum pressure rating 175 psi, weather-proof with tamper resistant screws, rated 10 amps at 120 volt.
- F. Pressure Gage: Rated for 300 psi use, 3-1/2" in diameter.

2.15 FIRE DEPARTMENT CONNECTIONS

A. Manufacturers

- 1. Crocker Model# 6369 or approved equal
 - a. Other acceptable manufacturers include:
 - 1) Potter Roemer.
 - 2) Viking Corp.
 - 3) Victaulic.
- B. Fire department connection shall be 5" stortz , polished chrome, post mounted type connection. Provide with polished chrome identification plate.
- C. Provide polished chrome alloy caps and chains for protection of the inlet.
- D. The fire department connection shall be constructed of cast brass with brass clapper, brass swivel couplings and a brass hinge pin. The words "AUTO SPKR" and "F.D. Conn" shall be cast in raised letters on the body.
- E. Fire department connection threads shall match the local fire departments standard.
- F. Provide ball drip at low point after check valve.
- G. Provide a 90-degree elbow with drain connection at each fire department connection to allow for drainage in areas exposed to the building exterior to prevent freezing. Elbow shall be Victaulic #10-DR.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate work of this Section with other affected work.
- B. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.
- C. Remove scale and foreign material, from inside and outside, before assembly.
- D. Prepare piping connections to equipment with grooved joint couplings, flanges, or unions.

3.02 INSTALLATION - GENERAL

- A. Install equipment in accordance with manufacturers instructions.
- B. Install fire protection systems in accordance with NFPA 13 for sprinkler systems.
- C. Impairments to the existing water supplies shall be minimized. All work shall be complete before making the final connections to the existing water supplies. The Contractor shall notify the owners representative before impairing any fire protection equipment.
- D. The Contractor shall maintain a clean and orderly site during the installation of the sprinkler system. Materials shall not be stored in the halls or other public areas.
- E. Cutting, welding and other hot work shall not be permitted without permission from the building owner. Contractor shall provide a fire watch for one hour after all welding.
- F. The required tests shall be witnessed by the Fire Marshall, authority having jurisdiction, Owner's insurance underwriter and Architect/Engineer.

3.03 INSTALLATION – PIPE AND FITTINGS

- A. Pipe/insulation: All wet sprinkler piping must be plumbed on the heated side of the building insulation to prevent freezing. The fire protection contractor must install the wet sprinkler piping such that space is provided around all wet piping for insulation to be installed. The space required for insulation is dictated by the insulation R-value for the specific area as specified by the Architect.
- B. Place piping in concealed spaces above finished ceilings unless noted otherwise.
- C. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- D. Install piping to conserve building space, to not interfere with use of space and other work.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Use Victaulic Style 77 or 75 couplings in accordance with Victaulic instructions for expansion and contraction of pipe.

- G. Grooved joint couplings and fittings shall be installed in accordance with the manufacturer's written installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be verified as suitable for the intended service prior to installation. Gaskets shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved joint products. The manufacturer's representative shall periodically visit the jobsite and review installation. Contractor shall remove and replace any joints deemed improperly installed.
- H. Pitch piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- I. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Division 9.
- J. Do not penetrate building structural members unless indicated.
- K. Provide sleeves when penetrating footings, floors and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required. Refer to Section 23 05 00.
- L. Die cut screw joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.
- M. Provide surge restrainers on all end of branches and arm overs in excess of 12-inches
- N. Where piping passes through rated partitions furnish and install Victaulic Style 155 flexible connector or approved equal on both sides of penetration.

3.04 INSTALLATION – VALVES

- A. All valves shall be accessible for operation and servicing. Provide access panels where required.
- B. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.
- C. Provide butterfly or gate valves for shut-off or isolating service.
- D. Provide drain valves at main shut-off valves, low points of piping and apparatus.
- E. Install buried shut-off valves in valve box. Provide post indicator valve.
- F. Provide dielectric fittings whenever joining two dissimilar metals

3.05 INSTALLATION – SPECIALTIES

- A. Provide Double check valve assembly at sprinkler system water source connection. Install a drain line from the air gap fitting and terminate at the nearest floor drain. The backflow preventer shall be installed at a minimum height to allow installation of the air gap fitting, but shall not be installed at more than 5'0" above finished floor for maintenance.

- B. Locate fire department connection with sufficient clearance from walls, obstructions, etc., to allow full swing of fire department wrench handle. Coordinate the exact location of the fire department connection with the local fire officials. Installation shall conform to the local fire officials requirements.
- C. Installation of Alarm Valves: Install a drain line from the drain connection to the nearest floor drain. Install a test line from the test connection to the exterior of the building. Provide a splash block. Provide gate valves at each line. Minimum Alarm valve riser shall be 4-inch.
- D. Center heads in two directions in ceiling tile and provide piping offsets as required.
- E. Sprinkler Bulb protector must remain in place until the sprinkler is completely installed. Remove the bulb protector by hand after installation and before the system is placed in service. (Do not use any tools to remove the bulb protector.)
- F. Do not install sprinklers that have been dropped, damaged, or show a visible loss of fluid. Never install sprinklers with cracked bulbs.
- G. Apply masking tape or paper cover to ensure concealed sprinkler head cover plates do not receive field paint finish.
- H. Install and connect to fire pump system in accordance with Section 23 30 00 and NFPA 13 and NFPA 20.
- I. Coordinate flow switches, tamper switches, and all other sprinkler devices with the fire alarm system.
- J. Provide wire guards on sprinklers as indicated on drawings.

3.06 TESTING

- A. Piping: The complete system shall be subject to a pressure test, and to such other tests as the authorities having jurisdiction may require. The pressure test shall be a hydrostatic pressure of 200 pounds per square inch for a period of two hours. The above ground piping and attached appurtenances shall show no pressure loss or leaks, refer to NFPA Standard 13 Hydrostatic tests. For buried piping refer to NFPA Standard 24 Testing Underground Systems. Before applying specified test pressure, all air must be expelled from the system. All defects of whatever type shall be repaired or replaced to the satisfaction of the Owner and authorities having jurisdiction and at no additional cost to the Owner. Packing rings, special joint bolts, gaskets, and other material required for the proper installation of the pipe and fittings shall be provided. Testing shall be completed prior to permanent sealing of walls and partitions.
- B. Leaks in mechanical joints shall be repaired by dismantling the joint, reassembling it, and tightening the bolts in the correct order. Leaks in screw or grooved joint shall be repaired by dismantling the joint and reassembling it. Attempting to repair leaks in joints by over tightening the bolts or fittings shall not be permitted.
- C. Upon satisfactory completion of all tests, the Contractor shall submit three copies of the Standard Contractors Material and Test Certificate to the Owner.

- D. Once the system is installed, hydrostatically tested, sprinkler waterflow alarm acceptance testing shall be conducted on the system and FM Global Form 85A, *Contractor's Material and Test Certificate for Automatic Sprinkler Systems*, shall be completed and submitted to FM Global for review and comment.
- E. Once all underground fire protection mains are installed, they shall be flushed and hydrostatically tested in accordance with Data Sheet 3-10, *Installation and Maintenance of Private Service Mains and Their Appurtenances*. Flowing 2 in. drains is not an acceptable method of flushing lead-ins. All flushing shall be conducted as follows:

<u>Pipe Size</u>	<u>Minimum Flow Rate</u>
6 in.	880 gpm
8 in.	1,560 gpm
10 in.	2,440 gpm
12 in.	3,520 gpm

Additionally, FM Global Form 85B, *Contractor's Material & Test Certificate for Underground Piping*, shall be completed and submitted to FM Global for review.

3.07 IDENTIFICATION

- A. Provide and apply signs to control, drain, test and alarm valves to identify their purpose and function. Provide and permanently attach hydraulic calculations data nameplate at the controlling valve for the sprinkler system. Provide lettering size and style from NFPA's suggested styles.

END OF SECTION

**SECTION 22 04 00
GENERAL CONDITIONS FOR PLUMBING TRADES**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Each Contractor, Subcontractor and/or supplier 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 RELATED REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. This section applies to certain sections of Division 16/26, "Electrical," and this section applies to all sections of Division 15/22 & 23, "Mechanical" of this project specification unless specified otherwise in the individual sections.

1.3 DESCRIPTION

- A. The General Conditions and Supplementary General Conditions are a part of this Division and are to be considered a part of this Contract.
- B. Where items of the General Conditions and Supplementary General Conditions are repeated in other Sections of the Specifications, it is merely intended to qualify or to call particular attention to them. It is not intended that any other parts of the General Conditions and Supplementary General Conditions shall be assumed to be omitted if not repeated therein. This Section applies equally and specifically to all Contractors supplying labor and/or equipment and/or materials as required under each Section of this Division. Where conflicts exist between the drawings and the specifications or between this section of the specifications and other sections, the more stringent or higher cost option shall apply.

1.4 INTENT

- A. It is the intent of the Specifications and Drawings to call for finished work, tested and ready for operation.
- B. Any apparatus, appliance, material or work not shown on drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation as determined by good trade practice even if not particularly specified, shall be furnished, delivered and installed under their respective Divisions without any additional expense to the Owner.
- C. Minor details not usually shown or specified but necessary for proper installation and operation shall be included in the work as though they were hereinafter shown or specified.
- D. Work under each Section shall include giving written notice to the Owner and Engineer of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; and any necessary items of work omitted. In the absence of such written notice, it is mutually agreed that work under each Section includes the cost of all required items for the accepted, satisfactory functioning of the entire system without extra compensation.

1.5 DEFINITIONS

- A. Approve: The term "approved," where used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in General and Supplementary Conditions.
- B. "Approved equal" mean any product which in the opinion of the Engineer is equal in quality, arrangement, appearance, and performance to the product specified.
- C. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Engineer," "requested by the Engineer," and similar phrases.
- D. "Finished" refers to all rooms and areas to be specified to receive architectural treatment as indicated on the drawings. All rooms and areas not covered, including underground tunnels and areas above ceilings shall be considered not finished, unless otherwise noted.
- E. "Furnish" or "supply" shall mean purchase, deliver to, and off-load at the job site, ready to be installed including where appropriate all necessary interim storage and protection.
- F. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.
- G. "Install" shall mean set in place complete with all mounting facilities and connections as necessary ready for normal use or service.
- H. "Product" shall mean any item of equipment, material, fixture, apparatus, appliance or accessory installed under this Division.
- I. "Provide" shall mean furnish (or supply) and install as necessary.
- J. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- K. Remove: The term "remove" means "to disconnect from its present position, remove from the premises and to dispose of in a legal manner."
- L. Special Warranties: The term "Special Warranties" are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.
- M. Standard Product Warranties: The term "Standard Product Warranties" are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- N. "Subcontractor" means specifically the subcontractor working under this Division. Other Contractors are specifically designated "Plumbing Subcontractor", "General Contractor" and so on. Note: Take care to ascertain limits of responsibility for connecting equipment which requires connections by two or more trades.
- O. Substitutions: Requests for changes in products, materials, equipment, and methods of construction proposed by the Contractor are considered requests for "substitutions."

- P. "Wiring" shall mean cable assembly, raceway, conductors, fittings and any other necessary accessories to make a complete wiring system.

1.6 DRAWINGS

- A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. Consult the Architectural Drawings and Details for exact location of fixtures and equipment; where same are not definitely located, obtain this information from the Architect. (Do not scale the drawings)
- B. Work under each Section shall closely follow Drawings in layout of work; check Drawings of other Divisions to verify spaces in which work will be installed. Maintain maximum headroom; where space conditions appear inadequate, Owner and Engineer shall be notified before proceeding with installations.
- C. The Owner may, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades and/or for proper execution of the work.
- D. Where variances occur between the Drawings and Specifications or within either of the Documents, the item or arrangement of better quality, shall be included in the Contract price. The Owner and Engineer shall decide on the item and the manner in which the work shall be installed.

1.7 SURVEYS AND MEASUREMENTS

- A. Before submitting his Bid, the Contractors shall visit the site and become thoroughly familiar with all existing conditions under which work will be installed. This Contract includes all modifications of existing systems required for the installation of new equipment. This Contract includes all necessary offsets, transitions and modifications required to install all new equipment in existing spaces. All new and existing equipment and systems shall be fully operational under this Contract before the job is considered complete. The Contractors shall be held responsible for any assumptions he makes, any omissions or errors he makes as a result of his failure to become fully familiar with the existing conditions at the site and the Contract Documents.
- B. The Contractor shall base all measurements, both horizontal and vertical, from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the work.
- C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or which interfere with the intent of the Drawings and Specifications, the Engineer will be notified and work will not proceed until instructions from the Engineer are received.

1.8 CODES AND STANDARDS

- A. Reference Standard Compliance
 - 1. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), and Underwriters Laboratories Inc. (UL), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.
 - 2. Independent Testing Organization Certificate: In lieu of the label or listing indicated above, submit a certificate from an independent testing organization,

competent to perform testing, and approved by the Engineer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

- B. The Following Codes and Standards listed below apply to all mechanical work. Wherever Codes and/or Standards are mentioned in these Specifications, the latest applicable edition or revision shall be followed:

Connecticut State Building Code - Connecticut Supplement
The International Building Code
The International Mechanical Code
The International Plumbing Code
The International Energy Conservation Code
The National Electrical Code
NFPA 101 Life Safety
ASHRAE 90.1 and International Energy Conservation Code

- C. The following Standards shall be used where referenced by the following abbreviations:

ACGIH	American Conference of Governmental Industrial Hygienists
AGA	American Gas Association
AIA	American Institute of Architects
ANSI	American National Standards Institute
API	American Petroleum Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society of Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CGA	Compressed Gas Association
CSA	Canadian Standards Association
CISPI	Cast Iron Soil Pipe Institute
EJMA	Expansion Joint Manufacturing Association
EPA	Environmental Protection Agency
FM	Factory Mutual
FSSC	Federal Specification
HIS	Hydraulic Institute Standards
IEEE	Institute of Electrical and Electronics Engineers
IRI	Industrial Risk Insurers
ISO	Insurance Services Office
MCAA	Mechanical Contractors Association of America
NBS	National Bureau of Standards
NEBB	National Environmental Balancing Bureau
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NOFI	National Oil Fuel Institute
NSC	National Safety Council
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PDI	Plumbing and Drainage Institute
SBI	Steel Boiler Industry (Division of Hydronics Institute)
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
STI	Steel Tank Institute
UL	Underwriters' Laboratories

- D. All materials furnished and all work installed shall comply with the rules and recommendations of the NFPA, the requirements of the local utility companies, the recommendations of the fire insurance rating organization having jurisdiction and the requirements of all Governmental departments having jurisdiction.
- E. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus and Drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether shown on Drawings and/or specified or not.

1.9 PERMITS AND FEES

- A. The Contractor shall give all necessary notices, obtain all permits; and pay all Government and State sales taxes and fees where applicable, and other costs, including utility connections or extensions in connection with the work, file all necessary Drawings, prepare all documents and obtain all necessary approvals of all Governmental and State departments having jurisdiction, obtain all required certificates of inspection for his work, and deliver a copy to the Owner and Engineer before request for acceptance and final payment for the work.

1.10 EQUIPMENT SUBSTITUTIONS

- A. In these Contract Documents, one or more makes of materials, apparatus or appliances may have been specified for use in this installation. These describe the basis of design and approved equivalents. This has been done for convenience in fixing the standard of workmanship, finish and design required for installation without consideration of any or all costs associated but not limited to (structural, mechanical, or electrical feeder, breaker, or transformer requirements). The Contractor acknowledges that not all requirements are shown for either alternate acceptable manufacturers listed or those alternates requiring a request for substitution and it is their responsibility to coordinate all requirements necessary to accommodate any change from the basis of design listed or scheduled. The contractor is required to submit any and all costs (including costs associated or required by all trades) along with performance differences as part of their request for substitution. The details of workmanship, finish and design, and the guaranteed performance of any material, apparatus or appliance which the Contractor desires to deviate for those mentioned herein shall also conform to these standards.
- B. Where no specific make of material, apparatus or appliance is mentioned, any first-class product made by a reputable manufacturer may be submitted for the Engineers review.
- C. Where two or more names are given as approved manufacturers of equivalents, the Contractor must use the specified item or one of the named equivalents which still must meet all of the performance characteristics of the basis of design make and model. Where one name only is used and is followed by the words "or approved equal", the Contractor must use the item named or he is required to apply for a substitution. Where one name only is used, the Contractor must use that item named.
- D. Where the Contractor proposes to deviate (provide an equivalent or request for substitution) from the equipment or materials as hereinafter specified, they are required to submit a requested for substitution in writing. The Contractor shall state in their request whether it is a substitution or a non approved equivalent to that specified and the amount of credit or extra cost involved. A copy of said request shall be included in the Base Bid with manufacturer's equipment cuts. The Base Bid shall be based on using the materials and equipment as specified with no exceptions.
- E. Where the Contractor proposes to use an item of equipment other than specified or detailed on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural

- layout, all such redesign and all new drawings and detailing required therefore shall be prepared by the Engineers/Architects of Record at the expense of the Contractor and at no additional cost to the Owner.
- F. Where such accepted deviation resulting from using an approved equivalent or substitution requires a different quantity and arrangement of piping, ductwork, valves, pumps, insulation, wiring, conduit and equipment from that specified or indicated on the Drawings, the Contractor shall, after acceptance by the Engineer, furnish and install any such additional equipment required by the system at no additional cost to the Owner, including any costs added to other trades due to the deviation.
- G. Equipment, material or devices submitted for review as an "equivalent" shall meet the following requirements:
1. The equivalent shall have the same construction features such as, but not limited to:
 - a. Material thickness, gauge, weight, density, etc.
 - b. Welded, riveted, bolted, etc., construction
 - c. Finish, undercoating, corrosion protection
 2. The equivalent shall perform with the same or better operating efficiency.
 3. The equivalent shall be locally represented by the manufacturer for service, parts and technical information.
 4. The equivalent shall bear the same labels of performance certification as is applicable to the specified item, such as UL or NEMA labels.
- H. Equipment, material or devices submitted for review as a "substitution" shall meet the following requirements:
1. Substitution Request Submittal: Requests for substitution will be considered if received in writing 14 days before the bid date. Requests received later than 14 days before the bid date may be considered or rejected at the discretion of the Engineer/Owner. Once the Contractor submits a complete request for substitution as determined by the engineer, the engineer reserves the right to request the time necessary to evaluate the request for substitution and review it with the Owner.
 2. Submit three (3) copies of each request for substitution for consideration.
 3. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - a. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
 - b. Samples, where applicable or requested.
 - c. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
 - d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors, that will become necessary to accommodate the proposed substitution.
 - e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
 - f. Cost information, including a proposal of the net change, if any in the Contract Sum.
 - g. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application

indicated. Include the Contractor's waiver of rights to additional payment or time, that may subsequently become necessary because of the failure of the substitution to perform adequately.

- h. Engineer's Action: Within one week of receipt of the request for substitution, the Engineer will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name. Acceptance of a product substitution will be in the form of an Addendum.
- i. Other Conditions: The Contractor's substitution request will be received and considered by the Engineer when one or more of the following conditions are satisfied, as determined by the Engineer; otherwise requests will be returned without action except to record noncompliance with these requirements.
 - 1) The request is directly related to an "or equal" clause or similar language in the Contract Documents.
 - 2) The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
 - 3) A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Engineer for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.

1.11 SUBMITTAL PROCEDURES

- A. Provide Submittals in accordance with the requirements of Division 1 and as indicated in the following.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.
 - 1. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Engineer will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
 - 2. If an intermediate submittal is necessary, process the same as the initial submittal.
 - 3. Allow two weeks for reprocessing each submittal.
 - 4. No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.

- D. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block. Submittals shall be arranged in order of specification sections.
1. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of Engineer.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Number, title and paragraph of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
- E. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Engineer using a transmittal form. Submittals received from sources other than the Contractor will be returned without action. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
- F. Except for submittals for record, information or similar purposes, the Engineer will review each submittal, mark to indicate action taken, and return promptly. Compliance with specified characteristics is the Contractor's responsibility.
- G. Action Stamp: The Engineer will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, to indicate the action taken.

1.12 SHOP DRAWINGS

- A. Submit neatly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.
- B. The Contractor shall submit for review detailed shop drawings of all equipment and material specified in each section and coordinated ductwork layouts. No material or equipment may be delivered to the job site or installed until the Contractor has received shop drawings for the particular material or equipment which have been properly reviewed. Shop drawings shall be submitted within 60 days after award of Contract before any material or equipment is purchased. The Contractor shall submit for review copies of all shop drawings to be incorporated in the Mechanical Contract. Refer to Division 1 for the quantity of copies required for submission. Where quantities are not specified, provide seven (7) copies for review.
- C. Provide shop drawings for all devices specified under equipment specifications for all systems. Shop drawings shall include manufacturers' names, catalog numbers, cuts, diagrams, dimensions, identification of products and materials included, compliance with specified standards, notation of coordination requirements, notation of dimensions established by field measurement and other such descriptive data as may be required to identify and accept the equipment. A complete list in each category (example: all fixtures), of all shop drawings, catalog cuts, material lists, etc., shall be submitted to the Engineer at one time. No consideration will be given to a partial shop drawing submittal.

- D. When a submittal could involve more than one trade, e.g., valves, piping, etc., the submitted shall be separated by traded involved, ie. HVAC, plumbing, fire protection, etc.
- E. Where multiple quantities or types of equipment are being submitted, provide a cover sheet (with a list of contents) on the submittal identifying the equipment or material being submitted.
- F. The Contractor shall furnish all necessary templates, patterns, etc., for installation work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as required.
- G. "No Exception Taken" rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, review does not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the Contract Drawings and Specifications. Verify available space prior to submitting shop drawings. Review of shop drawings shall not apply to quantity of material.
- H. After shop drawings have been reviewed, with no exceptions taken, no further changes will be allowed without the written consent of the Engineer.
- I. Shop drawing submittal sheets which may show items that are not being furnished shall have those items crossed off to clearly indicate which items will be furnished.
- J. Bidders shall not rely on any verbal clarification of the Drawings and/or Specifications. Any questions shall be referred to the Engineer in writing at least five (5) working days prior to Bidding to allow for issuance of an Addendum.
- K. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.
- L. Prepare sheetmetal and sprinkler shop drawings drawn in the latest AutoCAD version to a minimum scale of 1/4" = 1'- 0". Final approved drawings shall be turned over to the Owner on floppy disk or CD Rom.

1.13 COORDINATION DRAWINGS

- A. Prepare coordination drawings drawn in the latest AutoCAD version in accordance with Division 1 to a minimum scale of 1/4"=1'-0" detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - 1. The Contractor shall indicate the proposed locations of piping, conduit, ductwork, equipment, and materials. Include the following:
 - a. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
 - b. Equipment connections and support details.
 - c. Exterior wall and foundation penetrations.
 - d. Fire-rated wall and floor penetrations.
 - e. Sizes and locations of required concrete pads and bases.
- B. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

- C. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
- D. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.
- E. The Contractor and each subcontractor shall sign and date each coordination drawing prior to submission.
- F. Work shall not be performed until coordination drawings have been approved by the architect and engineer.
- G. Electronic copies of the MEP floor plans are available to use as a basis for preparing coordination drawings and can be provided by the Engineer. The cost for these floor plans is a lump sum fee of \$ 500.00. If the Contractor elects to obtain the Engineers electronic files a CADD File Release Form must be submitted with payment. This form must be signed by the Contractor, Owner, and Architect. Upon receipt of a signed copy of the CADD File Release Form, and payment, the Engineer will provide copies of the electronic files for the Contractor's use. A copy of the CADD File Release Form is appended to the end of this specification section

1.14 COORDINATION WITH OTHER DIVISIONS

- A. All work shall be carried out in conjunction with other trades and full cooperation shall be given in order that all work may proceed with a minimum of delay and interference. Particular emphasis is placed on timely installation of major apparatus and furnishing other Contractors, especially the Contractor or Construction Manager, with information as to openings, chases, sleeves, bases, inserts, equipment locations, panels, etc., required by other trades.
- B. The Contractors are required to examine all of the Project Drawings and mutually arrange work so as to avoid interference with the work of other trades. In general, ductwork, HVAC piping, sprinkler piping and drainage lines take precedence over water, gas and electrical conduits. The Engineer shall make final decisions regarding the arrangement of work which cannot be agreed upon by the Contractors.
- C. Where the work of the Contractor will be installed in close proximity to or will interfere with work of other trades, the Contractors will cooperate in working out space conditions to make a satisfactory adjustment.
- D. If the work under a Section is installed before coordinating with other Divisions or Sections or so as to cause interference with work of other Sections, the necessary changes to correct the condition shall be made by the Contractor causing the interference without extra charge to the Owner.

1.15 WORKMANSHIP

- A. Service Support: The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.
- B. Modification of References: In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears.

- C. The Contractor shall furnish the services of an experienced superintendent who shall be constantly in charge of the installation of the work together with all skilled workmen, fitters, metal workers, welders, helpers and laborers required to unload, transfer, erect, connect, adjust, start, operate and test each system.
- D. Unless otherwise specifically indicated on the Drawings or Specifications, all equipment and materials shall be installed with the acceptance of the Engineer and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.
- E. All labor for installation of plumbing systems shall be performed by experienced, skilled tradesmen under the supervision of a licensed journeyman foreman. All work shall be of a quality consistent with good trade practice and shall be installed in a neat, workmanlike manner. The Engineer reserves the right to reject any work which, in his opinion, has been installed in a substandard, dangerous or unserviceable manner. The Contractor shall replace said work in a satisfactory manner at no extra cost to the Owner.

1.16 SHUTDOWNS

- A. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such time as designated by the Owner.
- B. The Engineer and the Owner shall be notified in writing of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.
- C. Work shall be arranged for continuous performance whenever possible. The Contractor shall provide all necessary labor, including overtime if required, to assure that operating services will be shut down only during the time actually required to make necessary connections.

1.17 TEMPORARY UTILITIES

- A. General: Provide new materials and equipment; if acceptable to the Engineer, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.
- C. First Aid Supplies: Comply with governing regulations.
- D. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.
- E. Utilities: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.
 - 1. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Engineer, and will not be accepted as a basis of claims for a Change Order.

- F. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.
- G. Temporary Heat-Cool-Dehumidification: Provide temporary services required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate temporary services to produce the ambient condition required and minimize consumption of energy. The building's permanent HVAC systems shall not be used for these purposes.
- H. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.
- I. Termination and Removal: Unless the Engineer requires that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.

1.18 PROJECT PHASING

- A. Work under each Section shall include all necessary temporary connections, equipment, piping, heating, temperature control work, fire stopping, water heaters, labor, and material as necessary to accommodate the phasing of Construction as developed by the General Contractor or Construction Manager and approved by the Owner. All existing systems that pass-thru an area of the building shall remain operational during all phases of construction. No extra compensation shall be granted the Contractor for work required to maintain existing systems operational or to accommodate the construction phasing of the project.

1.19 PROTECTION OF MATERIALS AND EQUIPMENT

- A. Work under each Section shall include protecting the work and material of all other Sections from damage by work or workmen and shall include making good all damage thus caused.
- B. The Contractor shall be responsible for work and equipment until the facility has been accepted by the Owner. Protect work against theft, injury or damage and carefully store material and equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.
- C. Work under each Section includes receiving, unloading, uncrating, storing, protecting, setting in place and completely connecting equipment supplied under each Section. Work under each Section shall also include exercising special care in handling and protecting equipment and fixtures, and shall include the cost of replacing any of the equipment and fixtures which are missing or damaged.

- D. Equipment and material stored on the job site shall be protected from the weather, vehicles, dirt and/or damage by workmen or machinery. Insure that all electrical or absorbent equipment or material is protected from moisture during storage.

1.20 ADJUSTING AND TESTING

- A. After all the equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests so as to assure the Engineer that they are in proper adjustment and in satisfactory, permanent operating condition.
- B. Where requested by the Engineer, a factory-trained service representative shall inspect the installation and assist in the initial startup and adjustment to the equipment. The period of these services shall be for such time as necessary to secure proper installation and adjustments. After the equipment is placed in permanent operation, the service representative shall supervise the initial operation of the equipment and instruct personnel responsible for operation and maintenance of the equipment. The service representative shall notify the Contractor in writing, that the equipment was installed according to manufacturers recommendations and is operating as intended by the manufacturer.

1.21 CLEANING

- A. The Contractor shall thoroughly clean and flush all piping and equipment of all foreign substances, oils, burrs, solder, flux, etc., inside and out before being placed in operation.
- B. If any part of a system should be stopped or damaged by any foreign matter after being placed in operation, the system shall be disconnected, cleaned and reconnected wherever necessary to locate and/or remove obstructions. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.
- C. During the course of construction, all ducts and pipes shall be capped in an acceptable manner to insure adequate protection against the entrance of foreign matter.
- D. Upon completion of all work under the Contract, the Contractor shall remove from the premises all rubbish, debris and excess materials left over from his work. Any oil or grease stains on floor areas caused by the Contractor shall be removed and floor areas left clean.
- E. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
 - 1. Remove labels that are not permanent labels.
 - 2. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
 - 3. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
 - 4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
- F. Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into

drainage systems. Remove and dispose of ALL waste materials, packaging material, skids etc. from the site and dispose of in a lawful manner in accordance with municipal, state and federal regulations.

- G. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

1.22 OPERATING AND MAINTENANCE

- A. Upon completion of all work and tests, the Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period specified under each applicable Section of this Division. During this period, he shall fully instruct the Owner or the Owner's representative in the operation, adjustment and maintenance of all equipment furnished. The Contractor shall give at least seven (7) days notice to the Owner and the Engineer in advance of this period.
- B. The Contractor shall include the maintenance schedule for the principal items of equipment furnished under this Division.
- C. The Contractor shall physically demonstrate procedures for all routine maintenance of all equipment furnished under each respective Section to assure accessibility to all devices.
- D. An authorized manufacturer's representative shall attest in writing that the equipment has been properly installed prior to startup of any major equipment. The following equipment will require this inspection: pumps; air conditioning equipment, controls, air handling equipment, compressors, boilers etc. These letters shall be bound into the operating and maintenance books.
- E. Refer to individual trade Sections for any other particular requirements related to operating instructions.
- F. Demonstration shall be recorded on VHS audio/video tape with two (2) tapes turned over to the Owner.

1.23 OPERATING AND MAINTENANCE MANUALS

- A. Prepare operating and maintenance manuals in accordance with the requirements of Division 1 and as follows. The Contractor shall prepare six (6) copies of a complete maintenance and operating instructions manual, bound in booklet form. Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 3-ring vinyl-covered binders, with pocket folders for folded sheet information and designation partitions with identification tabs. Mark appropriate identification on front and spine of each binder.
- B. Manual shall include the following:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 - 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 - 4. Servicing and operating instructions including lubrication charts and schedules.
 - 5. Emergency and safety instructions.

6. Spare parts list.
 7. Copies of warranties.
 8. Wiring diagrams.
 9. Recommended "turn around" cycles.
 10. Inspection procedures.
 11. Approved Shop Drawings and Product Data.
 12. Equipment Start-up Reports.
 13. Temperature control diagrams and written sequences of operations.
 14. Balance reports.
- C. Include in the manual, a tabulated equipment schedule for all equipment. Schedule shall include pertinent data such as: make, model number, serial number, voltage, normal operating current, belt size, filter quantities and sizes, bearing number, etc. Schedule shall include maintenance to be done and frequency.
- D. Maintenance and instruction manuals shall be submitted to the Owner at the same time as the seven (7) day notice is given prior to the instruction period.

1.24 ACCEPTANCES

- A. The equipment, materials, workmanship, design and arrangement of all work installed under the Mechanical Sections shall be subject to the review of the Engineer.
- B. Within 30 days after the awarding of a Contract, the Plumbing Contractor shall submit to the Engineer, for review, a list of manufacturers of equipment proposed for the work under the Plumbing Sections. The intent to use the exact manufacturers and models specified does not relieve the Contractor of the responsibility of submitting such a list.
- C. If extensive or unacceptable delivery time is expected on a particular item of equipment specified, the Contractor shall notify the Owner and Engineer, in writing, within 30 days of award of the Contract. In such instances, equipment substitutions may be made pending acceptance by the Engineer or the Owner's representative.
- D. Where any specific material, process or method of construction or manufactured article is specified by reference to the catalog number of a manufacturer, the Specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the Drawings. In all cases, the Plumbing Contractor shall verify the duty specified with the specific characteristics of the equipment offered for review. Equipment characteristics are to be used as mandatory requirements where the Contractor proposes to use an acceptable equivalent.
- E. If material or equipment is installed before it is reviewed and/or approved, the Contractor shall be liable for its removal and replacement at no extra charge to the Owner if, in the opinion of the Engineer, the material or equipment does not meet the intent of, or standard of quality implied by, the Drawings and Specifications.
- F. Failure on the part of the Engineer to reject shop drawings or to reject work in progress shall not be interpreted as acceptance of work not in conformance with the Drawings and/or Specifications. Work not in conformance with the Drawings and/or Specifications shall be corrected whenever it is discovered.

1.25 RECORD DRAWINGS

- A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours.

- B. Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately. Give particular attention to concealed elements that would be difficult to measure and record at a later date. Items to be indicated include but are not limited to:
 - 1. Dimensional change
 - 2. Revision to drawing detail
 - 3. Location and depth of underground utility
 - 4. Revision to pipe routing
 - 5. Revision to electrical circuitry
 - 6. Actual equipment location
 - 7. Pipe size and routing
 - 8. Location of concealed internal utility
 - 9. Changes made by Change Order
 - 10. Details not on original Contract Drawing
 - 11. Information on concealed elements which would be difficult to identify or measure later
- C. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
- D. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
- E. Note related Change Order numbers where applicable.
- F. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
- G. These shall be clearly marked for Record Drawings on a clean set of reproducible mylar sepias at the completion of the work and turned over to the Owner.
- H. Final record documents shall be prepared in the latest AutoCad version and floppy disks or CD Rom of all drawings and a clean set of reproducible mylar sepias shall be turned over to the Owner at the completion of the work.

1.26 WARRANTIES AND BONDS

- A. The following general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties are to be included:
 - 1. General close-out requirements included in Division 1.
 - 2. Specific requirements for warranties for the Work and products and installation that are specified to be warranted, are included in the individual Sections of Divisions-2 through -16.
 - 3. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
- C. Separate Prime Contracts: Each prime Contractor is responsible for warranties related to its own Contract.

1.27 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, right and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- F. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- G. Submit written warranties to the Engineer prior to the date certified for Substantial Completion. If the Engineer's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Engineer.
- H. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Engineer within fifteen days of completion of that designated portion of the Work.
- I. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Engineer for approval prior to final execution.
 - 1. Refer to individual Sections of Divisions-2 through -16 for specific content requirements, and particular requirements for submittal of special warranties.
- J. Form of Submittal: At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- K. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the Project title or name, and the name of the Contractor.
3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.28 GUARANTEES

- A. The Contractor shall guarantee all material and workmanship under these Specifications and the Contract for a period of one (1) year from the date of final acceptance by Owner. During this guarantee period, all defects developing through faulty equipment, materials or workmanship shall be corrected or replaced immediately by this Contractor without expense to the Owner. Such repairs or replacements shall be made to the Engineer's satisfaction.
- B. Contractor shall provide name, address, and phone number of all contractors and subcontractors and associated equipment they provided.

1.29 PROJECT CLOSE-OUT

- A. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents in accordance with Division 1.
- B. Deliver tools, spare parts, extra stock, and similar items.
- C. Complete start-up testing of systems, including measuring and documenting all required startup checklist requirements documented in installation and maintenance instructions by the equipment manufacturer, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
- D. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.
- E. Field Observation Procedures: On receipt of a request for an Engineers Field Observation, the Engineer will advise the Contractor of unfulfilled requirements. The Engineer will advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
 1. The Engineer will repeat the Field Observation when requested and assured that the Work has been substantially completed.
 2. Results of the completed list of unfulfilled items will form the basis of requirements for final acceptance.

END OF SECTION

CADD File Release Form

DELIVERY OF CADD FILES FOR: _____
Project Name

In accepting and utilizing any drawings or other data on any form of electronic media generated and provided by the Design Professional, the Client covenants and agrees that all such drawings and data are instruments of service of the Design Professional, who shall be deemed the author of the drawings and data, and shall retain all common law, statutory law and other rights, including copyrights.

The Client further agrees not to use these drawings and data, in whole or in part, for any purpose or project other than the project which is the subject of this Agreement. The Client agrees to waive all claims against the Design Professional resulting in any way from any unauthorized changes or reuse of the drawings and data for any other project by anyone other than the Design Professional.

In addition, the Client agrees, to the fullest extent permitted by law, to indemnify and hold the Design Professional harmless from any damage, liability or cost, including reasonable attorneys' fees and costs of defense, arising from any changes made by anyone other than the Design Professional or from any reuse of the drawings and data without the prior written consent of the Design Professional.

Under no circumstances shall transfer of the drawings and other instruments of service on electronic media for use by the Client be deemed a sale by the Design Professional, and the Design Professional makes no warranties, either express or implied, of merchantability and fitness for any particular purpose.

_____ Client's Signature	_____ Date
_____ Company - Title	
_____ Architects' Signature	_____ Date
_____ Firm - Title	
_____ Owner's Signature	_____ Date
_____ Company - Title	

**SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Each Contractor, Subcontractor and/or supplier 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. Identification for Plumbing Piping and Equipment.
 - 2. Sleeves.
 - 3. Mechanical sleeve seals.
 - 4. Formed steel channel.
- B. Related Sections:
 - 1. Section 01 90 00 Commissioning Requirements.
 - 2. Section 03 10 00 - Concrete Forming and Accessories: Execution requirements for placement of inserts sleeves in concrete forms specified by this section.
 - 3. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for placement of concrete housekeeping pads specified by this section.
 - 4. Section 22 04 00 – General Conditions for Plumbing Trades
 - 5. Section 07 84 00 - Firestopping: Product requirements for firestopping for placement by this section.
 - 6. Section 07 90 00 - Joint Protection: Product requirements for sealant materials for placement by this section.
 - 7. Section 09 90 00 - Painting and Coating: Product and execution requirements for painting specified by this section.
 - 8. Section 22 05 03 - Pipes and Tubes for Plumbing Piping and Equipment: Execution requirements for placement of hangers and supports specified by this section.
 - 9. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment: Product and execution requirements for vibration isolators.

1.3 SUBMITTALS

- A. Shop Drawings: Submit for piping and equipment identification list of wording, symbols, letter size, and color coding for pipe identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- B. Product Data for Pipe and Equipment Identification: Submit for mechanical identification manufacturers catalog literature for each product required.

1.4 QUALITY ASSURANCE

- A. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

- A. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light background color.
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light background color, minimum 1-1/2 inches diameter.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener. Color and Lettering: Conform to ASME A13.1.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Color and Lettering: Conform to ASME A13.1.
- E. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.2 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sealant: Acrylic; refer to Section 07 90 00.

2.3 MECHANICAL SLEEVE SEALS

- A. Manufacturers:
 - 1. Thunderline Link-Seal, Inc.
 - 2. Substitutions: Permitted.
- B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.4 FORMED STEEL CHANNEL

- A. Manufacturers:
 - 1. Allied Tube & Conduit Corp.
 - 2. B-Line Systems
 - 3. Unistrut Corp.
 - 4. Substitutions: Permitted.
- B. Product Description: Galvanized 12 gage) thick steel. With holes 1-1/2 inches on center.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify openings are ready to receive sleeves.

3.2 INSTALLATION - PIPING AND EQUIPMENT IDENTIFICATION

- A. Install plastic nameplates with adhesive.
- B. Install plastic tags with corrosion resistant metal chain.

3.3 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with mechanical sleeve seals.
- B. Set sleeves in position in forms. Provide reinforcing around sleeves.
- C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- E. Where piping penetrates floor, ceiling, or wall, close off space between pipe adjacent work with stuffing firestopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- F. Install chrome plated steel plastic stainless steel escutcheons at finished surfaces.

END OF SECTION

**SECTION 22 05 16
EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Each Contractor, Subcontractor and/or supplier 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. Flexible pipe connectors.
 - 2. Expansion joints.
 - 3. Expansion compensators.
 - 4. Pipe alignment guides.
 - 5. Swivel joints.
 - 6. Pipe anchors.
- B. Related Sections:
 - 1. Section 22 04 00 – General Conditions for Plumbing Trades
 - 2. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment: Product and installation requirements for piping hangers and supports.
 - 3. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment: Product and installation requirements for vibration isolators used in piping systems.
 - 4. Section 22 10 00 – Plumbing piping and Pumps: Product and installation requirements for piping used in domestic water systems.

1.3 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B31.9 - Building Services Piping.
 - 2. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
- B. American Welding Society:
 - 1. AWS D1.1 - Structural Welding Code - Steel.

1.4 DESIGN REQUIREMENTS

- A. Provide structural work and equipment required for expansion and contraction of piping. Verify anchors, guides, and expansion joints provide and adequately protect system.
- B. Expansion Compensation Design Criteria:
 - 1. Installation Temperature: 50 degrees F.
 - 2. Domestic Hot Water: 140 degrees F.
 - 3. Safety Factor: 30 percent.

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

- B. Shop Drawings: Indicate layout of piping systems, including flexible connectors, expansion joints, expansion compensators, loops, offsets and swing joints. Submit shop drawings sealed by a registered professional engineer.
- C. Product Data:
 - 1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
 - 2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.
- D. Design Data: Indicate criteria and show calculations. Submit sizing methods and calculations sealed by a registered professional engineer.
- E. Manufacturer's Installation Instructions: Submit special procedures.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- G. Welders' Certificate: Include welders' certification of compliance with ASME Section IX. AWS D1.1.
- H. Manufacturer's Field Reports: Indicate results of inspection by manufacturer's representative.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of flexible pipe connectors, expansion joints, anchors, and guides.
- C. Operation and Maintenance Data: Submit adjustment instructions.

1.7 QUALITY ASSURANCE

- A. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- B. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.
- C. Design expansion compensating system under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.

1.9 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Accept expansion joints on site in factory packing with shipping bars and positioning devices intact. Inspect for damage.
- C. Protect equipment from exposure by leaving factory coverings, pipe end protection, and packaging in place until installation.

1.11 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for leak free performance of packed expansion joints.

1.12 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Supply two 12 ounce containers of packing lubricant and cartridge style grease gun.

PART 2 PRODUCTS

2.1 FLEXIBLE PIPE CONNECTORS

- A. Manufacturers:
 - 1. Metroflex
 - 2. Mason
 - 3. Vibration Eliminator
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Steel Piping:
 - 1. Inner Hose: Carbon Steel Stainless Steel Bronze.
 - 2. Exterior Sleeve: None Single braided Double braided stainless steel bronze.
 - 3. Pressure Rating: F 200 psig WOG and 250 degrees F
 - 4. Joint: As specified in Section 21 05 00, 22 11 00, 23 21 13.
 - 5. Size: Use pipe-sized units.
 - 6. Maximum offset: 3/4 inch on each side of installed center line.
- C. Copper Piping:
 - 1. Inner Hose: Bronze.
 - 2. Exterior Sleeve: Braided bronze.
 - 3. Pressure Rating: 200 psig WOG and 250 degrees F.
 - 4. Joint: As specified in Section 21 05 00, 22 11 00, 23 21 13.
 - 5. Size: Use pipe sized units.
 - 6. Maximum offset: 3/4 inch on each side of installed center line.

2.2 EXPANSION JOINTS

- A. Manufacturers:
 - 1. Metroflex
 - 2. Mason

3. Vibration Eliminator
 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Stainless Steel Bellows Type:
1. Pressure Rating: 200 psig WOG and 250 degrees F.
 2. Maximum Compression: 1-3/4 inch.
 3. Maximum Extension: 1/4 inch.
 4. Joint: As specified in Section 21 05 00, 22 11 00, 23 21 13.
 5. Size: Use pipe sized units.
 6. Application: Steel piping 3 inch and smaller.
- C. External Ring Controlled Stainless Steel Bellows Type:
1. Pressure Rating: 200 psig WOG and 250 degrees F.
 2. Maximum Compression: 1-1/4 inch.
 3. Maximum Extension: 3/8 inch.
 4. Maximum Offset: 5/16 inch.
 5. Joint: Flanged.
 6. Size: Use pipe sized units.
 7. Accessories: Internal flow liner.
 8. Application: Steel piping 3 inch and larger.
- D. Double Sphere, Flexible Compensators:
1. Body: Teflon Neoprene and nylon
 2. Working Pressure: 200 psi.
 3. Maximum Temperature: 250 degrees F.
 4. Maximum Compression: 1 inch.
 5. Maximum Elongation: 5/8 inch.
 6. Maximum Offset: 3/4 inch.
 7. Maximum Angular Movement: 30 degrees.
 8. Joint: Tapped steel flanges Galvanized flanges Galvanized unions.
 9. Size: Use pipe sized units.
 10. Accessories: Control rods Control cables.
 11. Application: Steel piping 2 inch and larger.
- E. Two-ply Bronze Bellows Type:
1. Construction: Bronze with anti-torque device, limit stops, internal guides.
 2. Pressure Rating: 200 psi WOG and 250 degrees F.
 3. Maximum Compression: 1-3/4 inch.
 4. Maximum Extension: 1/4 inch.
 5. Joint: As specified in Section 22 11 00, 23 21 13.
 6. Size: Use pipe sized units.
 7. Application: Copper piping.
- F. Low Pressure Compensators with two-ply Bronze Bellows:
1. Working Pressure: 80 psig.
 2. Maximum Temperatures: 250 degrees F.
 3. Maximum Compression: 1/2 inch.
 4. Maximum Extension: 5/32 inch.
 5. Joint: Soldered.
 6. Size: Use pipe sized units.
 7. Application: Copper or steel piping 2 inch and smaller.
- G. Copper with Packed Sliding Sleeve:
1. Maximum Temperature: 250 degrees F.
 2. Joint: As specified in Section 22 11 00 23 21 13.
 3. Size: Use pipe sized units.
 4. Copper or steel piping 2 inches and larger.

5. Application: Copper or steel piping 2 inch and larger.

2.3 ACCESSORIES

- A. Manufacturers:
 1. Metroflex
 2. Mason
 3. Vibration Eliminator
 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Pipe Alignment Guides: Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inch travel.
- C. Swivel Joints: Fabricated steel Cast steel body, double ball bearing race, field lubricated, with rubber (Buna-N) o-ring seals.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install Work in accordance with ASME B31.9
- B. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Refer to Section 22 05 48. Provide line size flexible connectors.
- C. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.
- D. Rigidly anchor pipe to building structure. Provide pipe guides to direct movement only along axis of pipe. Erect piping so strain and weight is not on cast connections or apparatus.
- E. Provide support and anchors for controlling expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required as indicated on Drawings. Refer to Section 22 05 29 for pipe hanger installation requirements.
- F. Provide grooved piping systems with minimum one joint per inch pipe diameter instead of flexible connector supported by vibration isolation. Grooved piping systems need not be anchored.
- G. Provide expansion loops as indicated on Drawings.

3.2 MANUFACTURER'S FIELD SERVICES

- A. Section 01 40 00 - Quality Requirements: Manufacturers' field services.
- B. Furnish inspection services by flexible pipe manufacturer's representative for final installation and certify installation is in accordance with manufacturer's recommendations and connectors are performing satisfactorily.

END OF SECTION

**SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

1.2 Each Contractor, Subcontractor and/or supplier 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."

1.3 SUMMARY

A. Section Includes:

1. Pipe hangers and supports.
2. Hanger rods.
3. Inserts.
4. Flashing.
5. Sleeves.
6. Mechanical sleeve seals.
7. Formed steel channel.
8. Firestopping relating to plumbing work.
9. Firestopping accessories.
10. Equipment bases and supports.

B. Related Sections:

1. Section 03 10 00 - Concrete Forming and Accessories: Execution requirements for placement of inserts sleeves in concrete forms specified by this section.
2. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for placement of concrete housekeeping pads specified by this section.
3. Section 22 04 00 – General Conditions for Plumbing Trades
- 4.
5. Section 07 84 00 - Firestopping: Product requirements for firestopping for placement by this section.
6. Section 07 90 00 - Joint Protection: Product requirements for sealant materials for placement by this section.
7. Section 09 90 00 - Painting and Coating: Product and execution requirements for painting specified by this section.
8. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment: Product and execution requirements for vibration isolators.
9. Section 22 10 00 – Plumbing piping & Pumps: Execution requirements for placement of hangers and supports specified by this section.

1.4 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME B31.1 - Power Piping.
2. ASME B31.9 - Building Services Piping.

B. ASTM International:

1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
3. ASTM E814 - Standard Test Method for Fire Tests of Through Penetration Fire Stops.

4. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
 5. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
- C. American Welding Society:
1. AWS D1.1 - Structural Welding Code - Steel.
- D. FM Global:
1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
- E. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
 2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
 3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
- F. Underwriters Laboratories Inc.:
1. UL 263 - Fire Tests of Building Construction and Materials.
 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
 3. UL 1479 - Fire Tests of Through-Penetration Firestops.
 4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
 5. UL - Fire Resistance Directory.
- G. Intertek Testing Services (Warnock Hersey Listed):
1. WH - Certification Listings.

1.5 DEFINITIONS

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.6 SYSTEM DESCRIPTION

- A. Firestopping Materials: ASTM E119 ASTM E814 UL 263 UL 1479 to achieve fire ratings as noted on Drawings for adjacent construction, but not less than 1 hour fire rating.
- B. Firestopping Materials: ASTM E119, ASTM E814, UL 263, UL 1479, to achieve fire ratings of adjacent construction noted in Schedule at end of this section. in accordance with FM UL WH noted in Schedule at end of this section.
- C. Firestop interruptions to fire rated assemblies, materials, and components.

1.7 PERFORMANCE REQUIREMENTS

- A. Firestopping: Conform to applicable code FM UL WH for fire resistance ratings and surface burning characteristics.
- B. Firestopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

1.8 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate system layout with location including critical dimensions, sizes, and pipe hanger and support locations and detail of trapeze hangers.

- C. Product Data:
 - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
 - 2. Firestopping: Submit data on product characteristics, performance and limitation criteria.
 - D. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
 - E. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers. Indicate calculations used to determine load carrying capacity of trapeze, multiple pipe, and riser support hangers. Submit sizing methods calculations sealed by a registered professional engineer.
 - F. Manufacturer's Installation Instructions:
 - 1. Hangers and Supports: Submit special procedures and assembly of components.
 - 2. Firestopping: Submit preparation and installation instructions.
 - G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
 - H. Engineering Judgements: For conditions not covered by UL or WH listed designs, submit judgements by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.
- 1.9 QUALITY ASSURANCE
- A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
 - 1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
 - 2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
 - a. Floor Penetrations Within Wall Cavities: T-Rating is not required.
 - B. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.
 - 1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
 - 2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.
 - C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
 - D. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10 inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.
 - E. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
 - F. Perform Work in accordance with applicable authority AWS D1.1 for welding hanger and support attachments to building structure.

- G. Maintain one copy of each document on site.

1.10 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum years documented experience.

1.11 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.13 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.
- C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.
- D. Provide ventilation in areas to receive solvent cured materials.

1.14 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.15 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for pipe hangers and supports.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

- A. Manufacturers:
1. Nibco
 2. Empire
 3. Flex-Weld, Inc.
 4. Glope Pipe Hanger Products Inc.
 5. Michigan Hanger Co.
 6. Superior Valve Co.
 7. Substitutions: Section 01 60 00 - Product Requirements.
- B. Plumbing Piping - DWV:
1. Conform to ASME B31.9 ASTM F708 MSS SP58 MSS SP69 MSS SP89.
 2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron Carbon steel, adjustable swivel, split ring.
 3. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 5. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
 6. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
 7. Vertical Support: Steel riser clamp.
 8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 9. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.
- C. Plumbing Piping - Water:
1. Conform to ASME B31.9 ASTM F708 MSS SP58 MSS SP69 MSS SP89.
 2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron Carbon steel, adjustable swivel, split ring.
 3. Hangers for Cold Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
 4. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
 5. Hangers for Hot Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll, double hanger.
 6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods, cast iron roll.
 8. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
 9. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
 10. Wall Support for Hot Pipe Sizes 6 inches and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
 11. Vertical Support: Steel riser clamp.
 12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 13. Floor Support for Hot Pipe Sizes 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 14. Floor Support for Hot Pipe Sizes 6 inches and Larger: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
 15. Copper Pipe Support: Copper-plated, Carbon-steel ring.

2.2 ACCESSORIES

- A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.3 INSERTS

- A. Manufacturers:
 - 1. Thunderline
 - 2. Link Seal
 - 3. Fernco
 - 4. BWM
 - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 FLASHING

- A. Metal Flashing: 26 gage thick galvanized steel.
- B. Metal Counterflashing: 22 gage thick galvanized steel.
- C. Lead Flashing:
 - 1. Waterproofing: 5 lb./sq. ft sheet lead.
 - 2. Soundproofing: 1 lb./sq. ft sheet lead.
- D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
- E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.5 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sealant: Acrylic; refer to Section 07 90 00.

2.6 MECHANICAL SLEEVE SEALS

- A. Manufacturers:
 - 1. Thunderline Link-Seal, Inc.
 - 2. NMP Corporation
 - 3. Fernco
 - 4. BWM Model
 - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.7 FORMED STEEL CHANNEL

- A. Manufacturers:
 - 1. Allied Tube & Conduit Corp.
 - 2. B-Line Systems
 - 3. Midland Ross Corporation, Electrical Products Division
 - 4. Unistrut Corp.
 - 5. Substitutions: Section 01 60 00 - Product Requirements.

- B. Product Description: Galvanized 12 gage) thick steel. With holes 1-1/2 inches on center.

2.8 FIRESTOPPING

- A. Manufacturers:
 - 1. Dow Corning Corp.
 - 2. Fire Trak Corp.
 - 3. Hilti Corp.
 - 4. International Protective Coating Corp.
 - 5. 3M fire Protection Products
 - 6. Specified Technology, Inc.
 - 7. Substitutions: Section 01 60 00 - Product Requirements.

- B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
 - 1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
 - 2. Foam Firestopping Compounds: Single component foam compound.
 - 3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
 - 4. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
 - 5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
 - 6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
 - 7. Firestop Pillows: Formed mineral fiber pillows.

- C. Color:As selected from manufacturer's full range of colors.

2.9 FIRESTOPPING ACCESSORIES

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

- B. Dam Material: Permanent:
 - 1. Mineral fiberboard.
 - 2. Mineral fiber matting.
 - 3. Sheet metal.
 - 4. Plywood or particle board.
 - 5. Alumina silicate fire board.

- C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

- D. General:
 - 1. Furnish UL listed products or products tested by independent testing laboratory.
 - 2. Select products with rating not less than rating of wall or floor being penetrated.

- E. Non-Rated Surfaces:
 - 1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.
 - 2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.
- C. Verify openings are ready to receive firestopping.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Install damming materials to arrest liquid material leakage.
- D. Obtain permission from Architect/Engineer before using powder-actuated anchors.
- E. Obtain permission from Architect/Engineer before drilling or cutting structural members.

3.3 INSTALLATION - INSERTS

- A. Install inserts for placement in concrete forms.
- B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above flush with top of recessed into and grouted flush with slab.

3.4 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install in accordance with ASME B31.1 ASME B31.5 ASME 31.9 ASTM F708 MSS SP 58 MSS SP 69 MSS SP 89.

- B. Support horizontal piping as scheduled.
- C. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each horizontal elbow.
- E. Use hangers with 1-1/2 inch minimum vertical adjustment.
- F. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- G. Support vertical piping at every other floor. Support vertical cast iron pipe at each floor at hub.
- H. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- I. Support riser piping independently of connected horizontal piping.
- J. Provide copper plated hangers and supports for copper piping sheet lead packing between hanger or support and piping.
- K. Design hangers for pipe movement without disengagement of supported pipe.
- L. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- M. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 22 07 00.

3.5 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment Refer to Section 03 30 00.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members formed steel channel steel pipe and fittings Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed. Refer to Section 21 05 48.

3.6 INSTALLATION - FLASHING

- A. Provide flexible flashing and metal counterflashing where piping penetrates weather or waterproofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked 1 inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash, and seal.

- C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.
- D. Seal floor, shower, mop sink drains watertight to adjacent materials.
- E. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.7 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with mechanical sleeve seals.
- B. Set sleeves in position in forms. Provide reinforcing around sleeves.
- C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- E. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with firestopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- F. Install chrome plated steel or stainless steel escutcheons at finished surfaces.

3.8 INSTALLATION - FIRESTOPPING

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, and other items, requiring firestopping. Refer to Section 07 84 13

3.9 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.10 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean adjacent surfaces of firestopping materials.

3.11 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

3.12 SCHEDULES

PIPE HANGER SPACING		
PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
Cast Iron (All Sizes)	5	5/8
Cast Iron (All Sizes) with 10 foot length of pipe	10	5/8
Copper Tube, 1-1/4 inches and smaller	6	1/2
Copper Tube, 1-1/2 inches and larger	10	1/2
Polybutylene	2.67	3/8
Polypropylene	4	3/8
PVC (All Sizes)	4	3/8
Steel, 3 inches and smaller	12	1/2
Steel, 4 inches and larger	12	5/8

END OF SECTION

**SECTION 22 05 48
VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT**

PART 1 GENERAL

1.1 Intent

1. All plumbing equipment and piping as noted on the equipment schedule or in the specification shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonably uniform deflections.
2. All isolators and isolation materials shall be of the same manufacturer and shall be certified by the manufacturer.
3. It is the intent of the seismic portion of this specification to keep all mechanical and electrical building system components in place during a seismic event.
4. All such systems must be installed in strict accordance with seismic codes, component manufacturer's recommendations and building construction standards. Whenever a conflict occurs between the manufacturer's recommendations or construction standards, the most stringent shall apply.
5. This specification is considered to be minimum requirements for seismic consideration and is not intended as a substitute for legislated, more stringent, national, state or local construction requirements (i.e. California Title 24, California OSHPD, Canadian Building Codes, or other requirements).
6. Any variance or non-compliance with these specification requirements shall be corrected by the contractor in an approved manner.

1.2 SUMMARY

A. Section Includes:

1. Certification of seismic restraint designs and installation supervision.
2. Certification of seismic attachment of housekeeping pads.
3. NOTE: For all mechanical and electrical systems. Equipment buried underground is excluded but entry of services through the foundation wall is included.
4. Seismic restraint products
 - a. Vibration isolation elements.
 - b. Equipment isolation bases.
 - c. Piping flexible connections.
 - d. Seismic restraints for isolated and non-isolated mechanical and electrical items.
5. Inertia bases.

B. Related Sections:

1. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for placement of isolators in floating floor slabs specified by this section and product requirements for concrete for placement by this section.
2. Section 07 90 00 - Joint Protection: Product requirements for joint sealers specified for placement by this section.
3. Section 22 04 00 – General Conditions for Plumbing Trades
4. Section 22 05 16 - Expansion Fittings and Loops for Plumbing Piping: Product requirements for anchors and piping expansion compensation.
5. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment: Product requirements for pipe hangers and supports.
6. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC: Requirements for sound and vibration measurements performed independent of this section.

1.3 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI S1.4 - Sound Level Meters.
 - 2. ANSI S1.8 - Reference Quantities for Acoustical Levels.
 - 3. ANSI S12.36 - Survey Methods for the Determination of Sound Power Levels of Noise Sources.

1.4 RELATED WORK

- A. Housekeeping Pads
 - 1. Housekeeping pad reinforcement and monolithic pad attachment to the structure details and design shall be prepared by the restraint vendor if not already indicated on the drawings.
 - 2. Housekeeping pads shall be coordinated with restraint vendor and sized to provide a minimum edge distance of ten (10) bolt diameters all around the outermost anchor bolt to allow development of full drill-in wedge anchor ratings. If cast-in anchors are to be used, the housekeeping pads shall be sized to accommodate the ACI requirements for bolt coverage and embedment.
- B. Supplementary Support Steel
 - 1. Contractor shall supply supplementary support steel for all equipment, piping, ductwork, etc. including roof mounted equipment, as required or specified.
- C. Attachments
 - 1. Contractor shall supply restraint attachment plates cast into housekeeping pads, concrete inserts, double sided beam clamps, etc. in accordance with the requirements of the vibration vendor's calculations.

1.5 SEISMIC FORCE LEVELS

- A. Installations shall be designed to safely accept external forces determined in accordance with the International Building Code –2003, Section 1621 in any direction for all rigidly supported equipment without failure and permanent displacement of the equipment. Seismic restraints shall not short circuit vibration isolation systems or transmit objectionable vibration or noise.

1.6 PERFORMANCE REQUIREMENTS

- A. Provide vibration isolation on motor driven equipment over 0.5 hp, plus connected piping.
- B. Provide minimum static deflection of isolators for equipment as follows:
 - 1. Basement, Under 20 hp
 - a. 400 - 600 rpm: 1 inch
 - b. 600 - 800 rpm: 0.5 inch
 - c. 800 - 900 rpm: 0.2 inch
 - d. 1100 - 1500 rpm: 0.14 inch
 - e. Over 1500 rpm: 0.1 inch
 - 2. Basement, Over 20 hp
 - a. 400 - 600 rpm: 2 inch
 - b. 600 - 800 rpm: 1 inch
 - c. 800 - 900 rpm: 0.5 inch
 - d. 1100 - 1500 rpm: 0.2 inch
 - e. Over 1500 rpm: 0.15 inch
- C. Use concrete inertia bases for motors in excess of 40 hp and on base mounted pumps over 10 hp.

- D. Maintain sound level of spaces at levels not to exceed those listed below by utilizing acoustical devices.

1.7 DEFINITIONS

- A. Life Safety Systems:
 - 1. All systems involved with and/or connected to emergency power supply including all generators, transfer switches, transformers and all flow paths to fire protection and/or emergency lighting systems.
 - 2. All medical and life support systems.
 - 3. Fresh air relief systems on emergency control sequence including air handlers, conduit, duct, dampers, etc.
- B. Positive Attachment:
 - 1. A positive attachment is defined as a cast-in anchor, a drill-in wedge anchor, a double sided beam clamp loaded perpendicular to a beam, or a welded or bolted connection to structure. Single sided "C" type beam clamps for support rods of overhead piping, ductwork, fire protection, electrical conduit, bus duct, or cable trays, or any other equipment are not acceptable on this project as seismic anchor points.
- C. Transverse Bracing:
 - 1. Restraint(s) applied to limit motion perpendicular to the centerline of the pipe, duct or conduit.
- D. Longitudinal Bracing:
 - 1. Restraint(s) applied to limit motion parallel to the centerline of the pipe, duct or conduit.
- E. Failure
 - 1. For the purposes of this project, failure is defined as the discontinuance of any attachment point between equipment or structure, vertical permanent deformation greater than 1/8" (3mm) and/or horizontal permanent deformation greater that 1/4" (6mm).

1.8 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings:
 - 1. Submit fabrication details for equipment bases including dimensions, structural member sizes and support point locations.
 - 2. Provide Drawings showing methods of suspension and support guides for conduit, piping and ceiling hung equipment.
 - 3. Record actual locations and installation of vibration isolators and seismic restraints including attachment points.
 - 4. Where walls, floors, slabs or supplementary steel work are used for seismic restraint locations, details of acceptable attachment methods for conduit and pipe must be included and approved before the condition is accepted for installation. Restraint manufacturers' submittals must include spacing, static loads and seismic loads at all attachment and support points.
 - 5. Provide specific details of seismic restraints and anchors; include number, size and locations for each piece of equipment.
 - 6. Drawings showing methods for isolation of conduits and pipes penetrating walls and floor slabs.
 - 7. Specific details of restraints including anchor bolts for mounting and maximum loading at each location, for each piece of equipment and/or pipe locations.

- C. Product Data: Submit schedule of vibration isolator type with location and load on each. Submit catalog information indicating, materials, dimensional data, pressure losses, and acoustical performance for standard sound attenuation products.
- D. Seismic Certification and Analysis:
1. Seismic restraint calculations must be provided for all connections of equipment to the structure. Calculations must be stamped by a registered professional engineer with at least five years of seismic design experience, licensed in the state of the job location.
 2. All restraining devices shall have a preapproval number from California OSHPD or some other recognized government agency showing maximum restraint ratings. Preapprovals based on independent testing are preferred to preapprovals based on calculations. Where preapproved devices are not available, submittals based on independent testing are preferred. Calculations (including the combining of tensile and shear loadings) to support seismic restraint designs must be stamped by a registered professional engineer with at least five years of seismic design experience and licensed in the state of the job location. Testing and calculations must include both shear and tensile loads as well as one test or analysis at 45 degrees to the weakest mode.
 3. Analysis must indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameter, embedment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the forces detailed in section 1.06 acting through the equipment center of gravity. Overturning moments may exceed forces at ground level.
- E. Design Data: Submit calculations indicating maximum room sound levels are not exceeded. Use sound power levels of actual equipment to be installed on project. Analysis shall include breakout noise calculations. In the absence of specified background sound level criteria, the guidelines as express in Table 34 of Chapter 47, "Sound and Vibration Control" of the 2003 ASHRAE Handbook – HVAC Applications, shall be used.
- F. Test Reports: Indicate dynamic insertion loss and noise generation values of silencers. acoustic housings meet or exceed specified sound transmission loss values.
- G. Manufacturer's Installation Instructions: Submit special procedures and setting dimensions. Indicate installation requirements maintaining integrity of sound isolation.
- H. Manufacturer's Certificate: Certify isolators meet or exceed specified requirements.
- I. Manufacturer's Field Reports: Indicate sound isolation installation is complete and in accordance with instructions.

1.9 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of hangers including attachment points.

1.10 QUALITY ASSURANCE

- A. Perform Work in accordance with ARI 575 ANSI S12.36.
- B. Maintain one copy of each document on site.

1.11 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.
- C. Design application of seismic bracing under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.

1.12 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.13 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.14 CONTRACTOR'S RESPONSIBILITIES

- A. Contractor shall have the following responsibilities:
 - 1. Determine vibration isolation and seismic restraint sizes and locations per specifications.
 - 2. Provide and install isolation systems and seismic restraints as scheduled or specified.
 - 3. Guarantee specified isolation system deflection.
 - 4. Provide installation instructions, drawings and field supervision to assure proper installation and performance.
 - 5. Provide installation instructions, drawings and trained field supervision to insure proper installation and performance.
 - 6. Substitution of "Internally Isolated" mechanical equipment in lieu of the specified isolation of this section is acceptable

1.15 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for inertia bases.

PART 2 PRODUCTS

2.1 INERTIA BASES

- A. Manufacturers:
 - 1. Mason
 - 2. Vibration Eliminator
 - 3. Vibro-Acoustics Ltd.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Structural Bases:
 - 1. Design: Sufficiently rigid to prevent misalignment or undue stress on machine, and to transmit design loads to isolators and snubbers.

2. Construction: Welded structural steel with gusset brackets, supporting equipment and motor with motor slide rails.

C. Concrete Inertia Bases:

1. Mass: Minimum of 1.5 times weight of isolated equipment.
2. Construction: Structured steel channel perimeter frame, with gusset brackets and anchor bolts, adequately reinforced, concrete filled.
3. Connecting Point: Reinforced to connect isolators and snubbers to base.
4. Concrete: Reinforced 3,000 psi concrete.

2.2 VIBRATION ISOLATORS

A. Manufacturers:

1. Mason
2. Vibration Eliminator
3. Amber Booth
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Open Spring Isolators:

1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
3. Spring Mounts: Furnish with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
4. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.

C. Restrained Spring Isolators:

1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
3. Spring Mounts: Furnish with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
4. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.
5. Restraint: Furnish mounting frame and limit stops.

D. Closed Spring Isolators:

1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance.

- E. Restrained Closed Spring Isolators:
 - 1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 - 2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
 - 3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 - 4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance and limit stops.

- F. Spring Hanger:
 - 1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 - 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 - 3. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators rubber hanger with threaded insert.
 - 4. Misalignment: Capable of 20 degree hanger rod misalignment.

- G. Neoprene Pad Isolators:
 - 1. Rubber or neoprene-waffle pads.
 - a. 30 durometer.
 - b. Minimum 1/2 inch thick.
 - c. Maximum loading 40 psi.
 - d. Height of ribs: not to exceed 0.7 times width.
 - 2. Configuration: Single layer.

- H. Rubber Mount or Hanger: Molded rubber designed for 0.5 inches deflection with threaded insert.

- I. Glass Fiber Pads: Neoprene jacketed pre-compressed molded glass fiber.

- J. Seismic Snubbers:
 - 1. Type: Non-directional and double acting unit consisting of interlocking steel members restrained by neoprene elements.
 - 2. Neoprene Elements: Replaceable, minimum of 0.75 inch thick.
 - 3. Capacity: 4 times load assigned to mount groupings at 0.4 inch deflection.
 - 4. Attachment Points and Fasteners: Capable of withstanding 3 times rated load capacity of seismic snubber.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify equipment and piping is installed before work in this section is started.

3.2 EXISTING WORK

- A. Provide access to existing piping and ductwork and other installations remaining active and requiring access.
- B. Extend existing piping and ductwork installations using materials and methods compatible with existing electrical installations.

3.3 INSTALLATION

- A. Install isolation for motor driven equipment.
- B. Bases:
 - 1. Set steel bases for 1 inch clearance between housekeeping pad and base.
 - 2. Set concrete inertia bases for 2 inch clearance between housekeeping pad and base.
- C. Adjust equipment level.
- D. Install spring hangers without binding.
- E. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.
- F. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.
- G. Provide pairs of horizontal limit springs on fans with more than 6.0 inch static pressure, and on hanger supported, horizontally mounted axial fans.
- H. Provide resiliently mounted equipment and piping with seismic snubbers. Provide each inertia base with minimum of four seismic snubbers located close to isolators. Snub equipment designated for post disaster use to 0.05 inch maximum clearance. Provide other snubbers with clearance between 0.15 inch and 0.25 inch.
- I. Support piping connections to isolated equipment resiliently to nearest flexible pipe connector. as follows:
 - 1. Up to 4 inch Diameter: First three points of support.
 - 2. 5 to 8 inch Diameter: First four points of support.
 - 3. 10 inch Diameter and Over: First six points of support.
 - 4. Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect isolated equipment after installation and submit report. Include static deflections.
- C. After start-up, final corrections and balancing of systems take octave band sound measurements over full audio frequency range in areas adjacent to plumbing equipment rooms, duct and pipe shafts, and other critical locations. Provide one-third octave band measurements of artificial sound sources in areas indicated as having critical requirements. Submit complete report of test results including sound curves.

- D. Furnish services of testing agency to take noise measurement. Use meters meeting requirements of ANSI S1.4.

3.5 SCHEDULES

- A. Pipe Isolation Schedule:

Pipe Size Inch	Isolated Distance from Equipment
1	120 diameters
2	90 diameters
3	80 diameters
4	75 diameters
6	60 diameters
8	60 diameters
10	54 diameters
12	50 diameters
16	45 diameters
24	38 diameters
Over 24	

3.6 VIBRATION ISOLATION AND SEISMIC RESTRAINT INSTALLATION

- A. Horizontal pipe isolation: The first three pipe hangers in the main lines near the mechanical equipment shall be as described in specification 11. Specification 11 hangers must also be used in all transverse braced isolated locations. Brace hanger rods with SRC clamps specification 14. Horizontal runs in all other locations throughout the building shall be isolated by hangers as described in specification 10. Floor supported piping shall rest on isolators as described in specification 6. Heat exchanger's and expansion tanks are considered part of the piping run. The first three isolators from the isolated equipment will have the same static deflection as specified for the mountings under the connected equipment. If piping is connected to equipment located in basements and hangs from ceilings under occupied spaces the first three hangers shall have 0.75" (19mm) deflection for pipe sizes up to and including 3" (75mm), 1 1/2" (38mm) deflection for pipe sizes up to and including 6" (150mm), and 2 1/2" (64mm) deflection thereafter. Hangers shall be located as close to the overhead structure as practical. Where piping connects to mechanical equipment install specification 23 expansion joints or specification 24 stainless hoses if 23 is not suitable for the service.
- B. Riser isolation: Risers shall be suspended from specification 10 hangers or supported by specification 5 mountings, anchored with specification 25 anchors, and guided with specification 26 sliding guides. Steel springs shall be a minimum of 0.75" (19mm) except in those expansion locations where additional deflection is required to limit load changes to $\pm 25\%$ of the initial load. Submittals must include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on the building structure, spring deflection changes and seismic loads. Submittal data shall include certification that the riser system has been examined for excessive stresses and that none will exist in the proposed design.
- C. Seismic Restraint of Piping
 - 1. Seismically restrain all piping listed as a, b or c below. Use specification 12 cables if isolated. Specification 12 or 13 restraints may be used on unisolated piping.

- a. Fuel oil piping, gas piping, medical gas piping, and compressed air piping that is 1" (25mm) I.D. or larger.
 - b. Piping located in boiler rooms, mechanical equipment rooms, and refrigeration equipment rooms that is 1 1/4" (32mm) I.D. and larger.
 - c. All other piping 2 1/2" (64mm) diameter and larger.
2. Transverse piping restraints shall be at 40' (12m) maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
 3. Longitudinal restraints shall be at 80' (24m) maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
 4. Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.
 5. For fuel oil and all gas piping transverse restraints must be at 20' (6m) maximum and longitudinal restraints at 40' (12m) maximum spacing.
 6. Transverse restraint for one pipe section may also act as a longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24" (600m) of the elbow or TEE or combined stresses are within allowable limits at longer distances.
 7. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints in a manner similar to clevis supports.
 8. Branch lines may not be used to restrain main lines.
 9. Cast iron pipe of all types, glass pipe and any other pipes joined with a four band shield and clamp assembly in Zones 2B, 3 and 4 shall be braced as in sections 3.2.D.2 and 3. For Zones 0, 1 and 2A, 2 band clamps may be used with reduced spacings of 1/2 of those listed in sections 3.2.D.2 and 3.
- D. Vibration Isolation and Seismic Restraint of Plumbing Equipment
1. All equipment shall be vibration isolated and seismically restrained as per the schedules in part 3.5 of this specification.
 2. Equipment mounted on housekeeping pads: Pads shall be properly doweled or expansion shielded to deck to meet acceleration criteria.
 3. Requirements for installation on concrete inertia bases shall be as follows:
 - a. Minimum operating clearance between concrete inertia and base and housekeeping pad or floor shall be 2".
 - b. The equipment structural steel or concrete inertia base shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the machine or isolators.
 - c. The isolators shall be installed without raising the machine and frame assembly.
 - d. After the entire installation is complete and under full operational load, the isolators shall be adjusted so that the load is transferred from the blocks to the isolators. When all isolators are properly adjusted, the blocks or shims shall be barely free and shall be removed.
 - e. Install equipment with flexibility in wiring connection.
 - f. Verify that all installed isolator and mounting systems permit equipment motion in all directions. Adjust or provide additional resilient restraints to flexibly limit start-up equipment lateral motion to 1/4".
 - g. Prior to start-up, clean out all foreign matter between bases and equipment. Verify that there are no isolation short circuits in the base, isolators, or seismic restraints.

3.7 SEISMIC RESTRAINT EXCLUSIONS

- A. General: All mechanical and electrical components and systems that are considered exempt from the requirement for seismic restraint, in accordance with The International Building Code – 2003, Section.1621 and all related State of Connecticut Supplements, shall not require seismic restraint.

- B. Piping
 - 1. Piping in boiler and mechanical rooms less than 1 1/4" (32mm) inside diameter.
 - 2. All other piping less than 2 1/2" (64mm) inside diameter.
 - 3. All piping suspended by individual hangers 12" (300mm) or less as measured from the top of the pipe to the bottom of the support where the hanger is attached. However, if the 12" (300mm) limit is exceeded by any hanger in the run, seismic bracing is required for the run.
 - 4. The 12" (300mm) exemption applies for trapeze supported systems if the top of each item supported by the trapeze qualifies.

3.8 INSPECTION

- A. Examine systems under provisions of Division 1.

- B. On completion of installation of all vibration isolation devices herein specified, the local representative shall inspect the completed system and report in writing any installation error, improperly elected isolation devices, or other faults in the system that could affect the performance of the system. Contractor shall submit a report to the Owner, including the manufacturers representatives' final report, indicating all isolation reported as properly installed or requiring correction, and include a report by the Contractor on steps taken to properly complete the isolation work.

END OF SECTION

**SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Each Contractor, Subcontractor and/or supplier 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. Nameplates.
 - 2. Tags.
 - 3. Stencils.
 - 4. Pipe markers.
 - 5. Ceiling tacks.
 - 6. Labels.
 - 7. Lockout devices.
- B. Related Sections:
 - 1. Section 09 90 00 - Painting and Coating: Execution requirements for painting specified by this section.
 - 2. Section 22 04 00 – General Conditions for Plumbing Trades

1.3 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit manufacturers catalog literature for each product required.
- C. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

1.6 QUALITY ASSURANCE

- A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.
- B. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.

1.8 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.9 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two containers of spray-on adhesive

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Manufacturers:
 - 1. Craftmark Identification Systems
 - 2. Safety Sign Co.
 - 3. Seton Identification Products
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.2 TAGS

- A. Plastic Tags:
 - 1. Manufacturers:
 - a. Craftmark Identification Systems
 - b. Safety Sign Co.
 - c. Seton Identification Products
 - d. Substitutions: Section 01 60 00 - Product Requirements.
 - 2. Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches diameter
- B. Metal Tags:
 - 1. Manufacturers:
 - a. Craftmark Identification Systems

- b. Safety Sign Co.
 - c. Seton Identification Products
 - d. Substitutions: Section 01 60 00 - Product Requirements.
- 2. Stainless Steel with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges.
- C. Information Tags:
 - 1. Manufacturers:
 - a. Craftmark Identification Systems
 - b. Safety Sign Co.
 - c. Seton Identification Products
 - d. Substitutions: Section 01 60 00 - Product Requirements.
 - 2. Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3-1/4 x 5-5/8 inches with grommet and self-locking nylon ties.
- D. Tag Chart: Typewritten letter size list of applied tags and location plastic laminated.

2.3 STENCILS

- A. Manufacturers:
 - 1. Craftmark Identification Systems
 - 2. Safety Sign Co.
 - 3. Seton Identification Products
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Stencils: With clean cut symbols and letters of following size:
 - 1. Up to 2 inches Outside Diameter of Insulation or Pipe: 1/2 inch high letters.
 - 2. 2-1/2 to 6 inches Outside Diameter of Insulation or Pipe: 1-inch high letters.
 - 3. Over 6 inches Outside Diameter of Insulation or Pipe: 1-3/4 inches high letters.
- C. Stencil Paint: As specified in Section 09 90 00, semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

2.4 PIPE MARKERS

- A. Color and Lettering: Conform to ASME A13.1.
- B. Plastic Pipe Markers:
 - 1. Manufacturers:
 - a. Craftmark Identification Systems
 - b. Safety Sign Co.
 - c. Seton Identification Products
 - d. Substitutions: Section 01 60 00 - Product Requirements.
 - 2. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.
- C. Plastic Tape Pipe Markers:
 - 1. Manufacturers:
 - a. Craftmark Identification Systems
 - b. Safety Sign Co.
 - c. Seton Identification Products
 - d. Substitutions: Section 01 60 00 - Product Requirements.

2. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Plastic Underground Pipe Markers:

1. Manufacturers:
 - a. Seton
 - b. Northtown
 - c. Kolbi
 - d. Substitutions: Section 01 60 00 - Product Requirements.
2. Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.5 CEILING TACKS

A. Manufacturers:

1. Seton
2. Northtown
3. Kolbi
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Description: Steel with 3/4 inch diameter color-coded head.

C. Color code as follows:

1. Plumbing valves: Green.

2.6 LABELS

A. Manufacturers:

1. Seton
2. Northtown
3. Kolbi
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Description: Aluminum, size 1.9 x 0.75 inches, adhesive backed with printed identification and bar code.

2.7 LOCKOUT DEVICES

A. Lockout Hasps:

1. Manufacturers:
 - a. Seton
 - b. Brady
 - c. Omark
 - d. Substitutions: Section 01 60 00 - Product Requirements
2. Reinforced nylon hasp with erasable label surface; size minimum 7-1/4 x 3 inches.

B. Valve Lockout Devices:

1. Manufacturers:
 - a. Seton
 - b. Brady
 - c. Omark
 - d. Substitutions: Section 01 60 00 - Product Requirements.

2. Nylon device preventing access to valve operator, accepting lock shackle.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.2 INSTALLATION

- A. Apply stencil painting in accordance with Section 09 90 00.
- B. Install identifying devices after completion of coverings and painting.
- C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
- D. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.
- E. Install tags using corrosion resistant chain. Number tags consecutively by location.
- F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- G. Install piping identification on medical gas systems. Refer to Section 22 60 13.
- H. Identify water heaters, pumps, tanks, and water treatment devices with plastic nameplates stencil painting. Identify in-line pumps and other small devices with tags.
- I. Identify control panels and major control components outside panels with plastic nameplates.
- J. Identify valves in main and branch piping with tags.
- K. Identify piping, concealed or exposed, with plastic pipe markers plastic tape pipe markers stenciled painting. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- L. Provide ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

**SECTION 22 07 00
PLUMBING INSULATION**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Each Contractor, Subcontractor and/or supplier 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. Plumbing piping insulation, jackets and accessories.
 2. Plumbing equipment insulation, jackets and accessories.
- B. Related Sections:
1. Section 07 84 00 - Firestopping: Product requirements for firestopping for placement by this section.
 2. Section 09 90 00 - Painting and Coating: Execution requirements for painting insulation jackets and covering specified by this section.
 3. Section 23 04 00 – General Conditions for Mechanical Trades

1.3 REFERENCES

- A. ASTM International:
1. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 2. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 3. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 4. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
 5. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
 6. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.
 7. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
 8. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
 9. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
 10. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 11. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 12. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
 13. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 14. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

15. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
16. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
17. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
18. ASTM D1785 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
19. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
20. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.
- C. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 450 50 in accordance with ASTM E84.
- B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.
- C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.
- D. Maintain one copy copies of each document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years documented experience.

1.7 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- C. Maintain temperature before, during, and after installation for minimum period of 24 hours.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.11 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for man made fiber.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Manufacturers for Glass Fiber and Mineral Fiber Insulation Products:
 - 1. CertainTeed.
 - 2. Knauf.
 - 3. Johns Manville.
 - 4. Owens-Corning.
 - 5. Substitutions: Section 01 60 00 - Product Requirements Not Permitted.
- B. Manufacturers for Closed Cell Elastomeric Insulation Products:
 - 1. Aeroflex. Aerocell.
 - 2. Armacell, LLC. Armaflex.
 - 3. Nomaco. K-flex.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- C. Manufacturers for Polyisocyanurate Foam Insulation Products:
 - 1. Dow Chemical Company.
 - 2. Johns Manville.
 - 3. Green Polyiso.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- D. Manufacturers for Extruded Polystyrene Insulation Products:
 - 1. Dow Chemical Company.
 - 2. Johns Manville.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.

2.2 PIPE INSULATION

- A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation. Conform to ASTM C795 for application on Austenitic stainless steel.
 - 1. Thermal Conductivity: 0.23 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 850 degrees F.
 - 3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
 - 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- B. TYPE P-5: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: Range: Minus 70 to 180 degrees F.

2.3 PIPE INSULATION JACKETS

- A. Vapor Retarder Jacket:
 - 1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
 - 2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.
- B. PVC Plastic Pipe Jacket:
 - 1. Product Description: ASTM D1785, One piece molded type fitting covers and sheet material, off-white color.
 - 2. Thickness: 15 mil.
 - 3. Connections: Brush on welding adhesive Tacks Pressure sensitive color matching vinyl tape.
- C. ABS Plastic Pipe Jacket:
 - 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - 2. Minimum service temperature: -40 degrees F.
 - 3. Maximum service temperature of 180 degrees F.
 - 4. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.
 - 5. Thickness: 30 mil.
 - 6. Connections: Brush on welding adhesive.
- D. Aluminum Pipe Jacket:
 - 1. ASTM B209.
 - 2. Thickness: 0.025 inch thick sheet.
 - 3. Finish: Smooth Embossed
 - 4. Joining: Longitudinal slip joints and 2 inch laps.
 - 5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 - 6. Metal Jacket Bands: 1/2 inch wide; 0.015 inch thick aluminum. 0.020 inch thick stainless steel.
- E. Stainless Steel Pipe Jacket:
 - 1. ASTM A240/A240M OR ASTM 666 Type 302 304 316 stainless steel.
 - 2. Thickness: 0.018 inch thick.
 - 3. Finish: Smooth. Corrugated.
 - 4. Metal Jacket Bands: 1/2 inch wide; 0.020 inch thick stainless steel.
- F. Field Applied Glass Fiber Fabric Jacket System:
 - 1. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
 - 2. Glass Fiber Fabric:
 - a. Cloth: Untreated; 9 oz/sq yd weight.
 - b. Blanket: 1.0 lb/cu ft density.
 - c. Weave 10 x 10.

3. Indoor Vapor Retarder Finish:
 - a. Cloth: Untreated; 9 oz/sq yd weight.
 - b. Vinyl emulsion type acrylic, compatible with insulation, black white color.

2.4 PIPE INSULATION ACCESSORIES

- A. Vapor Retarder Lap Adhesive: Compatible with insulation.
- B. Covering Adhesive Mastic: Compatible with insulation.
- C. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.
- D. Piping 2 inches diameter and larger: Wood insulation saddle, hard maple. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.
- E. Closed Cell Elastomeric Insulation Pipe Hanger: Polyurethane insert with aluminum stainless steel jacket single piece construction with self adhesive closure. Thickness to match pipe insulation.
- F. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- G. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.
- H. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.
- I. Adhesives: Compatible with insulation.

2.5 EQUIPMENT INSULATION

- A. TYPE E-1: ASTM C553; glass fiber, flexible or semi-rigid, noncombustible.
 1. Thermal Conductivity: 0.24 at 75 degrees F.
 2. Operating Temperature Range: 0 to 450 degrees F.
 3. Density: 1.65 pound per cubic foot.
- B. TYPE E-2: ASTM C612; glass fiber, rigid board, noncombustible with factory applied kraft reinforced aluminum foil jacket.
 1. Thermal Conductivity: 0.24 at 75 degrees F.
 2. Operating Temperature Range: 0 to 450 degrees F.
 3. Density: 3.0 pound per cubic foot.
 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- C. TYPE E-8: ASTM C534, Type II, flexible, closed cell elastomeric insulation, sheet.
 1. Thermal Conductivity: 0.27 at 75 degrees F.
 2. Operating Temperature Range: Range: Minus 70 to 220 degrees F.
 3. .

2.6 EQUIPMENT INSULATION JACKETS

- A. PVC Plastic Equipment Jacket:
 1. Product Description: ASTM D1785, sheet material, off-white color.
 2. Minimum Service Temperature: -40 degrees F.
 3. Maximum Service Temperature: 150 degrees F.
 4. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.
 5. Thickness: 20 mil.

6. Connections: Brush on welding adhesive Tacks Pressure sensitive color matching vinyl tape.
- B. Aluminum Equipment Jacket:
1. ASTM B209.
 2. Thickness: 0.020 inch thick sheet.
 3. Finish: Smooth Embossed
 4. Joining: Longitudinal slip joints and 2 inch laps.
 5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum. 0.010 inch thick stainless steel.
- C. Stainless Steel Equipment Jacket:
1. ASTM ASTM A240/A240M OR ASTM 666 Type 302 304 316 stainless steel.
 2. Thickness: 0.010 0.016 0.018 inch thick.
 3. Finish: Smooth. Corrugated.
 4. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.
- D. Canvas Equipment Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric with fire retardant lagging adhesive compatible with insulation.
- E. Vapor Retarder Jacket:
1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
 2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.
- F. Field Applied Glass Fiber Fabric Jacket System:
1. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
 2. Glass Fiber Fabric:
 - a. Cloth: Untreated; 9 oz/sq yd weight.
 - b. Blanket: 1.0 lb/cu ft density.
 - c. Weave: 10 x 10.
 3. Indoor Vapor Retarder Finish:
 - a. Cloth: Untreated; 9 oz/sq yd weight.
 - b. Vinyl emulsion type acrylic, compatible with insulation, black white color.

2.7 EQUIPMENT INSULATION ACCESSORIES

- A. Vapor Retarder Lap Adhesive: Compatible with insulation.
- B. Covering Adhesive Mastic: Compatible with insulation.
- C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- D. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.
- E. Adhesives: Compatible with insulation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify piping and equipment has been tested before applying insulation materials.

- C. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - PIPING SYSTEMS

- A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.
- B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Section 07 84 00 for penetrations of assemblies with fire resistance rating greater than one hour.
- C. Piping Systems Conveying Fluids Below Ambient Temperature:
 - 1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
 - 2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
 - 3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.
- D. Glass Fiber Board Insulation:
 - 1. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
 - 2. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
 - 3. Cover wire mesh or bands with cement to a thickness to remove surface irregularities.
- E. Polyisocyanurate Foam Insulation Extruded Polystyrene Insulation:
 - 1. Wrap elbows and fitting with vapor retarder tape.
 - 2. Seal butt joints with vapor retarder tape.
- F. Hot Piping Systems less than 140 degrees F:
 - 1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
 - 3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.
- G. Hot Piping Systems greater than 140 degrees F:
 - 1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
 - 3. Insulate flanges and unions at equipment.
- H. Inserts and Shields:
 - 1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.

2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.
 - a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
 - b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.
 3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.
- I. Insulation Terminating Points:
1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.
 2. Chilled Water Coil Branch Piping: Insulate chilled water piping and associated components up to coil connection.
 3. Condensate Piping: Insulate entire piping system and components to prevent condensation.
- J. Closed Cell Elastomeric Insulation:
1. Push insulation on to piping.
 2. Miter joints at elbows.
 3. Seal seams and butt joints with manufacturer's recommended adhesive.
 4. When application requires multiple layers, apply with joints staggered.
 5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.
- K. High Temperature Pipe Insulation:
1. Install in multiple layers to meet thickness scheduled.
 2. Attach each layer with bands. Secure first layer with bands before installing next layer.
 3. Stagger joints between layers.
 4. Finish with canvas jacket sized for finish painting.
 5. Cover with aluminum jacket stainless steel jacket with seams located on bottom side of horizontal piping.
- L. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting PVC jacket and fitting covers ABS jacket and fitting covers aluminum jacket stainless steel jacket.
- M. Piping Exterior to Building: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with aluminum stainless steel jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal piping.
- N. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel or direct buried. Install factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.
- O. Heat Traced Piping Interior to Building: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer.
- P. Heat Traced Piping Exterior to Building: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size insulation large enough to enclose pipe and heat tracer. Cover with aluminum stainless steel jacket with seams

located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water.

- Q. Prepare pipe insulation for finish painting. Refer to Section 09 90 00.

3.3 INSTALLATION - EQUIPMENT

- A. Factory Insulated Equipment: Do not insulate.
- B. Exposed Equipment: Locate insulation and cover seams in least visible locations.
- C. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
- D. Equipment Containing Fluids Below Ambient Temperature:
1. Insulate entire equipment surfaces.
 2. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
 3. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
 4. Finish insulation at supports, protrusions, and interruptions.
- E. Equipment Containing Fluids 140 degrees F Or Less:
1. Do not insulate flanges and unions, but bevel and seal ends of insulation.
 2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
 3. Finish insulation at supports, protrusions, and interruptions.
- F. Equipment Containing Fluids Over 140 degrees F:
1. Insulate flanges and unions with removable sections and jackets.
 2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
 3. Finish insulation at supports, protrusions, and interruptions.
- G. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas jacket sized for finish painting PVC jacket and fitting covers aluminum jacket stainless steel jacket.
- H. Equipment Located Exterior to Building: Install vapor barrier jacket or finish with glass mesh reinforced vapor barrier cement. Cover with aluminum stainless steel jacket with seams located on bottom side of horizontal equipment.
- I. Cover glass fiber cellular glass hydrous calcium silicate cellular foam insulation with metal mesh and finish with heavy coat of insulating cement aluminum jacket stainless steel jacket.
- J. Nameplates and ASME Stamps: Bevel and seal insulation around; do not cover with insulation.
- K. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.
- L. Prepare equipment insulation for finish painting. Refer to Section 09 90 00.

3.4 SCHEDULES

A. Water Supply Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Domestic Hot Water Supply and Recirculation	P-1	1-1/4 inches and smaller	0.5
		1-1/2 inches and larger	1.0
Domestic Hot Water Supply and Recirculation systems with domestic water temperature maintenance cable	P-1	1 inch and smaller	1.0
		1-1/4 inches to 2 inches	1.5
		2-1/2 inches and larger	2.0
Domestic Cold Water	P-1 or P-5	1-1/4 inches and smaller	0.5
		1-1/2 inches and larger	1.0

B. Drainage Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Storm Piping (horizontal above ground within building)	P-1 or P-5	All sizes	1.0
Storm Piping (horizontal and vertical above ground within building when PVC pipe is used)	P-1 or P-5	All sizes	1.0
Sanitary Sewer Piping (horizontal and vertical above ground within building when PVC piping is used)	P-1 or P-5	All sizes	1.0

C. Equipment Insulation Schedule:

EQUIPMENT	INSULATION TYPE	INSULATION THICKNESS inches
Roof Drain Bodies	E-2 E-8	0.5
Domestic Water Booster Pump Bodies	E-8	0.5

END OF SECTION

**SECTION 22 12 00
FACILITY POTABLE-WATER STORAGE TANKS**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Water pressure booster systems.
- B. Sump pumps.
- C. Waste water ejector pumps.
- D. Neutralization Tanks

1.02 RELATED SECTIONS

- A. Section 22 04 00– General Conditions for Plumbing Trades.
- B. Section 22 05 00– Common Work Results for Plumbing
- C. Section 23 05 48 - Vibration Isolation and Seismic Restraints
- D. Section 22 40 00 – Plumbing Fixtures
- E. Section 22 40 0– Plumbing Fixtures and Specialties
- F. Section 23 51 00 – Breaching, Chimneys and Stacks.
- G. Section 23 05 93 – Testing, Adjusting and Balancing for HVAC
- H. Division 26 – Electrical.

1.03 REFERENCES

- A. ANSI/ASHRAE 90A - Energy Conservation in New Building Design.
- B. ASME Section VIII D - Pressure Vessels; Boiler and Pressure Vessel Codes.
- C. ANSI/NFPA 30 - Flammable and Combustible Liquids Code.
- D. ANSI/NFPA 54 - National Fuel Gas Code.
- E. ANSI/NFPA 70 - National Electrical Code.
- F. ANSI/UL 1453 - Electric Booster and Commercial Storage Tank Water Heaters.
- G. ANSI/NEMA 250 - Enclosure for Electrical Equipment (1000 Volts Maximum).

1.04 SUBMITTALS

- A. Submit under provisions of Division 1, Section 23 04 00, and Section 23 04 00.
- B. Product Data:

1. Include equipment dimensions, size of tappings, drains, performance data and electrical characteristics.
 2. Pumps: Submit certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
- C. Shop Drawings:
1. Include dimension drawings of equipment indicating components and connections to other equipment and piping.
 2. Indicate capacity, power requirements, and affected adjacent construction.
 3. Provide electrical characteristics and connection requirements.
- D. Manufacturer's installation instructions.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 1, Section 23 04 00, and Section 23 05 00.
- B. Indicate actual installed locations for equipment, pipe mounted devices, controls etc.

1.06 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 1, Section 23 04 00, and Section 23 05 00.
- B. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- C. Interceptors: Indicate frequency of treatment required.
- D. Dilution/Neutralization Tanks: Indicate frequency of treatment required.

1.07 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Connecticut Building Code.
- B. Provide equipment with manufacturer's name, model number, and rating/capacity identified.
- C. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
 1. American Gas Association (AGA).
 2. National Sanitation Foundation (NSF).
 3. American Society of Mechanical Engineers (ASME).
 4. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
 5. National Electrical Manufacturers' Association (NEMA).

6. Underwriters Laboratories (UL).

1.08 REGULATORY REQUIREMENTS

- A. Water heaters: Conform to appropriate standard of construction as itemized in each section of Part 2 of this specification.
- B. Conform to ASME Section VIII D for manufacture of pressure vessels.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1, Section 23 04 00, and Section 23 05 00.
- B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.10 WARRANTY

- A. Provide standard warranty for all equipment under provisions of Division 1, Section 23 04 00, and Section 23 05 00.
- B. Water heater storage tank, submersible pump: Provide five year warranty under provisions of Division 1, Section 23 04 00, and Section 23 05 00. Scale build-up shall not void warranty

PART 2 - PRODUCTS

2.01 VERTICAL SUMP PUMPS

- A. Manufacturers:
 - 1. Hydromatic Model as scheduled on the drawings.
 - 2. Other acceptable manufacturers offering equivalent products.
 - a. Zoeller
 - b. Weil
 - c. Little Giant
 - d. Goulds
 - e. Myers
- B. Type: Vertical centrifugal, direct connected, duplex arrangement.
- C. Casing: Cast iron volute with radial clearance around impeller, inlet strainer, slide away couplings.
- D. Impeller: Bronze; open non-clog, closed, keyed to corrosion resistant alloy steel stainless steel shaft.
- E. Support: Cast iron pedestal motor support on steel floor plate with gas tight gaskets.
- F. Bearings: Forced grease Oil lubricated bronze sleeve spaced maximum 48 inches (1200 mm) and grease lubricated ball thrust at floor plate.
- G. Drive: Flexible coupling to vertical, solid shaft ball bearing electric motor.

- H. Sump: Steel cover plate with steel curb frame for grouting into concrete sump with inspection opening and cover, and alarm fittings.
- I. Controls (Duplex): Float operated mechanical alternator with float rod, stops, and corrosion resistant float to alternate operation of pumps, cut-in second pump on rising level or lead pump failure, separate pressure switch high level alarm with transformer, alarm bell, and standpipe, and extra set of wired terminals for remote alarm circuit and emergency float switch with float rod, stops, and corrosion resistant float to operate both pumps on failure of alternator.

2.02 SEDIMENT INTERCEPTORS

- A. Manufacturers: J R Smith model as scheduled on the drawings.
- B. Other acceptable manufacturers offer equivalent products:
 - 1. Josam
 - 2. Wade
 - 3. Zurn
- C. Cast iron body and secured cover with removable stainless steel sediment bucket.

2.03 OIL INTERCEPTOR

- A. Manufacturers: J R Smith model as scheduled on the drawings.
- B. Other acceptable manufacturers offer equivalent products:
 - 1. Josam
 - 2. Proceptor
 - 3. Wade
 - 4. Zurn
- C. Construction: Epoxy coated fabricated steel for (shallow rough-in) flush with floor (deep rough-in) multi-weir bucket assembly, integral deep seal trap, adjustable draw-off assembly, and non-skid epoxy coated steel cover with gasket and securing handle.

2.04 ACID NEUTRALIZATION TANKS

- A. Manufacturers: Orion model as scheduled on the drawings.
- B. Other acceptable manufacturers offer equivalent products:
 - 1. Enfield
 - 2. Zurn
- C. Construction: High density polyethylene conforming to ASTM D1248, seamless with uniform wall thickness, welded into tank inlets and outlets with bolted cover. Fill tanks

with limestone chips, 1" to 3" in diameter with calcium carbonate content in excess of 90%.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

- A. Install all equipment as per the manufacturer's recommendations.
- B. Confirm proper electrical power characteristics, refer to Division 16.

3.02 INTERCEPTORS

- A. Provide sediment interceptors for all art room sinks, maintain clearances as required by the manufacturer.
- B. Provide grease interceptor to intercept all drainage from kitchen drains, installation shall conform to all State of Connecticut Health Department requirements.

END OF SECTION

**SECTION 22 15 00
GENERAL SERVICE COMPRESSED AIR SYSTEM**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Pipe and Pipe Fittings.
- B. Valving.
- C. Air compressor.

1.02 RELATED SECTIONS

- A. Section 22 11 00- Facility Water Distribution
- B. Section 23 05 00 - Mechanical Identification.
- C. Section 23 05 48 - Vibration Isolation and Seismic Restraints.
- D. Section 22 08 00 – Commissioning Requirements
- E. Division 26 - Electrical.

1.03 REFERENCES

- A. ASME - Boiler and Pressure Vessel Code.
- B. ASME B16.3 - Malleable Iron Threaded Fittings.
- C. ASME B16.18 - Cast Bronze Solder-Joint Pressure Fittings.
- D. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.
- E. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes.
- F. ASME B31.1 - Power Piping.
- G. ASME B31.9 - Building Services Piping.
- H. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- I. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.
- J. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- K. ASTM A307 - Carbon Steel Externally and Internally Threaded Standard Fasteners.
- L. ASTM B32 - Solder Metal.
- M. ASTM B88 - Seamless Copper Water Tube.

N. AWS D1.1 - Structural Welding Code.

O. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Submit under provisions of Division 1.

B. Shop Drawings: Indicate piping system schematic with electrical characteristics and connection requirements.

C. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.

B. Record actual locations of equipment and components. Modify shop drawings to indicate final locations.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1.

B. Protect piping and equipment from weather and construction traffic.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.01 CARBON STEEL PIPING

A. Pipe: Welded or seamless carbon steel conforming to ASTM A53. Provide piping with threaded ends up to 2" (50 mm) and beveled ends in sizes over 2" (50 mm).

B. Fittings:

1. Sizes 2" and Under: Malleable iron, screwed, 150 lb. conforming to ASME B16.3 as manufactured by Grinnell, Stockham or Tube Turns.

2. Sizes Over 2": Standard weight butt weld carbon steel conforming to ASTM 234 as manufactured by Stockham, Tube Turns or Grinnell. Elbows shall be long radius type. Tees and fittings shall be prefabricated. Weldolet type fittings shall not be used. Reducers shall be eccentric.

C. Flanges: Class 150 socket or welding neck type with raised face and spiral serrated finish conforming to ASTM 105 as manufactured by Stockham, Tube Turns or Grinnell. Gaskets shall be red rubber wire reinforced. Bolts shall be unfinished square head machine bolts conforming to ASTM A307.

- D. Joints: Threaded with Teflon pipe thread tape, welded per AWS D1.1 or flanged.

2.02 COPPER TUBING

- A. Copper tubing may be used for compressed air piping 2 inch (50 mm) diameter and less.
- B. Tubing: ASTM B88, Type L, hard drawn.
- C. Fittings: ASME B16.22, solder wrought copper.
- D. Joints: Solder, lead free, ASTM B32, 95/5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F (220 to 280 degrees C). [Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 - 1480 degrees F (640 - 805 degrees C).]

2.03 UNIONS AND DIELECTRIC CONNECTIONS

- A. Unions for Pipe 2 Inches (50 mm) and Under:
 - 1. Ferrous Piping: 150 psig (1034 kPa) malleable iron, threaded.
 - 2. Copper Pipe: Bronze, soldered joints.
- B. Dielectric Connections: Union or flange with water impervious isolation barrier; Watts 3000 Series or approved equal.

2.04 BUTTERFLY VALVES

- A. Manufacturers:
 - 1. Keystone Figure AR1.
 - 2. Other acceptable manufacturers offering equivalent products include:
 - a. Centerline.
 - b. Norriseal.
- B. Body: Cast iron with resilient replaceable EPDM seat, wafer or lug ends, extended neck with 316 stainless steel stem.
- C. Disc: Aluminum bronze.
- D. Operator: Notched plate lever handle.

2.05 GATE VALVES

- A. Up To and Including 2 Inches (50 mm):
 - 1. Manufacturers:
 - a. NIBCO Figure T-113 or S-113.
 - b. Other acceptable manufacturers offering equivalent products include:
 - 1) Watts.
 - 2) Stockham.

2. Bronze body, bronze trim, screwed bonnet, non-rising stem, non-asbestos packing, handwheel, inside screw, solid wedge disc, Class 125, threaded or solder ends.
- B. Over 2 Inches (50 mm):
1. Manufacturers:
 - a. NIBCO Figure F-619.
 - b. Other acceptable manufacturers offering equivalent products include:
 - 1) Watts.
 - 2) Stockham.
 2. Iron body, bronze trim, bolted bonnet, non-asbestos packing, non-rising stem, handwheel, solid wedge disc with bronze seat rings, Class 125, flanged ends.

2.06 GLOBE VALVES

- A. Up To and Including 2 Inches (50 mm):
1. Manufacturers:
 - a. NIBCO Figure T-211 or S-211.
 - b. Other acceptable manufacturers offering equivalent products include:
 - 1) Watts.
 - 2) Stockham.
 2. Bronze body, bronze trim, screwed bonnet, non-asbestos packing, rising stem, handwheel, inside screw, renewable composition disc and bronze seat, Class 125, threaded or solder ends.
- B. Over 2 Inches (50 mm):
1. Manufacturers:
 - a. NIBCO Figure F-718-B.
 - b. Other acceptable manufacturers offering equivalent products include:
 - 1) Watts.
 - 2) Stockham.
 2. Iron body, bronze trim, bolted bonnet, rising stem, non-asbestos packing, handwheel, outside screw and yoke, rotating plug-type disc with renewable seat ring and disc, Class 125, flanged ends.

2.07 BALL VALVES

- A. Up To and Including 2 Inches (50 mm):
1. Manufacturers:
 - a. NIBCO Model 585-70-66.
 - b. Other acceptable manufacturers offering equivalent products include:
 - 1) Watts.
 - 2) Jamesbury.
 2. Bronze two piece body, blowout-proof stem, stainless steel ball, teflon seats and packing, lever handle, solder or threaded ends. Provide with full port thru 1" and conventional port in sizes over 1".

2.08 PRESSURE REGULATING VALVES

A. Manufacturers:

1. Wilkerson Model R30. {3/4" thru 1 1/4"} [R40 {1 1/2" thru 2"}]
2. Other acceptable manufacturers offering equivalent products:
 - a. Norgren.
 - b. Hankinson.

B. Balanced valve design, self relieving, piston actuated, 0 to 125 psig (860 kpa) pressure range and pressure gauge with 0 to 160 psig (1100 kpa) range.

2.09 FILTER/REGULATOR

A. Manufacturers:

1. Wilkerson Model CB6-04. {1/2" max size}
2. Other acceptable manufacturers offering equivalent products:
 - a. Norgren.
 - b. Hankinson.

B. Balanced valve design, self relieving, piston actuated, 0 to 125 psig (860 kpa) pressure range and pressure gauge with 0 to 160 psig (1100 kpa) range. Filter shall be 5 micron, reusable type installed in transparent plastic bowl with bowl guard. Bowl shall be provided with quick disconnect clamp ring.

2.10 FILTER/REGULATOR/LUBRICATOR

A. Manufacturers:

1. Wilkerson Model C31. {3/4" or 1" size}
2. Other acceptable manufacturers offering equivalent products:
 - a. Norgren.
 - b. Hankinson.

B. Regulator shall be balanced valve design, self relieving, piston actuated, 0 to 125 psig (860 kpa) pressure range and pressure gauge with 0 to 160 psig (1100 kpa) range.

C. Filter shall be 5 micron reusable type installed in transparent plastic bowl with bowl guard. Bowl shall be provided with quick disconnect clamp ring.

D. Lubricator shall be Economist type with transparent plastic bowl, metal bowl guard, adjustable oil feed and quick disconnect bowl clamp ring. Lubricator shall be capable of being refilled without releasing air pressure at the unit.

2.11 LOCKOUT VALVES

A. Manufacturers: Norgren Series 15 or approved equal.

B. Ball valve body with 1/4 turn shutoff handle, lockout hasp, designed to automatically relieve downstream pressure when in the closed position.

2.12 AIR OUTLETS (QUICK CONNECTS)

- A. Up To and Including 2 Inches (50 mm):
 - 1. Manufacturers:
 - a. Hansen Model 70-2, Type HK.
 - b. Other acceptable manufacturers offering equivalent products include:
 - 1) Parker Hannifin.
 - 2) Grinnell.
 - 2. Steel or brass body, two way type to shut-off both ends, stainless steel locking balls, O-ring seal.

2.13 SOLENOID VALVES {two way}

- A. Manufacturers:
 - 1. ASCO 8030 Series.
 - 2. Other acceptable manufacturers offering equivalent products include:
 - a. Parker.
- B. Brass [Stainless steel] body, Buna N seal, stainless steel core, stainless steel body for shading coil, UL listed, [normally closed], Type 1[NEMA 4X enclosure], [24] VAC operation.

2.14 SOLENOID VALVES {three port/two position}

- A. Manufacturers: Norgren Prospector Poppet Valve or approved equal.
- B. Valves shall be [1/4"] size, three port/two position type with [solenoid valve] actuator, manual override and speed control for varying the rate of exhaust air flow.
- C. Construction: Aluminum body with epoxy finish, Nitrile O-rings and seals, stainless steel core, stainless steel body for shading coil, normally [closed], [120] VAC operation. [Solenoid valves shall be explosion proof.]

2.15 AIR COMPRESSOR

- A. Manufacturers:
 - 1. Champion, Model PL40
 - 2. Other acceptable manufacturers offering equivalent products include:
 - a. Joy.
 - b. Ingersoll-Rand.
- B. Single unit, two stage, electric motor driven, ASME rated horizontal receiver tank, air pressure operated electric switch, motor, motor starter mounted on compressor with automatic mechanical alternator, safety valves, automatic tank drain, muffler-filter, belt guard, oil level switch, pressure gauge, air discharge shutoff valve and UL approved start and stop controls.
- C. Performance: 55 scfm at 110 psi continuous operating pressure with 120 gallon receiver.

- D. Motor: 15 hp, 460 volt, 3 phase, 60 hz.
- E. Low Pressure Alarm: Provide a low pressure alarm for supervision of air pressure with contacts for remote alarm signal. Low pressure alarm shall be Potter Electric Signal Company, Model No. HLSB.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with ASME B31.9.
- C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- D. Install piping to conserve building space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Sleeve pipe passing through partitions, walls and floors.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- H. Provide access where valves and fittings are not exposed.
- I. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level. Provide 3/4" drain valves with hose and connections at all low points, bases of vertical risers, main shut-off valves and at equipment.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- K. Install valves with stems upright or horizontal, not inverted.
- L. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

- M. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- N. Use non-conducting dielectric connections whenever joining dissimilar metals in open systems.
- O. Use gate, ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.03 CLEANING AND FLUSHING

- A. Upon completion of all work, all piping systems shall be flushed with water/[liquid alkaline solution with emulsifying agents and detergents, to remove dirt, grease, grit, chips and foreign matter. Flushing solution shall be disposed of off-site.
- B. Solution for flushing shall be used in sufficient quantity to produce a velocity of at least 2.5 feet per second. Flushing shall continue until discharge solution shows no discoloration or evidence of foreign materials.
- C. During flushing operation, all valves shall be operated several times, bypasses opened, pumps operated and equipment flushed.
- D. Upon completion of flushing operations, all strainers, filters and blowdowns shall be removed and cleaned of accumulated waste.

3.04 TESTING

- A. All piping systems installed under this Contract shall be pressure tested with clean, clear water to insure tightness. All piping shall be tested to 150 psig (1000 kpa).
- B. Contractor shall be responsible for furnishing all plugs, piping, valves, hoses, and pumps necessary for required tests and for proper disposal of the water upon completion of the tests. All lines shall be thoroughly cleaned before testing.
- C. Items which are not to be subjected to the hydrostatic test shall be either removed or blanked off. Short sections of piping which must be removed to permit the installation of blinds or blanks must be tested separately.
- D. The test pump hook-up for hydrostatic test shall be such that the pressure may be applied gradually under perfect control. A valve shall be provided for blocking in the piping during the test period. The system should be filled with water thru a low connection point, care being taken that air is completely vented so that there are no air pockets remain. The pressure shall be applied gradually and held at the specified value for the time required to visually check each weld, connection, joint, flange, etc., but not less than a minimum of two hours. Test readings may be taken at the lowest point of the line or system of lines providing static head is added to the minimum hydrostatic test pressure. Care shall be taken to insure that at no point a dangerous over-pressure is experienced.
- E. The hydrostatic test shall be considered satisfactory if no visible leakage, cracks or other signs of distress are discovered on the piping or at any joints. There is no requirement for minimum pressure drop during the test period; however, the cause of any pressure loss other than that due to temperature change or similar reasons shall be justified to the satisfaction of the Owner's representative.

- F. Minor leaks in screwed or flanged joints may be repaired without retesting subject to the approval of the Owner.
- G. After completion of the hydrostatic testing, the system shall be completely drained at all low points. All test blinds, temporary supports, test equipment, etc., shall then be removed, and any valves, short sections of piping, miscellaneous in-line equipment or instruments that were removed prior to testing shall be re-installed and the line left ready for service. New gaskets shall be used when re-installing flanged items.
- H. Piping system shall be blown out with dry, oil-free air to remove all remaining water.
- I. At completion of tests Contractor shall submit a typewritten log of test data for Owner's permanent file including:
 - 1. Data of test.
 - 2. Section tested-attach sketch.
 - 3. Equipment used.
 - 4. Personnel involved.
 - 5. Owner or Owner's witness in attendance.
 - 6. Results.

After repair any failed test shall be repeated until all requirements of this Section are met.

3.05 COMMISSIONING

- A. Engage a factory-authorized service representative, to perform startup service as per functional test sheets and requirements of Section 23 08 00 Commissioning.
- B. Verify that equipment is installed and commissioned as per requirements of Section 23 08 00 and manufacturer's written instructions.
- C. Complete installation and startup checks and functional tests according to Section 23 08 00 and manufacturer's written instructions.
- D. Operational Test: After electrical and control systems have been energized, start units to confirm proper unit operation. Rectify malfunctions, replace defective parts with new one and repeat the start up procedure.
- E. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

END OF SECTION

SECTION 22 34 00
FUEL-FIRED DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Water heaters.
- B. Domestic water heat exchangers.
- C. Hot water storage tanks.
- D. Diaphragm type compression tanks.
- E. Circulating pumps.

1.02 RELATED SECTIONS

- A. Section 22 10 00- Plumbing Piping
- B. Section 22 05 00 - Mechanical Identification.
- C. Section 22 05 48 - Vibration Isolation and Seismic Restraints.
- D. Section 22 08 00 – Commissioning Requirements
- E. Division 26 - Electrical.

1.03 REFERENCES

- A. ASME - Boiler and Pressure Vessel Code.
- B. ASME B16.3 - Malleable Iron Threaded Fittings.
- C. ASME B16.18 - Cast Bronze Solder-Joint Pressure Fittings.
- D. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.
- E. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes.
- F. ASME B31.1 - Power Piping.
- G. ASME B31.9 - Building Services Piping.
- H. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- I. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.
- J. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- K. ASTM A307 - Carbon Steel Externally and Internally Threaded Standard Fasteners.

- L. ASTM B32 - Solder Metal.
- M. ASTM B88 - Seamless Copper Water Tube.
- N. AWS D1.1 - Structural Welding Code.
- O. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Shop Drawings: Indicate piping system schematic with electrical characteristics and connection requirements.
- C. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 1.
- B. Record actual locations of equipment and components. Modify shop drawings to indicate final locations.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1.
- B. Protect piping and equipment from weather and construction traffic.

1.07 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.01 COMMERCIAL GAS FIRED WATER HEATER

- A. Manufacturers:
 - 1. PVI Model as scheduled on the drawings.
 - 2. Other acceptable manufacturers offering equivalent products.
 - a. Lochinvar
 - b. A O Smith
 - c. Rheem/Ruud
- B. Type: Automatic, natural gas-fired, tank type vertical storage.
- C. Maximum working pressure: 150 psig (1000 kPa)

- D. Tank: Nickel-plated tank lining, welded steel ASME labelled; multiple flu passages, 4 inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.
- E. Accessories: Brass water connections and dip tube, drain valve, high-density magnesium anode, and ASME rated temperature and pressure relief valve.
- F. Approval: By AGA as automatic storage water heater and automatic circulating tank water heater for operation at 180 degrees F (82 degrees C).
- G. Controls: Automatic direct immersion thermostat with temperature range adjustable minimum 175 degrees F (97 degrees C) differential, automatic reset high temperature limiting thermostat, factory set at 205 degrees F (96 degrees C), gas pressure regulator, multi-ribbon or tubular burner, 100 percent safety shut-off pilot and thermocouple, intermittent electronic ignition monitoring pilot and main flame, trial for re-ignition for momentary loss of flame, shut down of pilot and main burner in 2-4 seconds after loss of flame, and automatic flue damper and power venter.

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

- A. Manufacturer:
 - 1. Amtrol Model as shown on the drawings.
 - 2. Other acceptable manufacturers offering equivalent products.
 - a. Taco.
 - b. Bell & Gossett.
- B. Construction: Welded steel, ASME labelled, tested and stamped in accordance with Section 8D of ASME Code; supplied with National Board Form U-1, rated for working pressure of 125 psig (860 kPa), with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.
- C. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 12 psig.

2.03 IN-LINE CIRCULATOR PUMPS

- A. Manufacturers:
 - 1. Taco Model as scheduled on the drawings.
 - 2. Other acceptable manufacturers offering equivalent products.
 - a. Armstrong
 - b. Bell & Gossett
- B. Casing: Bronze, rated for 125 psig (860 kPa) working pressure.
- C. Impeller: Bronze.
- D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against a stationary ceramic seat.
- F. Drive: Flexible coupling.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.02 WATER HEATER INSTALLATION

- A. Install water heaters in accordance with manufacturer's instructions and to NSF, UL AGA ANSI/NFPA 54 requirements.
- B. Coordinate with plumbing work and related electrical work to achieve a complete operating system.
- C. Coordinate with flue venting, refer to Section 23 51 00.

3.03 DOMESTIC HOT WATER STORAGE TANK INSTALLATION

- A. Install tanks in accordance with manufacturer's instructions.
- B. Provide steel pipe support for tanks, independent of building structural framing members.
- C. Clean and flush tank prior to delivery to site after installation. Seal until pipe connections are made.

3.04 PUMP INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide line sized isolation valve and strainer on suction and line sized soft seated check valve, balancing valve and isolation valve on discharge.
- C. Support piping adjacent to pump such that no weight is carried on pump casings.
- D. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
- E. Sump Pump: Ensure shaft length allows pump to be located minimum 24 inches (600 mm) below lowest invert into sump pit and minimum 6 inches (150) clearance from bottom of sump pit.
- F. Horizontal Pumps: Provide air cock and drain connection on casings.
- G. Base Mounted Pumps: Align and verify alignment pumps prior to start-up.

- H. Install in accordance with manufacturer's instructions.

3.05 GENERAL INSTALLATION

- A. Install in accordance with ASME B31.9.
- B. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space, and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Sleeve pipe passing through partitions, walls and floors.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide access where valves and fittings are not exposed.
- H. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level. Provide 3/4" drain valves with hose and connections at all low points, bases of vertical risers, main shut-off valves and at equipment.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- J. Install valves with stems upright or horizontal, not inverted.
- K. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- L. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- M. Use non-conducting dielectric connections whenever joining dissimilar metals in open systems.
- N. Use gate, ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.06 CLEANING AND FLUSHING

- A. Upon completion of all work, all piping systems shall be flushed with water/[liquid alkaline solution with emulsifying agents and detergents, to remove dirt, grease, grit, chips and foreign matter. Flushing solution shall be disposed of off-site.
- B. Solution for flushing shall be used in sufficient quantity to produce a velocity of at least 2.5 feet per second. Flushing shall continue until discharge solution shows no discoloration or evidence of foreign materials.

- C. During flushing operation, all valves shall be operated several times, bypasses opened, pumps operated and equipment flushed.
- D. Upon completion of flushing operations, all strainers, filters and blowdowns shall be removed and cleaned of accumulated waste.

3.07 TESTING

- A. All piping systems installed under this Contract shall be pressure tested with clean, clear water to insure tightness. All piping shall be tested to 150 psig (1000 kpa).
- B. Contractor shall be responsible for furnishing all plugs, piping, valves, hoses, and pumps necessary for required tests and for proper disposal of the water upon completion of the tests. All lines shall be thoroughly cleaned before testing.
- C. Items which are not to be subjected to the hydrostatic test shall be either removed or blanked off. Short sections of piping which must be removed to permit the installation of blinds or blanks must be tested separately.
- D. The test pump hook-up for hydrostatic test shall be such that the pressure may be applied gradually under perfect control. A valve shall be provided for blocking in the piping during the test period. The system should be filled with water thru a low connection point, care being taken that air is completely vented so that there are no air pockets remain. The pressure shall be applied gradually and held at the specified value for the time required to visually check each weld, connection, joint, flange, etc., but not less than a minimum of two hours. Test readings may be taken at the lowest point of the line or system of lines providing static head is added to the minimum hydrostatic test pressure. Care shall be taken to insure that at no point a dangerous over-pressure is experienced.
- E. The hydrostatic test shall be considered satisfactory if no visible leakage, cracks or other signs of distress are discovered on the piping or at any joints. There is no requirement for minimum pressure drop during the test period; however, the cause of any pressure loss other than that due to temperature change or similar reasons shall be justified to the satisfaction of the Owner's representative.
- F. Minor leaks in screwed or flanged joints may be repaired without retesting subject to the approval of the Owner.
- G. After completion of the hydrostatic testing, the system shall be completely drained at all low points. All test blinds, temporary supports, test equipment, etc., shall then be removed, and any valves, short sections of piping, miscellaneous in-line equipment or instruments that were removed prior to testing shall be re-installed and the line left ready for service. New gaskets shall be used when re-installing flanged items.
- H. Piping system shall be blown out with dry, oil-free air to remove all remaining water.
- I. At completion of tests Contractor shall submit a typewritten log of test data for Owner's permanent file including:
 - 1. Data of test.
 - 2. Section tested-attach sketch.
 - 3. Equipment used.

4. Personnel involved.
5. Owner or Owner's witness in attendance.
6. Results.

After repair any failed test shall be repeated until all requirements of this Section are met.

3.08 COMMISSIONING

- A. Engage a factory-authorized service representative, to perform startup service as per functional test sheets and requirements of Section 23 08 00 Commissioning.
- B. Verify that equipment is installed and commissioned as per requirements of Section 23 08 00 and manufacturer's written instructions.
- C. Complete installation and startup checks and functional tests according to Section 23 08 00 and manufacturer's written instructions.
- D. Operational Test: After electrical and control systems have been energized, start units to confirm proper unit operation. Rectify malfunctions, replace defective parts with new one and repeat the start up procedure.
- E. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

END OF SECTION

SECTION 262000

ATTACHMENT 1

PANELBOARD SCHEDULES

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL: MSB-1			MAIN: 3000A MCB				NOTES:					
PROJECT: EOB TECH. H.S.			V & PH: 480V/277V 3PH 4W									
PROJECT #: 25100.00			A.I.C. 100,000									
LOCATION:			FEEDER:									
MOUNTING: FLOOR												
BREAKER			PHASE LOAD - KVA					BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	900	3	MDB-1	212.80	629.40			416.60	MSB-2	1600	3	2
3	-	-	-	199.40		604.70		405.30	-	-	-	4
5	-	-	-	190.10			591.10	401.00	-	-	-	6
7	100	3	RTU-S1	17.31	59.81			42.50	LP-1C	200	3	8
9	-	-	-	17.31		44.41		27.10	-	-	-	10
11	-	-	-	17.31			49.31	32.00	-	-	-	12
13	125	3	EQBA	27.00	59.30			32.30	EQ-1B	150	3	14
15	-	-	-	27.40		30.70		3.30	-	-	-	16
17	-	-	-	27.20			59.80	32.60	-	-	-	18
19	500	3	EQ-1C	104.67	124.07			19.40	LSDP	200	3	20
21	-	-	-	104.67		126.97		22.30	-	-	-	22
23	-	-	-	104.67			124.07	19.40	-	-	-	24
25	200	3	EMDP-1	25.80	34.00			8.20	SP-4	60	3	26
27	-	-	-	29.70		37.50		7.80	-	-	-	28
29	-	-	-	30.50			38.00	7.50	-	-	-	30
31	350	3	SP-6	84.30	84.30				SPARE	100	3	32
33	-	-	-	84.90		84.90			-	-	-	34
35	-	-	-	83.90			83.90		-	-	-	36
37	100	3	SPARE		-					20	1	38
39	-	-	-			-				20	1	40
41	-	-	-							20	1	42
TOTAL LOAD PER PHASE:					990.9	929.2	946.2					
TOTAL LOAD ON PANEL:					2866.24 KVA							

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		MDB-1		MAIN:		16000A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W						
PROJECT #:		25100.00		A.I.C.:		65,000						
LOCATION:				FEEDER:								
MOUNTING:		FLOOR										
BREAKER				PHASE LOAD - KVA				BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	225	3	SP-1	22.20	26.30			4.10	PP-BA	100	3	2
3	-	-	-	18.10		21.00		2.90	-	-	-	4
5	-	-	-	12.90			15.80	2.90	-	-	-	6
7	300	3	SP-2	27.50	76.10			48.60	SP-8	500	3	8
9	-	-	-	27.00		75.40		48.40	-	-	-	10
11	-	-	-	27.10			74.20	47.10	-	-	-	12
13	350	3	SP-7	29.10	41.50			12.40	SP-9	250	3	14
15	-	-	-	29.30		39.00		9.70	-	-	-	16
17	-	-	-	29.10			39.20	10.10	-	-	-	18
19	125	3	SP-5	7.90	14.50			6.60	SP-10	125	3	20
21	-	-	-	6.80		13.50		6.70	-	-	-	22
23	-	-	-	6.50			11.90	5.40	-	-	-	24
25	225	3	PP-1G	23.30	54.40			31.10	SP-3	15	3	26
27	-	-	-	20.90		50.50		29.60	-	-	-	28
29	-	-	-	20.00			49.00	29.00	-	-	-	30
31	100	3	SPARE		-	-	-		SPARE	100	3	32
33	-	-	-		-	-	-		-	-	-	34
35	-	-	-		-	-	-		-	-	-	36
37	20	1			-	-	-			20	1	38
39	20	1			-	-	-			20	1	40
41	20	1			-	-	-			20	1	42
TOTAL LOAD PER PHASE:					212.8	199.4	190.1					
TOTAL LOAD ON PANEL:					602.30 KVA							

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		MDB-2		MAIN:		16000A MCB		NOTES: TWO SECTION PANELBOARD				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W						
PROJECT #:		25100.00		A.I.C.:		22,000						
LOCATION:		-		FEEDER:		-						
MOUNTING:		FLOOR										
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	100	3	EQ-BR	4.00	10.40			6.40	PP-1C	100	3	2
3	-	-	-	4.00		9.70		5.70	-	-	-	4
5	-	-	-	4.00			8.90	4.90	-	-	-	6
7	200	3	UDS	9.33	24.03			14.70	PP-1D	175	3	8
9	-	-	-	9.33		24.43		15.10	-	-	-	10
11	-	-	-	9.33			22.33	13.00	-	-	-	12
13	100	3	UDS	2.00	12.60			10.60	PP-1E	150	3	14
15	-	-	-	2.00		12.50		10.50	-	-	-	16
17	-	-	-	2.00			12.10	10.10	-	-	-	18
19	225	3	PP-1A	20.90	37.60			16.70	KP-1	225	3	20
21	-	-	-	20.20		39.30		19.10	-	-	-	22
23	-	-	-	17.80			36.40	18.60	-	-	-	24
25	100	3	PP-1B	5.60	15.80			10.20	KP-2	175	3	26
27	-	-	-	4.50		16.80		12.30	-	-	-	28
29	-	-	-	4.70			18.90	14.20	-	-	-	30
31	300	3	PP-2A	31.30	46.70			15.40	PP-1H	225	3	32
33	-	-	-	28.20		44.50		16.30	-	-	-	34
35	-	-	-	29.20			44.10	14.90	-	-	-	36
37	225	3	PP-1F	24.60	32.05			7.45	ELEV.	125	3	38
39	-	-	-	16.40		23.85		7.45	-	-	-	40
41	-	-	-	17.90			25.35	7.45	-	-	-	42
43	100	3	SPARE		-				SPARE	100	3	44
45	-	-	-			-			-	-	-	46
47	-	-	-				-		-	-	-	48
49	100	3	SPARE		-					20	1	50
51	-	-	-			-				20	1	52
53	-	-	-				-			20	1	54
55	20	1			-					20	1	56
57	20	1				-				20	1	58
59	20	1					-			20	1	60
61	20	1			-					20	1	62
63	20	1				-				20	1	64
65	20	1					-			20	1	66
67	20	1			-					20	1	68
69	20	1				-				20	1	70
71	20	1					-			20	1	72
73	20	1			-					20	1	74
75	20	1				-				20	1	76
77	20	1					-			20	1	78
79	20	1			-					20	1	80
81	20	1				-				20	1	82
83	20	1					-			20	1	84
TOTAL LOAD PER PHASE:					179.2	171.1	168.1					
TOTAL LOAD ON PANEL:					518.34 KVA							

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		MSB-2		MAIN:		1600A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W						
PROJECT #:		25100.00		A.I.C.		42,000						
LOCATION:				FEEDER:								
MOUNTING:		FLOOR										
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	700	3	MDB-2	179.20	269.39			90.19	EQ-2A	450	3	2
3	-	-	-	171.10		261.29		90.19	-	-	-	4
5	-	-	-	168.10			258.29	90.19	-	-	-	6
7	300	3	EQ-1A	65.10	98.21			33.11	EQ-KP	175	3	8
9	-	-	-	65.10		98.21		33.11	-	-	-	10
11	-	-	-	65.10			98.21	33.11	-	-	-	12
13	200	3	EQ-1D	26.00	49.00			23.00	LP-1B	200	3	14
15	-	-	-	26.00		45.80		19.80	-	-	-	16
17	-	-	-	26.00			44.50	18.50	-	-	-	18
19	100	3	SPARE		-	-	-		SPARE	100	3	20
21	-	-	-			-			-	-	-	22
23	-	-	-				-		-	-	-	24
25	20	1			-					20	1	26
27	20	1				-				20	1	28
29	20	1					-			20	1	30
31	20	1			-					20	1	32
33	20	1				-				20	1	34
35	20	1					-			20	1	36
37	20	1			-					20	1	38
39	20	1				-				20	1	40
41	20	1					-			20	1	42
TOTAL LOAD PER PHASE:					416.6	405.3	401.0					
TOTAL LOAD ON PANEL:					1222.90			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		LSDP		MAIN:		200A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W						
PROJECT #:		25100.00		A.I.C.:		35,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	LIGHTING	0.76	10.66			9.90	LS-1B, LS-1A	100	3	2
3	100	3	LS-1C, LS-1D	11.00		20.00		9.00	-	-	-	4
5	-	-	-	11.00			18.60	7.60	-	-	-	6
7	-	-	-	8.00	8.00					20	1	8
9	20	1	LIGHTING	0.76		0.76				20	1	10
11	20	1					0.76	0.76	EM LIGHTING	20	1	12
13	20	1			0.76			0.76	EM LIGHTING	20	1	14
15	20	1	EM LIGHTING CORR. E106A	0.76		1.52		0.76	EM LIGHTING E101, E101A	20	1	16
17	20	1	SPARE				-		SPARE	20	1	18
19	20	1	SPARE		-				SPARE	20	1	20
21	20	1				-				20	1	22
23	20	1					-			20	1	24
25	20	1			-					20	1	26
27	20	1				-				20	1	28
29	20	1					-			20	1	30
TOTAL LOAD PER PHASE:					19.4	22.3	19.4					
TOTAL LOAD ON PANEL:					61.06			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		EMDP-1		MAIN:		200A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W						
PROJECT #:		25100.00		A.I.C.:		35,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA				BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	40	3	EP-1A	5.50	11.50			6.00	EP-1C	40	3	2
3	-	-		8.50		15.00		6.50		-	-	4
5	-	-		8.50			16.00	7.50		-	-	6
7	40	3	EP-1D	6.50	14.30			7.80	EP-EQ	100	3	8
9	-	-		6.50		14.70		8.20		-	-	10
11	-	-		8.30			14.50	6.20		-	-	12
13	20	1	SPARE		-				SPARE	20	1	14
15	20	3	SPARE			-			SPARE	20	3	16
17	-	-	-				-		-	-	-	18
19	-	-	-		-				-	-	-	20
21	20	1				-				20	1	22
23	20	1					-			20	1	24
25	20	1			-					20	1	26
27	20	1				-				20	1	28
29	20	1					-			20	1	30
31	20	1			-					20	1	32
33	20	1				-				20	1	34
35	20	1					-			20	1	36
37	20	1			-					20	1	38
39	20	1				-				20	1	40
41	20	1					-			20	1	42
TOTAL LOAD PER PHASE:					25.8	29.7	30.5					
TOTAL LOAD ON PANEL:					86.00			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		EP-1A		MAIN:		100A MCB		NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W							
PROJECT #:		25100.00		A.I.C.:		22,000							
LOCATION:				FEEDER:									
MOUNTING:		SURFACE											
BREAKER				PHASE LOAD - KVA					BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#	
1	20	1	EM POWER B112A	0.36	0.72			0.36	EM POWER 8P B11A	20	1	2	
3	30	2	EM POWER UPS B112A	1.50		3.00		1.50	EM POWER UPS B122A	30	2	4	
5	-	-	-	1.50			3.00	1.50	-	-	-	6	
7	20	1	EM POWER B112B	0.18	0.68			0.50	EM POWER FA	20	1	8	
9	30	2	EM POWER UPS D102	1.50		3.00		1.50	EM POWER UPS D102	30	2	10	
11	-	-	-	1.50			3.00	1.50	-	-	-	12	
13	30	2	EM POWER UPS D102	1.50	1.86			0.36	EM POWER D102	20	1	14	
15	-	-	-	1.50		1.86		0.36	EM POWER D102	20	1	16	
17	20	1	EM POWER D102	0.36			2.23	1.87	EM POWER ACCU-1	25	2	18	
19	15	2	EM POWER ACU-1	0.10	1.97			1.87	-	-	-	20	
21	-	-	-	0.10		0.60		0.50	EM POWER FIRE DOOR	20	1	22	
23	20	2	EM POWER CHAIR LIFT	0.75			0.75		SPARE	20	1	24	
25	-	-	-	0.75	0.75				SPARE	20	1	26	
27	20	1	SPARE			-			SPARE	20	1	28	
29	20	1					-			20	1	30	
31	20	1			-					20	1	32	
33	20	1				-				20	1	34	
35	20	1					-			20	1	36	
37	20	1			-					20	1	38	
39	20	1				-				20	1	40	
41	20	1					-			20	1	42	
TOTAL LOAD PER PHASE:					6.0	8.5	9.0						
TOTAL LOAD ON PANEL:					23.43			KVA					

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		EP-1B		MAIN:		100A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W						
PROJECT #:		25100.00		A.I.C.		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA				BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	30	2	UPS	0.85	1.70			0.85	UPS	30	2	2
3	-	-	-	0.85		1.70		0.85	-	-	-	4
5	30	2	UPS	0.85			1.70	0.85	UPS	30	2	6
7	-	-	-	0.85	1.70			0.85	-	-	-	8
9	20	1	RECEPTACLE	0.96		1.92		0.96	RECEPTACLE	20	1	10
11	20	1	RECEPTACLE	0.96			1.92	0.96	RECEPTACLE	20	1	12
13	25	2	ACCU-5, ACU-5	1.45	1.81			0.36	49 COOLER EVAP. COIL	20	1	14
15	-	-	-	1.45		1.95		0.50	49 COOLER LIGHTS	20	1	16
17	25	3	49 COOLER COND. UNIT	1.80			1.80		SPARE	20	1	18
19	-	-	-	1.80	1.80				SPARE	20	1	20
21	-	-	-	1.80		1.80				20	1	22
23	20	1	SPARE					-		20	1	24
25	20	1	SPARE		-					20	1	26
27	20	1				-				20	1	28
29	20	1					-			20	1	30
TOTAL LOAD PER PHASE:					7.0	7.4	5.4					
TOTAL LOAD ON PANEL:					19.80			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		EP-1C		MAIN:		100A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W						
PROJECT #:		25100.00		A.I.C.		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA				BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	EM POWER H	0.72	1.44			0.72	EM POWER H	20	1	2
3	30	2	EM POWER UPS	1.50		3.00		1.50	EM POWER UPS	30	2	4
5	-	-	-	1.50			3.00	1.50	-	-	-	6
7	20	1	EM POWER H	0.72	1.44			0.72	EM POWER H	20	1	8
9	30	2	EM POWER UPS	1.50		3.00		1.50	EM POWER UPS	30	2	10
11	-	-	-	1.50			3.00	1.50	-	-	-	12
13	20	1	EM POWER GEN. HTR	1.00	1.70			0.70	GEN. BATTER CHRGR.	20	1	14
15	20	1	EM POWER HTR.	0.50		0.50			SPARE	20	1	16
17	25	2	ACCU-3, ACU-3	1.45			1.45		SPARE	20	1	18
19	-	-	-	1.45	1.45					20	1	20
21	20	1	SPARE			-				20	1	22
23	20	1	SPARE							20	1	24
25	20	1			-					20	1	26
27	20	1				-				20	1	28
29	20	1					-			20	1	30
TOTAL LOAD PER PHASE:					6.0	6.5	7.5					
TOTAL LOAD ON PANEL:					19.98			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		EP-1D		MAIN:		100A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W						
PROJECT #:		25100.00		A.I.C.:		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	EM POWER H104B	0.36	0.72			0.36	EM POWER H104B	20	1	2
3	20	1	EM POWER H104B	0.36		0.72		0.36	EM POWER H104B	20	1	4
5	30	2	EM POWER UPS	1.50			3.00	1.50	EM POWER UPS	30	2	6
7	-	-	-	1.50	3.00			1.50	-	-	-	8
9	25	2	ACCU-4, ACU-4	1.45		2.90		1.45	ACCU-6, ACU-6	25	2	10
11	-	-	-	1.45			2.90	1.45	-	-	-	12
13	35	3	50 FREEZER COND. UNIT	2.40	2.76			0.36	50 FREEZER EVAP. COIL	20	1	14
15	-	-	-	2.40		2.90		0.50	50 FREEZER LGTS	20	1	16
17	-	-	-	2.40			2.40		SPARE	20	1	18
19	20	1	SPARE		-				SPARE	20	1	20
21	20	1	SPARE			-				20	1	22
23	20	1					-			20	1	24
25	20	1			-					20	1	26
27	20	1				-				20	1	28
29	20	1					-			20	1	30
TOTAL LOAD PER PHASE:					6.5	6.5	8.3					
TOTAL LOAD ON PANEL:					21.30			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		EP-EQ		MAIN:		100A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W						
PROJECT #:		25100.00		A.I.C.:		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA				BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	15	3	JP-1	0.83	0.83				FUTURE LOAD	20	1	2
3	-	-	-	0.83		0.83			FUTURE LOAD	20	1	4
5	-	-	-	0.83			0.83		FUTURE LOAD	20	1	6
7	20	3	FUTURE LOAD		-				FUTURE LOAD	20	3	8
9	-	-	-			-			-	-	-	10
11	-	-	-				-		-	-	-	12
13	20	1	SPARE		-				SPARE	20	1	14
15	20	1	SPARE			-			SPARE	20	1	16
17	20	1					-			20	1	18
19	20	1			-					20	1	20
21	20	1				-				20	1	22
23	20	1					-			20	1	24
25	20	1			-					20	1	26
27	20	1				-				20	1	28
29	20	1					-			20	1	30
31	20	1			-					20	1	32
33	20	1				-				20	1	34
35	20	1					-			20	1	36
37	20	1			7.00			7.00	EP-1B	40	3	38
39	20	1				7.40		7.40	-	-	-	40
41	20	1					5.40	5.40	-	-	-	42
TOTAL LOAD PER PHASE:					7.8	8.2	6.2					
TOTAL LOAD ON PANEL:					22.29			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		EQ-1A		MAIN:		300A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W						
PROJECT #:		25100.00		A.I.C.		22,000						
LOCATION:		SURFACE		FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	125	3	RTU-C5	34.27	37.62			3.35	HX-1	20	3	2
3	-	-	-	34.27		37.62		3.35	-	-	-	4
5	-	-	-	34.27			37.62	3.35	-	-	-	6
7	25	3	HX-2	4.27	21.87			17.60	RTU-C4	70	3	8
9	-	-	-	4.27		21.87		17.60	-	-	-	10
11	-	-	-	4.27			21.87	17.60	-	-	-	12
13	35	3	RTU-S6	5.60	5.60					20	1	14
15	-	-	-	5.60		5.60				20	1	16
17	-	-	-	5.60			5.60			20	1	18
19	20	3	SPARE		-				SPARE	20	3	20
21	-	-	-			-			-	-	-	22
23	-	-	-				-		-	-	-	24
25	20	3	SPARE		-					20	1	26
27	-	-	-			-				20	1	28
29	-	-	-				-			20	1	30
31	20	1			-					20	1	32
33	20	1				-				20	1	34
35	20	1					-			20	1	36
37	20	1			-					20	1	38
39	20	1				-				20	1	40
41	20	1					-			20	1	42
TOTAL LOAD PER PHASE:					65.1	65.1	65.1					
TOTAL LOAD ON PANEL:					195.27			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		EQ-1B		MAIN:		150A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W						
PROJECT #:		25100.00		A.I.C.:		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA				BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	15	3	SEF-1	0.31	5.66			5.35	ERV-S3	25	3	2
3	-	-	-	0.31		5.66		5.35	-	-	-	4
5	-	-	-	0.31			5.66	5.35	-	-	-	6
7	15	3	ERV-S4	3.49	16.87			13.38	RTU-S2	60	3	8
9	-	-	-	3.49		16.87		13.38	-	-	-	10
11	-	-	-	3.49			16.87	13.38	-	-	-	12
13	40	3	CU-S7	5.69	6.13			0.44	EF-3	15	3	14
15	-	-	-	5.69		6.13		0.44	-	-	-	16
17	-	-	-	5.69			6.42	0.44	-	-	-	18
19	15	3	AHU-S7	2.11	3.05			0.94	D-2	15	3	20
21	-	-	-	2.11		3.05		0.94	-	-	-	22
23	-	-	-	2.11			3.05	0.94	-	-	-	24
25	20	3	SP-1	0.58	0.58					20	1	26
27	-	-	-	0.58		0.58				20	1	28
29	-	-	-	0.58			0.58			20	1	30
31	20	3	SPARE		-				SPARE	20	3	32
33	-	-	-			-				-	-	34
35	-	-	-				-			-	-	36
37	20	3	SPARE		-					60	3	38
39	-	-	-			-				20	1	40
41	-	-	-				-			20	1	42
TOTAL LOAD PER PHASE:					32.3	32.3	32.6					
TOTAL LOAD ON PANEL:					97.16			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		EQ-1C		MAIN:		500A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W						
PROJECT #:		25100.00		A.I.C.		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA				BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	110	3	H101	20.78	23.42			2.64	ERV-S5	20	3	2
3	-	-	-	20.78		23.42		2.64	-	-	-	4
5	-	-	-	20.78			23.42	2.64	-	-	-	6
7	35	3	ERV-S6	6.27	17.28			11.01	RTU-S3	60	3	8
9	-	-	-	6.27		17.28		11.01	-	-	-	10
11	-	-	-	6.27			17.28	11.01	-	-	-	12
13	20	3	RTU-S4	2.90	30.18			27.28	RTU-S5	125	3	14
15	-	-	-	2.90		30.18		27.28	-	-	-	16
17	-	-	-	2.90			30.18	27.28	-	-	-	18
19	110	3	CNC ROUTER	19.39	33.79			14.40	D-1	90	3	20
21	-	-	-	19.39		33.79		14.40	-	-	-	22
23	-	-	-	19.39			33.80	14.40	-	-	-	24
25	20	3	SPARE		-				SPARE	20	3	26
27	-	-	-			-			-	-	-	28
29	-	-	-				-		-	-	-	30
31	20	3	SPARE		-					20	1	32
33	-	-	-			-				20	1	34
35	-	-	-				-			20	1	36
37	20	1			-					20	1	38
39	20	1				-				20	1	40
41	20	1					-			20	1	42
TOTAL LOAD PER PHASE:					104.7	104.7	104.7					
TOTAL LOAD ON PANEL:					314.01			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		EQ-1D		MAIN:		200A MCB		NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W							
PROJECT #:		25100.00		A.I.C.:		22,000							
LOCATION:				FEEDER:									
MOUNTING:		SURFACE											
BREAKER				PHASE LOAD - KVA				BREAKER					
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#	
1	15	3	P-5	0.58	1.74			1.16	P-6, P-7	15	3	2	
3	-	-	-	0.58		1.74		1.16	-	-	-	4	
5	-	-	-	0.58			1.74	1.16	-	-	-	6	
7	40	3	P-1	5.82	11.64			5.82	P-2	40	3	8	
9	-	-	-	5.82		11.64		5.82	-	-	-	10	
11	-	-	-	5.82			11.64	5.82	-	-	-	12	
13	40	3	P-3	5.82	11.64			5.82	P-4	40	3	14	
15	-	-	-	5.82		11.64		5.82	-	-	-	16	
17	-	-	-	5.82			11.64	5.82	-	-	-	18	
19	20	3	SPARE	-	0.58			0.58	RP-1	15	3	20	
21	-	-	-	-		0.58		0.58	-	-	-	22	
23	-	-	-	-			0.58	0.58	-	-	-	24	
25	15	3	RP-2	0.44	0.44			-	SPARE	20	3	26	
27	-	-	-	0.44		0.44		-	-	-	-	28	
29	-	-	-	0.44			0.44	-	-	-	-	30	
31	20	3	SPARE	-	-			-	SPARE	20	3	32	
33	-	-	-	-				-	-	-	-	34	
35	-	-	-	-				-	-	-	-	36	
37	20	3	SPARE	-	-			-	-	20	1	38	
39	-	-	-	-				-	-	20	1	40	
41	-	-	-	-				-	-	20	1	42	
TOTAL LOAD PER PHASE:					26.0	26.0	26.0						
TOTAL LOAD ON PANEL:					78.12			KVA					

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		EQ-2A		MAIN:		450A MCB		NOTES: TWO SECTION PANELBOARD				
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W						
PROJECT #:		25100.00		A.I.C.:		22,000						
LOCATION:		-		FEEDER:								
MOUNTING:				SURFACE								
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	70	3	AHU-A1S	9.42	12.47			3.05	AHU-A1R	20	3	2
3	-	-	-	9.42		12.47		3.05	-	-	-	4
5	-	-	-	9.42			12.47	3.05	-	-	-	6
7	125	3	CU-A1	15.63	33.91			18.28	RTU-C1	70	3	8
9	-	-	-	15.63		33.91		18.28	-	-	-	10
11	-	-	-	15.63			33.91	18.28	-	-	-	12
13	70	3	RTU-C2	18.28	39.75			21.47	RTU-C3	90	3	14
15	-	-	-	18.28		39.75		21.47	-	-	-	16
17	-	-	-	18.28			39.75	21.47	-	-	-	18
19	15	3	LEF-1	0.58	1.16			0.58	LEF-2	15	3	20
21	-	-	-	0.58		1.16		0.58	-	-	-	22
23	-	-	-	0.58			1.16	0.58	-	-	-	24
25	15	3	LEF-3	0.58	1.16			0.58	LEF-4	15	3	26
27	-	-	-	0.58		1.16		0.58	-	-	-	28
29	-	-	-	0.58			1.16	0.58	-	-	-	30
31	15	3	LEF-5	0.58	1.16			0.58	LEF-6	15	3	32
33	-	-	-	0.58		1.16		0.58	-	-	-	34
35	-	-	-	0.58			1.16	0.58	-	-	-	36
37	15	3	LEF-7	0.58	0.58				SPARE	20	3	38
39	-	-	-	0.58		0.58			-	-	-	40
41	-	-	-	0.58			0.58		-	-	-	42
43	20	3	SPARE		-				SPARE	20	3	44
45	-	-	-			-			-	-	-	46
47	-	-	-				-		-	-	-	48
49	20	1			-					20	1	50
51	20	1				-				20	1	52
53	20	1					-			20	1	54
55	20	1			-					20	1	56
57	20	1				-				20	1	58
59	20	1					-			20	1	60
61	20	1			-					20	1	62
63	20	1				-				20	1	64
65	20	1					-			20	1	66
67	20	1			-					20	1	68
69	20	1				-				20	1	70
71	20	1					-			20	1	72
73	20	1			-					20	1	74
75	20	1				-				20	1	76
77	20	1					-			20	1	78
79	20	1			-					20	1	80
81	20	1				-				20	1	82
83	20	1					-			20	1	84
TOTAL LOAD PER PHASE:					90.2	90.2	90.2					
TOTAL LOAD ON PANEL:					270.57 KVA							

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		EQBA		MAIN: 125A MCB			NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH: 480V/277V 3PH 4W								
PROJECT #:		25100.00		A.I.C. 22,000								
LOCATION:		SURFACE		FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	LIGHTING	0.93	6.75			5.82	CA-2	40	3	2
3	40	3	CA-1	5.82		11.64		5.82	-	-	-	4
5	-	-	-	5.82			11.64	5.82	-	-	-	6
7	-	-	-	5.82	19.53			13.71	ERV-S2	70	3	8
9	25	3	ERV-S1	0.53		14.24		13.71	-	-	-	10
11	-	-	-	0.53			15.31	13.71	-	-	-	12
13	-	-	-	0.53	0.53			1.33	VEF-1	15	3	14
15	15	3	SP-3	0.20		1.53		1.33	-	-	-	16
17	-	-	-	0.20			0.20	1.33	-	-	-	18
19	-	-	-	0.20	0.20				SPARE	20	3	20
21	20	3	SPARE			-			-	-	-	22
23	-	-	-						-	-	-	24
25	-	-	-						SPARE	20	3	26
27	20	1				-			-	-	-	28
29	20	1							-	-	-	30
31	20	1				-				20	1	32
33	20	1								20	1	34
35	20	1								20	1	36
37	20	1				-				60	3	38
39	20	1								20	1	40
41	20	1								20	1	42
TOTAL LOAD PER PHASE					27.0	27.4	27.2					
TOTAL LOAD ON PANEL					81.57			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		EQ-BR		MAIN: 100A MCB			NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH: 208V/120V 3PH 4W								
PROJECT #:		25100.00		A.I.C. 22,000								
LOCATION:		SURFACE		FEEDER:								
MOUNTING:		SURFACE										
BREAKER			PHASE LOAD - KVA					BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	15	3	B-2	0.58	1.44			0.86	EF-2	15	1	2
3	-	-	-	0.58		1.44		0.86	EK-3	15	1	4
5	-	-	-	0.58			1.08	0.50	WH-1	20	1	6
7	20	1	WH-2	0.50	0.50					20	1	8
9	15	1	CF-2	0.86		1.72		0.86	CF-3	15	1	10
11	20	1	RECEPTACLE	0.72			0.72			20	1	12
13	15	1	SITE LIGHTING	0.50	1.70			1.20	SITE LIGHTING	20	3	14
15	15	1	SITE LIGHTING	0.50		1.70		1.20	-	-	-	16
17	15	1	SITE LIGHTING	0.50			1.70	1.20	-	-	-	18
19	20	1	SPARE		-				SPARE	20	1	20
21	20	1	SPARE			-			SPARE	20	1	22
23	20	1	SPARE				-		SPARE	20	1	24
25	20	1			-					20	1	26
27	20	1				-				20	1	28
29	20	1					-			20	1	30
31	20	1			-					20	1	32
33	20	1				-				20	1	34
35	20	1					-			20	1	36
37	20	1			-					20	1	38
39	20	1				-				20	1	40
41	20	1					-			20	1	42
TOTAL LOAD PER PHASE					3.6	4.9	3.5					
TOTAL LOAD ON PANEL					12.01			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		EQ-KP		MAIN: 175A MCB			NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH: 480V/277V 3PH 4W								
PROJECT #:		25100.00		A.I.C. 22,000								
LOCATION:		SURFACE		FEEDER:								
MOUNTING:		SURFACE										
BREAKER			PHASE LOAD - KVA					BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	15	3		1.67	5.67			4.00		20	3	2
3	-	-		1.67		5.67		4.00		-	-	4
5	-	-		1.67			5.67	4.00		-	-	6
7	20	3	MAU-1	3.05	6.10			3.05	MAU-2	20	3	8
9	-	-		3.05		6.10		3.05		-	-	10
11	-	-		3.05			6.10	3.05		-	-	12
13	15	3	KEF-1	2.11	4.22			2.11	KEF-2	15	3	14
15	-	-		2.11		4.22		2.11		-	-	16
17	-	-		2.11			4.22	2.11		-	-	18
19	20	3	DISH WASHER 56	1.33	6.33			5.00	HEATER 56A	25	3	20
21	-	-		1.33		6.33		5.00		-	-	22
23	-	-		1.33			6.33	5.00		-	-	24
25	70	3	HOT WATER	10.80	10.80				SPARE	20	2	26
27	-	-		10.80		10.80				-	-	28
29	-	-		10.80			10.80			-	-	30
31	20	3	SPARE							20	1	32
33	-	-								20	1	34
35	-	-								20	1	36
37	20	1								20	1	38
39	20	1								20	1	40
41	20	1								20	1	42
TOTAL LOAD PER PHASE					33.1	33.1	33.1					
TOTAL LOAD ON PANEL					99.36			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL: KP-1			MAIN: 225A MCB					NOTES: TWO SECTION PANELBOARD				
PROJECT: EOB TECH. H.S.			V & PH: 208V/120V 3PH 4W									
PROJECT #: 25100.00			A.I.C.: 22,000									
LOCATION: -			FEEDER:									
MOUNTING: SURFACE												
BREAKER			PHASE LOAD - KVA					BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	ITEM 1	0.90	0.90					20	1	2
3	20	1	ITEM 4	1.30		1.30				20	1	4
5	20	1					0.70	0.70	ITEM 9	15	3	6
7	20	1	ITEM 16	0.60	1.30			0.70	-	-	-	8
9	20	1	ITEM 17	1.00		1.70		0.70	-	-	-	10
11	20	1	ITEM 20A	0.96			1.92	0.96	ITEM 20B	20	1	12
13	20	1	ITEM 20C	0.96	1.96			1.00	ITEM 20D	20	1	14
15	20	1	ITEM 20E	0.96		1.96		1.00	ITEM 20F	20	1	16
17	20	1	ITEM 41	0.90			2.10	1.20	ITEM 24	20	1	18
19	20	1	ITEM 27	1.35	2.70			1.35	ITEM 28A	20	1	20
21	20	1	ITEM 28B	1.35		3.05		1.70	ITEM 29B	25	1	22
23	25	1	ITEM 29A	1.70			3.07	1.37	ITEM 30	20	1	24
25	25	2	ITEM 31B	1.05	1.53			0.48	ITEM 30	20	1	26
27	-	-		1.05		5.05		4.00	ITEM 32	60	2	28
29	20	1	ITEM 32	1.35			5.35	4.00	-	-	-	30
31	20	1	ITEM 32	1.54	1.54					20	1	32
33	20	1				-				20	1	34
35	20	1					-			20	1	36
37	20	1			0.90			0.90	ITEM 41	15	3	38
39	20	1	ITEM 41	0.50		1.40		0.90	-	-	-	40
41	20	1	ITEM 42B	1.35			2.25	0.90	-	-	-	42
43	20	1	KITCHEN WASHER	1.20	2.55			1.35	U2	20	1	44
45	30	2	KITCHEN DRYER	1.20		2.14		0.94	C2	15	3	46
47	-	-	-	1.20			2.14	0.94	-	-	-	48
49	30	2	ITEM 31A	1.05	1.99			0.94	-	-	-	50
51	-	-	-	1.05		1.85		0.80	ITEM 22	20	3	52
53	20	1					0.80	0.80	-	-	-	54
55	20	1			0.80			0.80	-	-	-	56
57	20	1				0.70		0.70	DEF-2	15	1	58
59	20	1	ANSUL	0.30			0.30			20	1	60
61	20	1	ITEM 104	0.54	0.54					20	1	62
63	20	1	SPARE			-			SPARE	20	1	64
65	20	1	SPARE				-		SPARE	20	1	66
67	20	1	SPARE		-				SPARE	20	1	68
69	20	1	SPARE			-			SPARE	20	1	70
71	20	1					-			20	1	72
73	20	1			-					20	1	74
75	20	1				-				20	1	76
77	20	1					-			20	1	78
79	20	1			-					20	1	80
81	20	1					-			20	1	82
83	20	1						-		20	1	84
TOTAL LOAD PER PHASE:					16.7	19.1	18.6					
TOTAL LOAD ON PANEL:					54.49 KVA							

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL: KP-2			MAIN: 175A MCB					NOTES: TWO SECTION PANELBOARD				
PROJECT: EOB TECH. H.S.			V & PH: 208V/120V 3PH 4W									
PROJECT #: 25100.00			A.I.C.: 22,000									
LOCATION: -			FEEDER:									
MOUNTING: SURFACE												
BREAKER			PHASE LOAD - KVA					BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	-		-			-	-	20	1	2
3	20	1	-			-		-	-	20	1	4
5	20	1	-				-	-	-	20	1	6
7	20	1	-		-			-	-	20	1	8
9	15	3	ITEM 55	0.94		0.94		-	-	20	1	10
11	-	-	-	0.94			1.44	0.50	GAS VALVE	20	1	12
13	-	-	-	0.94	0.94				-	20	1	14
15	20	1	ITEM 68	1.33		2.68		1.35	ITEM 72	20	1	16
17	20	1	ITEM 78	1.35			2.35	1.00	ITEM 73	20	1	18
19	20	1	ITEM 84A	1.35	2.29			0.94	ITEM 76	20	3	20
21	30	2	ITEM 74	1.35		2.29		0.94	-	-	-	22
23	-	-	-	1.35			2.29	0.94	-	-	-	24
25	20	1	ITEM 71	1.32	2.67			1.35	ITEM 84B	20	1	26
27	20	1	ITEM 60A	0.84		0.84				20	1	28
29	20	1	ITEM 60B	0.84			0.84			20	1	30
31	20	1			-					20	1	32
33	20	1				-				20	1	34
35	20	1					-			20	1	36
37	20	1	ITEM 97A	0.18	0.18					20	1	38
39	20	1	ITEM 97B	0.18		0.18				20	1	40
41	20	1	ITEM 98A	0.70			1.39	0.70	ITEM 98B	20	1	42
43	20	1	ITEM 99B	0.10	0.80			0.70	DEF-1	20	1	44
45	30	2	ITEM 100A	1.35		2.85		1.50	ITEM 100B	30	2	46
47	-	-	-	1.35			2.85	1.50	-	-	-	48
49	20	1	-		1.18			1.18	ITEM 79	20	1	50
51	20	1	ITEM 101A	0.36		0.72		0.36	ITEM 101B	20	1	52
53	20	1	KCF-3	0.70			1.63	0.94	ITEM 62B	15	3	54
55	20	1	VC REF-82	0.70	1.64			0.94	-	-	-	56
57	20	1	MILK COOLER 103A	0.86		1.80		0.94	-	-	-	58
59	20	1	MILK COOLER 103B	0.86			1.36	0.50	SERV. MON.	20	1	60
61	20	1	SERV. MON.	0.50	0.50					20	1	62
63	20	1	SPARE			-			SPARE	20	1	64
65	20	1	SPARE				-		SPARE	20	1	66
67	20	1	SPARE		-				SPARE	20	1	68
69	20	1	SPARE			-			SPARE	20	1	70
71	20	1					-			20	1	72
73	20	1			-					20	1	74
75	20	1				-				20	1	76
77	20	1					-			20	1	78
79	20	1			-					20	1	80
81	20	1				-				20	1	82
83	20	1					-			20	1	84
TOTAL LOAD PER PHASE:					10.2	12.3	14.2					
TOTAL LOAD ON PANEL:					36.63 KVA							

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		LP-1A		MAIN:		100A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W						
PROJECT #:		25100.00		A.I.C.:		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA				BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	LIGHTING C104, C105	2.30	4.32			2.02	LIGHTING C106	20	1	2
3	20	1	LIGHTING C101, C103	2.30		4.99		2.69	LIGHTING C106	20	1	4
5	20	1	LIGHTING	2.55			5.51	2.96	LIGHTING	20	1	6
7	20	1	LIGHTING CORRIDOR	1.00	3.74			2.74	LIGHTING	20	1	8
9	20	1	LIGHTING	1.54		3.97		2.44	LIGHTING	20	1	10
11	20	1	LIGHTING	1.20			3.98	2.78	LIGHTING	20	1	12
13	20	1	LIGHTING	1.21	1.21					20	1	14
15	20	1				0.15		0.15	LIGHTING ELEVATOR	20	1	16
17	20	1	SPARE				-		SPARE	20	1	18
19	20	1	SPARE		-				SPARE	20	1	20
21	20	1				-				20	1	22
23	20	1					-			20	1	24
25	20	1			5.82			5.82	LP-2A	60	3	26
27	20	1				5.82		5.82	-	-	-	28
29	20	1					5.82	5.82	-	-	-	30
TOTAL LOAD PER PHASE:					15.1	14.9	15.3					
TOTAL LOAD ON PANEL:					45.33			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		LP-1B		MAIN:		200A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W						
PROJECT #:		25100.00		A.I.C.:		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA				BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	LIGHTING	1.58	3.92			2.34	LIGHTING	20	1	2
3	20	1	LIGHTING	2.38		4.71		2.33	LIGHTING	20	1	4
5	20	1	LIGHTING	1.15			3.39	2.24	GYM	20	1	6
7	20	1	GYM	1.60	3.94			2.34	LIGHTING	20	1	8
9	20	1	EXTERIOR			-			SPARE	20	1	10
11	20	1	SPARE				-		SPARE	20	1	12
13	20	1	SPARE		-				SPARE	20	1	14
15	20	1	SPARE			-				20	1	16
17	20	1					-			20	1	18
19	20	1			-					20	1	20
21	20	1				-				20	1	22
23	20	1					-			20	1	24
25	20	1			15.11			15.11	LP-1A, LP-2A	100	3	26
27	20	1				15.11		15.11		-	-	28
29	20	1					15.11	15.11		-	-	30
TOTAL LOAD PER PHASE:					23.0	19.8	18.5					
TOTAL LOAD ON PANEL:					61.29			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		LP-1C		MAIN:		200A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W						
PROJECT #:		25100.00		A.I.C.		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER			PHASE LOAD - KVA					BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	LIGHTING E102	3.65	7.30			3.65	LIGHTING E102	20	1	2
3	20	1	LIGHTING E102	2.68		5.28		2.60	LIGHTING	20	1	4
5	20	1	LIGHTING F104	3.28			5.55	2.27	LIGHTING F106	20	1	6
7	20	1	LIGHTING F101	2.30	5.62			3.32	LIGHTING F101	20	1	8
9	20	1	SPARE			-			SPARE	20	1	10
11	20	1	LIGHTING F103, F102	3.07			6.34	3.26	LIGHTING F103	20	1	12
13	20	1	LIGHTING F103	3.65	7.71			4.06	LIGHTING F111	20	1	14
15	20	1	LIGHTING CORRIDOR F112	1.03		4.73		3.71	LIGHTING F110, F107	20	1	16
17	20	1	LIGHTING F107A, FLO7B	1.54			3.01	1.47	LIGHTING F113 CORRIDOR	20	1	18
19	20	1	LIGHTING E101A, E101	2.05	4.74			2.69	LIGHTING E101 LIGHTING	20	1	20
21	20	1	LIGHTING DISPLAY CASE			-			SPARE	20	1	22
23	20	1	SPARE						SPARE	20	1	24
25	20	1	SPARE		17.11			17.11	LP-1D	100	3	26
27	20	1				17.11		17.11	-	-	-	28
29	20	1					17.11	17.11	-	-	-	30
TOTAL LOAD PER PHASE:					42.5	27.1	32.0					
TOTAL LOAD ON PANEL:					101.60			KVA				

EMMETT O'BREIN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		LP-1D		MAIN:		100A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH						
PROJECT #:		25100.00		A.I.C.		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	LIGHTING CORRIDOR	2.11	3.89			1.78	LIGHTING KITCHEN	20	1	2
3	20	1	LIGHTING KITCHEN	2.27		3.43		1.16	LIGHTING G102	20	1	4
5	20	1	LIGHTING H103	2.05			5.06	3.01	LIGHTING H103	20	1	6
7	20	1	LIGHTING H103	3.65	7.10			3.46	LIGHTING H101	20	1	8
9	20	1	LIGHTING H101	3.52		6.56		3.04	LIGHTING H105	20	1	10
11	20	1	LIGHTING H101, H105	2.96			4.96	2.00	LIGHTING EXTERIOR	20	1	12
13	20	1	LIGHTING CAFÉ	3.56	7.48			3.92	LIGHTING CAFÉ	20	1	14
15	20	1	LIGHTING CAFÉ	3.92		4.60		0.68	LIGHTING CAFÉ	20	1	16
17	20	1	LIGHTINGS	2.50			5.38	2.88	LIGHTING ALT H102	20	1	18
19	20	1	SPARE						SPARE	20	1	20
21	20	1	SPARE			-			SPARE	20	1	22
23	20	1	SPARE				-		SPARE	20	1	24
25	20	1	LIGHTING	2.88	2.88					20	1	26
27	20	1				-				20	1	28
29	20	1					-			20	1	30
TOTAL LOAD PER PHASE:					21.4	14.6	15.4					
TOTAL LOAD ON PANEL:					51.33			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		LP-2A	MAIN:		60A MCB		NOTES:					
PROJECT:		EOB TECH. H.S.	V & PH:		480V/277V 3PH 4W							
PROJECT #:		25100.00	A.I.C.:		22,000							
LOCATION:			FEEDER:									
MOUNTING:		SURFACE										
BREAKER			PHASE LOAD - KVA					BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	LIGHTING 2ND FLOOR	2.85	6.59			3.74	LIGHTING 2ND FLOOR	20	1	2
3	20	1	LIGHTING 2ND FLOOR	2.99		6.69		3.71	LIGHTING 2ND FLOOR	20	1	4
5	20	1	LIGHTING 2ND FLOOR	2.78			4.17	1.39	LIGHTING 2ND FL. CORR.	20	1	6
7	20	1	SPARE		-				SPARE	20	1	8
9	20	1	SPARE			-			SPARE	20	1	10
11	20	1					-			20	1	12
13	20	1			-					20	1	14
15	20	1				-				20	1	16
17	20	1					-			20	1	18
19	20	1			-					20	1	20
21	20	1				-				20	1	22
23	20	1					-			20	1	24
25	20	1			-					20	1	26
27	20	1				-				20	1	28
29	20	1					-			20	1	30
TOTAL LOAD PER PHASE:					6.6	6.7	4.2					
TOTAL LOAD ON PANEL:					17.45			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		LS-1A		MAIN:		60A MCB		NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W							
PROJECT #:		25100.00		A.I.C.:		22,000							
LOCATION:				FEEDER:									
MOUNTING:		SURFACE											
BREAKER					PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#	
1	20	1	LIGHTING 2ND FLOOR	2.17	5.22			3.05	LIGHTING 1ST FLOOR B-C	20	1	2	
3	20	1	LIGHTING 1ST FLOOR A	3.37		5.37		2.00	LIGHTING	20	1	4	
5	20	1	LIGHTINGS	2.00			2.00			20	1	6	
7	20	1	LIGHTING ELEV, MACH RM	0.15	0.15					20	1	8	
9	20	1	SPARE			-			SPARE	20	1	10	
11	20	1	SPARE				-		SPARE	20	1	12	
13	20	1			-					20	1	14	
15	20	1				-				20	1	16	
17	20	1					-			20	1	18	
19	20	1								20	1	20	
21	20	1					-			20	1	22	
23	20	1						-		20	1	24	
TOTAL LOAD PER PHASE:					5.4	5.4	2.0						
TOTAL LOAD ON PANEL:					12.74			KVA					

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		LS-1B		MAIN:		100A MCB		NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W							
PROJECT #:		25100.00		A.I.C.:		22,000							
LOCATION:		SURFACE		FEEDER:									
MOUNTING:		SURFACE											
BREAKER				PHASE LOAD - KVA				BREAKER					
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#	
1	20	1	LIGHTING	2.80	5.10			2.30	LIGHTING	20	1	2	
3	20	1	LIGHTING GYM	2.56		4.80		2.24	LIGHTING GYM	20	1	4	
5	20	1	LIGHTING	1.90			3.40	1.50	LIGHTING EXTERIOR	20	1	6	
7	15	1	LIGHTING EXT- STEPS	0.52	0.52				SPARE	20	1	8	
9	20	1	SPARE			-			SPARE	20	1	10	
11	20	1	SPARE				-			20	1	12	
13	20	1			-					20	1	14	
15	20	1				-				20	1	16	
17	20	1					-			20	1	18	
19	20	1			4.24			4.24	LS-1A	60	3	20	
21	20	1				4.24		4.24		-	-	22	
23	20	1					4.24	4.24		-	-	24	
TOTAL LOAD PER PHASE:					9.9	9.0	7.6						
TOTAL LOAD ON PANEL:					26.53			KVA					

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		LS-1C		MAIN:		100A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W						
PROJECT #:		25100.00		A.I.C.:		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER					PHASE LOAD - KVA					BREAKER		
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	LIGHTING F BUILDING	1.58	4.71			3.13	LIGHTING F BUILDING	20	1	2
3	20	1	LIGHTING F CORRIDOR	1.73		4.71		2.98	LIGHTING E BUILDING	20	1	4
5	20	1	EM LIGHTING F101	1.73			1.73		SPARE	20	1	6
7	20	1	SPARE		-				SPARE	20	1	8
9	20	1	SPARE			-				20	1	10
11	20	1					-			20	1	12
13	20	1			-					20	1	14
15	20	1				-				20	1	16
17	20	1					-			20	1	18
19	20	1			6.32			6.32	LS-1D	60	3	20
21	20	1				6.32		6.32		-	-	22
23	20	1					6.32	6.32		-	-	24
TOTAL LOAD PER PHASE:					11.0	11.0	8.0					
TOTAL LOAD ON PANEL:					30.11			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		LS-1D		MAIN:		60A MCB		NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH:		480V/277V 3PH 4W							
PROJECT #:		25100.00		A.I.C.		22,000							
LOCATION:		SURFACE		FEEDER:									
MOUNTING:		SURFACE											
BREAKER					PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#	
1	20	1	LIGHTING AREA G	3.17	5.40			2.23	LIGHTING HALL	20	1	2	
3	20	1	LIGHTING AREA H	2.18		3.47		1.29	LIGHTING AREA H	20	1	4	
5	20	1	LIGHTING EXTERIOR	1.50			5.42	3.92	LIGHTING CAFÉ	20	1	6	
7	20	1	LIGHTING CAFÉ	0.68	2.68			2.00	LIGHTING	20	1	8	
9	20	1	LIGHTING	2.00		2.00			SPARE	20	1	10	
11	20	1	SPARE				-		SPARE	20	1	12	
13	20	1	SPARE		-					20	1	14	
15	20	1				-				20	1	16	
17	20	1					-			20	1	18	
19	20	1								20	1	20	
21	20	1					-			20	1	22	
23	20	1						-		20	1	24	
TOTAL LOAD PER PHASE:					8.1	5.5	5.4						
TOTAL LOAD ON PANEL:					18.97			KVA					

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		PP-1A		MAIN:		225A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W		TWO SECTION PANELBOARD				
PROJECT #:		25100.00		A.I.C.:		22,000						
LOCATION:		-		FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	RECEPT. C104	0.72	1.62			0.90	RECEPT. C104	20	1	2
3	20	1	RECEPT. C104	1.08		2.16		1.08	RECEPT. C104	20	1	4
5	20	1	RECEPT. C105	0.72			1.62	0.90	RECEPT. C105	20	1	6
7	20	1	RECEPT. C105	1.08	2.16			1.08	RECEPT. C105	20	1	8
9	20	1	RECEPT. C106	0.90		1.80		0.90	RECEPT. C106	20	1	10
11	20	1	RECEPT. C106	0.72			1.62	0.90	RECEPT. C106	20	1	12
13	20	1	RECEPT. C107A	0.36	1.08			0.72	RECEPT. C103	20	1	14
15	20	1	RECEPT. C103	1.08		2.16		1.08	RECEPT. C103	20	1	16
17	20	1	RECEPT. C103	0.90			1.62	0.72	RECEPT. C102	20	1	18
19	20	1	RECEPT. C102	1.08	2.16			1.08	RECEPT. C102	20	1	20
21	20	1	RECEPT. C102	0.90		1.62		0.72	RECEPT. C101	20	1	22
23	20	1	RECEPT. C101	0.90			2.40	1.50	RECEPT. C107	20	1	24
25	20	1	RECEPT. C107	0.54	1.62			1.08	RECEPT. B106A	20	1	26
27	20	1	RECEPT. B106	1.08		1.80		0.72	RECEPT. B106C	20	1	28
29	20	1	RECEPT. B106E	0.72			1.44	0.72	RECEPT. B101	20	1	30
31	20	1	RECEPT. B101	0.72	1.44			0.72	RECEPT. B101	20	1	32
33	20	1	RECEPT. B102	0.90		1.62		0.72	RECEPT. B101	20	1	34
35	20	1	RECEPT. B102	0.90			1.62	0.72	RECEPT. B102	20	1	36
37	20	1	RECEPT. B102	1.08	2.16			1.08	RECEPT. B102	20	1	38
39	20	1	RECEPT. B103	0.72		1.80		1.08	RECEPT. B103	20	1	40
41	20	1	RECEPT. B103	1.08			1.98	0.90	RECEPT. B103	20	1	42
43	20	1	RECEPT. B107	0.90	1.98			1.08		20	1	44
45	20	1	RECEPT.	0.90		1.80		0.90	RECEPT. B108C	20	1	46
47	20	1	RECEPT. B108	0.90			1.44	0.54	RECEPT. B108A	20	1	48
49	20	1	RECEPT. B104	0.90	1.62			0.72	RECEPT. B104	20	1	50
51	20	1	RECEPT. B104	1.08		2.16		1.08	RECEPT. B104	20	1	52
53	20	1	RECEPT. B105	0.90			1.44	0.54	RECEPT. B105	20	1	54
55	20	1	RECEPT. B105	1.08	2.16			1.08	RECEPT. B105	20	1	56
57	20	1	RECEPT. B108B	0.36		1.08		0.72	RECEPT. B112	20	1	58
59	20	1	RECEPT. B107A	0.36			1.08	0.72	RECEPT. B107	20	1	60
61	20	1	RECEPT. B106D	0.72	1.80			1.08	RECEPT. B106E	20	1	62
63	20	1	RECEPT. C101	1.08		2.16		1.08	RECEPT. C101	20	1	64
65	20	1	CUH	1.08			1.53	0.45	VAVS	20	1	66
67	20	1	VAVS	0.45	1.11			0.66	EF-1	15	1	68
69	20	1	SPARE			-			SPARE	20	1	70
71	20	1	SPARE				-		SPARE	20	1	72
73	20	1	SPARE		-				SPARE	20	1	74
75	20	1	SPARE			-			SPARE	20	1	76
77	20	1	SPARE				-		SPARE	20	1	78
79	20	1			-					20	1	80
81	20	1				-				20	1	82
83	20	1					-			20	1	84
TOTAL LOAD PER PHASE:					20.9	20.2	17.8					
TOTAL LOAD ON PANEL:					58.86			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		PP-1B		MAIN:		100A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W						
PROJECT #:		25100.00		A.I.C.		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	RECEPT. B112C	0.48	1.20			0.72	RECEPT. B112D	20	1	2
3	20	1	RECEPT. B112, B112E	0.36		1.08		0.72	RECEPT. B110	20	1	4
5	20	1	RECEPT. B111	0.54			1.44	0.90	RECEPT. B109D	20	1	6
7	20	1	RECEPT. B109	0.72	1.48			0.76	RECEPT. B109A+B	20	1	8
9	20	1	RECEPT. A113G	0.72		1.44		0.72	RECEPT. A113F	20	1	10
11	20	1	RECEPT. A113F	0.72			1.44	0.72	RECEPT. A113D	20	1	12
13	20	1	RECEPT. A113C	0.72	1.44			0.72	RECEPT. A113B	20	1	14
15	20	1	RECEPT. A113A	0.72		1.26		0.54	RECEPT. A112	20	1	16
17	20	1	RECEPT. A112	0.90			1.80	0.90	RECEPT. A112	20	1	18
19	20	1	RECEPT. A113, 101D, 101C	0.72	1.44			0.72	RECEPT. A113, A113H	20	1	20
21	20	1	RECEPT. B111 SEC. SYST.	0.72		0.72				20	1	22
23	20	1	SPARE				-		SPARE	20	1	24
25	20	1	SPARE		-				SPARE	20	1	26
27	20	1	SPARE			-			SPARE	20	1	28
29	20	1	SPARE				-		SPARE	20	1	30
31	20	1	SPARE		-				SPARE	20	1	32
33	20	1				-				20	1	34
35	20	1					-			20	1	36
37	20	1			-					20	1	38
39	20	1				-				20	1	40
41	20	1					-			20	1	42
TOTAL LOAD PER PHASE:					5.6	4.5	4.7					
TOTAL LOAD ON PANEL:					14.74			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		PP-1C		MAIN:		100A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W						
PROJECT #:		25100.00		A.I.C.:		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER					PHASE LOAD - KVA					BREAKER		
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	RECEPT. A108	0.90	1.80			0.90	RECEPT. A107	20	1	2
3	20	1	RECEPT. A106	0.90		1.80		0.90	RECEPT. A102	20	1	4
5	20	1	RECEPT. A101B	0.36			1.08	0.72	RECEPT. A102A	20	1	6
7	20	1	RECEPT. A102	0.72	1.26			0.54	VAVS	20	1	8
9	20	1	RECEPT. A103A, A103B	0.54		1.26		0.72	RECEPT. A104	20	1	10
11	20	1	RECEPT. A110, A111	0.56			1.46	0.90	RECEPT. A109	20	1	12
13	20	1	RECEPT. A108A	0.36	0.90			0.54	RECEPT. A101A, A105	20	1	14
15	20	1	RECEPT. A102	0.72		1.26		0.54	RECEPT. A103	20	1	16
17	20	1	RECEPT. A114C	0.90			1.65	0.75	EWC	20	1	18
19	20	1	RECEPT. A114A	0.90	1.44			0.54	RECEPT. A115C, A114B	20	1	20
21	20	1	CUH 1+2	0.50		1.04		0.54	RECEPT. A114, A114D	20	1	22
23	20	1					0.72	0.72	RECEPT. A109	20	1	24
25	20	1	PA SYSTEM	0.72	1.02			0.30	ART WORK DRIVER	20	1	26
27	20	1	ART WORK DRIVER	0.30		0.30				20	1	28
29	20	1	SPARE				-		SPARE	20	1	30
31	20	1	SPARE		-				SPARE	20	1	32
33	20	1	SPARE			-			SPARE	20	1	34
35	20	1	SPARE				-		SPARE	20	1	36
37	20	1	SPARE		-				SPARE	20	1	38
39	20	1				-				20	1	40
41	20	1					-			20	1	42
TOTAL LOAD PER PHASE:					6.4	5.7	4.9					
TOTAL LOAD ON PANEL:					16.99			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		PP-1D		MAIN:		175A MCB		NOTES: TWO SECTION PANELBOARD				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W						
PROJECT #:		25100.00		A.I.C.		22,000						
LOCATION:		-		FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA				BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	RECEPT. GYM	0.72	1.44			0.72	RECEPT. GYM	20	1	2
3	20	1	RECEPT. GYM	0.72		1.44		0.72	RECEPT. GYM	20	1	4
5	20	1	RECEPT. A115B, 118A, 119,1	1.30			1.66	0.36	RECEPT. A115A	20	1	6
7	20	1	RECEPT. A117	0.36	0.90			0.54	RECEPT. A117F, A118	20	1	8
9	20	1	RECEPT. A117C + D	0.76		1.76		1.00	EWC A117	20	1	10
11	20	1	RECEPT. A117A	0.54			1.26	0.72	RECEPT. A117A	20	1	12
13	20	1	RECEPT. A117B	0.38	0.92			0.54	RECEPT. A101E, A101F	20	1	14
15	20	1	EWC	1.50		1.68		0.18	RECEPT. D103	20	1	16
17	20	1	CUH	1.00			1.54	0.54	RECEPT. D103	20	1	18
19	20	1	RECEPT. D103	0.54	1.08			0.54	RECEPT. D103	20	1	20
21	20	1	RECEPT. D103	0.54		1.26		0.72	RECEPT. D105	20	1	22
23	20	1	RECEPT. D105A, D106A	0.66			0.84	0.18	RECEPT. D111A	20	1	24
25	30	2	DRYER D111A	2.50	3.40			0.90	REC. D108B, D110, D110A	20	1	26
27	-	-	-	2.50		3.04		0.54	RECEPT. D104	20	1	28
29	20	1	RECEPT. D103	0.54			0.72	0.18	RECEPT. D103	20	1	30
31	20	1	RECEPT. D103	0.18	0.36			0.18	RECEPT. D103	20	1	32
33	15	1	TEF-15	0.70		1.20		0.50	EWC	20	1	34
35	20	1	EPO COIL D107	0.10			0.60	0.50	CUH D104	20	1	36
37	20	1	SCOREBOARD	0.20	1.88			1.68	MOTORIZED BB	20	1	38
39	20	1	MOTORIZED BB	1.68		3.36		1.68	MOTORIZED BB	20	1	40
41	20	1	MOTORIZED BB	1.68			3.36	1.68	MOTORIZED BB	20	1	42
43	20	1	MOTORIZED BB	1.68	3.36			1.68	DIV. CURTAIN	20	1	44
45	20	1	SCORER'S TABLE	0.54		0.80		0.26	STAGE PROJ.	20	1	46
47	20	1	GYM LOCAL SOUND	1.20			2.40	1.20	GYM LOCAL SOUND	20	1	48
49	15	3	MOTOR BLEACHERS	0.15	0.30			0.15	MOTOR BLEACHERS	15	3	50
51	-	-	-	0.15		0.30		0.15	-	-	-	52
53	-	-	-	0.15			0.30	0.15	-	-	-	54
55	15	3	MOTOR BLEACHERS	0.15	0.30			0.15	MOTOR BLEACHERS	15	3	56
57	-	-	-	0.15		0.30		0.15	-	-	-	58
59	-	-	-	0.15			0.30	0.15	-	-	-	60
61	20	1	GYM	0.80	0.80					20	1	62
63	20	1	SPARE			-			SPARE	20	1	64
65	20	1	SPARE				-		SPARE	20	1	66
67	20	1	SPARE			-			SPARE	20	1	68
69	20	1	SPARE			-			SPARE	20	1	70
71	20	1					-			20	1	72
73	20	1				-				20	1	74
75	20	1				-				20	1	76
77	20	1					-			20	1	78
79	20	1				-				20	1	80
81	20	1					-			20	1	82
83	20	1					-			20	1	84
TOTAL LOAD PER PHASE:					14.7	15.1	13.0					
TOTAL LOAD ON PANEL:					42.86			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL: PP-1E			MAIN: 150A MCB			NOTES: TWO SECTION PANELBOARD						
PROJECT: EOB TECH. H.S.			V & PH: 208V/120V 3PH 4W									
PROJECT #: 25100.00			A.I.C.: 22,000									
LOCATION: -			FEEDER: -									
MOUNTING: SURFACE												
BREAKER				PHASE LOAD - KVA				BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	RECEPT. D101D	0.54	1.08			0.54	RECEPT. D101E	20	1	2
3	20	1	RECEPT. D101E	0.36		0.90		0.54	RECEPT. D101E	20	1	4
5	20	1	RECEPT. D101B	0.54			1.26	0.72	RECEPT. D101B	20	1	6
7	20	1	RECEPT. D101B	0.72	1.44			0.72	RECEPT. D101B	20	1	8
9	20	1	RECEPT. D101B	0.72		1.44		0.72	RECEPT. D101B	20	1	10
11	20	1	RECEPT. D101B	0.72			1.44	0.72	RECEPT. D101B	20	1	12
13	20	1	RECEPT. D101B	0.72	1.44			0.72	RECEPT. D101B	20	1	14
15	20	1	RECEPT. D101B	0.72		1.44		0.72	RECEPT. D101B	20	1	16
17	20	1	RECEPT. D101B	0.72			1.62	0.90	RECEPT. D101	20	1	18
19	20	1	RECEPT. D101	0.72	1.44			0.72	RECEPT. D101	20	1	20
21	20	1	RECEPT. D101	0.72		1.44		0.72	RECEPT. D101	20	1	22
23	20	1	RECEPT. D101	0.72			1.08	0.36	RECEPT. D101	20	1	24
25	20	1	RECEPT. D101	0.54	1.26			0.72	RECEPT. D101	20	1	26
27	20	1	RECEPT. D101A	0.72		1.44		0.72	RECEPT. D101A	20	1	28
29	20	1	RECEPT. D101A	0.72			1.44	0.72	RECEPT. D101A	20	1	30
31	20	1	RECEPT. D101A	0.72	1.44			0.72	RECEPT. D101A	20	1	32
33	20	1	RECEPT. D101A	0.72		1.44		0.72	RECEPT. D101A	20	1	34
35	20	1	RECEPT. D101A	0.72			1.44	0.72	RECEPT. D101A	20	1	36
37	20	1	RECEPT. D101A	0.72	1.44			0.72	RECEPT. D101C	20	1	38
39	20	1	RECEPT. D101A	0.54		1.26		0.72	RECEPT. D101G	20	1	40
41	20	1	RECEPT. D101H	0.38			1.28	0.90	RECEPT. D101F	20	1	42
43	20	1	RECEPT. D101B	0.72	1.10			0.38	CUH	20	1	44
45	20	1	VAVS	0.40		1.12		0.72	RECEPT. D101D	20	1	46
47	20	1	RECEPT. D101E	0.54			0.54			20	1	48
49	20	1	SPARE		-				SPARE	20	1	50
51	20	1	SPARE			-			SPARE	20	1	52
53	20	1	SPARE				-		SPARE	20	1	54
55	20	1	SPARE		-				SPARE	20	1	56
57	20	1	SPARE			-			SPARE	20	1	58
59	20	1					-			20	1	60
61	20	1			-					20	1	62
63	20	1				-				20	1	64
65	20	1					-			20	1	66
67	20	1			-					20	1	68
69	20	1				-				20	1	70
71	20	1					-			20	1	72
73	20	1			-					20	1	74
75	20	1				-				20	1	76
77	20	1					-			20	1	78
79	20	1			-					20	1	80
81	20	1				-				20	1	82
83	20	1					-			20	1	84
TOTAL LOAD PER PHASE:					10.6	10.5	10.1					
TOTAL LOAD ON PANEL:					31.22			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL: PP-1F			MAIN: 225A MCB			NOTES: TWO SECTION PANELBOARD						
PROJECT: EOB TECH. H.S.			V & PH: 208V/120V 3PH 4W									
PROJECT #: 25100.00			A.I.C.: 22,000									
LOCATION: -			FEEDER:									
MOUNTING: SURFACE												
BREAKER			PHASE LOAD - KVA					BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	RECEPTACLE	0.72	1.62			0.90	RECEPTACLE	20	1	2
3	20	1	RECEPTACLE	0.72		1.44		0.72	RECEPTACLE	20	1	4
5	20	1	RECEPTACLE	0.72			1.80	1.08	RECEPTACLE	20	1	6
7	20	1	RECEPTACLE	0.72	1.44			0.72	RECEPTACLE	20	1	8
9	20	1	RECEPTACLE	0.72		1.44		0.72	RECEPTACLE	20	1	10
11	20	1	RECEPTACLE	0.72			1.62	0.90	RECEPTACLE	20	1	12
13	20	1	RECEPTACLE	0.90	1.80			0.90	RECEPTACLE	20	1	14
15	20	1	RECEPTACLE	0.36		0.86		0.50	RECEPTACLE	20	1	16
17	20	1	RECEPTACLE	0.72			1.44	0.72	RECEPTACLE	20	1	18
19	20	1	RECEPTACLE	0.72	1.44			0.72	RECEPTACLE	20	1	20
21	20	1	RECEPTACLE	0.72		1.44		0.72	RECEPTACLE	20	1	22
23	20	1	RECEPTACLE	0.72			1.80	1.08	RECEPTACLE	20	1	24
25	20	1	RECEPTACLE	0.72	1.44			0.72	RECEPTACLE	20	1	26
27	20	1	RECEPTACLE	0.72		1.44		0.72	RECEPTACLE	20	1	28
29	20	1	RECEPTACLE	0.72			1.44	0.72	RECEPTACLE	20	1	30
31	20	1	RECEPTACLE	0.72	1.44			0.72	RECEPTACLE	20	1	32
33	20	1	RECEPTACLE	0.72		1.44		0.72	RECEPTACLE	20	1	34
35	20	1	RECEPTACLE	0.72			1.80	1.08	RECEPTACLE	20	1	36
37	20	1	RECEPTACLE	0.72	1.44			0.72	RECEPTACLE	20	1	38
39	20	1	RECEPTACLE	0.72		1.44		0.72	RECEPTACLE	20	1	40
41	20	1	RECEPTACLE	0.54			1.04	0.50	TEF 7,8,9,	20	1	42
43	20	1	TEF 10,11,12,13	0.50	1.00			0.50	TEF 17,19	20	1	44
45	20	1				-				20	1	46
47	20	1					-			20	1	48
49	15	2	FCU S3B	0.62	2.88			2.26	CU S3B	25	2	50
51	-	-	-	0.62		2.88		2.26	-	-	-	52
53	15	2	FCU-S4	0.62			2.88	2.26	CU S4	25	2	54
55	-	-	-	0.62	2.88			2.26	-	-	-	56
57	15	2	FSC-S5	0.62		2.88		2.26	CU S5	25	2	58
59	-	-	-	0.62			2.88	2.26	-	-	-	60
61	20	1	REC. F103D, F103C, EX.GFI	0.70	1.24			0.54	RECEPT. F103F	20	1	62
63	20	1	RECEPT. F103, EPO.	0.20		1.10		0.90	REC. F103 FL. BOX	20	1	64
65	20	1	REC. F109 PROJ. SCREEN	0.26			1.16	0.90	REC. F102A FL. BOX	20	1	66
67	20	1	F111 WASHER	1.44	6.02			4.58	F111 DRYER	20	1	68
69	20	1	SPARE			-			SPARE	20	1	70
71	20	1	SPARE				-		SPARE	20	1	72
73	20	1	SPARE		-				SPARE	20	1	74
75	20	1				-				20	1	76
77	20	1					-			20	1	78
79	20	1			-					20	1	80
81	20	1				-				20	1	82
83	20	1					-			20	1	84
TOTAL LOAD PER PHASE:					24.6	16.4	17.9					
TOTAL LOAD ON PANEL:					58.86 KVA							

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL: PP-1G			MAIN: 225A MCB					NOTES: TWO SECTION PANELBOARD				
PROJECT: EOB TECH. H.S.			V & PH: 208V/120V 3PH 4W									
PROJECT #: 25100.00			A.I.C.: 22,000									
LOCATION: -			FEEDER:									
MOUNTING: SURFACE												
BREAKER				PHASE LOAD - KVA				BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	E104 WIRE MOLD	0.72	1.44			0.72	E104 WIRE MOLD	20	1	2
3	20	1	E104 WIRE MOLD	0.72		1.44		0.72	E104 WIRE MOLD	20	1	4
5	20	1	E104 WIRE MOLD	0.72			1.44	0.72	E104 WIRE MOLD	20	1	6
7	20	1	E104 WIRE MOLD	0.72	1.44			0.72	E104 WIRE MOLD	20	1	8
9	20	1	E104 WIRE MOLD	0.72		1.44		0.72	E104 WIRE MOLD	20	1	10
11	20	1	E104 WIRE MOLD	0.72			1.44	0.72	E104 WIRE MOLD	20	1	12
13	20	1	E104 SM. BRD.	0.50	1.10			0.60	E104 CEIL. PROJ.	20	1	14
15	20	1	RECEPT. E102D	0.72		1.62		0.90	RECEPT. E101C	20	1	16
17	20	1	E101C SM. BRD.	0.50			1.22	0.72	E101C WIRE MOLD	20	1	18
19	20	1	E101C WIRE MOLD	0.72	1.44			0.72	E101C WIRE MOLD	20	1	20
21	20	1	E101C WIRE MOLD	0.72		1.44		0.72	E101C WIRE MOLD	20	1	22
23	20	1	RECEPT. F101E	1.08			1.80	0.72	E101C WIRE MOLD	20	1	24
25	20	1	E101C WIRE MOLD	0.72	1.44			0.72	RECEPT. E101C	20	1	26
27	20	1	RECEPT. F101D UC	0.50		1.22		0.72	RECEPT. F101D	20	1	28
29	20	1	RECEPT. F101D	0.36			0.46	0.10	CONT. SP-2	20	1	30
31	20	1	SPARE	-	-					20	1	32
33	20	1	SPARE	-		0.72		0.72	RECEPT. E101B	20	1	34
35	20	1	RECEPT. E101H, E101I	0.40			1.48	1.08	RECEPT. F102F	20	1	36
37	20	1	RECEPT. F104H	1.08	1.48			0.40	RECEPT. F108B	20	1	38
39	20	1	RECEPT. CORR. F108	0.90		1.62		0.72	TEF 1,2,3	20	1	40
41	15	1	TEF 4,5,6	0.80			0.80			20	1	42
43	15	2	FCU-S1	0.60	3.60			3.00	CU-S1	40	2	44
45	-	-	-	0.60		3.60		3.00	-	-	-	46
47	15	2	FCU-S2	0.60			3.60	3.00	CU-S2	40	2	48
49	-	-	-	0.60	3.60			3.00	-	-	-	50
51	20	1	SPARE	-		-		-	SPARE	20	1	52
53	20	1	SPARE	-		-		-	SPARE	20	1	54
55	15	3	E102 O.H. DOOR	0.82	1.64			0.82	E101A O.H. DOOR	15	3	56
57	-	-	-	0.82		1.64		0.82	-	-	-	58
59	-	-	-	0.82			1.64	0.82	-	-	-	60
61	15	3	E101 O.H. DOOR	0.82	1.64			0.82	E101 O.H. DOOR	15	3	62
63	-	-	-	0.82		1.64		0.82	-	-	-	64
65	-	-	-	0.82			1.64	0.82	-	-	-	66
67	15	3	E101A SM. EUT	0.90	1.80			0.90	E101 SM. EUT	15	3	68
69	-	-	-	0.90		1.80		0.90	-	-	-	70
71	-	-	-	0.90			1.80	0.90	-	-	-	72
73	15	3	E101A SM. EUT	0.90	1.80			0.90	E101 SM. EUT	15	3	74
75	-	-	-	0.90		1.80		0.90	-	-	-	76
77	-	-	-	0.90			1.80	0.90	-	-	-	78
79	20	1	SPARE	-	0.90			0.90	E101 SM. EUT	15	3	80
81	20	1	SPARE	-		0.90		0.90	-	-	-	82
83	20	1					0.90	0.90	-	-	-	84
TOTAL LOAD PER PHASE:					23.3	20.9	20.0					
TOTAL LOAD ON PANEL:					64.22 KVA							

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		PP-1H		MAIN:		225A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W		TWO SECTION PANELBOARD				
PROJECT #:		25100.00		A.I.C.:		22,000						
LOCATION:		-		FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	LOW VOLTAGE LIGHTING	0.90	1.80			0.90	LOW VOLTAGE LIGHTING	20	1	2
3	20	1	RECEPT. H101G	0.54		1.62		1.08	RECEPT. H101G	20	1	4
5	20	1	RECEPT. H101G	0.72			1.44	0.72	RECEPT. H101G	20	1	6
7	20	1	RECEPT. H101G	0.72	1.44			0.72	RECEPT. H101G	20	1	8
9	20	1	RECEPT. H101G	0.72		1.44		0.72	RECEPT. H101G	20	1	10
11	20	1	RECEPT. H101G	0.72			1.44	0.72	RECEPT. H101G	20	1	12
13	20	1	RECEPT. H101G	0.72	1.44			0.72	RECEPT. H101G	20	1	14
15	20	1	RECEPT. H101G	0.72		1.44		0.72	RECEPT. H101G	20	1	16
17	20	1	RECEPT. H101G	0.72			1.44	0.72	RECEPT. H105G	20	1	18
19	20	1	RECEPT. H101G	0.72	1.44			0.72	RECEPT. H105G	20	1	20
21	20	1	RECEPT. H101G	0.72		1.44		0.72	RECEPT. H105G	20	1	22
23	20	1	RECEPT. H101G	0.72			1.44	0.72	RECEPT. H105G	20	1	24
25	20	1	RECEPT. H101G	0.72	1.44			0.72	RECEPT. H105G	20	1	26
27	20	1	RECEPT. H101G	0.72		1.62		0.90	RECEPT. H105G	20	1	28
29	20	1	RECEPT. H101G	1.08			1.62	0.54	RECEPT. H103	20	1	30
31	20	1	RECEPT. H103, H104A	0.65	1.65			1.00	EWC H104	20	1	32
33	20	1	RECEPT. H104	0.50		1.22		0.72	RECEPT. H103	20	1	34
35	15	3	RECEPT. GARAGE	0.27			0.27		SPARE	20	1	36
37	-	-	-	0.27	0.27				SPARE	20	1	38
39	-	-	-	0.27		1.27		1.00	EWC H104	20	1	40
41	20	1	RECEPT H103	0.50			1.22	0.72	RECEPT. H103C	20	1	42
43	20	1	RECEPT. G106	0.54	1.62			1.08	RECEPT. 103	20	1	44
45	20	1	RECEPT. G106	0.64		1.72		1.08	RECEPT.G103B	20	1	46
47	20	1	RECEPT. G106	1.08			1.80	0.72	RECEPT. CORR.	20	1	48
49	20	1	RECEPT. G106	1.08	2.16			1.08	RECEPT.	20	1	50
51	20	1	RECEPT. G106	1.08		2.58		1.50	RECEPT. ALT.	20	1	52
53	20	1	RECEPT. ALT	1.08			2.58	1.50	UH	20	1	54
55	20	1	RECEPT. G106 MON.	0.54	0.54				SPARE	20	1	56
57	20	1	RECEPT. G106 MON.	0.36		0.36			SPARE	20	1	58
59	20	1	-				-		SPARE	20	1	60
61	15	3	H103 O.H. DOOR	0.27	0.54			0.27	H103 O.H.DOOR	15	3	62
63	-	-	-	0.27		0.54		0.27	-	-	-	64
65	-	-	-	0.27			0.54	0.27	-	-	-	66
67	15	3	H103 O.H. DOOR	0.27	0.54			0.27	H103 O.H.DOOR	15	3	68
69	-	-	-	0.27		0.54		0.27	-	-	-	70
71	-	-	-	0.27			0.54	0.27	-	-	-	72
73	15	3	H102 O.H. DOOR	0.27	0.54			0.27	H103 O.H.DOOR	15	3	74
75	-	-	-	0.27		0.54		0.27	-	-	-	76
77	-	-	-	0.27			0.54	0.27	-	-	-	78
79	20	1	SPARE		-				SPARE	20	1	80
81	20	1	SPARE			-			SPARE	20	1	82
83	20	1	SPARE				-			20	1	84
TOTAL LOAD PER PHASE:					15.4	16.3	14.9					
TOTAL LOAD ON PANEL:					46.62			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		PP-2A		MAIN:		300A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W		TWO SECTION PANELBOARD				
PROJECT #:		25100.00		A.I.C.:		22,000						
LOCATION:		-		FEEDER:								
MOUNTING:		SURFACE										
BREAKER			DESCRIPTION	LOAD KVA	PHASE LOAD - KVA			LOAD KVA	DESCRIPTION	BREAKER		
#	A	P			A	B	C			A	P	#
1	20	1	RECEPT. C201	0.90	1.62			0.72	RECEPT. C201	20	1	2
3	20	1	RECEPT. C201	1.08		2.16		1.08	RECEPT. C201	20	1	4
5	20	1	RECEPT. C202	0.72			1.80	1.08	RECEPT. C202	20	1	6
7	20	1	RECEPT. C202	1.08	1.98			0.90	RECEPT. C203	20	1	8
9	20	1	RECEPT. C203	0.72		1.80		1.08	RECEPT. C203	20	1	10
11	20	1	RECEPT. C203	1.08			1.44	0.36	RECEPT. C208A, C208B	20	1	12
13	20	1	RECEPT. C204	1.08	2.16			1.08	RECEPT. C204	20	1	14
15	20	1	RECEPT. C204	0.90		1.62		0.72	RECEPT. C204	20	1	16
17	20	1	RECEPT. C206	0.90			1.62	0.72	RECEPT. C206	20	1	18
19	20	1	RECEPT. C206	1.08	2.16			1.08	RECEPT. C206	20	1	20
21	20	1	RECEPT. C208A	0.36		1.44		1.08	RECEPT. C207	20	1	22
23	20	1	RECEPT. C207	1.08			3.58	2.50	RECEPT. C207 UPS	30	2	24
25	30	2	RECEPT. C207 UPS	2.50	5.00			2.50	-	-	-	26
27	-	-	-	2.50		4.00		1.50	EWC C208	20	1	28
29	20	1	RECEPT. 208	0.54			1.44	0.90	RECEPT. B206A	20	1	30
31	20	1	RECEPT. B206A	0.72	1.80			1.08	RECEPT. B206A	20	1	32
33	20	1	RECEPT. B206A	1.08		1.98		0.90	RECEPT. B207	20	1	34
35	20	1	RECEPT. B207	0.72			1.80	1.08	RECEPT. B207	20	1	36
37	20	1	RECEPT. B207	1.08	1.98			0.90	RECEPT. B208	20	1	38
39	20	1	RECEPT. B208	1.08		2.16		1.08	RECEPT. B208	20	1	40
41	20	1	RECEPT. B208	0.90			1.66	0.76	RECEPT. B203A, B203B	20	1	42
43	20	1	RECEPT. B203	1.26	1.62			0.36	RECEPT. B209A, B209C	20	1	44
45	20	1	RECEPT. B209A	0.28		1.36		1.08	RECEPT. B202B	20	1	46
47	20	1	RECEPT. B202A	1.08			1.62	0.54	RECEPT. B209A, B209C	20	1	48
49	20	1	TEF 16,18	1.22	2.72			1.50	TEF 20,21,22	20	1	50
51	20	1	RECEPT. C202	0.90		1.40		0.50	VAV'S EP1.1.2C	20	1	52
53	20	1	VAV'S EP1.1.2B	0.50			0.50			20	1	54
55	20	1	SPARE		-				SPARE	20	1	56
57	20	1	SPARE			-			SPARE	20	1	58
59	20	1	SPARE				-		SPARE	20	1	60
61	20	1	SPARE		-				SPARE	20	1	62
63	20	1	SPARE			-			SPARE	20	1	64
65	20	1					-			20	1	66
67	20	1			-					20	1	68
69	20	1				-				20	1	70
71	20	1					-			20	1	72
73	60	2	SC-1	3.43	3.43					20	1	74
75	-	-	-	3.43		3.43				20	1	76
77	60	2	SC-2	3.43			6.86	3.43	SC-1	60	2	78
79	-	-	-	3.43	6.86			3.43	-	-	-	80
81	60	2	SC-3	3.43		6.86		3.43	SC-5	60	2	82
83	-	-	-	3.43			6.86	3.43	-	-	-	84
TOTAL LOAD PER PHASE:					31.3	28.2	29.2					
TOTAL LOAD ON PANEL:					88.72			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		PP-BA		MAIN:		50A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W						
PROJECT #:		25100.00		A.I.C.:		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER					PHASE LOAD - KVA					BREAKER		
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	POWER BASEMENT	0.72	1.26			0.54	POWER BASEMENT	20	1	2
3	20	1				-				20	1	4
5	20	1					-			20	1	6
7	20	3	POWER SITE LIGHTING	1.44	2.88			1.44	POWER SITE LIGHTING	20	3	8
9	-	-	-	1.44		2.88		1.44	-	-	-	10
11	-	-	-	1.44			2.88	1.44	-	-	-	12
13	20	1	SPARE		-				SPARE	20	1	14
15	20	1	SPARE			-			SPARE	20	1	16
17	20	1	SPARE				-		SPARE	20	1	18
19	20	1			-					20	1	20
21	20	1				-				20	1	22
23	20	1					-			20	1	24
25	20	1			-					20	1	26
27	20	1				-				20	1	28
29	20	1					-			20	1	30
TOTAL LOAD PER PHASE:					4.1	2.9	2.9					
TOTAL LOAD ON PANEL:					9.90			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		SC-1		MAIN:		60A MCB		NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 2PH							
PROJECT #:		25100.00		A.I.C.:		22,000							
LOCATION:				FEEDER:									
MOUNTING:		SURFACE											
BREAKER					PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#	
1	20	1	RECEPTACLE	0.36	1.26			0.90	RECEPTACLE	20	1	2	
3	20	1	RECEPTACLE	0.72		1.44		0.72	RECEPTACLE	20	1	4	
5	20	1	RECEPTACLE	0.72			1.44	0.72	RECEPTACLE	20	1	6	
7	20	1	GAS SHUTOFF	0.50	1.22			0.72	RECEPTACLE	20	1	8	
9	20	1	FUME HOOD	1.50		1.50			GOGGLE CABINET	20	1	10	
11	20	1	SPARE				-		SPARE	20	1	12	
13	20	1	SPARE		-				SPARE	20	1	14	
15	20	1	SPARE			-			SPARE	20	1	16	
17	20	1					-			20	1	18	
19	20	1			-					20	1	20	
21	20	1				-				20	1	22	
23	20	1					-			20	1	24	
TOTAL LOAD PER PHASE:					2.5	2.9	1.4						
TOTAL LOAD ON PANEL:					6.86			KVA					

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		SC-2		MAIN:		60A MCB		NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 2PH							
PROJECT #:		25100.00		A.I.C.:		22,000							
LOCATION:				FEEDER:									
MOUNTING:		SURFACE											
BREAKER					PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#	
1	20	1	RECEPTACLE	0.36	1.26			0.90	RECEPTACLE	20	1	2	
3	20	1	RECEPTACLE	0.72		1.44		0.72	RECEPTACLE	20	1	4	
5	20	1	RECEPTACLE	0.72			1.44	0.72	RECEPTACLE	20	1	6	
7	20	1	GAS SHUTOFF	0.50	1.22			0.72	RECEPTACLE	20	1	8	
9	20	1	FUME HOOD	1.50		1.50			GOGGLE CABINET	20	1	10	
11	20	1	SPARE				-		SPARE	20	1	12	
13	20	1	SPARE		-				SPARE	20	1	14	
15	20	1	SPARE			-			SPARE	20	1	16	
17	20	1					-			20	1	18	
19	20	1			-					20	1	20	
21	20	1				-				20	1	22	
23	20	1					-			20	1	24	
TOTAL LOAD PER PHASE:					2.5	2.9	1.4						
TOTAL LOAD ON PANEL:					6.86			KVA					

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		SC-3		MAIN:		60A MCB		NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 2PH							
PROJECT #:		25100.00		A.I.C.:		22,000							
LOCATION:				FEEDER:									
MOUNTING:		SURFACE											
BREAKER					PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#	
1	20	1	RECEPTACLE	0.36	1.26			0.90	RECEPTACLE	20	1	2	
3	20	1	RECEPTACLE	0.72		1.44		0.72	RECEPTACLE	20	1	4	
5	20	1	RECEPTACLE	0.72			1.44	0.72	RECEPTACLE	20	1	6	
7	20	1	GAS SHUTOFF	0.50	1.22			0.72	RECEPTACLE	20	1	8	
9	20	1	FUME HOOD	1.50		1.50			GOGGLE CABINET	20	1	10	
11	20	1	SPARE				-		SPARE	20	1	12	
13	20	1	SPARE		-				SPARE	20	1	14	
15	20	1	SPARE			-			SPARE	20	1	16	
17	20	1					-			20	1	18	
19	20	1			-					20	1	20	
21	20	1				-				20	1	22	
23	20	1					-			20	1	24	
TOTAL LOAD PER PHASE:					2.5	2.9	1.4						
TOTAL LOAD ON PANEL:					6.86			KVA					

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		SC-4		MAIN:		60A MCB		NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 2PH							
PROJECT #:		25100.00		A.I.C.:		22,000							
LOCATION:				FEEDER:									
MOUNTING:		SURFACE											
BREAKER					PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#	
1	20	1	RECEPTACLE	0.36	1.26			0.90	RECEPTACLE	20	1	2	
3	20	1	RECEPTACLE	0.72		1.44		0.72	RECEPTACLE	20	1	4	
5	20	1	RECEPTACLE	0.72			1.44	0.72	RECEPTACLE	20	1	6	
7	20	1	GAS SHUTOFF	0.50	1.22			0.72	RECEPTACLE	20	1	8	
9	20	1	FUME HOOD	1.50		1.50			GOGGLE CABINET	20	1	10	
11	20	1	SPARE				-		SPARE	20	1	12	
13	20	1	SPARE		-				SPARE	20	1	14	
15	20	1	SPARE			-			SPARE	20	1	16	
17	20	1					-			20	1	18	
19	20	1			-					20	1	20	
21	20	1				-				20	1	22	
23	20	1					-			20	1	24	
TOTAL LOAD PER PHASE:					2.5	2.9	1.4						
TOTAL LOAD ON PANEL:					6.86			KVA					

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		SC-5		MAIN:		70A MCB		NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 2PH							
PROJECT #:		25100.00		A.I.C.:		22,000							
LOCATION:				FEEDER:									
MOUNTING:		SURFACE											
BREAKER					PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#	
1	20	1	RECEPTACLE	0.36	1.26			0.90	RECEPTACLE	20	1	2	
3	20	1	RECEPTACLE	0.72		1.44		0.72	RECEPTACLE	20	1	4	
5	20	1	RECEPTACLE	0.72			1.44	0.72	RECEPTACLE	20	1	6	
7	20	1	GAS SHUTOFF	0.50	1.22			0.72	RECEPTACLE	20	1	8	
9	20	1	FUME HOOD	1.50		1.50			GOGGLE CABINET	20	1	10	
11	20	1	SPARE				-		SPARE	20	1	12	
13	20	1	SPARE		-				SPARE	20	1	14	
15	20	1	SPARE			-			SPARE	20	1	16	
17	20	1					-			20	1	18	
19	20	1			-					20	1	20	
21	20	1				-				20	1	22	
23	20	1					-			20	1	24	
TOTAL LOAD PER PHASE:					2.5	2.9	1.4						
TOTAL LOAD ON PANEL:					6.86			KVA					

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL: SP-1			MAIN: 300A MLO					NOTES: TWO SECTION PANELBOARD				
PROJECT: EOB TECH. H.S.			V & PH: 208V/120V 3PH 4 W									
PROJECT #: 25100.00			A.I.C.: 22,000									
LOCATION: -			FEEDER:									
MOUNTING: SURFACE												
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	60	2	#1 F. END. ALIG	2.70	3.42			0.72	#2 ALIG. MACH.	20	1	2
3	-	-	-	2.70		3.90		1.20	#3B LIFT	25	2	4
5	25	2	#3A LIFT	1.20			2.40	1.20	-	-	-	6
7	-	-	-	1.20	2.40			1.20	#3D LIFT	25	2	8
9	25	2	#3C LIFT	1.20		2.40		1.20	-	-	-	10
11	-	-	-	1.20			2.40	1.20	#3F LIFT	25	2	12
13	25	2	#3E LIFT	1.20	2.40			1.20	-	-	-	14
15	-	-	-	1.20		2.40		1.20	#4A TIRE MACH.	20	2	16
17	25	2	#3G LIFT	1.20			2.40	1.20	-	-	-	18
19	-	-	-	1.20	3.10			1.90	#7 BRAKE LATHE	20	1	20
21	20	2	#5A WHEEL BAL.	1.10		1.94		0.84	#8 PED. GRINDER	20	1	22
23	-	-	-	1.10			2.54	1.44	#10 DRILL PRESS	20	1	24
25	30	1	#12 MIG WELDER	2.40	5.70			3.30	#14 PLAZA CUTTER	30	1	26
27	20	2	#5B WHEEL BAL.	1.10		3.50		2.40	#13 MIG WELDER	30	1	28
29	-	-	-	1.10			1.10			20	1	30
31	20	2	#4B TIRE MACH.	1.20	1.20					20	1	32
33	-	-	-	1.20		1.20				20	1	34
35	20	1					-			20	1	36
37	20	1			-					20	1	38
39	20	1				-				20	1	40
41	20	1					-			20	1	42
43	20	1	E101A RECEPT.	0.72	1.62			0.90	E101A RECEPT.	20	1	44
45	20	1	E101A RECEPT.	0.72		1.08		0.36	E101A CORD REEL	20	1	46
47	20	1	E101A CORD REEL	0.36			0.72	0.36	E101 CORD REEL	20	1	48
49	20	1	E101 CORD REEL	0.36	0.72			0.36	E101 CORD REEL	20	1	50
51	20	1	E101 CORD REEL	0.36		0.72		0.36	E101 CORD REEL	20	1	52
53	20	1	E101 CORD REEL	0.36			0.72	0.36	E101 CORD REEL	20	1	54
55	20	1	E101 RECEPT.	0.90	1.62			0.72	E101 RECEPT.	20	1	56
57	20	1	E101, E101D RECEPT.	0.72		0.92		0.20	E101 SINK + GFI	20	1	58
59	20	1	E101 EWC	0.60			0.60		SPARE	20	1	60
61	20	1	SPARE		-				SPARE	20	1	62
63	20	1	SPARE			-			SPARE	20	1	64
65	20	1	SPARE				-		SPARE	20	1	66
67	20	1	SPARE		-				SPARE	20	1	68
69	20	1	SPARE			-				20	1	70
71	20	1					-			20	1	72
73	20	1			-					20	1	74
75	20	1				-				20	1	76
77	20	1					-			20	1	78
79	20	1			-					20	1	80
81	20	1				-				20	1	82
83	20	1					-			20	1	84
TOTAL LOAD PER PHASE:					22.2	18.1	12.9					
TOTAL LOAD ON PANEL:					53.12 KVA							

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		SP-10		MAIN:		125A MCB		NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W							
PROJECT #:		25100.00		A.I.C.		22,000							
LOCATION:				FEEDER:									
MOUNTING:		SURFACE											
BREAKER				PHASE LOAD - KVA					BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#	
1	20	1	F111C RECEPT.	0.36	0.86			0.50	EWC	20	1	2	
3	20	1	F111I WIREMOLD RECEPT.	0.36		0.72		0.36	F111I WIREMOLD RECEPT.	20	1	4	
5	20	1	F111I WIREMOLD RECEPT.	0.36			0.72	0.36	F111I WIREMOLD RECEPT.	20	1	6	
7	20	1	F111I WIREMOLD RECEPT.	0.36	0.72			0.36	F111I WIREMOLD RECEPT.	20	1	8	
9	20	1	F111I WIREMOLD RECEPT.	0.36		1.08		0.72	F111I RECEPT.	20	1	10	
11	20	1	F111H WIREMOLD RECEPT.	0.36			0.72	0.36	F111H WIREMOLD RECEPT.	20	1	12	
13	20	1	F111H WIREMOLD RECEPT.	0.36	1.08			0.72	F111H RECEPT.	20	1	14	
15	20	1	F111H WIREMOLD RECEPT.	0.36		0.72		0.36	F111H WIREMOLD RECEPT.	20	1	16	
17	20	1	F111H WIREMOLD RECEPT.	0.36			0.72	0.36	F111H WIREMOLD RECEPT.	20	1	18	
19	20	1	F111H POWER POLE	0.36	0.72			0.36	F111H POWER POLE	20	1	20	
21	20	1	F111H POWER POLE	0.36		0.72		0.36	F111H POWER POLE	20	1	22	
23	20	1	F111H POWER POLE	0.36			0.72	0.36	F111H POWER POLE	20	1	24	
25	20	1	F111 RECEPT.	0.90	1.44			0.54	F111 RECEPT.	20	1	26	
27	20	1	F111 RECEPT.	1.08		1.98		0.90	F111A RECEPT.	20	1	28	
29	20	1	F111B RECEPT.	0.90			1.82	0.92	F111C RECEPT.	20	1	30	
31	20	1	F111D RECEPT.	1.08	1.80			0.72	F111 FLOOR RECEPT.	20	1	32	
33	20	1	F111I RECEPT.	0.72		1.44		0.72	F111 RECEPT.	20	1	34	
35	20	1	F111 RECEPT.	0.72			0.72		SPARE	20	1	36	
37	20	1	SPARE		-				SPARE	20	1	38	
39	20	1	SPARE			-			SPARE	20	1	40	
41	20	1	SPARE				-			20	1	42	
TOTAL LOAD PER PHASE:					6.6	6.7	5.4						
TOTAL LOAD ON PANEL:					18.70			KVA					

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		SP-2		MAIN:		300A MLO		NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W		TWO SECTION PANELBOARD					
PROJECT #:		25100.00		A.I.C.:		22,000							
LOCATION:		-		FEEDER:									
MOUNTING:		SURFACE											
BREAKER				PHASE LOAD - KVA					BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#	
1	20	1	RECEPT.	0.36	0.46			0.10	GAS VALVE	20	1	2	
3	20	1	RECEPT.	0.90		1.44		0.54	RECEPT.	20	1	4	
5	20	1	RECEPT.	0.90			1.26	0.36	CORD REEL	20	1	6	
7	20	1	CORD REEL	0.36	0.72			0.36	CORD REEL	20	1	8	
9	20	1	CORD REEL	0.36		0.72		0.36	CORD REEL	20	1	10	
11	20	1	CORD REEL	0.36			0.72	0.36	CORD REEL	20	1	12	
13	20	1	CORD REEL	0.36	0.72			0.36	CORD REEL	20	1	14	
15	20	1	CORD REEL	0.36		0.72		0.36	CORD REEL	20	1	16	
17	20	1	CORD REEL	0.36			0.90	0.54	RECEPT.	20	1	18	
19	20	1	CORD REEL	0.36	0.72			0.36	CORD REEL	20	1	20	
21	20	1	CORD REEL	0.36		0.72		0.36	CORD REEL	20	1	22	
23	20	1	CORD REEL	0.36			0.72	0.36	CORD REEL	20	1	24	
25	20	1	CORD REEL	0.36	0.72			0.36	CORD REEL	20	1	26	
27	20	1	CORD REEL	0.36		0.72		0.36	CORD REEL	20	1	28	
29	20	1	CORD REEL	0.36			0.72	0.36	CORD REEL	20	1	30	
31	100	3	BD-C	2.15	4.40			2.25	BD-D	100	3	32	
33	-	-	-	2.15		4.40		2.25	-	-	-	34	
35	-	-	-	2.15			4.40	2.25	-	-	-	36	
37	100	3	BD-E	3.15	4.60			1.45	DRILL PRESS	30	1	38	
39	-	-	-	3.15		3.99		0.84	PEDESTOOL GRINDER	20	1	40	
41	-	-	-	3.15			3.51	0.36	CORD REEL	20	1	42	
43	20	1	CORD REEL	0.36	1.54			1.18	POWER THREADER 26	20	1	44	
45	50	1	POWER THREADER	1.90		3.80		1.90	POWER THREADER 28	40	1	46	
47	25	1	WELDER 29A	2.10			4.20	2.10	WELDER 29B	25	1	48	
49	25	1	WELDER 30	2.10	4.20			2.10	WELDER 31	25	1	50	
51	15	2	WELDER 59A	0.52		1.04		0.52	WELDER 59 B	15	2	52	
53	-	-	-	0.52			1.04	0.52	-	-	-	54	
55	15	2	WELDER 59C	0.52	1.04			0.52	WELDER 66A	15	2	56	
57	-	-	-	0.52		1.04		0.52	-	-	-	58	
59	15	2	WELDER 66B	0.52			1.04	0.52	WELDER 67A	15	2	60	
61	-	-	-	0.52	1.04			0.52	-	-	-	62	
63	15	2	WELDER 67B	0.52		1.04		0.52	WELDER 69A	15	2	64	
65	-	-	-	0.52			1.04	0.52	-	-	-	66	
67	15	2	WELDER 69B	0.52	1.04			0.52	WELDER 70A	15	2	68	
69	-	-	-	0.52		1.04		0.52	-	-	-	70	
71	15	2	WELDER 70B	0.52			1.06	0.54	LOFT RECEPT.	20	1	72	
73	-	-	-	0.52	0.52				SPARE	20	1	74	
75	20	1	LOFT RECEPT.	0.54		0.54			SPARE	20	1	76	
77	20	1	LOFT RECEPT.	0.72			0.72		SPARE	20	1	78	
79	20	1	SPARE		5.80			5.80	SP-2A	100	3	80	
81	20	1	SPARE			5.80		5.80	-	-	-	82	
83	20	1	SPARE				5.80	5.80	-	-	-	84	
TOTAL LOAD PER PHASE:					27.5	27.0	27.1						
TOTAL LOAD ON PANEL:					81.66			KVA					

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		SP-2A		MAIN:		100A MLO		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W						
PROJECT #:		25100.00		A.I.C.:		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER			PHASE LOAD - KVA					BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	FUTURE LOAD	0.54	1.08			0.54	FUTURE LOAD	20	1	2
3	20	1	FUTURE LOAD	0.54		1.08		0.54	FUTURE LOAD	20	1	4
5	20	1	FUTURE LOAD	0.54			1.08	0.54	FUTURE LOAD	20	1	6
7	20	1	FUTURE LOAD	0.54	1.08			0.54	FUTURE LOAD	20	1	8
9	20	1	FUTURE LOAD	0.54		1.08		0.54	FUTURE LOAD	20	1	10
11	20	1	FUTURE LOAD	0.54			1.08	0.54	FUTURE LOAD	20	1	12
13	20	1	FUTURE LOAD	0.54	1.08			0.54	FUTURE LOAD	20	1	14
15	20	1	FUTURE LOAD	0.54		1.08		0.54	FUTURE LOAD	20	1	16
17	20	1	FUTURE LOAD	0.54			1.08	0.54	FUTURE LOAD	20	1	18
19	20	1	FUTURE LOAD	0.54	1.08			0.54	FUTURE LOAD	20	1	20
21	20	1	FUTURE LOAD	0.54		1.08		0.54	FUTURE LOAD	20	1	22
23	20	1	FUTURE LOAD	0.54			1.08	0.54	FUTURE LOAD	20	1	24
25	20	1	FUTURE LOAD	0.54	1.08			0.54	FUTURE LOAD	20	1	26
27	20	1	FUTURE LOAD	0.54		1.08		0.54	FUTURE LOAD	20	1	28
29	20	1	DUPLEX PUMP	1.40			2.18	0.78	PUMP CONTROLS	20	1	30
TOTAL LOAD PER PHASE:					5.4	5.4	6.5					
TOTAL LOAD ON PANEL:					17.30			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		SP-3		MAIN:		300A MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W						
PROJECT #:		25100.00		A.I.C.:		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	RECEPT.	1.33	2.07			0.74	RECEPT.	20	1	2
3	20	1	RECEPT.	0.72		1.72		1.00	RECEPT.	20	1	4
5	20	1	RECEPT.	0.18			0.90	0.72	RECEPT.	20	1	6
7	300	3	BUS DUCT B	27.00	27.36			0.36	RECEPT.	20	1	8
9	-	-	-	27.00		27.36		0.36	RECEPT.	20	1	10
11	-	-	-	27.00			27.18	0.18	RECEPT.	20	1	12
13	20	1	BANDSAW	1.50	1.68			0.18	RECEPT.	20	1	14
15	20	1	RECEPT.	0.54		0.54			CORD REEL	20	1	16
17	20	1	CORD REEL	0.36			0.96	0.60	CMM	20	1	18
19	20	1	SPARE		-				SPARE	20	1	20
21	20	1	SPARE			-			SPARE	20	1	22
23	20	1	SPARE				-		SPARE	20	1	24
25	20	1	SPARE		-				SPARE	20	1	26
27	20	1	SPARE			-			SPARE	20	1	28
29	20	1					-			20	1	30
31	20	1			-					20	1	32
33	20	1				-				20	1	34
35	20	1					-			20	1	36
37	20	1			-					20	1	38
39	20	1				-				20	1	40
41	20	1					-			20	1	42
TOTAL LOAD PER PHASE:					31.1	29.6	29.0					
TOTAL LOAD ON PANEL:					89.77			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		SP-4		MAIN:		125 MCB		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W						
PROJECT #:		25100.00		A.I.C.		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER					PHASE LOAD - KVA					BREAKER		
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	F104 W-MOLD	0.72	1.44			0.72	F104 W-MOLD	20	1	2
3	20	1	F104 W-MOLD	0.72		1.44		0.72	F104 W-MOLD	20	1	4
5	20	1	F104 W-MOLD	0.72			1.44	0.72	F104 REC.	20	1	6
7	20	1	F104 RECEPT.	0.72	1.44			0.72	F104 W-STAT.	20	1	8
9	20	1	F104 W-STAT	0.72		1.44		0.72	F104 W-STAT.	20	1	10
11	20	1	F104 W-STAT	0.72			1.72	1.00	F104 SM. BRD.	20	1	12
13	20	1	F104 FLOOR BOX RECEPT.	0.54	1.08			0.54	F105 RECEPT.	20	1	14
15	20	1	F105 RECEPT.	0.54		1.54		1.00	F105 SM. BRD.	20	1	16
17	20	1	F105 TEACH. RECEPT.	0.90			1.44	0.54	F105 RECEPT.	20	1	18
19	20	1	F105 RECEPT.	0.54	1.54			1.00	F104 SM. BRD.	20	1	20
21	20	1	F104 W-ST.	0.72		1.44		0.72	F104 W-ST.	20	1	22
23	20	1	F104 W-ST.	0.72			1.44	0.72	F104 W-ST.	20	1	24
25	20	1	F104 W-ST.	0.72	1.44			0.72	F104 W-ST.	20	1	26
27	20	1	F104 W-MOLD	0.72		1.44		0.72	F104 W-MOLD	20	1	28
29	20	1	F104 W-MOLD	0.72			1.44	0.72	F104 W-MOLD	20	1	30
31	20	1	F104 RECEPT.	0.72	1.22			0.50	F104 EWC	20	1	32
33	20	1	F106C,D RECEPT.	0.50		0.50			SPARE	20	1	34
35	20	1	SPARE				-		SPARE	20	1	36
37	20	1	SPARE		-				SPARE	20	1	38
39	20	1	SPARE			-				20	1	40
41	20	1					-			20	1	42
TOTAL LOAD PER PHASE:					8.2	7.8	7.5					
TOTAL LOAD ON PANEL:					23.44			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL: SP-5			MAIN: 125A MCB				NOTES: TWO SECTION PANELBOARD					
PROJECT: EOB TECH. H.S.			V & PH: 208V/120V 3PH 4W									
PROJECT #: 25100.00			A.I.C.: 22,000									
LOCATION: -			FEEDER:									
MOUNTING: SURFACE												
BREAKER			PHASE LOAD - KVA					BREAKER				
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	F107 WALL RECEPT.	0.72	1.44			0.72	F107 TEACH. RECEPT.	20	1	2
3	20	1	PRINTER RECEPT.	1.00		1.36		0.36	F107 WIRE FURN.	20	1	4
5	20	1	F107 WIRE FURN.	1.00			1.36	0.36	F107 WIRE FURN.	20	1	6
7	20	1	F107 WIRE FURN.	0.72	1.08			0.36	F107 WIRE FURN.	20	1	8
9	20	1	F107 WIRE FURN.	0.72		1.08		0.36	F107 WIRE FURN.	20	1	10
11	20	1	F107 WIRE FURN.	0.72			0.72			20	1	12
13	20	1	-		-					20	1	14
15	20	1	-			0.36		0.36	WORK TABLE RECEPT.	20	1	16
17	20	1	WORK TABLE RECEPT.	0.36			1.36	1.00	F107A PRINTER	20	1	18
19	20	1	F107A RECEPT.	0.72	1.44			0.72	F107A RECEPT.	20	1	20
21	20	1	F107B RECEPT.	0.36		0.86		0.50	F107C, F107D RECEPT.	20	1	22
23	20	1	EWC RECEPT.	0.50			0.86	0.36	F107 WIRE FURN.	20	1	24
25	20	1	F107A WIRE FURN.	0.72	1.08			0.36	F107 WIRE FURN.	20	1	26
27	20	1	F107A WIRE FURN.	0.36		0.72		0.36	F107 WIRE FURN.	20	1	28
29	20	1	F107A WIRE FURN.	0.36			0.72	0.36	F107 WIRE FURN.	20	1	30
31	20	1	F107A WIRE FURN.	0.36	0.72			0.36	F107 WIRE FURN.	20	1	32
33	20	1	F107A WIRE FURN.	1.00		1.36		0.36	F107 WIRE FURN.	20	1	34
35	20	1	F107A WIRE FURN.	0.36			0.72	0.36	F107 WIRE FURN.	20	1	36
37	20	1	F107A WIRE FURN.	0.36	0.72			0.36	F107 WIRE FURN.	20	1	38
39	20	1	F107A WIRE FURN.	0.36		0.36				20	1	40
41	20	1					-			20	1	42
43	20	1	F107A WIRE FURN.	0.36	0.72			0.36	F107A WIRE FURN.	20	1	44
45	20	1	F107A WIRE FURN.	0.36		0.72		0.36	F107A WIRE FURN.	20	1	46
47	20	1	F107A WIRE FURN.	0.36			0.72	0.36	F107A WIRE FURN.	20	1	48
49	20	1	F107A WIRE FURN.	0.36	0.72			0.36	F107A WIRE FURN.	20	1	50
51	20	1	SPARE			-			SPARE	20	1	52
53	20	1	SPARE				-		SPARE	20	1	54
55	20	1	SPARE		-				SPARE	20	1	56
57	20	1				-				20	1	58
59	20	1					-			20	1	60
61	20	1			-					20	1	62
63	20	1				-				20	1	64
65	20	1					-			20	1	66
67	20	1			-					20	1	68
69	20	1				-				20	1	70
71	20	1					-			20	1	72
TOTAL LOAD PER PHASE:					7.9	6.8	6.5					
TOTAL LOAD ON PANEL:					21.20			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		SP-6		MAIN:		800A MLO		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W						
PROJECT #:		25100.00		A.I.C.		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	RECEPT.	0.90	1.08			0.18	RECEPT.	20	1	2
3	20	1	RECEPT.	0.54		1.54		1.00	RECEPT.	20	1	4
5	20	1	RECEPT.	0.76			45.96	45.20	BUS DUCT A	400	3	6
7	20	2	M16 RECEPT.	0.83	46.03			45.20	-	-	-	8
9	-	-	-	0.83		46.03		45.20	-	-	-	10
11	20	1	CORD REEL RECEPT.	0.36			0.72	0.36	CORD REEL RECEPT.	20	1	12
13	20	1	RECEPT.	0.72	1.44			0.72	RECEPT.	20	1	14
15	20	1	RECEPT.	0.54		1.62		1.08	RECEPT.	20	1	16
17	20	1	RECEPT.	0.90			1.62	0.72	RECEPT.	20	1	18
19	20	1	RECEPT.	0.18	33.08			32.90	SP-3	300	3	20
21	20	1	M17 RECEPT.	1.80		34.70		32.90	-	-	-	22
23	30	2	TIG WELDER	1.70			34.60	32.90	-	-	-	24
25	-	-	-	1.70	2.70			1.00	DRILL PRESS	15	3	26
27	20	1				1.00		1.00	-	-	-	28
29	20	1					1.00	1.00	-	-	-	30
31	20	1	SPARE		-				SPARE	20	1	32
33	20	1	SPARE			-			SPARE	20	1	34
35	20	1	SPARE				-		SPARE	20	1	36
37	20	1	SPARE		-				SPARE	20	1	38
39	20	1				-				20	1	40
41	20	1					-			20	1	42
TOTAL LOAD PER PHASE:					84.3	84.9	83.9					
TOTAL LOAD ON PANEL:					253.12			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		SP-7		MAIN:		400A MLO		NOTES:				
PROJECT:		EOB TECH. H.S.		V & PH:		208Y/120V 3PH 4W						
PROJECT #:		25100.00		A.I.C.		22,000						
LOCATION:				FEEDER:								
MOUNTING:		SURFACE										
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	F103 RECEPT.	0.54	0.64			0.10	F103 FAUCET SENSOR	20	1	2
3	20	1	F103 RECEPT.	0.54		0.90		0.36	F103b RECEPT.	20	1	4
5	20	1	F103 RECEPT.	0.36			0.72	0.36	F103 RECEPT.	20	1	6
7	20	1	F103 CORD REEL	0.36	0.72			0.36	F103 CORD REEL	20	1	8
9	20	1	F103 CORD REEL	0.36		0.72		0.36	F103 CORD REEL	20	1	10
11	20	1	F103 CORD REEL	0.36			0.72	0.36	F103 CORD REEL	20	1	12
13	20	1	SPARE		-				SPARE	20	1	14
15	20	1	SPARE			-			SPARE	20	1	16
17	20	1	SPARE				-		SPARE	20	1	18
19	20	1								20	1	20
21	20	1				-				20	1	22
23	20	1					-			20	1	24
25	60	2	STUDENT PANEL	2.20	4.40			2.20	STUDENT PANEL	60	2	26
27	-	-		2.20		4.40		2.20		-	-	28
29	60	2	STUDENT PANEL	2.20			4.40	2.20	STUDENT PANEL	60	2	30
31	-	-		2.20	4.40			2.20		-	-	32
33	60	2	STUDENT PANEL	2.20		4.40		2.20	STUDENT PANEL	60	2	34
35	-	-		2.20			4.40	2.20		-	-	36
37	200	3	225A BUSSWAY	11.70	18.90			7.20	3 PH. STUDENT PANEL	100	3	38
39	-	-	-	11.70		18.90		7.20		-	-	40
41	-	-	-	11.70			18.90	7.20		-	-	42
TOTAL LOAD PER PHASE:					29.1	29.3	29.1					
TOTAL LOAD ON PANEL:					87.52			KVA				

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL:		SP-8		MAIN:		500A MLO		NOTES:					
PROJECT:		EOB TECH. H.S.		V & PH:		208V/120V 3PH 4W							
PROJECT #:		25100.00		A.I.C.		22,000							
LOCATION:				FEEDER:									
MOUNTING:		SURFACE											
BREAKER				PHASE LOAD - KVA				BREAKER					
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#	
1	20	1			1.00			1.00	OVERHEAD DR.	20	1	2	
3	20	1	CORD REEL	0.36		0.72		0.36	CORD REEL	20	1	4	
5	20	1	CORD REEL	0.36			0.72	0.36	CORD REEL	20	1	6	
7	20	1	CORD REEL	0.36	0.72			0.36	CORD REEL	20	1	8	
9	20	1	CORD REEL	0.36		0.96		0.60	DRILL PRESS	20	1	10	
11	20	1	CORD REEL	0.36			0.96	0.60	DRILL PRESS	20	1	12	
13	20	1	#13 BAND SAW	1.20	2.04			0.84	H101 RECEPT.	20	1	14	
15	20	1	SCROLL SAW	0.96		1.92		0.96	SCROLL SAW	20	1	16	
17	20	1	H101 RECEPT.	0.54			0.54			20	1	18	
19	20	1	SPARE		-				SPARE	20	1	20	
21	20	1	SPARE			-			SPARE	20	1	22	
23	20	1	SPARE				-		SPARE	20	1	24	
25	15	3	H101 O.H.	0.82	1.64			0.82	H101 O.H.	15	3	26	
27	-	-	-	0.82		1.64		0.82	-	-	-	28	
29	-	-	-	0.82			1.64	0.82	-	-	-	30	
31	100	3	#24 BELT SANDER	7.60	7.60					20	1	32	
33	-	-	-	7.60		7.60				20	1	34	
35	-	-	-	7.60			7.60			20	1	36	
37	200	3	BUSWAY B	15.35	35.60			20.25	BUSWAY A	225	3	38	
39	-	-	-	15.35		35.60		20.25	-	-	-	40	
41	-	-	-	15.35			35.60	20.25	-	-	-	42	
TOTAL LOAD PER PHASE:					48.6	48.4	47.1						
TOTAL LOAD ON PANEL:					144.10			KVA					

EMMETT O'BRIEN TECHNICAL HIGH SCHOOL

PANELBOARD SCHEDULES

PANEL: SP-9			MAIN: 250A MCB					NOTES: TWO SECTION PANELBOARD				
PROJECT: EOB TECH. H.S.			V & PH: 208V/120V 3PH 4W									
PROJECT #: 25100.00			A.I.C.: 22,000									
LOCATION: -			FEEDER:									
MOUNTING: SURFACE												
BREAKER				PHASE LOAD - KVA					BREAKER			
#	A	P	DESCRIPTION	LOAD KVA	A	B	C	LOAD KVA	DESCRIPTION	A	P	#
1	20	1	H105E ST. STATION	0.36	0.72			0.36	H105E ST. STATION	20	1	2
3	20	1	H105E ST. STATION	0.36		0.72		0.36	H105E ST. STATION	20	1	4
5	20	1	H105E ST. STATION	0.36			0.72	0.36	H105E ST. STATION	20	1	6
7	20	1	H105F RECEPT.	0.36	1.36			1.00	H105E H. DR.	20	1	8
9	20	1	H105E HD.	1.00		2.00		1.00	H105E H. DR.	20	1	10
11	20	1	H105E HD.	1.00			1.72	0.72	H105E ST.	20	1	12
13	20	1	H105E MAN. RECEPT.	0.72	0.72					20	1	14
15	20	1				-				20	1	16
17	20	1					-			20	1	18
19	20	1			1.00			1.00	RECEPT.	20	1	20
21	20	1	H105B RECEPT.	0.54		1.44		0.90	H105 MAN. RECEPT.	20	1	22
23	20	1	H105 H. DR.	1.00			2.00	1.00	H105 H. DR.	20	1	24
25	20	1	H105 H. DR.	1.00	2.00			1.00	H105 H. DR.	20	1	26
27	20	1	H105E RECEPT.	0.72		1.26		0.54	H105E RECEPT.	20	1	28
29	20	1	H105B GFI.	0.18			2.01	1.83	DRYER	30	2	30
31	20	1	H105I RECEPT.	0.40	2.23			1.83	-	-	-	32
33	20	1	H105E ST. STATION	0.36		0.72		0.36	H105E ST. STATION	20	1	34
35	20	1	H105E ST. STATION	0.36			0.72	0.36	H105E ST. STATION	20	1	36
37	20	1	H105E ST. STATION	0.36	0.72			0.36	H105E ST. STATION	20	1	38
39	20	1				-				20	1	40
41	20	1					-			20	1	42
43	20	1	H105E ST. STATION	0.36	0.72			0.36	H105E ST. STATION	20	1	44
45	20	1	H105E ST. STATION	0.36		0.72		0.36	H105E ST. STATION	20	1	46
47	20	1	H105E ST. STATION	0.36			0.72	0.36	H105E ST. STATION	20	1	48
49	20	1	H105E ST. STATION	0.36	0.72			0.36	H105E ST. STATION	20	1	50
51	20	1	H105 ST. STATION	0.36		0.72		0.36	H105 ST. STATION	20	1	52
53	20	1	H105 ST. STATION	0.36			0.72	0.36	H105 ST. STATION	20	1	54
55	20	1	H105 ST. STATION	0.36	0.72			0.36	H105 ST. STATION	20	1	56
57	20	1	H105 ST. STATION	0.36		0.72		0.36	H105 ST. STATION	20	1	58
59	20	1	H105 ST. STATION	0.36			0.72	0.36	H105 ST. STATION	20	1	60
61	20	1	H105 ST. STATION	0.36	0.72			0.36	H105 ST. STATION	20	1	62
63	20	1	H105 ST. STATION	0.36		0.72		0.36	H105 ST. STATION	20	1	64
65	20	1	H105 ST. STATION	0.36			0.72	0.36	H105 ST. STATION	20	1	66
67	20	1	H105 ST. STATION	0.36	0.72			0.36	H105 ST. STATION	20	1	68
69	20	1	H105 ST. STATION	0.36		0.72		0.36	H105 ST. STATION	20	1	70
71	20	1	SPARE				-		SPARE	20	1	72
73	20	1	SPARE		-				SPARE	20	1	74
75	20	1	SPARE			-			SPARE	20	1	76
77	20	1	SPARE				-		SPARE	20	1	78
79	20	1			-					20	1	80
81	20	1				-				20	1	82
83	20	1					-			20	1	84
TOTAL LOAD PER PHASE:					12.4	9.7	10.1					
TOTAL LOAD ON PANEL:					32.14 KVA							

**SECTION 32 80 00
PERFORMANCE IRRIGATION SYSTEM**

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. The work contemplated by these specifications consists of the provisions of labor, material, equipment, and services required for all work described herein. Unless otherwise specified, the plans and specifications are intended to include everything obviously requisite and necessary for the proper installation and completion of the work whether each necessary item is mentioned herein or not. The plans and specifications are intended to be cooperative and any item called for in one and not the other shall be as binding as if called for in both. All work herein specified or called for on the drawings will be executed in accordance with all governing ordinances, laws and regulations that meet all local conditions.

1.02 RELATED WORK:

All Sections of Division 1

02 01 00	Sitework
31 02 20	Earth Moving
32 90 00	Trees, Shrubs, Groundcovers and Perennials

1.03 QUALITY ASSURANCE:

- A. Codes and Inspections: The entire installation shall fully comply with all local and state laws and ordinances, and with all the established codes applicable thereto. The Contractor shall take out all required permits, arrange for all necessary inspections and shall pay any fees and expenses in conjunction with the same as a part of the work under this contract.
- B. Supervision: The Owner assumes no responsibility in the supervision and inspection of the work involved in the execution of this contract beyond insuring, to the Owner's satisfaction, that the plans and specifications are being properly interpreted. This supervision and checking will not relieve the Contractor of any responsibility for the performance of his work in accordance with the plans and these specifications.

1.04 JOB CONDITIONS:

- A. Site Inspection: Each bidder shall visit the site of the proposed work and fully acquaint himself with the conditions there relating to construction and labor, and should fully inform himself as to the facilities involved, and the difficulties and restrictions attending the performance of the Contract. The Bidder should thoroughly examine and familiarize himself with Drawings, Technical Specifications, and all other Bid and Contract Documents. The Contractor by the execution of the Contract shall in no way be relieved of any obligation under it due to his failure to receive or examine any form or legal document or to visit the site and acquaint himself with the conditions there existing and the Owner will be justified in rejecting any claim thereof.
- B. Equipment, Tools and Labor: The contractor shall furnish all such equipment, tools, and labor necessary to push work in an acceptable manner, to a speedy completion. This Contract is based on the Contractor furnishing equipment, tools and labor which are suitable to carry out this contract in a professional manner, unless otherwise herein specified.

- C. **Cleaning the Premises:** The Contractor shall at all times keep the premises in which the Work is being done, and the adjoining premises, clean of rubbish caused by his Work. Upon completion of the job, the Contractor shall clean up all debris caused by this Work and leave the job in a neat and clean conditions. All debris shall be removed from the premises at the Contractor's expense.

1.05 **SPECIAL CONDITIONS:** The Contractor will be responsible to provide shop drawings indicating all required equipment and layout to provide irrigation to the designated areas on the drawings

1.06 **SUBMITTALS:**

- A. **General:** Refer to Division 1 for Submittal Requirements.
- B. The Contractor shall submit the following prior to use on the project.
 - 1. **Shop drawings:** Indicate piping layout to water source, location of sleeves under pavement, location and coverage of sprinkler heads, plant and landscaping features, site structures, schedule of fittings to be used.
 - 2. **Product data:** Provide component and control system and wiring diagrams.
- C. **Operation and Maintenance Data:** Provide instructions for operation and maintenance of system and controls, seasonal activation and shutdown, and manufacturer's parts catalogue. Provide schedule indicating length of time each valve is required to be open to provide a determined amount of water.
- D. **As-Built Drawings:** After completion of the piping installation, the Contractor shall furnish an "as-built" drawing showing all sprinkler heads, valves, drains, and pipelines to scale with dimensions where required. Instruction sheets and parts lists covering all operating equipment will be bound into a folder and furnished to the owner in duplicate.
- E. **Instructions:** After completion and testing of the system, the Contractor will instruct the Owner's personnel in the proper operations and maintenance of the system.

1.07 **SERVICE AND GUARANTEE:**

- A. The Contractor shall submit a single guarantee that all portions of the work are in accordance with the Contract requirements and providing for maintenance of the system. The Contractor shall guarantee all work against faulty and improper material and workmanship for a period of one (1) year from date of final acceptance by the Owner, except that where guarantees or warranties for longer terms are specified herein, such longer term to apply. Within twenty-four (24) hours after notification, Contractor shall correct any deficiencies which occur during the guarantee period at no additional cost tot the Owner, all to the satisfaction of the Owner and Engineer. The Contractor shall be responsible for any damage caused by such leaks and repair.
- B. The Contractor shall provide all service necessary to maintain the system for a period of one (1) year from date of final acceptance form the Owner. This shall include blowing out of the system with compressed air and providing all work and equipment necessary to properly winterize the system and start the system in Spring.

PART 2 - PRODUCTS

2.01 **GENERAL:**

- A. The materials providers have been chosen to supply high quality materials for the design of the sprinkler system. This allows the Owner to establish the level of quality and performance required by the system design. Equipment by other manufacturers will be considered only after written application, including copies of specifications and manufacturer's product data, is made by the Bidder and written approval is received from the Owner.

There is a roughly 8'x8' structure that is meant to house the controller, etc.

- 2.02 MATERIALS: Unless specifically designated, all equipment and layout will be designated on shop drawings by the contractor for review and approval by the Owner's Representative. Provide the following materials as furnished by Hunter, TORO or Rainbird .The list below does not necessarily include all elements of a sprinkler system. The contractor is required to supply all elements to high quality system.

- A. Manufacturers Data:

1. **Hunter Industries**

U.S.A. Headquarters
1940 Diamond Street
San Marcos, CA 92078
Tel: (1) 760-744-5240
Fax: (1) 760-744-7461

Technical Support
Product Questions: (1) 760-591-7383

2. **Toro**

Contact information is on the Internet.

3. **Rain bird**

Contact information is on the Internet.

- B. Controller of a suitable zone capacity

- C. Valves / valve boxes

- D. Sprinkler heads.

- E. Polyethylene Pipe

1. All poly pipe specified on the plan shall be flexible non-toxic polyethylene made from 100 percent virgin polyethylene materials, and all sizes shall have a minimum 100 working pressure rating. All polyethylene pipe shall be continuously and permanently marked with the manufacturer's name, materials, size, and schedule. The poly pipe shall be high density and approved by the National Safety Foundations.
2. The polyethylene pipe shall comply with the following standards and codes: ASTM-D-1248, ASTM-D-2239.

- F. Polyethylene Pipe Fittings: Insert fittings for use on poly pipe shall be manufactured from 100% virgin materials. The fittings shall meet the following codes and specifications: ASTM-D2609, ASTM-D1784.

- G. PVC Cement: Cement for use of PVC fitting shall be NSF approved for Type I and Type II PVC pipe and schedule 40 fittings. Cement is to meet ASTM D-2564 and F-493 for potable water, pressure, gas conduit and drain pipes. Application temperature shall be 35 to 110 degrees F.
- H. Pincer Type Clamps
1. Clamps for use on poly pipe insert fittings shall be pincer type, 1-ear design made from 300 series stainless steel and specifically designed for underground irrigation systems. Clamps shall be constructed with patented "dimple" which increases strength and also creates a spring-like action which will permit the clamp to "breathe" without loosening. Welding techniques shall not be used on the mechanical lock therefore eliminating the possibility of failure due to corrosion at the spot weld. Specially designed pincers shall be used with clamps.
 2. The clamps shall be manufactured by Oetiker Incorporated, Livingston, New Jersey, or equal.
- I. Scotchpack Wire Splicing Kits
1. Wire splicing kits shall be Scotchpack #3577 sealing packs consisting of Scotchpack brand 4 resin packages in Unipac brand containers for exact mixing ratios and convenience. They shall be U.L. listed.
 2. Scotchpacks shall be manufactured by 3M, Electrical Products Division, St. Paul, Minnesota, or equal.
- J. Wire Nuts
3. Wire nuts shall have "live" spring action and shall be able to splice all common combinations of solid and stranded wire from 18 through 8 AWG. Spring shall be encased in a steel shell with an outer jacket of color-coded vinyl plastic insulation. Wire nuts shall be U.L. listed.
 4. Wire nuts shall be manufactured by 3M, Electrical Products Division, St. Paul, Minnesota.
- Electrical Tape: Electrical tape shall be non-corrosive, water and oil resistant and 8 mil. thick. Tape shall be suitable for use between 32 degrees F. and 176 degrees F. Tape shall be U.L. listed and approved.
- K. Wire: Wire shall be single conductor with 3/64" low density, high molecular weight polyethylene insulation suitable for direct burial for operations up to 300 volts, and U.L. listed. Wire shall be marked "PE Irrigation Control Wire." Both common and control wire shall be no less than #14 AWG and differentiated in color.
- L. Rainswitch Shut-off
1. The Rainswitch device shall be designed to prevent sprinkler operation during rainfall.
 2. The rainswitch shall install easily to roof eaves or 3/4 inch PVC pipe. Two wire nuts and wood screws shall be provided. The rainswitch shall be easily wired into any new or existing sprinkler control system.
 3. When exposed to rain water, a stack of absorbent disks within the rainswitch shall expand and open a microswitch, interrupting power to the control valves. An adjustment knob on the rainswitch shall allow the shut-off point set from 1/8 inch to 1 inch of rainfall. When

the rain stops, the disks dry out allowing the microswitch to close and the sprinklers to operate as scheduled.

4. The normally-open/normally-closed microswitch shall be rated 125 VAC, 4 Amp. The rainswitch shall be UL listed.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS:

- A. Install all items in accordance with the manufacturer's recommendations.
- B. The drawings indicate the planting areas to be served by the sprinkler system. The system as installed shall supply complete coverage for the areas indicated on the plan. The Contractor shall take into considered the fact that the sprinkler system installed must be coordinated with the landscape needs and that any further changes or additions needed to water the indicated planting areas shall be included as part of the Contract without additional charges unless agreed upon by the Owner.
- C. The arrangements, positions as connection of pipes, drains, valves, and the like indicated on the Drawings, shall be followed as closely as possible, but the right is reserved by the Architect to change locations and elevations to accommodate conditions which may arise during the progress of the work prior or installation without additional compensation for such changes. The responsibility for accurately laying out the work and coordinating the installation with other trades rests with the Contractor. Should it be found that any work is laid out so that interferences will occur, report that to the Architect before commencing work.

3.02 EXCAVATING AND BACKFILLING:

- A. The Contractor shall do all necessary excavating and backfilling required for the proper installation of the work excepting as noted on the plans.
- B. When backfilling, all backfill material shall be free from rock, large stone, or other unsuitable substances to prevent damage to the pipe. Backfilling of trenches containing plastic pipe shall be done when the pipe is cool to avoid excessive contractions in cold weather. All backfill material will be compacted in 6" layers as it's brought up to finish grade so as to insure that no settling results.

3.03 PIPE INSTALLATION:

- A. The Contractor must provide effective protection at all times to prevent sand, rubbish, or any other debris from entering the piping. When work is stopped at night, or at any other time, the ends of the pipes must be closed with plugs properly secured.
- B. Piping 2½ inches and larger in size shall be trenched to a depth of 12 to 18 inches and backfilled with 4" of sand completely surrounding pipe.
- C. Piping 2 inches and smaller shall be trenched or pulled to a depth of 10 to 15 inches if soil and grade conditions permit.

3.04 ELECTRICAL INSTALLATION:

- A. The Contractor will be responsible to make connections to the building electrical system as is required for the proper operation of the automatic control system.

- B. All control circuitry, whether electrical or hydraulic passing through the wall of the building or beneath a sidewalk, road, or drive, shall be installed in a suitable sleeve; whereas in all other locations they shall be installed in the pipe trench and protected by the pipe whenever possible.
- C. The joining of all underground wires shall be by the use of wire nuts, covered with Scotch Lok or D.B.Y. water-proof connection per installation instructions provided by the manufacturer.
- D. Wire shall be coiled at all solenoid connections by wrapping at least five (5) turns of wire around a rod or pipe approximately one (1) inch in diameter, then withdrawing rod.

3.05 WATER PIPING INSTALLATION:

- A. Install pipe, valves, control and outlets in accordance with manufacturer's instructions.
- B. Connect to water service.

3.06 BUILDING WALL PENETRATIONS: Patch and dampproof all building wall penetrations.

3.07 DEPTH OF COVER: Minimum depth of cover piping use as lateral water distribution piping downstream of a control valve shall be 4 inches.

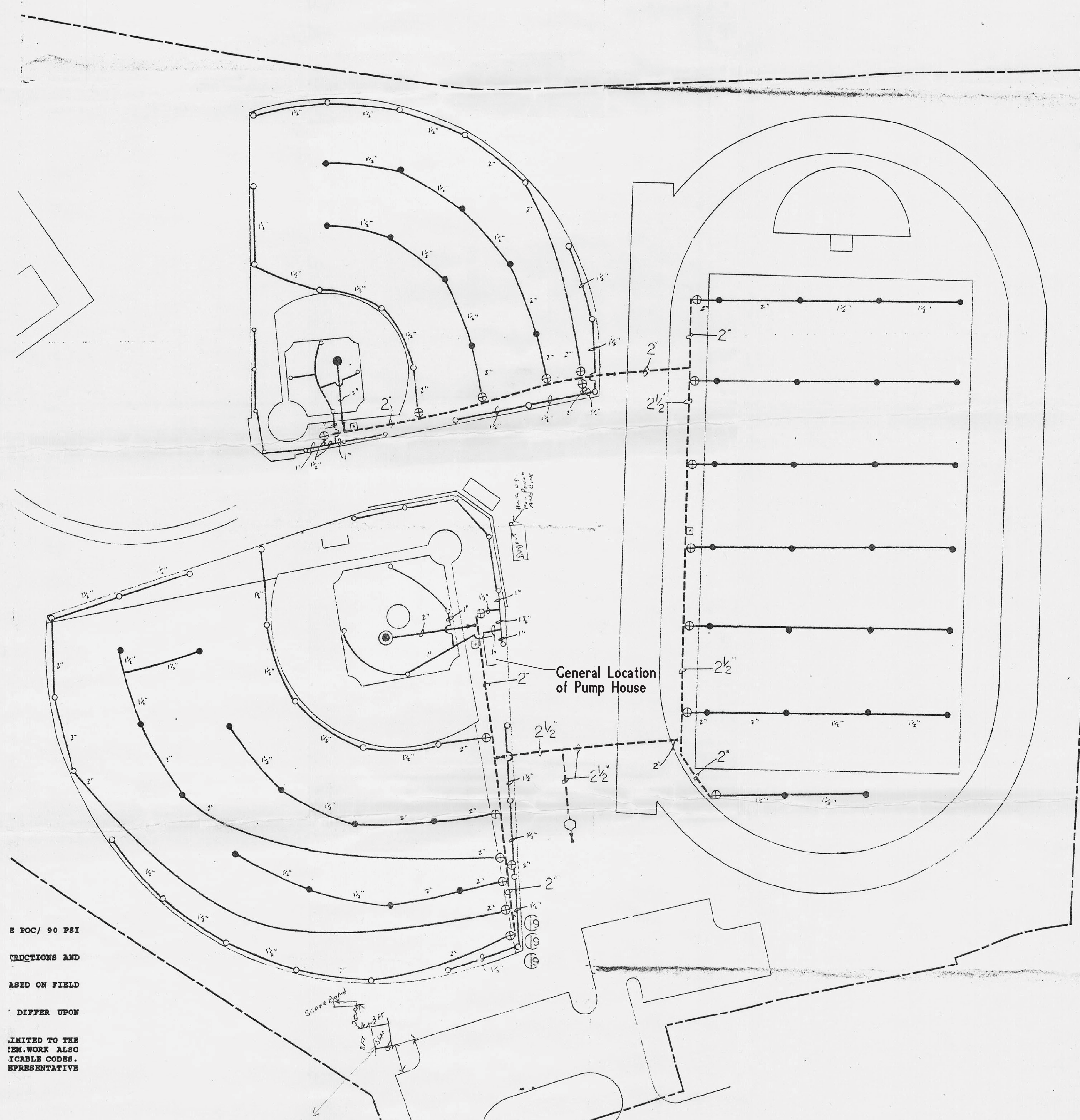
3.08 TESTING THE SYSTEM: The entire system shall be tested at the normal system working pressure and upon visual inspection of the ground, should any leak be found, it shall be promptly repaired. The line shall then be retested until satisfactory.

3.09 TRENCH SETTLEMENT: If within one year from completion date, major settlement due to improper compaction occurs and an adjustment in pipe, sprinkler heads, topsoil and seed or paving is necessary to bring the system to the proper level of the permanent grade, the Contractor as part of the work under this Contract shall make said adjustment without extra cost to the Owner.

3.10 ADJUSTMENT AND BALANCING THE SYSTEM: All areas of the irrigation system shall be inspected to insure proper coverage. If necessary the Contractor shall adjust or change nozzles of sprinkler heads to correct any overcoverage or undercoverage.

3.11 CLEANING THE PREMISES: Upon completion of the job, the Contractor shall clean up all debris caused by his work and leave the job in a neat and clean condition. All debris removed from the job will be taken away from the premises.

END OF SECTION



POC/ 90 PSI
 DIRECTIONS AND
 BASED ON FIELD
 DIFFER UPON
 LIMITED TO THE
 WORK ALSO
 REPRESENTATIVE

LEGEND

- - TORO 2001 FULL CIRCLE #12 SPRINKLER
 - - TORO 2001 PART CIRCLE #12 SPRINKLER
 - - TORO SUPER 700C PART CIRCLE 3.0 SPRINKLER W/ RUBBER COVER (R.C.)
 - - TORO 694-06-92-1 VALVE-IN-HEAD SPRINKLER W/ R.C.
 - ⊙ - TORO 674-06-74-1 VALVE-IN-HEAD SPRINKLER W/ R.C.
 - ⊕ - TORO 252-26-06 1 1/2" PLASTIC VALVE IN 10" PIT (USE DRY SPLICE KITS; WIRE TO BE #14/1 UF)
 - - TORO 474-00 1" QUICK COUPLER VALVE ON GALV SWING JOINT IN 6" PIT
 - ⊖ - 2" BRONZE IPS BALL VALVE IN 10" PIT
 - ⊙ - TORO VISION II 9-STA. CONTROLLER MODEL # 189-96-01 W/ RAIN GAUGE (LOCATE IN ENCLOSURE UPON INSTALLATION; REQUIRES 115 VAC)
 - ▽ - POINT OF CONNECTION (2" LINE AT 65 PSI; INSTALL SHUT-OFF AT POC; A BOOSTER PUMP IS REQ'D.; TAP ACCORDING TO OWNER'S SPECIFICATIONS)
 - - FIBCO 825Y 2" EPD W/ 1/2" TEE W/PVC PLUG FOR BLOW-OUT (INSTALL ON 2" COPPER; PLACE WITH PUMP IN ENCLOSURE; LOCATION TO BE DETERMINED UPON INSTALLATION)
 - - - - - MAIN LINE (CL 200 SW PVC; TRENCHED 12" - 18" W/ WIRE)
 - — — — — SONE PIPE (CL 200 SW PVC; TRENCH OR PULL 12" - 18")
- 2" BALL VALVE IN 3 1/4" PIT; CONTRACTOR SHALL LOCATE AND ATTACH TO THE EXISTING 2" LINE AT THIS LOCATION

STATE OF CONNECTICUT
 DEPARTMENT OF PUBLIC WORKS

DATE: 06 OCT 94
 04-181

JOB NAME: ANSONIA, CONNECTICUT
 IRRIGATION DESIGN
 PLAN
 DESIGNED BY: E.S.

tpc turf products corporation
 157 Moody Road, Enfield, CT 06032
 7 Coppage Drive, Worcester, MA 01602
 (860) 751-2081

NOTES

- 1) SYSTEM IS DESIGNED FOR 60 GPM MAX AT 65 PSI AT THE POC/ 90 PSI AFTER THE BOOSTER PUMP.
- 2) SEE ALL MANUFACTURER'S DATA FOR INSTALLATION INSTRUCTIONS AND PRODUCT SPECIFICATIONS.
- 3) RUN TIMES SHALL BE DETERMINED UPON INSTALLATION BASED ON FIELD CONDITIONS AND PRODUCT SPECIFICATIONS.
- 4) DESIGN IS DIAGNOSTIC. ACTUAL INSTALLATION MAY DIFFER UPON INSTALLATION DUE TO UNSEEN OBSTRUCTIONS.
- 5) IRRIGATION CONTRACTOR IS RESPONSIBLE FOR, BUT NOT LIMITED TO THE COMPLETE INSTALLATION OF THIS TORO IRRIGATION SYSTEM. WORK ALSO INCLUDES THE WATER AND ELECTRICAL TAPS. FOLLOW ALL APPLICABLE CODES. ALL WORK SHALL BE IN ACCORDANCE WITH THE OWNER'S REPRESENTATIVE BEFORE INSTALLATION.

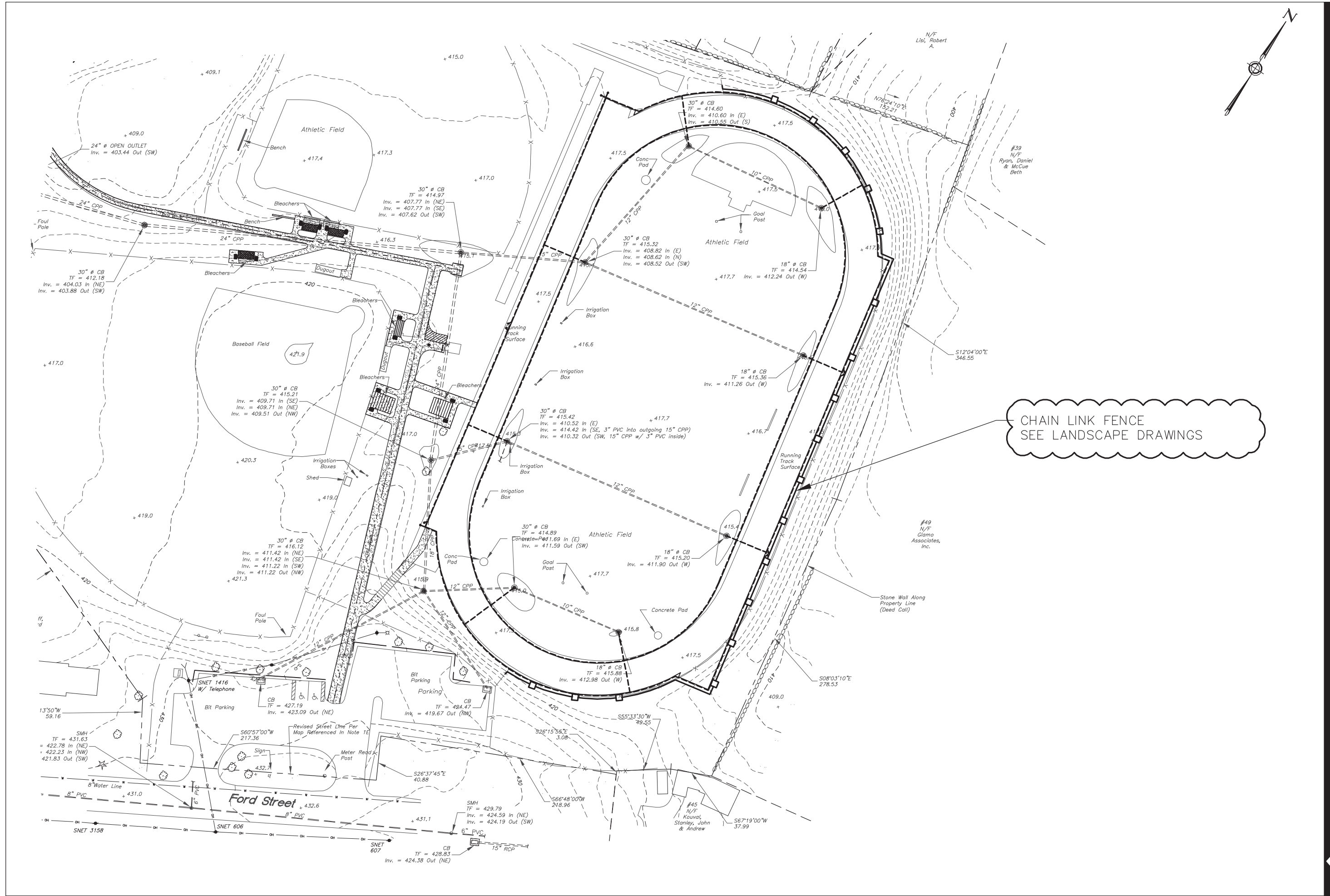
1 Existing Irrigation Layout from 1994
 L5.14 Scale: NS

The existing 1994 irrigation system shown on this drawing represents the general limits of the new system. Contractors bidding this project shall assume that all elements of the original irrigation design are unusable.

Addendum No.2



drawing title IRRIGATION SYSTEM		STATE OF CONNECTICUT DEPARTMENT OF PUBLIC WORKS	
REVISIONS		drawing prepared by DRUMMEY ROSANE ANDERSON, INC. WINDSOR, CONNECTICUT	
mark	date	description	date 10-23-2013
			scale AS SHOWN
		project RENOVATIONS AND ADDITIONS TO EMMETT O'BRIEN TECHNICAL HIGH SCHOOL ANSONIA, CONNECTICUT	drawn by GRH/AMF/CPC approved by GRH
		project no. BLRT-844	drawing no. L5.14

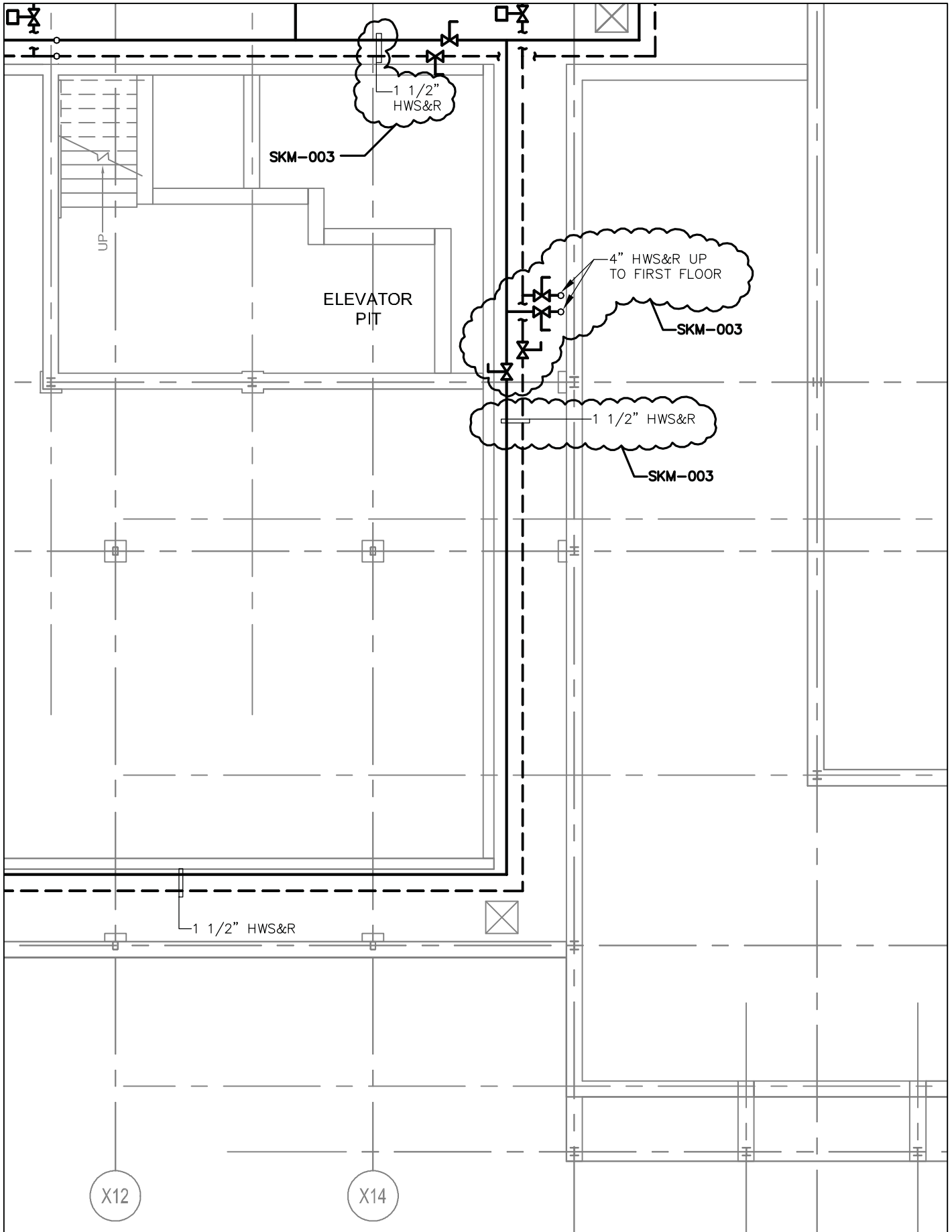
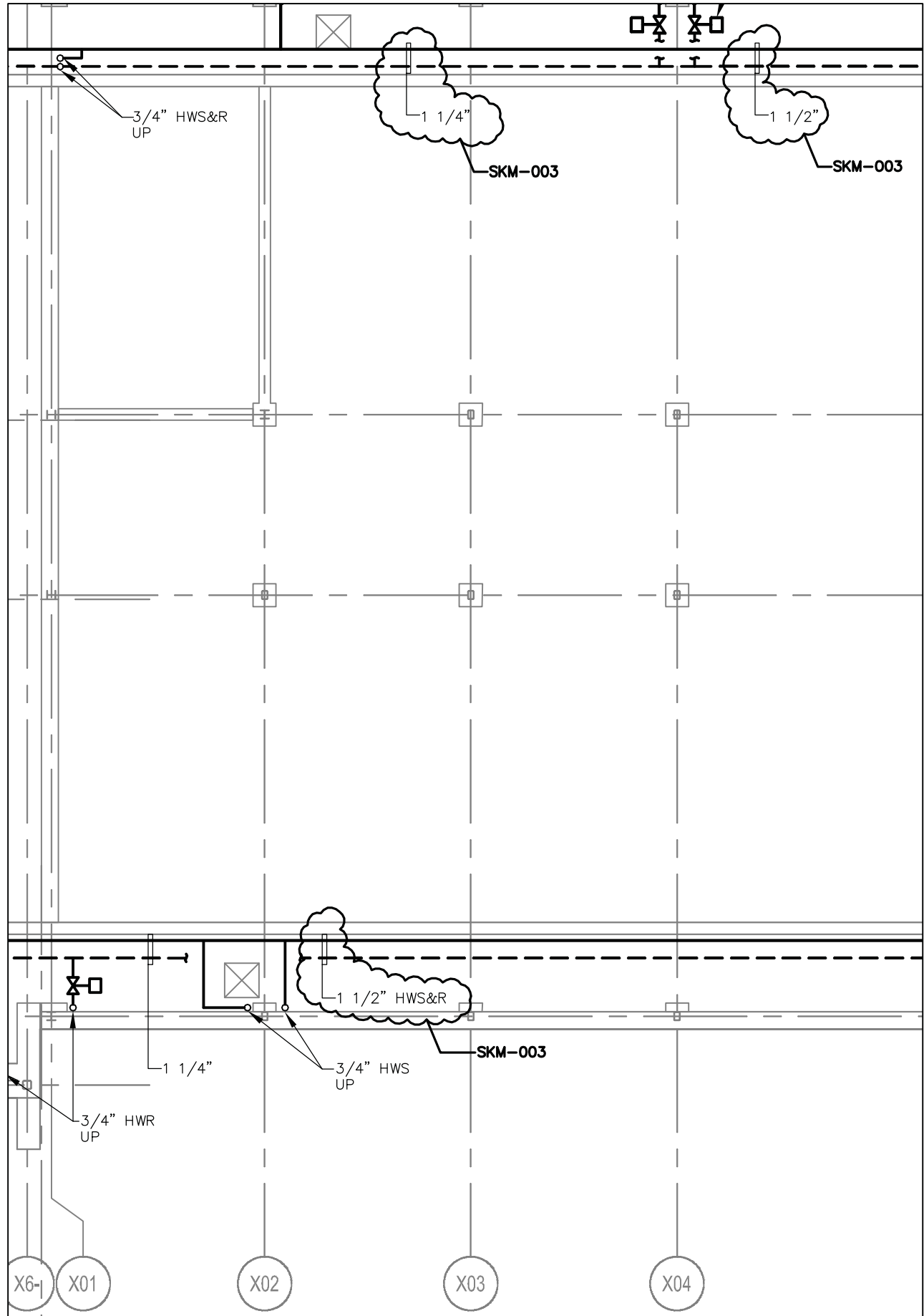


REF. DWG # C4.1
Addendum No.2
SKC-001

SCALE | 1" = 80'
 DRAWN BY | DRA
 DCS No. | BI-RT-844-CMR
 DATE | JAN. 14, 2014

Emmett O'Brien Technical High School, Ansonia, Connecticut
REVISION TO SITE UTILITY PLAN-FORD

D.R.A. Drumrey Rosane Anderson, Inc.
 Studio 205
 225 Oakland Road
 South Windsor, CT 06074
 860-644-8300



1 TUNNEL PIPING PLAN-AREA B
SCALE: 1/8" = 1'0"

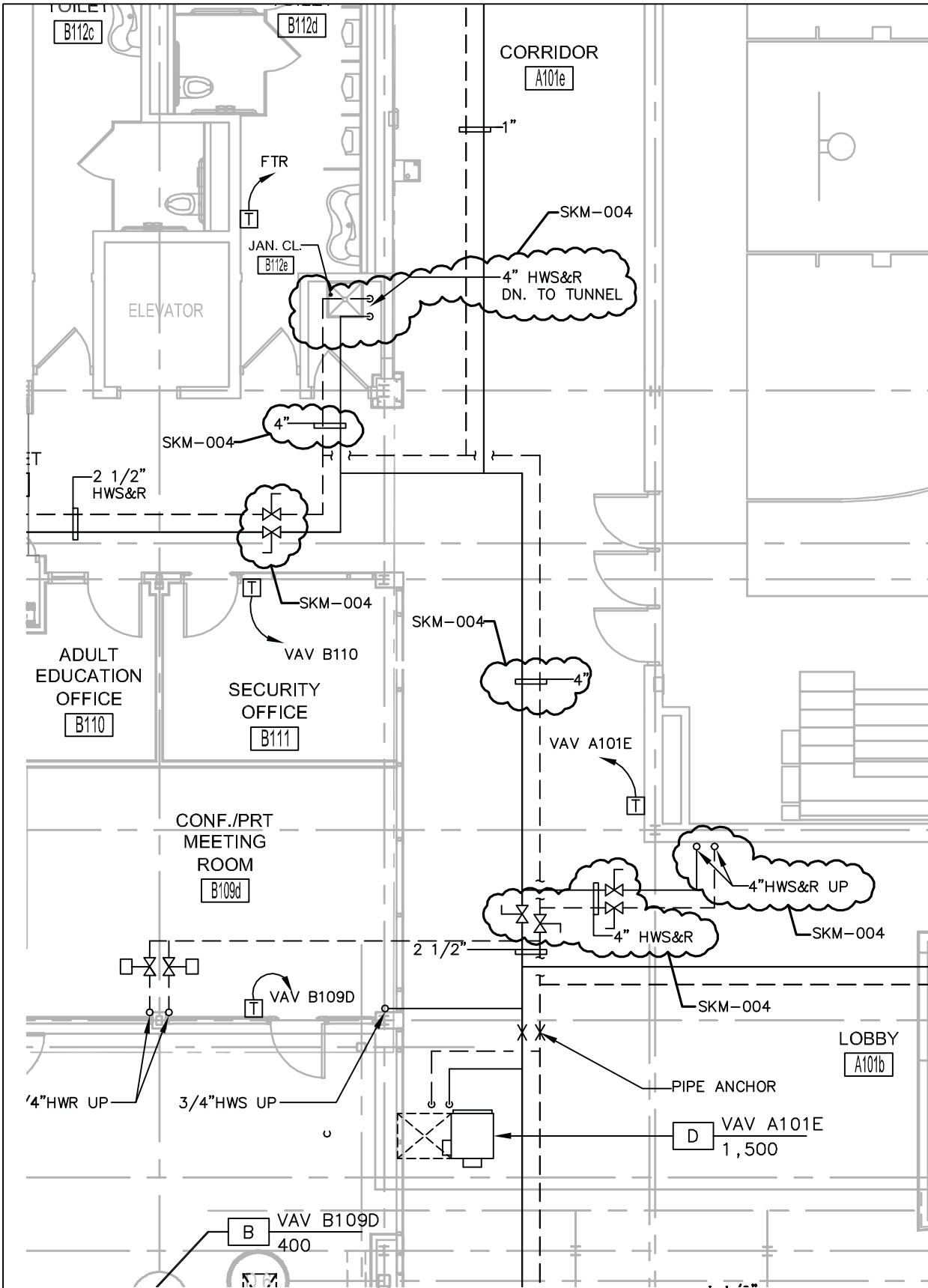
REF. DWG: MP1.1.0B
ADDENDUM #2
SKM-003

SCALE | 1/8" = 1'-0"
DRAWN BY | DRA
DCS No. | BI-RT-844-CMR
DATE | JAN. 14, 2014

Emmett O'Brien Technical High School, Ansonia, Connecticut

TUNNEL PIPING PLAN - AREA B

D·R·A Drummey Rosane Anderson, Inc.
Studio 205
225 Oakland Road
South Windsor, CT 06074
860-644-6300



REF. DWG: MP1.1.1A
ADDENDUM #2

SKM-004

SCALE | 1/8" = 1'-0"
DRAWN BY | DRA

DCS No. | BI-RT-844-CMR
DATE | JAN. 14, 2014

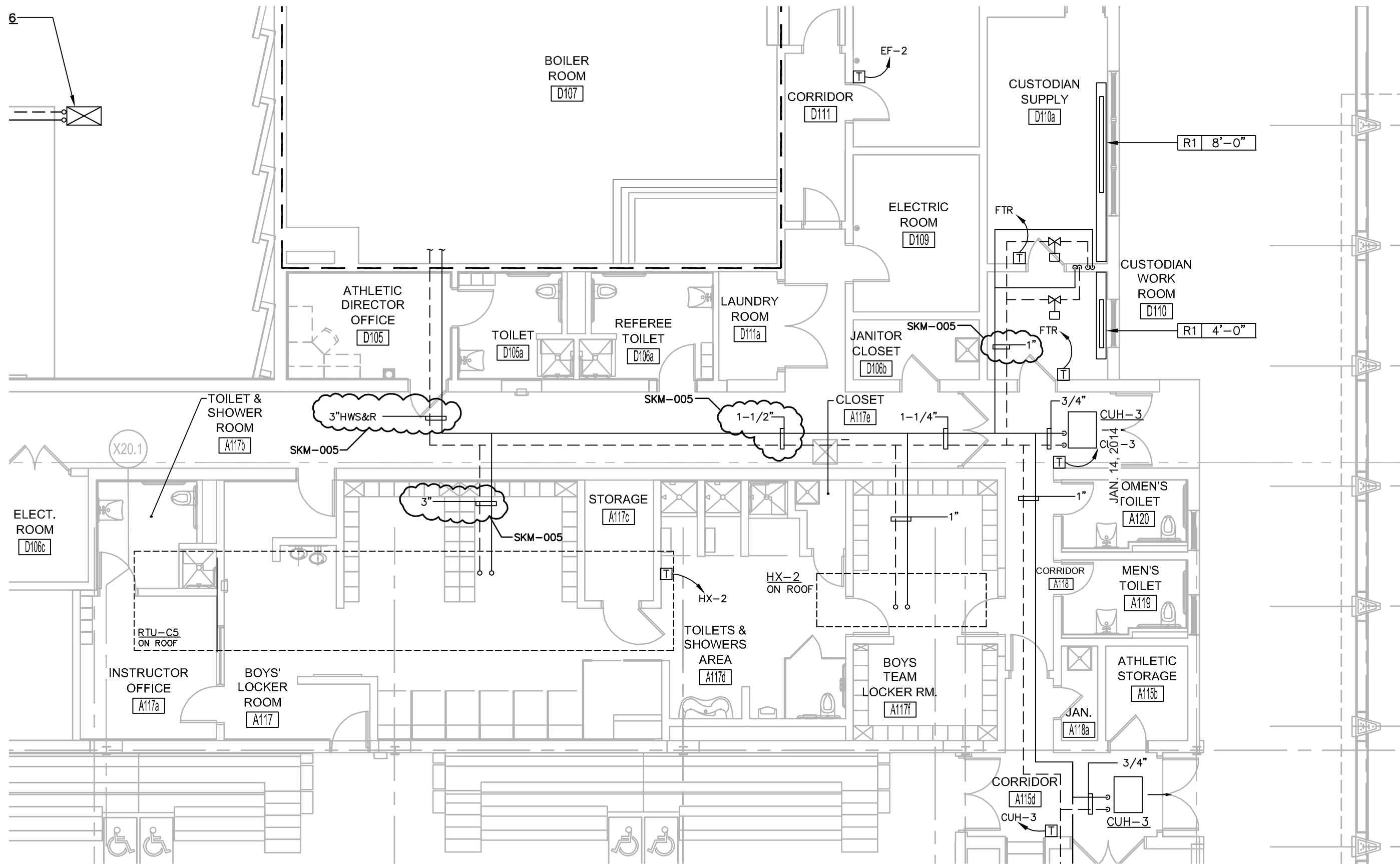
Emmett O'Brien Technical High School, Ansonia, Connecticut

FIRST FLOOR MECHANICAL PIPING PLAN - AREA A

D.R.A. Drummey Rosane Anderson, Inc.

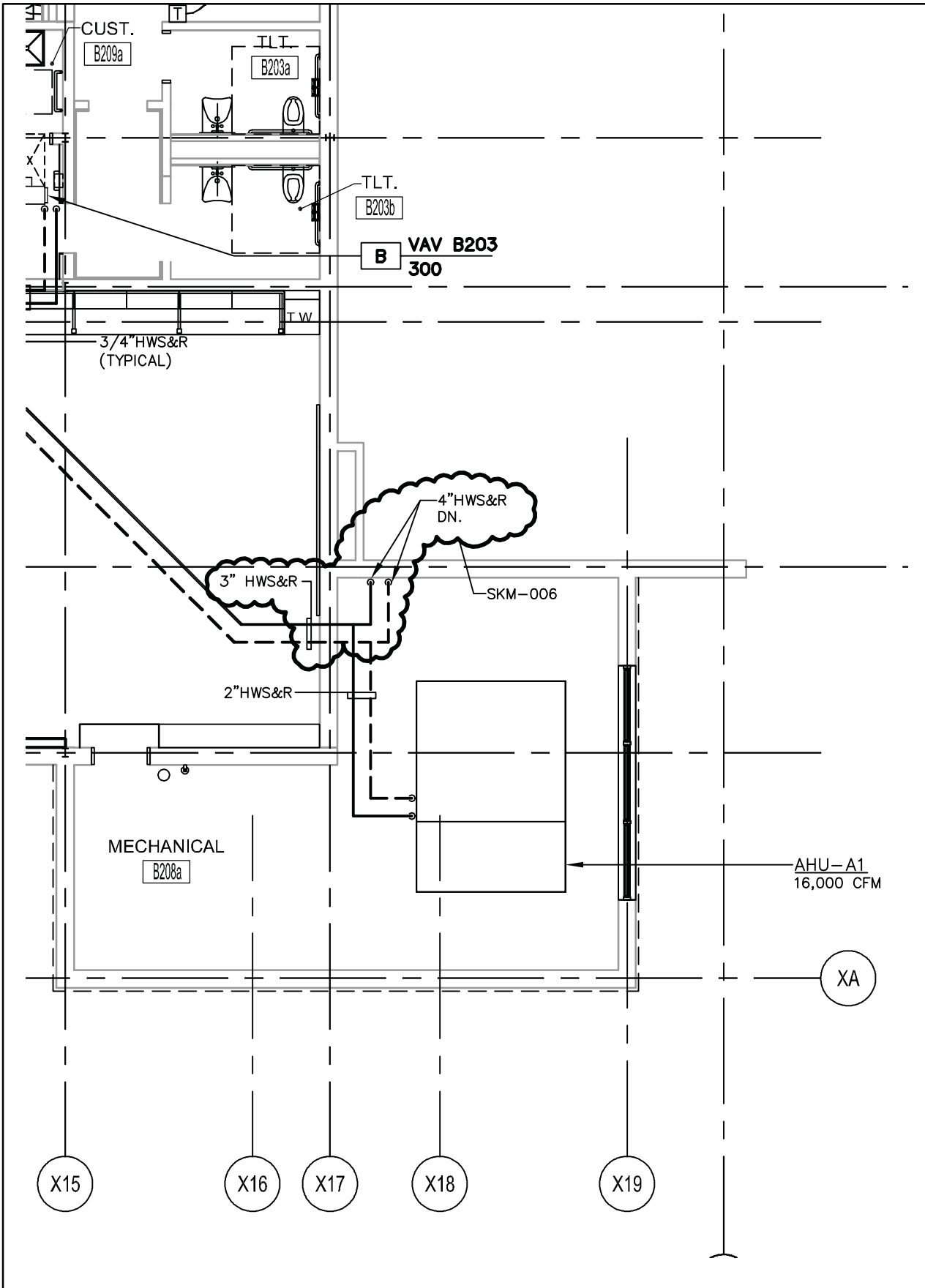
Studio 205
225 Oakland Road
South Windsor, CT 06074
860-644-8300

1 FIRST FLOOR MECHANICAL PIPING PLAN-AREA A
SCALE: 1/8" = 1'0"



1 FIRST FLOOR MECHANICAL PIPING PLAN-AREA D
 SCALE: 1/8" = 1'0"

D.R.A Drummey Rosane Anderson, Inc. Studio 205 225 Oakland Road South Windsor, CT 06074 860-644-8300	Emmett O'Brien Technical High School, Ansonia, Connecticut FIRST FLOOR MECHANICAL PIPING PLAN - AREA D	REF. DWG: MP1.1.1D ADDENDUM #2 SKM-005
	SCALE 1/8" = 1'0" DRAWN BY DRA DCS No. BI-RT-844-CMR DATE JAN. 14, 2014	



REF. DWG: MP1.1.2B
ADDENDUM #2

SKM-006

SCALE | 1/8" = 1'-0"
DRAWN BY | DRA

DCS No. | BI-RT-844-CMR
DATE | JAN. 14, 2014

Emmett O'Brien Technical High School, Ansonia, Connecticut

SECOND FLOOR MECHANICAL PIPING PLAN - AREA B

D.R.A. Drummey Rosane Anderson, Inc.

Studio 205
225 Oakland Road
South Windsor, CT 06074
860-644-8300

1 SECOND FLOOR MECHANICAL PIPING PLAN-AREA B
SCALE: 1/8" = 1'0"

HOT WATER COIL SCHEDULE

SYMBOL	MANUFACTURER/ MODEL NUMBER	TYPE	NO. OF ROWS	TOTAL CAP (MBH)	MAXIMUM FACE VELOCITY (FPM)	AIR SIDE				GLYCOL SOLUTION SIDE				SIZE (W x H)	REMARKS
						FLOW (CFM)	EAT (°F)	LAT (°F)	PD (IN WG)	FLOW (GPM)	EWT (°F)	LWT (°F)	PD (FT HD)		
HWC-A1	MCQUAY	UM	2	552	500	16,000	58	90	.35	54.25	180	140	4.7	-	1
HWC-A7	MCQUAY	UM	1	208.8	500	4,500	58	100.5	0.09	20.7	180	159.8	7.6	-	1
HWC-C1	MCQUAY	UM	2	445.8	500	8,000	56.9	107.8	.23	30.5	180	149.2	5.4	-	1
HWC-C2	MCQUAY	UM	2	481.8	500	9,000	57.8	106.8	.28	33.4	180	149.6	6.4	-	1
HWC-C3	MCQUAY	UM	2	551.7	500	10,250	56	105.2	.35	40.1	180	151	9.1	-	1
HWC-C4	MCQUAY	UM	2	535.8	500	10,300	57.8	105.2	.35	38.2	180	150.5	8.3	-	1
HWC-C5	MCQUAY	UM	2	897.9	500	16,000	56.9	108.2	.33	80.9	180	156.2	86.5	-	1
HWC-S1	MCQUAY	UM	2	329.9	500	8,150	68.7	105.7	.24	20.0	180	160	2.4	-	1
HWC-S2	MCQUAY	UM	1	226.5	500	5,000	57	98.4	.25	19.0	180	154.9	0.2	-	1
HWC-S3	MCQUAY	DM FL	1	186	500	3,675	56	101	.03	1.5	180	153	11.9	-	1
HWC-S4	MCQUAY	DM FL	1	90.0	500	2,000	50	95	.08	3.6	180	130	5.0	24x24	1
HWC-S5	MCQUAY	UM	1	868.4	500	16,825	56.9	104.1	.36	65.3	180	151.5	56.0	-	1
HWC-S6	MCQUAY	DM FL	1	180.0	500	4,000	50	95	.18	7.2	180	130	5.0	48x24	1
HWC-E1	MCQUAY	UM	1	225	500	5,210	57.8	97.6	.05	19.3	180	155	19.3	-	1
HWC-E2	MCQUAY	UM	1	494.5	500	12,180	45.4	82.5	.21	70	180	164	259.4	-	1

REF. DWG: M3.1.3
ADDENDUM #2

SKM-007

SCALE | N.T.S.
DRAWN BY | DRA

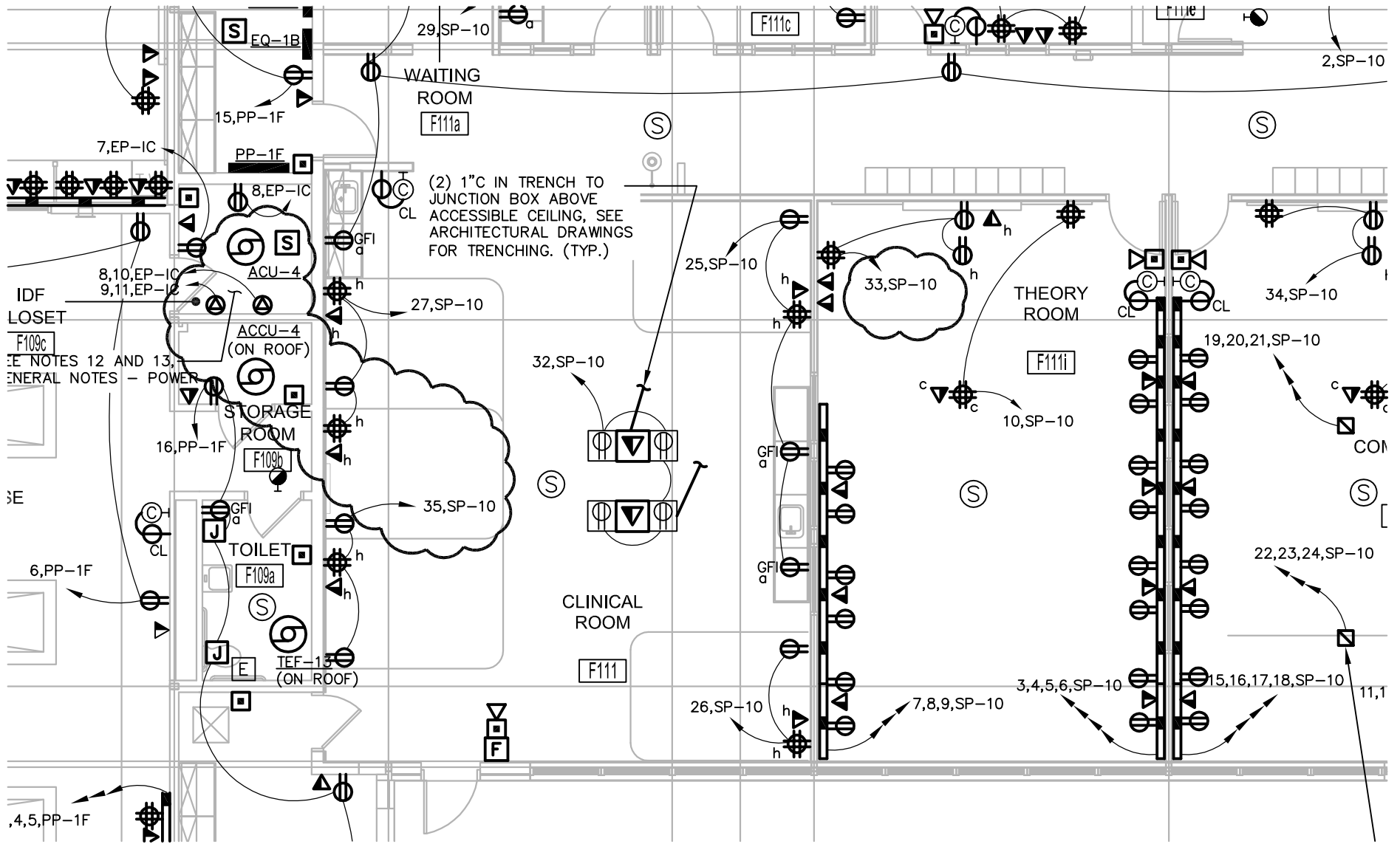
DCS No. | BI-RT-844-CMR
DATE | JAN. 14, 2014

Emmett O'Brien Technical High School, Ansonia, Connecticut

MECHANICAL SCHEDULES

D·R·A
Drumrey Rosane Anderson, Inc.

Studio 205
225 Oakland Road
South Windsor, CT 06074
860-644-6300

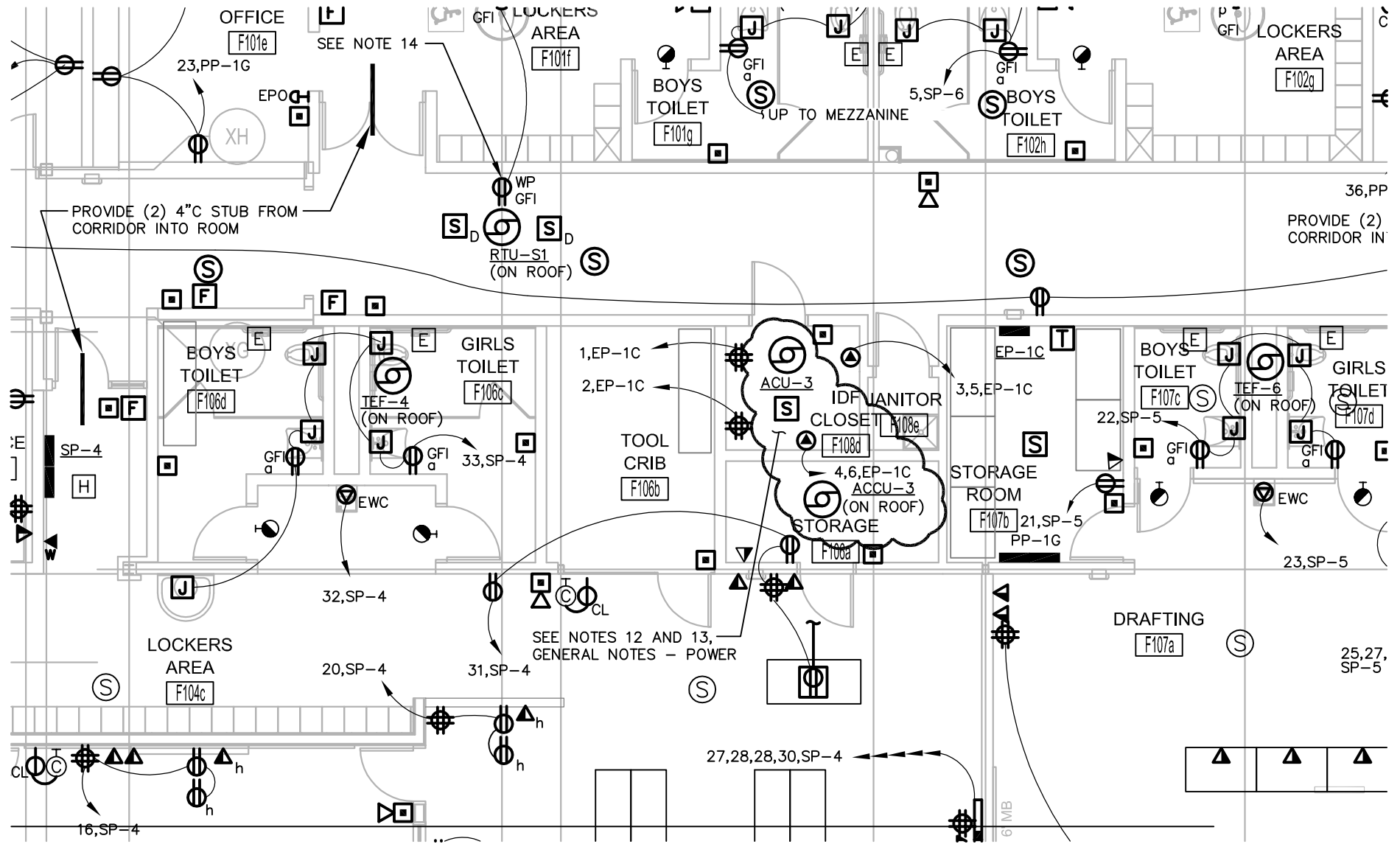


D·R·A Drummey Rosane Anderson, Inc.
 Studio 205
 225 Oakland Road
 South Windsor, CT 06074
 860-644-8300

Emmett O'Brien Technical High School, Ansonia, Connecticut
FIRST FLOOR POWER PLAN-AREA F

SCALE | 1/8" = 1'-0"
 DRAWN BY | RSM
 DCS No. | BI-RT-844-CMR
 DATE | FEB. 15 2014

REF. DWG: EP1.1.1F
 ADDENDUM #2
SKE-001



D·R·A

Drummeey Rosane Anderson, Inc.

Studio 205
225 Oakland Road
South Windsor, CT 06074
860-644-8300

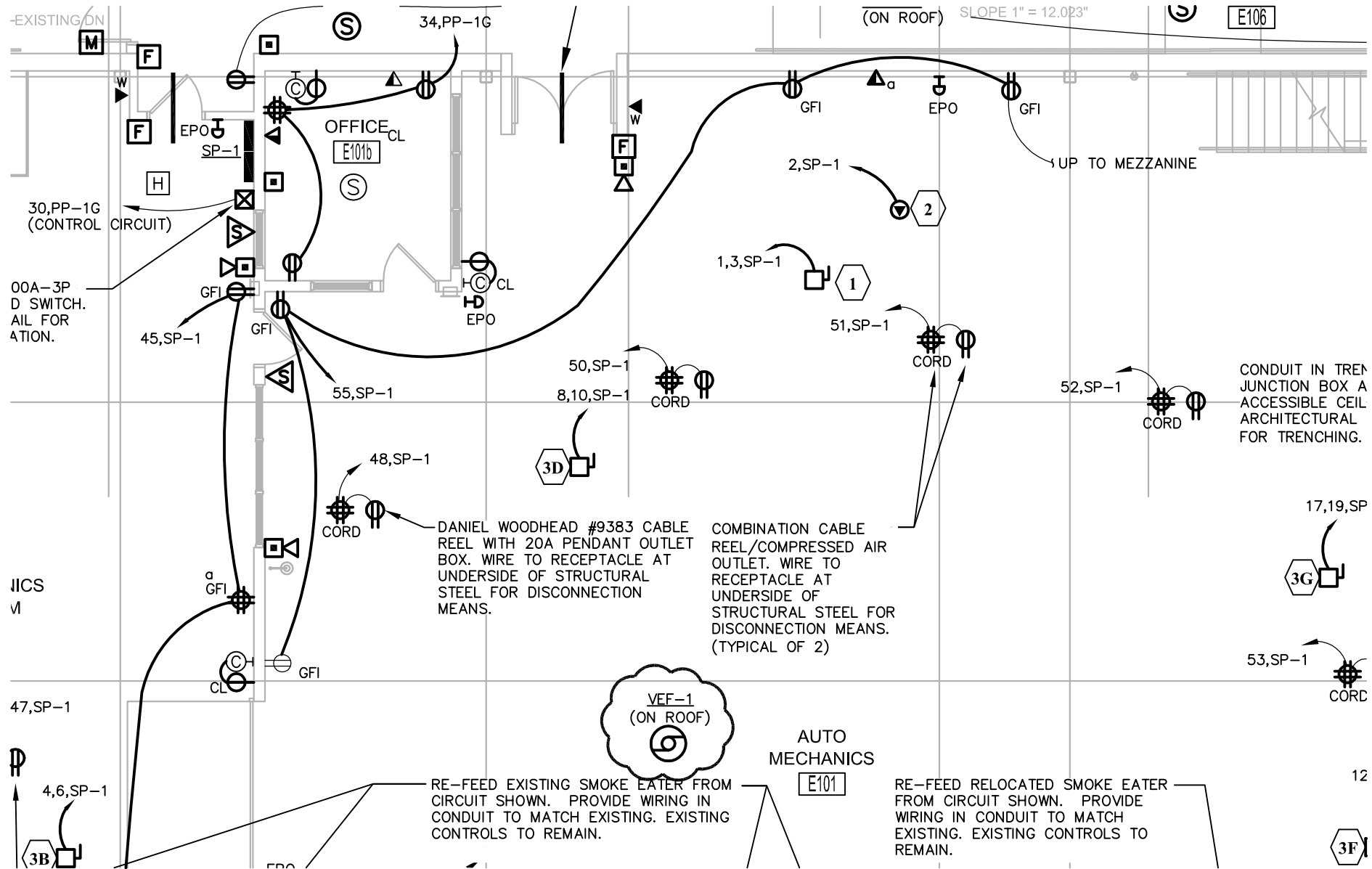
Emmett O'Brien Technical High School, Ansonia, Connecticut

FIRST FLOOR POWER PLAN-AREA F

SCALE | 1/8" = 1'-0"
DRAWN BY | RSM
DCS No. | BI-RT-844-CMR
DATE | FEB. 15 2014

REF. DWG: EP1.1.1F
ADDENDUM #2

SKE-002

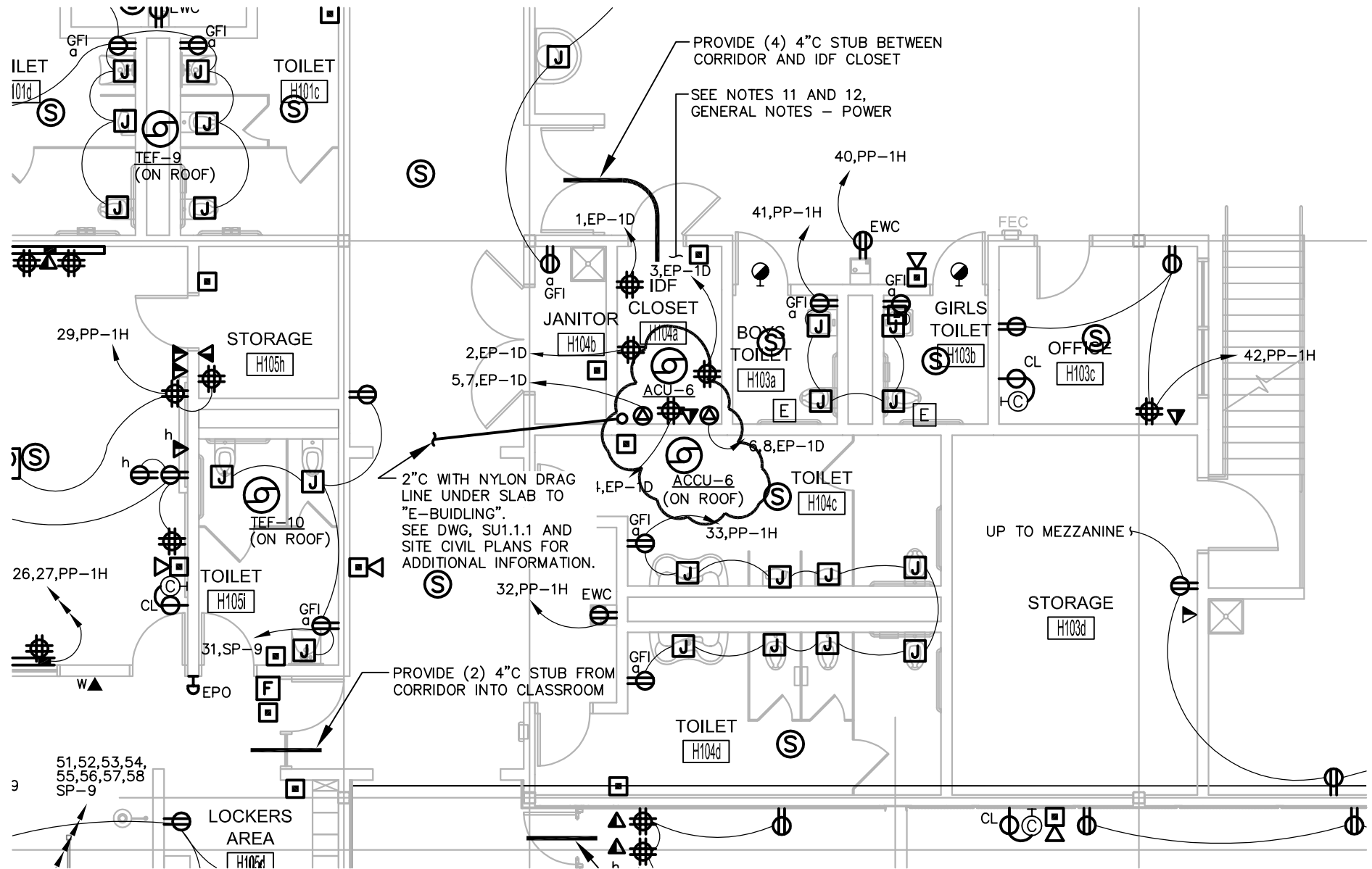


D·R·A
 Drummeey Rosane Anderson, Inc.
 Studio 205
 225 Oakland Road
 South Windsor, CT 06074
 860-644-8300

Emmett O'Brien Technical High School, Ansonia, Connecticut
FIRST FLOOR POWER PLAN-AREA E

SCALE | 1/8" = 1'-0"
 DRAWN BY | RSM
 DCS No. | BI-RT-844-CMR
 DATE | FEB. 15 2014

REF. DWG: EP1.1.1E
 ADDENDUM #2
SKE-003

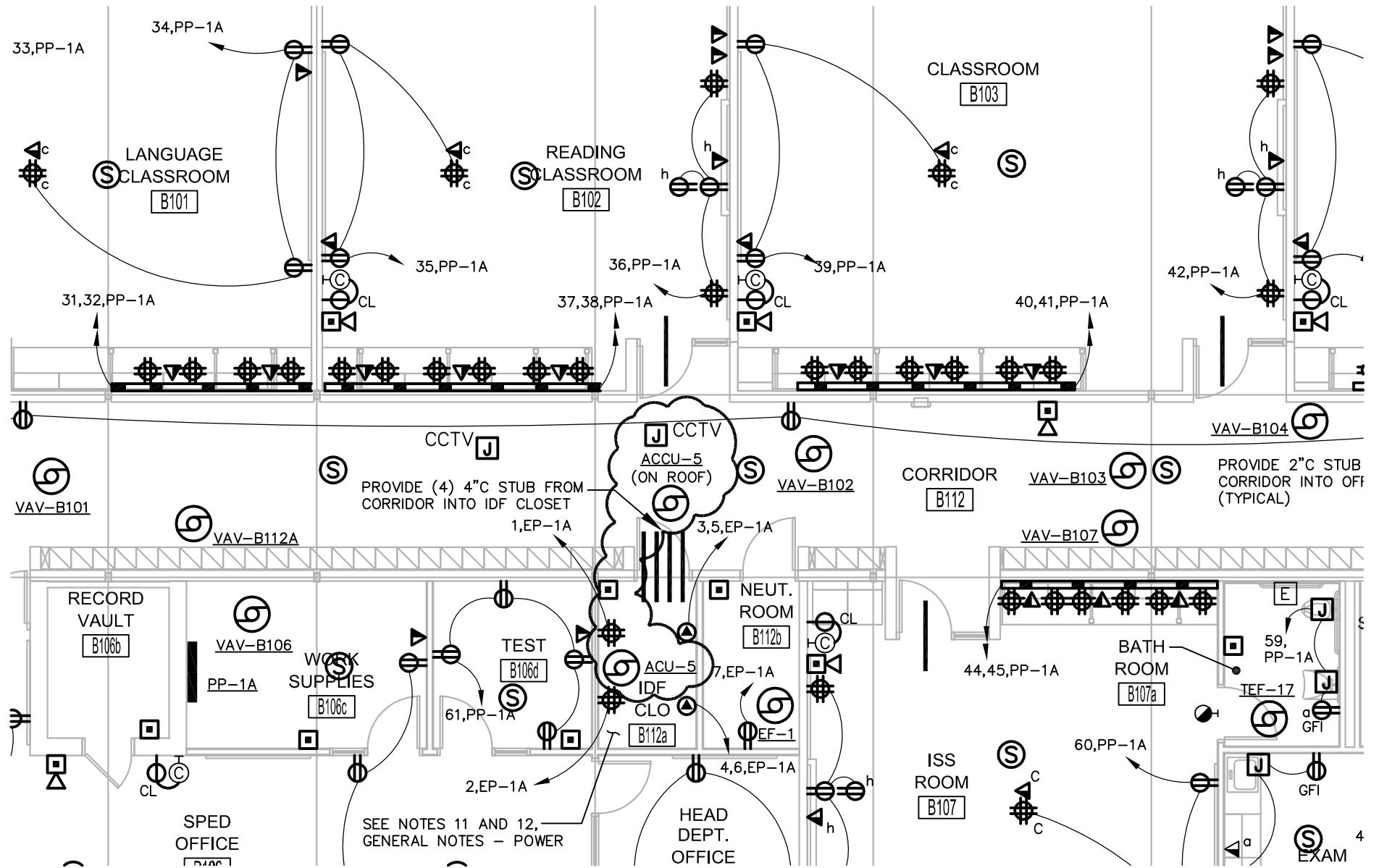


D·R·A
 Drummeey Rosane Anderson, Inc.
 Studio 205
 225 Oakland Road
 South Windsor, CT 06074
 860-644-8300

Emmett O'Brien Technical High School, Ansonia, Connecticut
FIRST FLOOR POWER PLAN-AREA H

SCALE | 1/8" = 1'-0"
 DRAWN BY | RSM
 DCS No. | BI-RT-844-CMR
 DATE | FEB. 15 2014

REF. DWG: EP1.1.1H
 ADDENDUM #2
SKE-004



<p>D·R·A Drummeey Rosane Anderson, Inc.</p>	<p>Emmett O'Brien Technical High School, Ansonia, Connecticut</p>	<p>SCALE 1/8" = 1'-0" DRAWN BY RSM</p>	<p>REF. DWG: EP1.1.1B ADDENDUM #2</p>
<p>Studio 205 225 Oakland Road South Windsor, CT 06074 860-644-8300</p>	<p>FIRST FLOOR POWER PLAN-AREA B</p>	<p>DCS No. BI-RT-844-CMR DATE FEB. 15 2014</p>	<p>SKE-005</p>