ADDENDUM #3

Date Issued: March 27, 2018

GENERAL INFORMATION

1. The bid due dates have remained unchanged since Addendum #2. Refer to Addendum #2 for the bid due date and time for each bid package.
2. Due to the bid extension in Addendum #2, the scope review dates have changed. Apparent low bidders for the following critical packages need to be available for scope review meetings per the following schedule:
    - Monday April 9th 8am – BP-02A Sitework Scope Review
    - Monday April 9th 9:30am – BP-05A Structural Steel & Misc Metals Scope Review
    - Monday April 9th 11am – BP-03A Concrete Scope Review
    - Monday April 9th 1pm – BP-15A Mechanical Scope Review
    - Monday April 9th 3pm – BP-16A Electrical Scope Review
    - Tuesday April 10th 8am – BP-06A Wall Systems & Specialties Scope Review
    - Tuesday April 10th 9:30am – BP-04A Masonry Scope Review
    - Tuesday April 10th 11am – BP-08A Windows & Curtainwall Scope Review
    - Wednesday April 11th 8am – BP-07A Roofing
    - Wednesday April 11th 1pm – BP-07B Exterior Panels

3. **Bidder's List:** An updated bidder's list is attached. If you are bidding this project and are not on the list, or if there is incorrect or missing information, please contact Chris Malerba: cmm@giordano.build
4. **All Bid Packages:** All original scope notes shall apply to any new work added by this addendum.
5. **All substitution requests approved since the last Addendum are attached to this Addendum.**
6. **All RFIs with responses issued since the last Addendum are attached to this Addendum.**

REVISIONS TO THE SPECIFICATIONS

1. TABLE OF CONTENTS: Add new Section: "014339 MOCKUPS"
2. Add new Section: Section 014339 – MOCKUPS (6 pages)

3. **Plumbing:**
    - **REVISE**: Specification 220503
        - Section 2.3-A: Sanitary piping: PVC shall be Schedule 40.
        - Section 2.5-A: Storm water piping: PVC shall be Schedule 40.
        - Section 2.11-C: Unions and flanges: PVC shall be Schedule 40.

4. **Mechanical:**
    - **CLARIFICATION**:
        - Boiler flues: refer to 235100 section 2.1.
        - Boiler combustion air intake: refer to 232113 section 2.6.

    - **Specification 230700:**
        - REVISE: Heat tracing: Specification 230700 section 2.11-A Manufacturers: BriskHeat Type SLM-Cable by Raychem or approved equal.
        - REVISE: Section 3.5 “Schedules” in Specification 230700- HVAC Insulation, shall read as follows: “Chilled water & condenser water supply and return”, Chilled water & condenser water supply and return cooling tower piping (outside of building).
        - REVISE: Section 3.5 “Schedules” in Specification 230700- HVAC Insulation, shall read as follows: “Refrigerant Liquid, Suction, Relief or Hot Gas”.

    - **ADD**: Specification 230900: All automatic control damper actuators and control valves, Belimo is an acceptable equal.

    - **Specification 230993:**
        - **CLARIFICATION**: Dewpoint sensors (D1 and D2) on MP Series drawings can be provided as single combination Temperature and Humidity sensors where BMS calculates space dewpoint as required within sequence of operations specifications 230993.
        - **ADD**: Section 3.1-I: Provide additional control points for BMS devices as shown on M-700 series drawings.
        - **ADD**: Section 3.33: Heat Trace Interface
        - **CLARIFICATION**: Specification 230993 section 3.32 Utility monitoring revised per attached specification.
        - **ADD**: Section 4.11 points list for chilled beam loop modulating control valve
        - **REVISE**: Section 4.15 points listed for Condenser Water Isolation Valves Status & Condenser Water Isolation Valves.
        - **ADD**: Section 4.19 points list
            1. Heat tracing at cold water makeup piping
            2. Expansion tank control valve

    - **Specification 232113:**
        - **REMOVE**: Section 2.2 “Chilled Water Piping, Buried” from Specification 232113-Hydronic Piping

  - **REVISE**: Section 2.3 in Specification 232113- Hydronic Piping, shall read as follows: "Chilled Water & Condenser Water Piping".
  - **REVISE**: Combustion Air Piping: Specification 232113 section 2.6-A CPVC shall be schedule 40.

- **ADD**: Plate and Frame HX: Specification 232116 section 2.17

- **ADD**: Specification 235100 Section 2.1-A-5: Heat Fab Model CI Vent.

5. **Electrical**:

- **CLARIFICATION:** Artis energy meters to be installed refer to Specification 230993 section 3.32 Utility monitoring revised per attached specification for additional information.
  - Meters serving Artis energy system shall be installed by Division 26.

REVISIONS TO THE DRAWINGS

Civil

- L-102: Revised to add blue light location.
- L-610: Revised to add detail 10 blue light foundation.

Architectural

- A-111: Changed wall type between Toilet 131A and Storage 131B to wall type Q.
- A-111: Deleted 1 shelving unit in Storage 131B.
- A-202: Deleted roof access ladder on elevation 1.
- A-210: Revised elevation 4, SF-1 to add horizontal mullions at glazing panels and lower overall height of storefront.
- A-210: Revised location of exit signs to be ceiling in lieu of wall mounted.
- A-324: Revised elevation 2 to add horizontal mullions at glazing panels.
- A-327: Added call out for detail 21/A-550.
- A-327: Revised detail 1 to match blow up detail 4/A-503 and added call out on typical condition.
- A-520: Revised details to clarify roof system AVB
- A-521: Revised details to clarify roof system AVB
- A-522: Revised details to clarify roof system AVB
- A-550: Modified details 13, 16 & 18 to indicate correct ceiling type.
- A-550: Added detail 21 for soffit condition at east gym/café curtain wall.
- A-560: Revised glazing type in frame type C.
- A-560: Modified detail 4 to indicate correct ceiling type.
- A-561: Revised details 6, 7 & 8 to indicate correct 1/4" glazing thickness.
- A-570: Revised SF-1 elevation to add horizontal mullions at glazing panels and lower overall height of storefront.
- A-581: Revised section 3 mailbox slot depths.

Fire Protection

1. **ADD**: Sprinklers within soffit as indicated on drawing FP-111 an FP-112. Sidewall concealed sprinklers cover plates shall be custom colored to match architectural soffit.

Mechanical

1. Women 110 and Men 112
   - **CLARIFICATION:** Drawing M-112 & MP-112 VAV box serving Women 110 and Men 112 shall be type VAV-DHW.
   - **ADD:** 1" Hot water supply and return piping to serve VAV-DHW within Women 110 and Men 112 .

2. Boys 204B & Girls 204A
   - **CLARIFICATION:** Drawing M-122 & MP-122 VAV box serving Boys 204B & Girls 204A shall be type VAV-BHW
   - **ADD:** 1" Hot water supply and return piping to serve VAV-BHW within Boys 204B & Girls 204A.

3. Boys 304B & Girls 304A
   - **CLARIFICATION:** Drawing M-132 & MP-132 VAV box serving Boys 304B & Girls 304A shall be type VAV-BHW
   - **ADD:** 1" Hot water supply and return piping to serve VAV-BHW within Boys 304B & Girls 304A.

4. **ADD:** Drawing M-601: add VAV-BHW to "Variable Air Volume Terminal Unit Schedule".
5. **REVISE:** Hot water supply and return pipe sizes serving Cafeteria area VAV boxes. Refer to revised drawing MP-122 for updated pipe sizes.
6. **ADD:** Air separator (AS-3) to "Chiller Hydronic System Equipment and Accessories" on drawing M-603
7. **CLARIFICATION:** Note on drawing M702 has been clarified.
8. **CLARIFICATION**: Section 4/M-300 was added to drawings to clarify the extent of work for Thermaduct exterior ductwork system.
9. **CLARIFICATION**: Hot water supply and return piping serving third floor was changed to 4" in lieu of 6" as shown on construction documents.

Electrical

1. **DELETE**: Sheets EP-121, EP-122 and EP-131
2. **ADD**: Sheets EP-121, EP-122 and EP-131
   - Power and fire alarm connections to folding partition around main staircase.
   - Added and shifted fire alarm speaker/strobes.

3. **DELETE**: Drawing EL-112, wall mounted exit signs in the Main Lobby 102.
4. **ADD**: Drawing EL-112, Ceiling mounted exit signs in the Main Lobby 102

5. **CLARIFICATION**: Refer to contract documents drawing EP-131 for power and fire alarm connections to folding partition around main staircase.
6. **ADD:** Provide emergency Blue Light device, along with power and phone cabling/conduit as indicated on attached revised drawing SU-100.

SCOPE CLARIFICATIONS

BP-02A Sitework Scope Clarifications:

1. This addendum has added an Emergency Blue Light to the project. Refer to revised L-102, L-610 & SU-100 issued in this addendum. The BP-02A Sitework contractor shall perform the following work:
   - All excavation, setting bed & backfill required.
   - Furnish and install the concrete base shown on L610.
   - Remove and replace construction fence as required.
   - Restore and reseed all areas of the adjacent Lang House lawn disturbed performing this work.

BP-03A Concrete Scope Clarifications:

1. Clarification: The entire retaining wall that supports the precast pedestrian bridge slab is in the BP-03A Concrete Scope. Refer to S111, L102 & L201 for full extent. The total extent of this wall was highlighted in the "Retaining Wall Clarification Sketch" issued in addendum #1.

2. Clarification on BP-03A scope note #40: Grout material is specified in Section 05 12 00 paragraph 2.4.

3. Clarification on BP-03A Scope note #63: 4" Curbs being poured at the mechanical penetrations shall be dowelled into the floor slab with ¾" dowels. Dowels to be 4" long and placed 12" on center.

BP-04A Masonry Clarifications:

1. Clarification on Air / Vapor Barriers:
   - BP-07A Roofing owns the Vapor Retarder (Specified in 075419 PVC Roofing 2.3 VAPOR RETARDER - Self-Adhering-Sheet Vapor Retarder) under all the PVC roofing and copings and it should lap 6" down vertically at all exterior walls. This vapor retarder has been re-labeled on the drawings as "PV Roof System Vapor Retarder" for clarity.

   - The sheet applied AVBs on the exterior skin of the building, both VP (072715 - NONBITUMINOUS SELF-ADHERING SHEET AIR BARRIERS) and IP (072713 Modified Bituminous Sheet Air Barriers) are to be furnished and installed by the BP-04A Masonry Contractor and in addition to where shown on the CDs at all vertical and horizontal areas of the exterior walls, these AVBs should extend over the top of the exterior walls and terminate at the back side of the parapet/coping framing, so it laps under the PVC roofing system.

BP-05A Structural Steel & Misc Metals Scope Clarifications:

1. The roof ladder previously shown in detail 1 on A-202 has been deleted per the revised A-202 drawing included in this addendum.

BP-06A Wall System & Specialties Scope Clarifications:

1. Clarification: BP-06A Scope note #92 for the trash chute, add a hopper/door section at the 3rd floor. Change the 2nd bullet point to read as follows:

   - Top hopper at roof level, hopper/door section @ 3rd floor and hopper/door section at 2nd floor

2. The soffit details along the east walls in the gym/café have been revised. Refer to revised A-327 & A-550 issued in this addendum.

BP-06B Millwork Scope Clarifications:

1. The mailbox wall cabinet (3 on A-581) has been revised, refer to the revised A-581 drawing issued in this addendum.

2. The BP-06B Millwork Contractor shall furnish and install the Decorative Acrylic Glazing (DA-1) shown at the reception desk on A-583, refer to section 088400 for specification.

BP-06C SCD Acoustical Ceilings Scope Clarifications:

1. BP-06C Scope of Work – Change the footer on the bottom of scope pages 1 thru 5 from "Scope of Work BP-02A Sitework" to "Scope of Work BP-6C SCD – SCD Acoustical Ceilings"

BP-07A Roofing Scope Clarifications:

1. Clarification on scope note #38 in reference to walkpads under PV supports: For purposes of this bid, assume that walkpads need to be installed continuously under the entire footprint of PV panel areas shown on the CDs. Provide a separate breakout cost for the walkpads under the PVs. A revised BP-07A Roofing Bid breakdown form is attached to this addendum.

2. Clarification on Air / Vapor Barriers:

    - BP-07A Roofing owns the Vapor Retarder (Specified in 075419 PVC Roofing 2.3 VAPOR RETARDER - Self-Adhering-Sheet Vapor Retarder) under all the PVC roofing and copings and it should lap 6" down vertically at all exterior walls. This vapor retarder has been re-labeled on the drawings as "PV Roof System Vapor Retarder" for clarity.

    - The sheet applied AVBs on the exterior skin of the building, both VP (072715 - NONBITUMINOUS SELF-ADHERING SHEET AIR BARRIERS) and IP (072713 Modified Bituminous Sheet Air Barriers) are to be furnished and installed by the BP-04A Masonry Contractor and in addition to where shown on the CDs at all vertical and horizontal areas of the exterior walls, these AVBs should extend over the top of the exterior walls and terminate at the back side of the parapet/coping framing, so it laps under the PVC roofing system.

BP-09A Flooring Scope Clarifications:

1. FLOOR PROTECTION CLARIFICATION (Scope note #36): Tile in all corridors: In lieu of RAM board, protect with Neo Shield Neoprene Floor runners per 09 65 00 2.6 E. Provide a 54" wide travel path from all entrances, in all corridors and into each room.

BP-16A Electrical Scope Clarifications:

1. This addendum has added an Emergency Blue Light to the project. Refer to revised L-102, L-610 & SU-100 issued in this addendum. The BP-16A Electrical Contractor shall perform the following work:
    - Furnish and install the Blue Light as specified on SU-100. Provide anchor bolts and layout to the BP-02A Sitework Contractor who will be responsible to furnish and install the concrete base
    - Furnish and install all conduit, wiring and handholes shown on the plan from Blue Light location to the D-marc in the Lang house basement.
    - Core drill the penetration thru the Lang House foundation. Install waterproof sealant at the penetration after conduit/wiring is installed.
    - All excavation & backfill by BP-02A Sitework.

ATTACHMENTS:

1. Bidders List dated 3-26-18
2. March 20, 2018 Pre-Bid Meeting Sign-In Sheet
3. Approved Substitution Requests
4. RFIs with responses (004, 005, 006, 007, 008, 009, 010, 011, 013, 014, 015, 017, 018)
5. Revised BP-07A Bid Breakdown Sheet
6. JCJ Architects Addendum #3 dated March 27, 2018 with specifications & drawings attached.

End of Addendum #3

GIORDANO Construction Co., Inc.

EUP Eco-Urban Pioneers

Strong 21st Century Communications Magnet Lab School
BIDDERS LIST

Company	Contact	Email	Phone	Prime or Sub	Sub Discipline	SCD	MBE AA	MBE H	WBE
BP-01A Progress & Final Cleaning									
Orissa LLC	Tejal Vallum	tvallam@gmail.com	(860) 983-6999	Prime					X
Advantage Maintenance	Tom Wilkinson	tom@advantagemaintenanceinc.com	(203) 387-1968	Prime					
Horizon Services Company	Tom Baerlein	tbaerlein@horizonsvcs.com	(860) 291-9111	Prime					
Go To Services	Bob Fitch	BFITCH@GTSERVU.COM	203-624-3200	Prime				X	
Orange Cleaning Services, Conny Inc	Thomas Marshall	thomas@orangecleaning services.net	203 940-6632	Prime			X		
K & P Facilities Maintenance	Carlos Espinosa	carlos@kandpcleaning.com	845 206-3580	Prime				X	
McKay's Custom Clean LLC	Blaine McKay	mckayscustomclean@gmail.com	(203) 444-3375	Sub	Final Cleaning		X		
CDees Cleaning	Claudette Deer	claudettedeer1954@gmail.com	203-727-7800	Sub	Final Cleaning	X	X		X
BP-01C SCD Final Cleaning									
Tim's Enterprises LLC	Timothy Washington	tims.enterprises@yahoo.com	203.410.5189	Prime		X	X		
CDees Cleaning	Claudette Deer	claudettedeer1954@gmail.com	203-727-7800	Prime		X	X		X
Amazon Landscaping & Handyman	Marco Zanette	landscapeamazon@hotmail.com	(203) 934-7476	Prime		X		X	
BP-01S SCD Site Security									
Investigative Consultants LLC	Mark Schachter	mschachter@ic-ct.com	203 623-7955			X		X	
BP-02A Sitework									
AMEC Construction	Ray Zanon	estimating@amecllc.com	203-726-4653	Prime					
C.J. Fucci	Vincent Federico	vfederico@cjfucci.com	(203) 469-7487	Prime					
Camputaro & Sons	Dennis Camputaro	dcamputaro@camputaroandson.com	(203) 483-0330	Prime					
Manafort Brothers Incorporated	Timothy J. Meneo	tmeneo@manafort.com	860.983.0733	Prime					
Center Earth LLC	Brian Smith	BSmith@centerearth.com	203.780.8433	Prime					
Core Site Services	Allen Page	apage@coresiteservicesct.com	475.227.9026	SUB	Curbs, sidewalks, stairs, drainage		X		
Aqua Technologies	Luz Carvajal	aquatechnologiesllc@outlook.com	(203) 889-7707	SUB	Waterproofing	X		X	X
White Owl Construction, LLC	Clayton Henderson	hollywod@comcast.net	203-435-4455	SUB	Sidewalks, Pads, Stairs	X	X		
J & S General Contractors, LLC	Mike D'Errico	jsgc.mike@gmail.com	203 497-9096	SUB	Fencing	X			
Cornerstone Fence	Sharon Boucher	sharon.cfllc@gmail.com	203-237-4283	SUB	Fencing				
Select Fence & Guardrail	Maryanne Ottaviano	selectfence@att.net	203-843-2726	SUB	Fencing	X			X
Beech Construction LLC	Mike Gaudio	beechconstructionllc@gmail.com	(203) 200-9047	SUB	Curbs, sidewalks, stairs	X			X
C.A.S.T. LLC	Samuel Wilson	s.wilson@castco.co	203.368.6086	SUB	Curbs, sidewalks, stairs		X		
ACP Plus	Hamptom Watson	Watsoneliminator@aol.com	(860) 982-1330	Sub	Conc Pumping, Sidewalks, Pads	X	X		

BP-02F SCD Construction Fencing									
Select Fence & Guardrail	Maryanne Ottaviano	selectfence@att.net	203-843-2726	Prime		X			X
J & S General Contractors, LLC	Mike D'Errico	jsgc.mike@gmail.com	203 497-9096	Prime		X			
BP-02L SCD Landscaping									
Beech Construction	Mike Gaudio	beechconstructionllc@gmail.com	(203) 200-9047	Prime		X			X
Glen Terrace Landscaping	Mario Calcagni	m.calcagni@outlook.com	(203) 996-9390	Prime		X			X
Amazon Landscaping Design	Marco Zanette	landscapeamazon@hotmail.com	(203) 934-7476	Prime		X		X	
BP-02W SCD Concrete Sidewalks & Stairs									
Beech Construction	Mike Gaudio	beechconstructionllc@gmail.com	(203) 200-9047	Prime		X			X
Americity Construction Co, Inc	Durval Pereira	americity@cox.net	(203) 271-2704	Prime		X		X	
White Owl Construction, LLC	Clayton Henderson	hollywod@comcast.net	203-435-4455	Prime		X	X		
DP& Sons	Durval Pereira	Durval@cox.net	(203) 271-2704	Prime		X			
Tim's Enterprises LLC	Timothy Washington	tims.enterprises@yahoo.com	203.410.5189	Prime		X	X		
BP-03A Concrete									
Universal Foundations	Abi Malode	abim@universalfoundations.com	(203) 272-5966	Prime					
Carvalho & McDowell Construction	Mike Aletta	estimating@cm-inc.net	(860) 231-7110	Prime					
Camputaro & Sons	Dennis Camputaro	dcamputaro@camputaroandson.com	(203) 483-0330	Prime					
Manafort Brothers Incorporated	Timothy J. Meneo	tmeneo@manafort.com	860.983.0733	Prime					
Alvarez Industries	Lenny Alvarez	Lenny.alvarez@gmail.com	(203) 799-2356	Sub	Rebar			X	
Americity Construction Co, Inc	Durval Pereira	americity@cox.net	(203) 271-2704	Sub		X		X	
C.A.S.T. LLC	Samuel Wilson	s.wilson@castco.co	203.368.6086	SUB	Concrete		X		
ACP Plus	Hamptom Watson	Watsoneliminator@aol.com	(860) 982-1330	Sub	Conc Pumping, Slabs	X	X		
BP-04A Masonry									
Joe Capasso Mason	Riazulla Baig	estimating@joecapassomason.com	(860) 638-1111	Prime					
Civitillo Masonry, Inc.	Carm D'Agostino	CDAgostino@civitillo.net	860-523-5278	Prime					
Connecticut Mason Contractors	John Civitillo	jcivitillo@connecticutmason.com	860.296.9984	Prime					
Aqua Technologies	Luz Carvajal	aquatechnologiesllc@outlook.com	(203) 889-7707	SUB	Caulking	X		X	X
Premier Construction MAC, LLC	Marshan Coleman	premiermac@optonline.net	203.650.2656	Sub	Masonry	X	X		
C.A.S.T. LLC	Samuel Wilson	s.wilson@castco.co	203.368.6086	SUB	Masonry		X		
Tri-State Brick	David Zetoff	TSB-CT@HOTMAIL.COM	(860) 649-8886	Sub	Brick Supplier				

BP-05A Structural Steel & Misc Metals									
Schenectady Steel	Claudio Zullo	CZullo@schenectadysteel.com	518-355-3220	Prime					
Berlin Steel	Joseph Pizzichemi	jpizzichemi@berlinsteel.com	860-828-3531	Prime					
United Steel Inc.	Brian Dube	bdube@unitedsteel.com	(860) 610-4095	Prime					
Shepard Steel Co Inc	Eric Staszko	estaszko@shepardsteel.com	(860) 692-7049	Prime					
Steeltech Bldg Prod, Inc	Brenda Walker	BWalker@Steeltechbp.com	860 290.8930	Prime					
Proiron, LLC	John Charbonneau	john@promocoinc.com	203-934-7967	Sub	Misc Metals, Steel Erection	X			X
BP-06A Wall Systems & Specialties									
Conn Acoustics	Coby Emshwiller	cemshwiller@connacoustics.com	(860) 666-5631	Prime					
A & A Drywall	Alex Klemonski	aadrywall@hotmail.com	(203) 878-3392	Prime					
THP - Tomlinson Hawley Patterson	Michael Jackson	mjackson@thp-gc.com	(203) 372-3583	Prime					
Acoustics Inc.	Christopher Cianci	chrisc@acousticsinc.net	(860) 282-0226	Prime					
Central Conn Acoustics Inc	Gerald St.Hilaire	gsthilaire@centralconnacoustics.com	(203) 269-1421	Sub	Acoustical Ceilings				
J and J Acoustics	Kyle Jackowitz	kyle@jandjacoustics.com	203 641-8188	Sub	Acoustical Ceilings				
Willco Sales & Service	Tricia Tague	triciatague@willcosales.com	(203) 366-3896	Sub	Folding Partitions				
Aqua Technologies	Luz Carvajal	aquatechnologiesllc@outlook.com	(203) 889-7707	SUB	Caulking	X		X	X
Hewitt Construction Services LLC	Charles Hewitt	Hewittconstruction@yahoo.com	203.214.6134	Sub	Drywall	X	X		
The Steel Network	Chris Tomaino	ctomaino@steelnetwork.com	(919) 845-1025	Sub	Light gauge framing & connectors				
MacKenzie Companies	Brendan Luddy	bluddy@themackenziecos.com	(203) 380-9000	Sub	Fireproofing & Spray Insulation				
Builder's Hardware	David Beaton	daveb@okee.net	(203) 380-2122	Sub	Door & Hardware Supplier				
BP-06B Millwork									
Desco Professional Builders, Inc	Shane Bruscoe	sbruscoe@descopro.com	413-218-6111	Prime					
Northeast Interior Systems	Robin Quinn	rquinn@neis.cc	(401) 721-5600	Prime					
Madigan Millworks	Matthew Madigan	Mmadigan@madiganmillworks.com	(860) 673-7601	Prime					
Legere Group	Nate Tomlan	nathantomlin@legeregroup.com	(860) 674-0392	Prime					
Maple Carpentry & GC LLC	Joel Perez	joelperez75@att.net	203 668-2325	Sub	Millwork Installation	X		X	
Gyroscope Construction LLC	Gregory Howard	gregorycraftmens@aol.com	203.578.7719	Sub	Millwork Installation		X		
Turnbridge Construction, LLC	John Mastriano	johnm@turnbridgeconstruction.com	203-776-8876	Sub	Millwork Installation	X			X
Millennium Seating Corporation	Chase Logue	RCLogue@millenniumseating.com	770-565-1965	Sub	Bench Seating				

BP-06C SCD Acoustical Ceilings									
Turnbridge Construction, LLC	John Mastriano	johnm@turnbridgeconstruction.com	203-776-8876	Prime		X			X
BP-06D SCD Drywall & Taping									
Turnbridge Construction, LLC	John Mastriano	johnm@turnbridgeconstruction.com	203-776-8876	Prime		X			X
Tim's Enterprises LLC	Timothy Washington	tims.enterprises@yahoo.com	203.410.5189	Prime		X	X		
BP-06M SCD Millwork Installation									
Maple Carpentry & GC LLC	Joel Perez	joelperez75@att.net	203 668-2325	Prime		X		X	
Turnbridge Construction, LLC	John Mastriano	johnm@turnbridgeconstruction.com	203-776-8876	Prime		X			X
BP-07A Roofing									
The Imperial Company	Amy Carpenter	amyc@theImperialco.com	(860) 632-2258	Prime					
Silktown Roofing	Steve Pumphrey	steve@silktownroofing.com	203.735.0552	Prime					
Titan Roofing	Edguardo Vasquez	evazquez@titanroofing.com	413-536-1624	Prime					
Allied Restoration	Herb Williamson	herb@alliedrestoration.net	(860) 291-8833	Prime					
Greenwood Industries		bidcoordinator@greenwood-industries.com	(508) 865-4040	Prime					
Barrett Roofing	Jim Dobush	jdobush@barrettroofing.com	(203) 744-2780	Prime					
Streamline Roofing Services	Damien Teed	damienteed@gmail.com	(203) 803-6250	Prime					
Turnbridge Construction, LLC	John Mastriano	johnm@turnbridgeconstruction.com	203-776-8876	Sub	Roof Blocking	X			X
Maple Carpentry & GC LLC	Joel Perez	joelperez75@att.net	203 668-2325	Sub	Roof Blocking	X		X	
Hewitt Construction Services LLC	Charles Hewitt	Hewittconstruction@yahoo.com	203.214.6134	Sub	Roofing	X	X		
Evergreen Environments, LLC	John Kruzshak	jk@evergreeninc.net	(800) 547-1222	Sub	Green Roof Trays				X
Columbia Green Technologies	Jordan Hammett	jordanh@columbia-green.com	(503) 327-8723	Sub	Green Roof Trays				
Weston Solutions, Inc.	Michal Krol	Michal.Krol@WestonSolutions.com	(888) 404-4743	Sub	Green Roof Trays				
BP-07B Exterior Panels									
Cherry Hill Glass	Kevin O'Neill	koneill@cherryhillglass.com	(203) 483-1717	Prime					
Massey Plate Glass & Aluminum	Rob Kolek	rkolek@masseysglass.com	203.488.2377	Prime					
Greenwood Industries		bidcoordinator@greenwood-industries.com	(508) 865-4040	Prime					
Northeast Panel Company	James Thaxter	northeast_panel@snet.net	(860) 678-9078	Prime					
3D Panels	Marc Bolduc	m.bolduc@3dpanelsinc.com		Sub	Panel supplier				
Pro-Const & Seal LLC	Wilmer Valverde	pro.const.seal.llc@gmail.com	203 828-7719	Sub		X			X

BP-08A Windows & Curtainwall									
Cherry Hill Glass	Kevin O'Neill	koneill@cherryhillglass.com	(203) 483-1717	Prime					
Massey Plate Glass & Aluminum	Rob Kolek	rkolek@masseysglass.com	203.488.2377	Prime					
New Haven Glass & Mirror	Rich McCormick	estimating@newhavenglass.net	(203) 469-2440	Sub		X			
BP-09A Flooring									
M Frank Higgins	Kathleen Cloud	kcloud@mfhiggins.com	(860) 953-6826	Prime					
R&B Ceramic Tile	Dan Wolfer	dan@rbceramictile.com	203-284-1856	Prime					X
Spectrum Floors	Wojtek Pelka	wpelka@spectrumfloor.com	203-250-1500	Prime					
MacKenzie Companies	Brendan Luddy	bluddy@themackenziecos.com	(203) 380-9000	Sub	Epoxy Flooring				
Bella Tile LLC	Alphonse Piscitelli	bellatilellc@yahoo.com	(203) 234-8300	Sub	Ceramic Tile	X			
BP-09B Painting									
Professional Painting	William Ianiello	professionalptg@aol.com	(203) 789-0326	Prime		X			X
Decco International	Francesco Zaffina	fazaffina@decco-int.com	(203) 334-5100	Prime					
Scholar Painting & Restoration	Vaughn Butler	scholarpainting@gmail.com	203 906-8650	Prime		X	X		
MacKenzie Companies	Brendan Luddy	bluddy@themackenziecos.com	(203) 380-9000	Prime					
Hewitt Construction Services LLC	Charles Hewitt	Hewittconstruction@yahoo.com	203.214.6134	Sub	Painting	X	X		
B&W Painting	Milllicent Bowens	millicentbowens@aol.com	(203) 887-7896	Sub	Painting	X	X		X
BP-09F SCD Flooring									
Bella Tile LLC	Alphonse Piscitelli	bellatilellc@yahoo.com	(203) 234-8300	Prime		X			
Sullivan & Son Carpet	Brad Sullivan	bradsullivan22@yahoo.com	(203) 281-3022	Prime		X			
BP-09P SCD Painting									
Professional Painting	William Ianiello	professionalptg@aol.com	(203) 789-0326	Prime		X			X
Scholar Painting & Restoration	Vaughn Butler	scholarpainting@gmail.com	203 906-8650	Prime		X	X		
B&W Painting	Milllicent Bowens	millicentbowens@aol.com	(203) 887-7896	Prime		X	X		X
Tim's Enterprises LLC	Timothy Washington	tims.enterprises@yahoo.com	203.410.5189	Prime		X	X		
M.Q.S. Painting	Alwyn Morrison	alwynraymorrison@yahoo.com	(203) 308-9684	Prime		X	X		
BP-10A SCD Toilet Partitions & Accessories									
The Coe & Brown Company	John Carey	johncarey@snet.net	(203) 288-9211	Prime		X			X
BP-10B SCD Metal Shelving									
The Coe & Brown Company	John Carey	johncarey@snet.net	(203) 288-9211	Prime		X			X
Maple Carpentry & GC LLC	Joel Perez	joelperez75@att.net	203 668-2325	Prime		X		X	

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BP-10C SCD Lockers									
The Coe & Brown Company	John Carey	johncarey@snet.net	(203) 288-9211	Prime		X			X
BP-10D SCD Signage									
Maple Carpentry & GC LLC	Joel Perez	joelperez75@att.net	203 668-2325	Prime		X		X	
Archer Signs	Bryan Vasser	bryan@archer-signs.com	(203) 882-8484	Prime		X			
BP-15A Mechanical									
P & D Mechanical	Alison Burzdak	alisonb@pdmechanical-inc.com	(860) 537-0617	Prime					
MJ Daly	Rich Melo	rmelo@mjdalyllc.com	203·706·1841	Prime					
B G Mechanical Contractors Inc.	Stuart Davis	sdavis@bgmechanical.com	(413) 527-5200	Prime					
F&F Mechanical Enterprises, Inc.	Paul Cassarino	pcassarino@ffmechanical.com	(203) 239-7025	Prime					
Fire Protection Testing	John Abbate	John@fireprotectiontesting.com	860.578.0382	Sub	Fire Protection				
K&M Fire Protection Services	Kyle Evans	kyle.evans@kandmfire.com	(877) 591-1970	Sub	Fire Protection				
Environmental Systems Corp	James Barber	j.barber@esccontrols.com	(860) 953-8800	Sub	Mech Controls				
Automated Building Systems	Salvatore Fazzino	sfazzino@absddc.com	860-682-2591	Sub	Mech Controls				
New Haven Firestop, LLC	Robert Carter	carterrobert1988@gmail.com	203-821-7428	Sub	Firesafing	X	X		
Barber Firestop Systems, LLC	Todd Barber	barberfirestop@hotmail.com	203-795-3622	Sub	Firesafing	X			
East West Mechanical, LLC	James Jones	joneslogic@hotmail.com	(203) 605-1820	Sub	Plumbing, HVAC		X		
Duct Diagnostics, LLX	Ralph Fico	ralph@ductdiagnostics.com	(203) 734-1532	Sub	Duct Cleaning & Sealing				
Providence Install	Keith Providence	providenceinstall@gmail.com	646.573.0308	Sub	HVAC		X		
BP-16A Electrical									
Paul Dinto Electrical Contractors	Wayne Strong	wstrong@pauldintoelec.com	203.575.9473	Prime					
Custom Electric, Inc.	Jackie Collet	jcollet@customelectricusa.com	(860) 643-7110	Prime					
Ducci Electrical Contractor	Rich Kelleher	rkelleher@duccielectrical.com	(860) 489-9267	Prime					
McPhee Electric Ltd	Julie Blum	julieb@mcpheeusa.com	(860) 677-9797	Prime					
Nationwide Security Corp	Michael Colavito	mikec@nationwidesecuritycorp.com	(203) 785-0300	Sub	Security				
Consolidated Electric	William Mackey	mackeyb@conelectricinc.com	203-468-2111	Sub	Telecom, security, AV	X			
New Haven Firestop, LLC	Robert Carter	carterrobert1988@gmail.com	203-821-7428	Sub	Firesafing	X	X		
Barber Firestop Systems, LLC	Todd Barber	barberfirestop@hotmail.com	203-795-3622	Sub	Firesafing	X			
Security 101	Matthew Moore	Matthew.Moore@Security101ne.com	860-538-3631	Sub	Security, FA, Access, Video				
Hadco Safety Solutions	Martin Beck	m.beck@hadco.us	(800) 451-5488	Sup	Luminous Egress Path Markings				
TPC Systems	Mike Cimadon	mcimadon@tpcsystems.com	203) 878-1321	Sup	Wireless Clock System				
Pyramid Time Systems	Takaiya Palmer	tpalmer@ptitime.com	(203) 238-0550	Sup	Wireless Clock System				
Masque Sound	Jeanne Wu	jeannewu@masquesound.com	201.939.8666	Sub	AV				
North American Theatrix	Gary Peck	gpeck@natheatrix.com	(860) 863-4122	Sub	AV				
Professional Audio Designs, Inc.	Kim Leonard	kim@proaudiodesigns.com	(414) 476-1011	Sub	AV				
Sound Associates, Inc	Phillip Peglow	ppeglow@soundassociates.com	914.963.3452	Sub	AV				

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Company	Contact	Email	Phone	Prime or Sub	Sub Discipline	SCD	MBE AA	MBE H	WBE
BP-01A Progress & Final Cleaning									
Orissa LLC	Tejal Vallum	tvallam@gmail.com	(860) 983-6999	Prime					X
Advantage Maintenance	Tom Wilkinson	tom@advantagemaintenanceinc.com	(203) 387-1968	Prime					
Horizon Services Company	Tom Baerlein	tbaerlein@horizonsvcs.com	(860) 291-9111	Prime					
Go To Services	Bob Fitch	BFITCH@GTSERVU.COM	203-624-3200	Prime				X	
Orange Cleaning Services, Conny Inc	Thomas Marshall	thomas@orangecleaning services.net	203 940-6632	Prime			X		
K & P Facilities Maintenance	Carlos Espinosa	carlos@kandpcleaning.com	845 206-3580	Prime				X	
McKay's Custom Clean LLC	Blaine McKay	mckayscustomclean@gmail.com	(203) 444-3375	Sub	Final Cleaning		X		
CDees Cleaning	Claudette Deer	claudettedeer1954@gmail.com	203-727-7800	Sub	Final Cleaning	X	X		X
BP-01C SCD Final Cleaning									
Tim's Enterprises LLC	Timothy Washington	tims.enterprises@yahoo.com	203.410.5189	Prime		X	X		
CDees Cleaning	Claudette Deer	claudettedeer1954@gmail.com	203-727-7800	Prime		X	X		X
Amazon Landscaping & Handyman	Marco Zanette	landscapeamazon@hotmail.com	(203) 934-7476	Prime		X		X	
BP-01S SCD Site Security									
Investigative Consultants LLC	Mark Schachter	mschachter@ic-ct.com	203 623-7955			X		X	
BP-02A Sitework									
AMEC Construction	Ray Zanon	estimating@amecllc.com	203-726-4653	Prime					
C.J. Fucci	Vincent Federico	vfederico@cjfucci.com	(203) 469-7487	Prime					
Camputaro & Sons	Dennis Camputaro	dcamputaro@camputaroandson.com	(203) 483-0330	Prime					
Manafort Brothers Incorporated	Timothy J. Meneo	tmeneo@manafort.com	860.983.0733	Prime					
Center Earth LLC	Brian Smith	BSmith@centerearth.com	203.780.8433	Prime					
Core Site Services	Allen Page	apage@coresiteservicesct.com	475.227.9026	SUB	Curbs, sidewalks, stairs, drainage		X		
Aqua Technologies	Luz Carvajal	aquatechnologiesllc@outlook.com	(203) 889-7707	SUB	Waterproofing	X		X	X
White Owl Construction, LLC	Clayton Henderson	hollywod@comcast.net	203-435-4455	SUB	Sidewalks, Pads, Stairs	X	X		
J & S General Contractors, LLC	Mike D'Errico	jsgc.mike@gmail.com	203 497-9096	SUB	Fencing	X			
Cornerstone Fence	Sharon Boucher	sharon.cfllc@gmail.com	203-237-4283	SUB	Fencing				
Select Fence & Guardrail	Maryanne Ottaviano	selectfence@att.net	203-843-2726	SUB	Fencing	X			X
Beech Construction LLC	Mike Gaudio	beechconstructionllc@gmail.com	(203) 200-9047	SUB	Curbs, sidewalks, stairs	X			X
C.A.S.T. LLC	Samuel Wilson	s.wilson@castco.co	203.368.6086	SUB	Curbs, sidewalks, stairs		X		
ACP Plus	Hamptom Watson	Watsoneliminator@aol.com	(860) 982-1330	Sub	Conc Pumping, Sidewalks, Pads	X	X		

BP-02F SCD Construction Fencing									
Select Fence & Guardrail	Maryanne Ottaviano	selectfence@att.net	203-843-2726	Prime		X			X
J & S General Contractors, LLC	Mike D'Errico	jsgc.mike@gmail.com	203 497-9096	Prime		X			
BP-02L SCD Landscaping									
Beech Construction	Mike Gaudio	beechconstructionllc@gmail.com	(203) 200-9047	Prime		X			X
Glen Terrace Landscaping	Mario Calcagni	m.calcagni@outlook.com	(203) 996-9390	Prime		X			X
Amazon Landscaping Design	Marco Zanette	landscapeamazon@hotmail.com	(203) 934-7476	Prime		X		X	
BP-02W SCD Concrete Sidewalks & Stairs									
Beech Construction	Mike Gaudio	beechconstructionllc@gmail.com	(203) 200-9047	Prime		X			X
Americity Construction Co, Inc	Durval Pereira	americity@cox.net	(203) 271-2704	Prime		X		X	
White Owl Construction, LLC	Clayton Henderson	hollywod@comcast.net	203-435-4455	Prime		X	X		
DP& Sons	Durval Pereira	Durval@cox.net	(203) 271-2704	Prime		X			
Tim's Enterprises LLC	Timothy Washington	tims.enterprises@yahoo.com	203.410.5189	Prime		X	X		
BP-03A Concrete									
Universal Foundations	Abi Malode	abim@universalfoundations.com	(203) 272-5966	Prime					
Carvalho & McDowell Construction	Mike Aletta	estimating@cm-inc.net	(860) 231-7110	Prime					
Camputaro & Sons	Dennis Camputaro	dcamputaro@camputaroandson.com	(203) 483-0330	Prime					
Manafort Brothers Incorporated	Timothy J. Meneo	tmeneo@manafort.com	860.983.0733	Prime					
Alvarez Industries	Lenny Alvarez	Lenny.alvarez@gmail.com	(203) 799-2356	Sub	Rebar			X	
Americity Construction Co, Inc	Durval Pereira	americity@cox.net	(203) 271-2704	Sub		X		X	
C.A.S.T. LLC	Samuel Wilson	s.wilson@castco.co	203.368.6086	SUB	Concrete		X		
ACP Plus	Hamptom Watson	Watsoneliminator@aol.com	(860) 982-1330	Sub	Conc Pumping, Slabs	X	X		
BP-04A Masonry									
Joe Capasso Mason	Riazulla Baig	estimating@joecapassomason.com	(860) 638-1111	Prime					
Civitillo Masonry, Inc.	Carm D'Agostino	CDAgostino@civitillo.net	860-523-5278	Prime					
Connecticut Mason Contractors	John Civitillo	jcivitillo@connecticutmason.com	860.296.9984	Prime					
Aqua Technologies	Luz Carvajal	aquatechnologiesllc@outlook.com	(203) 889-7707	SUB	Caulking	X		X	X
Premier Construction MAC, LLC	Marshan Coleman	premiermac@optonline.net	203.650.2656	Sub	Masonry	X	X		
C.A.S.T. LLC	Samuel Wilson	s.wilson@castco.co	203.368.6086	SUB	Masonry		X		
Tri-State Brick	David Zetoff	TSB-CT@HOTMAIL.COM	(860) 649-8886	Sub	Brick Supplier				

BP-05A Structural Steel & Misc Metals									
Schenectady Steel	Claudio Zullo	CZullo@schenectadysteel.com	518-355-3220	Prime					
Berlin Steel	Joseph Pizzichemi	jpizzichemi@berlinsteel.com	860-828-3531	Prime					
United Steel Inc.	Brian Dube	bdube@unitedsteel.com	(860) 610-4095	Prime					
Shepard Steel Co Inc	Eric Staszko	estaszko@shepardsteel.com	(860) 692-7049	Prime					
Steeltech Bldg Prod, Inc	Brenda Walker	BWalker@Steeltechbp.com	860 290.8930	Prime					
Proiron, LLC	John Charbonneau	john@promocoinc.com	203-934-7967	Sub	Misc Metals, Steel Erection	X			X
BP-06A Wall Systems & Specialties									
Conn Acoustics	Coby Emshwiller	cemshwiller@connacoustics.com	(860) 666-5631	Prime					
A & A Drywall	Alex Klemonski	aadrywall@hotmail.com	(203) 878-3392	Prime					
THP - Tomlinson Hawley Patterson	Michael Jackson	mjackson@thp-gc.com	(203) 372-3583	Prime					
Acoustics Inc.	Christopher Cianci	chrisc@acousticsinc.net	(860) 282-0226	Prime					
Central Conn Acoustics Inc	Gerald St.Hilaire	gsthilaire@centralconnacoustics.com	(203) 269-1421	Sub	Acoustical Ceilings				
J and J Acoustics	Kyle Jackowitz	kyle@jandjacoustics.com	203 641-8188	Sub	Acoustical Ceilings				
Willco Sales & Service	Tricia Tague	triciatague@willcosales.com	(203) 366-3896	Sub	Folding Partitions				
Aqua Technologies	Luz Carvajal	aquatechnologiesllc@outlook.com	(203) 889-7707	SUB	Caulking	X		X	X
Hewitt Construction Services LLC	Charles Hewitt	Hewittconstruction@yahoo.com	203.214.6134	Sub	Drywall	X	X		
The Steel Network	Chris Tomaino	ctomaino@steelnetwork.com	(919) 845-1025	Sub	Light gauge framing & connectors				
MacKenzie Companies	Brendan Luddy	bluddy@themackenziecos.com	(203) 380-9000	Sub	Fireproofing & Spray Insulation				
Builder's Hardware	David Beaton	daveb@okee.net	(203) 380-2122	Sub	Door & Hardware Supplier				
BP-06B Millwork									
Desco Professional Builders, Inc	Shane Bruscoe	sbruscoe@descopro.com	413-218-6111	Prime					
Northeast Interior Systems	Robin Quinn	rquinn@neis.cc	(401) 721-5600	Prime					
Madigan Millworks	Matthew Madigan	Mmadigan@madiganmillworks.com	(860) 673-7601	Prime					
Legere Group	Nate Tomlan	nathantomlin@legeregroup.com	(860) 674-0392	Prime					
Maple Carpentry & GC LLC	Joel Perez	joelperez75@att.net	203 668-2325	Sub	Millwork Installation	X		X	
Gyroscope Construction LLC	Gregory Howard	gregorycraftmens@aol.com	203.578.7719	Sub	Millwork Installation		X		
Turnbridge Construction, LLC	John Mastriano	johnm@turnbridgeconstruction.com	203-776-8876	Sub	Millwork Installation	X			X
Millennium Seating Corporation	Chase Logue	RCLogue@millenniumseating.com	770-565-1965	Sub	Bench Seating				

BP-06C SCD Acoustical Ceilings									
Turnbridge Construction, LLC	John Mastriano	johnm@turnbridgeconstruction.com	203-776-8876	Prime		X			X
BP-06D SCD Drywall & Taping									
Turnbridge Construction, LLC	John Mastriano	johnm@turnbridgeconstruction.com	203-776-8876	Prime		X			X
Tim's Enterprises LLC	Timothy Washington	tims.enterprises@yahoo.com	203.410.5189	Prime		X	X		
BP-06M SCD Millwork Installation									
Maple Carpentry & GC LLC	Joel Perez	joelperez75@att.net	203 668-2325	Prime		X		X	
Turnbridge Construction, LLC	John Mastriano	johnm@turnbridgeconstruction.com	203-776-8876	Prime		X			X
BP-07A Roofing									
The Imperial Company	Amy Carpenter	amyc@theImperialco.com	(860) 632-2258	Prime					
Silktown Roofing	Steve Pumphrey	steve@silktownroofing.com	203.735.0552	Prime					
Titan Roofing	Edguardo Vasquez	evazquez@titanroofing.com	413-536-1624	Prime					
Allied Restoration	Herb Williamson	herb@alliedrestoration.net	(860) 291-8833	Prime					
Greenwood Industries		bidcoordinator@greenwood-industries.com	(508) 865-4040	Prime					
Barrett Roofing	Jim Dobush	jdobush@barrettroofing.com	(203) 744-2780	Prime					
Streamline Roofing Services	Damien Teed	damienteed@gmail.com	(203) 803-6250	Prime					
Turnbridge Construction, LLC	John Mastriano	johnm@turnbridgeconstruction.com	203-776-8876	Sub	Roof Blocking	X			X
Maple Carpentry & GC LLC	Joel Perez	joelperez75@att.net	203 668-2325	Sub	Roof Blocking	X		X	
Hewitt Construction Services LLC	Charles Hewitt	Hewittconstruction@yahoo.com	203.214.6134	Sub	Roofing	X	X		
Evergreen Environments, LLC	John Kruzshak	jk@evergreeninc.net	(800) 547-1222	Sub	Green Roof Trays				X
Columbia Green Technologies	Jordan Hammett	jordanh@columbia-green.com	(503) 327-8723	Sub	Green Roof Trays				
Weston Solutions, Inc.	Michal Krol	Michal.Krol@WestonSolutions.com	(888) 404-4743	Sub	Green Roof Trays				
BP-07B Exterior Panels									
Cherry Hill Glass	Kevin O'Neill	koneill@cherryhillglass.com	(203) 483-1717	Prime					
Massey Plate Glass & Aluminum	Rob Kolek	rkolek@masseysglass.com	203.488.2377	Prime					
Greenwood Industries		bidcoordinator@greenwood-industries.com	(508) 865-4040	Prime					
Northeast Panel Company	James Thaxter	northeast_panel@snet.net	(860) 678-9078	Prime					
Steeltech Building Products, Inc.	Ryan Keohane	rkeohane@steeltechbp.com	(860) 290-8930	Prime					
3D Panels	Marc Bolduc	m.bolduc@3dpanelsinc.com		Sub	Panel supplier				
Pro-Const & Seal LLC	Wilmer Valverde	pro.const.seal.llc@gmail.com	203 828-7719	Sub		X			X

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BP-08A Windows & Curtainwall									
Cherry Hill Glass	Kevin O'Neill	koneill@cherryhillglass.com	(203) 483-1717	Prime					
Massey Plate Glass & Aluminum	Rob Kolek	rkolek@masseysglass.com	203.488.2377	Prime					
New Haven Glass & Mirror	Rich McCormick	estimating@newhavenglass.net	(203) 469-2440	Sub		X			
BP-09A Flooring									
M Frank Higgins	Kathleen Cloud	kcloud@mfhiggins.com	(860) 953-6826	Prime					
R&B Ceramic Tile	Dan Wolfer	dan@rbceramictile.com	203-284-1856	Prime					X
Spectrum Floors	Wojtek Pelka	wpelka@spectrumfloor.com	203-250-1500	Prime					
MacKenzie Companies	Brendan Luddy	bluddy@themackenziecos.com	(203) 380-9000	Sub	Epoxy Flooring				
Bella Tile LLC	Alphonse Piscitelli	bellatilellc@yahoo.com	(203) 234-8300	Sub	Ceramic Tile	X			
BP-09B Painting									
Professional Painting	William Ianiello	professionalptg@aol.com	(203) 789-0326	Prime		X			X
Decco International	Francesco Zaffina	fazaffina@decco-int.com	(203) 334-5100	Prime					
Scholar Painting & Restoration	Vaughn Butler	scholarpainting@gmail.com	203 906-8650	Prime		X	X		
MacKenzie Companies	Brendan Luddy	bluddy@themackenziecos.com	(203) 380-9000	Prime					
Hewitt Construction Services LLC	Charles Hewitt	Hewittconstruction@yahoo.com	203.214.6134	Sub	Painting	X	X		
B&W Painting	Milllicent Bowens	millicentbowens@aol.com	(203) 887-7896	Sub	Painting	X	X		X
BP-09F SCD Flooring									
Bella Tile LLC	Alphonse Piscitelli	bellatilellc@yahoo.com	(203) 234-8300	Prime		X			
Sullivan & Son Carpet	Brad Sullivan	bradsullivan22@yahoo.com	(203) 281-3022	Prime		X			
BP-09P SCD Painting									
Professional Painting	William Ianiello	professionalptg@aol.com	(203) 789-0326	Prime		X			X
Scholar Painting & Restoration	Vaughn Butler	scholarpainting@gmail.com	203 906-8650	Prime		X	X		
B&W Painting	Milllicent Bowens	millicentbowens@aol.com	(203) 887-7896	Prime		X	X		X
Tim's Enterprises LLC	Timothy Washington	tims.enterprises@yahoo.com	203.410.5189	Prime		X	X		
M.Q.S. Painting	Alwyn Morrison	alwynraymorrison@yahoo.com	(203) 308-9684	Prime		X	X		
BP-10A SCD Toilet Partitions & Accessories									
The Coe & Brown Company	John Carey	johncarey@snet.net	(203) 288-9211	Prime		X			X
BP-10B SCD Metal Shelving									
The Coe & Brown Company	John Carey	johncarey@snet.net	(203) 288-9211	Prime		X			X
Maple Carpentry & GC LLC	Joel Perez	joelperez75@att.net	203 668-2325	Prime		X		X	

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BP-10C SCD Lockers									
The Coe & Brown Company	John Carey	johncarey@snet.net	(203) 288-9211	Prime		X			X
BP-10D SCD Signage									
Maple Carpentry & GC LLC	Joel Perez	joelperez75@att.net	203 668-2325	Prime		X		X	
Archer Signs	Bryan Vasser	bryan@archer-signs.com	(203) 882-8484	Prime		X			
BP-15A Mechanical									
P & D Mechanical	Alison Burzdak	alisonb@pdmechanical-inc.com	(860) 537-0617	Prime					
MJ Daly	Rich Melo	rmelo@mjdalyllc.com	203·706·1841	Prime					
B G Mechanical Contractors Inc.	Stuart Davis	sdavis@bgmechanical.com	(413) 527-5200	Prime					
F&F Mechanical Enterprises, Inc.	Paul Cassarino	pcassarino@ffmechanical.com	(203) 239-7025	Prime					
Fire Protection Testing	John Abbate	John@fireprotectiontesting.com	860.578.0382	Sub	Fire Protection				
K&M Fire Protection Services	Kyle Evans	kyle.evans@kandmfire.com	(877) 591-1970	Sub	Fire Protection				
Environmental Systems Corp	James Barber	j.barber@esccontrols.com	(860) 953-8800	Sub	Mech Controls				
Automated Building Systems	Salvatore Fazzino	sfazzino@absddc.com	860-682-2591	Sub	Mech Controls				
New Haven Firestop, LLC	Robert Carter	carterrobert1988@gmail.com	203-821-7428	Sub	Firesafing	X	X		
Barber Firestop Systems, LLC	Todd Barber	barberfirestop@hotmail.com	203-795-3622	Sub	Firesafing	X			
East West Mechanical, LLC	James Jones	joneslogic@hotmail.com	(203) 605-1820	Sub	Plumbing, HVAC		X		
Duct Diagnostics, LLX	Ralph Fico	ralph@ductdiagnostics.com	(203) 734-1532	Sub	Duct Cleaning & Sealing				
Providence Install	Keith Providence	providenceinstall@gmail.com	646.573.0308	Sub	HVAC		X		
BP-16A Electrical									
Paul Dinto Electrical Contractors	Wayne Strong	wstrong@pauldintoelec.com	203.575.9473	Prime					
Custom Electric, Inc.	Jackie Collet	jcollet@customelectricusa.com	(860) 643-7110	Prime					
Ducci Electrical Contractor	Rich Kelleher	rkelleher@duccielectrical.com	(860) 489-9267	Prime					
McPhee Electric Ltd	Julie Blum	julieb@mcpheeusa.com	(860) 677-9797	Prime					
Nationwide Security Corp	Michael Colavito	mikec@nationwidesecuritycorp.com	(203) 785-0300	Sub	Security				
Consolidated Electric	William Mackey	mackeyb@conelectricinc.com	203-468-2111	Sub	Telecom, security, AV	X			
New Haven Firestop, LLC	Robert Carter	carterrobert1988@gmail.com	203-821-7428	Sub	Firesafing	X	X		
Barber Firestop Systems, LLC	Todd Barber	barberfirestop@hotmail.com	203-795-3622	Sub	Firesafing	X			
Security 101	Matthew Moore	Matthew.Moore@Security101ne.com	860-538-3631	Sub	Security, FA, Access, Video				
Hadco Safety Solutions	Martin Beck	m.beck@hadco.us	(800) 451-5488	Sup	Luminous Egress Path Markings				
TPC Systems	Mike Cimadon	mcimadon@tpcsystems.com	203) 878-1321	Sup	Wireless Clock System				
Pyramid Time Systems	Takaiya Palmer	tpalmer@ptitime.com	(203) 238-0550	Sup	Wireless Clock System				
Masque Sound	Jeanne Wu	jeannewu@masquesound.com	201.939.8666	Sub	AV				
North American Theatrix	Gary Peck	gpeck@natheatrix.com	(860) 863-4122	Sub	AV				
Professional Audio Designs, Inc.	Kim Leonard	kim@proaudiodesigns.com	(414) 476-1011	Sub	AV				
Sound Associates, Inc	Phillip Peglow	ppeglow@soundassociates.com	914.963.3452	Sub	AV				

Advancement of Construction Technology

SUBSTITUTION REQUEST
(During the Bidding Phase)

Project: Strong 21st Century Communications Magnet Lab School Phase 1

Substitution Request Number: _____

From: Beverly Griffin

To: JCJ Architecture

Date: 03/21/2017

A/E Project Number: SDOE# 093-0368-N

Re: Substitution Request

Contract For: FLUID-APPLIED MEMBRANE AIR BARRIERS

Specification Title: FLUID-APPLIED MEMBRANE AIR BARRIERS Description: Vapor-Retarding Membrane Air Barrier

Section: 07 27 26 Page: 3 Article/Paragraph Part 2 Products 2.01 A

Proposed Substitution: MasterSeal AWB 660 I

Manufacturer: BASF Master Builders Address: 3550 St. Johns Bluff Road S Phone: 904-996-6071

Trade Name: Master Builders Jacksonville, FL 32224 Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution. (Pending BASF Wall Systems approval)

Submitted by: Beverly J. Griffin

Signed by:

Firm: BASF Wall Systems

Address: 3550 St. Johns Bluff Road S
Jacksonville, FL 32224

Telephone: 904-996-6071

A/E's REVIEW AND ACTION

☒ Substitution approved - Make submittals in accordance with Specification Section 01330.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01330.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by:

Date: 3-26-18

Supporting Data Attached: ☐ Drawings ☒ Product Data ☐ Samples ☒ Tests ☐ Reports ☐ _____

Side by Side Comparison of Specified Vs. Masterseal AWB 660 l

Physical Properties	Test Method	BASF MasterSeal AWB 660 l	Grace Perm-A-Barrier Liquid	RPC - Rub-R-Wall Airtight	W.R. Meadows Air-Shield LSR	Carlisle Fire Resist Barritech NP60
Application Type		**Fluid-Applied -- spray, roller, brush or trowel. Back rolling possible**	Fluid-Applied	Fluid-Applied	Fluid-Applied	Spray Applied
Air Leakage of Air Barrier Assemblies	ASTM E2357	**0.0007 l/sm2 @ 75 Pa Positive/post conditioning**	<.0008 cfm/ft2 (<0.004 L/s.m2)	Not Reported	0.04 cfm / ft^2 @ 75 Pa (1.57 lbs / ft^2).	<0.05 L/s*m^2 @ 75 PA
Air Permeance of Building Materials	ASTM E2178	**0.00098 cfm/ft2 (0.0049 L/sm2)**	<.0002 cfm/ft2	0.004 cfm/ft4	0.004 cfm / ft^2 @ 75 Pa (1.57 lbs / ft^2).	0.003 L/S*m^2 @ 75 PA
Rate of Air Leakage	ASTM E 283	**0.0037 cfm/ft2 (0.0185 L/sm2)**	Not Reported	0.0004 cfm/ft2 on block/drywall	Not Reported	Not Reported
Water Vapor Transmission	ASTM E 96	**0.09 Perms**	.08 Perms	12 perms	0.1 Perms	0.61 Perms
Pull-off Strenth of Coatings	ASTM D 4541	**Pass**	Pass	Not Reported	Not Reported	328 psi on CMU
Nominal Wet Film Thickness on Sheathing	C1177	**26 Mils**	60 Mils	60-80 mils	80 Mils	110 Mils
Nail Sealability (without Sheathing Fabric)	ASTM D 1970	**Pass**	Unaffected	Pass	Pass	Pass
Flame Spread	ASTM E 84	**15 (class A)**	Not Reported	Not Reported	Class A (# not reported)	Not Reported
Acceptance for Flexible Flashing Materials	ICC-E AC 148	**Pass - Single Component System**	Requires Separate Component - Detail Membrane	Not Reported	Not Reported	Not Reported
Maximum exposure period		**180 days**	60 days	30 days	120 Days	180 Days
Cure Time		**2-10 Hours (depending on ambient conditions)**	3 days	4 hour	48 Hours	48 hours
ABAA Approved		**Yes**	Yes	No		No
LEED IEQ 4.2 - VOC Content		**11 g/L**	75 g/L	<20 g/L	56	<10 g/L (0.82% wt)
Single Component		**Yes**	No	Not Reported	Yes	yes

BASF

We create chemistry

Technical Data Guide

7 | 07 27 26
Fluid-Applied Membrane Air Barriers

MasterSeal® AWB 660 I

Air/water-resistive barrier membrane Class 1 Vapor retarder FORMERLY ENERSHIELD® I

PACKAGING

MASTERSEAL® AWB 660 I

- 5-gallon pail (18.9 L) pail

ACCESSORIES

MasterSeal® AWB 971 FIB:

- 4": 4" x 180 ft (101.5 mm x 54.8 m) roll
- 6": 6" x 180 ft (152.4 mm x 54.8 m) roll
- 9": 9" x 180 ft (228.5 mm x 54.8 m) roll
- 56 MasterSeal® AWB 975 FIB pieces per dispenser box

MasterSeal® AWB 970 FIB 4: 4" x 100' (10.2 cm x 30.5 m) rolls - 9 rolls per carton

MasterSeal® AWB 970 FIB 9: 9" x 100 (22.9 cm x 30.5 m) rolls - 4 per carton

MasterSeal® AWB 950 P 19 liter (5 gallon) pails, 3.8 liter (1 gallon) bottles with 4 bottles per carton

MasterSeal® AWB 960 AC 0.95L (1 quart) plastic bottles with 8 bottles per carton

MasterSeal® AWB 900 20 oz. propak with 20 propaks per carton

SHELF LIFE

MasterSeal® AWB 660 I has 2 years shelf life when properly stored

STORAGE

Store in unopened containers in clean, dry place protected liquid system components from freezing. Store at no less than 4 °C (40 °F) and below 49 °C (120 °F). Protect from extreme heat and direct sunlight. Do not stack pallets.

VOC CONTENT

21 g/l, or 0.17 lbs/gal less water and exempt solvents per ASTM D2369 (based in part on EPA method 24).

SOLIDS

74%

COLOR

Reddish Brown

DESCRIPTION

MasterSeal® AWB 660 I is a one-component fluid-applied air/water-resistive barrier that can also function as a Class I vapor retarder$_1$. It is based on Silica Fortified Rubber™ chemistry. This water-resistant, resilient membrane may be spray-, roller-, or brush- applied directly to approved above grade wall substrates. It provides excellent secondary moisture protection behind most wall claddings including brick, siding, metal panels, EIFS and stucco. A slipsheet is required for stucco claddings.

APPLICATION/APPROVED SUBSTRATE

For use over the following exterior wall substrates:

Poured concrete/unit masonry, poured concrete/unit masonry treated with MasterSeal® AWB 600 FL , ASTM C1177 type sheathings, including DensGlass™ or DensElementexterior sheathing, eXP™ sheathing, GlasRoc® sheathing, Securock™ glass-mat sheathing, Weather Defense™ Platinum sheathing, GreenGlass® sheathing, PermaBase™ cement-board by National Gypsum and other cement-boards (ASTM C1325 Type A Exterior), untreated Exposure I or exterior plywood sheathing (grade C-D or better), untreated Exposure I OSB, gypsum sheathing (ASTM C79/ASTM C1396), Fire resistive sheathing such as MagTec, LP FlameBlock

Do not use MasterSeal® AWB 660 I for below-grade applications or on surfaces subject to water immersion

COVERAGE

Substrate

ASTM C1177 Type Sheathing
290 ft² (27 m²) per pail
Cement Board
290 ft² (27 m²) per pail
Plywood*
265 ft² (24 m²) per pail
Oriented Strand Board (OSB)*
265 ft² (24 m²) per pail
Concrete Masonry Units (CMU)*
230 ft² (21 m²) per pail
Poured Concrete*
290 ft² (27 m²) per pail
Concrete / Masonry with MasterSeal® AWB 600 FL Block Filler
290 ft² (27 m²) per pail

Embed Sheathing Fabric
4" Sheathing Fabric: 630 ft (192 m) per pail
6" Sheathing Fabric: 420 ft (128 m) per pail
9" Sheathing Fabric: 280 ft (85 m) per pail

*Roll or spray / backroll for optimum coverage rate. Other application methods may provide less coverage. Actual results may vary depending on surface porosity, roughness, moisture uptake or other factors.

Note:
MasterSeal® AWB 971 FIB saturated with MasterSeal® AWB 660 I, when applied per manufacturer instructions, self gauges to a 30-40 mil thickness.

MasterSeal® AWB 660 I complies with the air barrier requirements of the Massachusetts State Energy Code

FEATURES	BENEFITS
ICC-ESR 3310 evaluation report	Confirms compliance with IBC, IRC, and IECC requirements
ABAA evaluated	Approved for projects requiring ABAA specifications and quality assurance
<1% of allowable air leakage per ASTM E2357 Air Leakage of Building assemblies test	Easily meets air tightness requirements defined by ASHRAE 189.1, ASHRAE 90.1 and ABAA
Meets ASTM D1970 nail sealability requirements with and without sheathing fabric	Self sealing performance
One component, low-VOC formulation	Easy to apply, meets VOC requirements in all 50 states
Nonflammable as applied	Workplace safety
Mineral oil and plasticizer free	Will not dry out or crack due to loss of oil / plasticizer over time
Water based	Cleans up with water; solvents and citrus based cleaners not required
Tough, abrasion resistant	Rugged membrane resists damage after installation
Approved for use with BASF EIFS and stucco systems	Full system warranty, seamless membrane for buildings with multiple claddings
Low temperature performance with MasterSeal® AWB 960 AC	Extends minimum application temperature to -4 ˚C (25 ˚F)
180 day outdoor exposure rating	Flexible construction scheduling

TEST DATA

PROPERTY	RESULTS	TEST METHOD
Air Leakage of Air Barrier Assemblies	0.0007 l/s.m^2 (0.0001 cfm/ft^2) @ 75 Pa (1.57 psf) positive/post conditioning 0.0014 l/s.m^2 (0.0003 cfm/ft^2) @ 75 Pa (1.57 psf) negative/post conditioning	ASTM E 2357
Air Permeance of Building Materials	0049 l/s.m^2 @ 75 Pa (0.00098 cfm/ft^2 @ 1.57 psf) (.00098 cfm/ft(2) @ 1.57 psf	ASTM E 2178
Rate of Air Leakage	0.0185 l/s·m^2 @ 75 Pa (0.0037 cfm/ft^2 @ 1.57 psf)	ASTM E 283
Water Vapor Transmission	0.09 Perms (grains/Hr. in Hg. ft^2) @ 26 mils wet film thickness 0.18 Perms (grains/Hr. in Hg. ft^2) @ 10 mils wet film thickness	ASTM E 96 Method A
Pull-Off Strength of Coatings	Pass - Min. 110 kPa (15.9 psi) or substrate failure (Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood; pvc and galvanized flashing)	ASTM D 4541
Nail Sealability (without Sheathing Fabric)	Pass - No water penetration at galvanized roofing nail penetration under 127 mm (5") head of water after 3 days at 4 °C (40 °F)	ASTM D 1970
Compound Stability (Elevated Temperature)	No flowing, dripping or drop formation up to 177 °C (350 °F)	ASTM D 5147 Section 15
Surface Burning	Class A Flame Spread (<25) Class A Smoke Developed Spread (<450)	ASTM E 84
Radiant Heat Multi-Story Tests	Passed using numerous wall assemblies. Engineering analyses available upon request.	NFPA 285

ICC-ES AC 212: Acceptance Criteria for Water-Resistive Coatings used as Water-Resistive Barriers over Exterior Sheathing

PROPERTY	RESULTS	TEST METHOD
Sequential Testing		
1. Structural	No cracking at joints or interface of flashing	ASTM E 1233 Procedure A
2. Racking	No cracking at joints or interface of flashing	ASTM E 72
3. Restrained Environmental Conditioning	No cracking at joints or interface of flashing	ICC-ES AC 212
4. Water Penetration	No water penetration after 90 min @ 299 Pa (6.24 psf) Tested over OSB and gypsum sheathing	ASTM E 331
Sequential Testing - Weathering		
1. UV Light Exposure	No cracking or bond failure to substrate	ICC-ES AC 212
2. Accelerated Aging	No cracking or bond failure to substrate	ICC-ES AC 212
3. Hydrostatic Pressure	No water penetration at 55 cm (21.7") water column for 5 hours	AATCC 127-1985
Freeze-Thaw	No sign of deleterious effects after 10 cycles (Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood)	ASTM E 2485 (Method B)
Water Resistance	No sign of deleterious effects after 14 day exposure (Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood)	ASTM D 2247
Tensile Bond	>103 kPa (15 psi) Tested over exterior gypsum sheathing, ASTM C1177 glassmat sheathing, cement board, OSB, plywood, CMU; pvc and galvanized flashing	ASTM C 297
Tensile Bond (before & after freeze-thaw)	>103 kPa (15 psi) avg; no failure of the lamina after 10 cycles freeze-thaw (Tested over various substrates)	ASTM C 297

ICC-ES AC 148: Acceptance Criteria for Flexible Flashing Materials

PROPERTY	RESULTS	TEST METHOD
Sequential Testing – Weathering		
1. UV Light Exposure	No cracking or bond failure to substrate	ICC-ES AC 148
2. Accelerated Aging	No cracking or bond failure to substrate	ICC-ES AC 148
3. Hydrostatic Pressure Test	No water penetration at 55 cm (21.7") water column for 5 hours	AATCC 127-1985
Peal Adhesion	Tested over ASTM C1177 glass-mat sheathing, OSB, plywood, pvc and uncoated aluminum	ASTM D 3330 Method F
After UV Exposure	Pass	ASTM D 3330 Method F
After Accelerated Aging	Pass	ASTM D 3330 Method F
After Elevated Temperature Exposure	Pass	ASTM D 3330 Method F
After Water Immersion	Pass	ASTM D 3330 Method F
Nail Sealability after Thermal Cycling	Pass	ASTM D 1970 (Modified), AAMA 711
Tensile Strength after UV Exposure	All samples meet the minimum requirement of 3.5N/mm (20 lbs/in)	ASTM D 5034, AAMA 711
Cold Temperature Pliability	No cracking after bending around a 25 mm (1") mandrel after 2 hour exposure to -18 °C (0 °F)	ASTM D 1970, AAMA 711
Resistance to Peeling	No signs of distress or failure after 24 hours of exposure at room temperature, 50 °C (122 °F), 65 °C (149 °F), 80 °C (176 °F)	AAMA 711

MIXING

1. Use directly from original packaging or prepare in a container that is clean and free of foreign substances. Do not use a container which has contained or been cleaned with a petroleum-based product.
2. Mix MasterSeal® AWB 660 I with a clean, rust-free paddle and drill until thoroughly blended. Dilution of MasterSeal® AWB 660 I is not recommended.
3. Additives other than MasterSeal® AWB 960 AC are not permitted.
4. Close container when not in use.
5. Clean tools and equipment with water immediately after use. Dried material can only be removed mechanically.

APPLICATION

JOB CONDITIONS

To apply MasterSeal® AWB 660 I at ambient temperatures below 4 °C (40 °F) but greater than -4 °C (25 °F), thoroughly blend 1 full quart of MasterSeal® AWB 960 AC with one full 5-gallon pail of MasterSeal® AWB 660 I . When using MasterSeal® AWB 960 AC , extended drying time can be expected. Do not apply MasterSeal® AWB 660 I to frozen or frost-laden substrates.

Do not apply MasterSeal® AWB 660 I in ambient temperatures below 4 °C (40 °F) or onto substrates below 4 °C (40 °F) unless MasterSeal® AWB 960 AC is used.

Walls shall be capped to prevent moisture and precipitation from entering wall during construction.

Limit the weather exposure of MasterSeal® AWB 660 I to a maximum of 180 days

SURFACE PREPARATION

Substrate shall be dry, clean, sound and free of release agents, paint or other residue or coatings.

Unsatisfactory conditions shall be reported to the general contractor and corrected before application of MasterSeal® AWB 660 I .

EQUIPMENT

Use a 20 mm (¾") nap roller or paint brush. If spraying, refer to *Spray Application of MasterSeal® AWB 660 /MasterSeal® AWB 660 I/ MasterSeal® AWB 665/ MasterSeal® AWB 600 FL* technical bulletin for spray application equipment and application instructions.

Note: If using roller application, it is necessary to pre-wet the synthetic roller pad with water and spin out the excess water. The pre-wetting only needs to be done once at the start of application.

PROCEDURE

1. Substrate shall be of a type acceptable by BASF and shall be installed per substrate manufacturer's instructions and local code requirements.
2. Apply MasterSeal® AWB 660 I and/or MasterSeal® AWB 900 Liquid Flashing Membrane to fasteners, sheathing joints, and rough openings as outlined in *MasterSeal® AWB Application Guidelines for Joint Treatment and Flashing Rough Openings on Framed Construction* technical bulletin or *MasterSeal® AWB Application Guidelines for Flashing Rough Openings on Concrete and Masonry Construction* technical bulletin.
3. A. Immediately place and center MasterSeal® AWB 971 FIB over wet MasterSeal® AWB 660 I at knot holes and check cracks that may exist in plywood or OSB. Completely saturate MasterSeal AWB 971 FIB with MasterSeal® AWB 660 I .

   B. If using roller, brush, or trowel application, allow to dry to the touch before applying MasterSeal® AWB 660 I to entire wall surface. If spraying, "wet on wet" application is acceptable.
4. Refer to *Spray Application of MasterSeal® AWB 660 /MasterSeal® AWB 660 I/ MasterSeal® AWB 665/ MasterSeal® AWB 600 FL* technical bulletin for spray application equipment and application instructions
5. A. Apply MasterSeal® AWB 660 I to DensGlass™ exterior sheathing, eXP™ sheathing, GlasRoc® sheathing, Securock™ glass-mat sheathing, Weather Defense™ Platinum sheathing, GreenGlass® sheathing, PermaBase™ cement-board by National Gypsum and other cement-boards (ASTM C1325 Type A Exterior), gypsum sheathing (ASTM C79/ASTM C1396) plywood, OSB, concrete or CMU substrate(s) with a 20 mm (¾") nap roller or spray to a consistent, minimum 13 wet mil thickness. Prior to application of the second coat, visually inspect to assure that the surface is blister free and coating is free of voids and pinholes. Repair if needed and then apply a second coat after the initial coating is sufficiently dry. A minimum of two (2) 13 mil wet coats of MasterSeal® AWB 660 I is required. MasterSeal® AWB 660 I may be sprayed onto ASTM C1177 sheathing to a 26-mil thickness in one wet application. Note: Refer technical bulletin for spray application equipment and application instructions .

   B. One application of MasterSeal® AWB 660 I at a minimum of 26-mil wet film thickness on concrete/masonry substrates that have been treated with a fully cured coat of MasterSeal® AWB 600 FL. For concrete/masonry substrates that have not been treated with MasterSeal® AWB 600 FL, two (2) minimum 13-mil applications of MasterSeal® AWB 660 I are required. Note: Lightweight CMU or other CMU with high porosity may require additional MasterSeal® AWB 660 I to produce an acceptable result.

   C. Visually inspect the MasterSeal® AWB 660 I for voids, pinholes, surface deficiencies, etc. Repair deficiencies and areas that are not intact. Apply additional MasterSeal® AWB 660 I as necessary such that MasterSeal® AWB 660 I is free of voids, pinholes, etc. All sheathing joints, terminations, inside and outside corners must be reinforced with 4" or 9" MasterSeal® AWB 971 FIB or MasterSeal® AWB 970 FIB 4 or 9.

Drying Time

Allow to dry completely, typically 2 to 4 hours at 25 °C (77 °F) and 50% relative humidity. Protect from rain and from temperatures less than 4 °C (40 °F) until dry.

TECHNICAL SUPPORT

Consult the BASF Construction Systems Technical Services Department for specific recommendations concerning all other applications. Consult the Master Builders website, www.master-builders-solutions.basf.com, for additional information about products and systems and for updated literature.

HEALTH AND SAFETY

Follow good safety and industrial hygiene practices during handling and installing products and systems. Take necessary precautions and wear the appropriate personal protective equipment as needed. Read Safety Data Sheet (SDS) and related literature on this product before specification and/or installation.

Solids

74% solids

VOC Content

21 g/l, or 0.17 lbs/gal less water and exempt solvents per ASTM D2369 (based in part on EPA method 24)

For medical emergencies only, call CHEMTREC at (800) 424-9300.

WARRANTY

BASF warrants this product to be free from manufacturing defects and to meet the technical properties on the current Product Bulletin, if used as directed within shelf life. Satisfactory results depend not only on quality products but also upon many factors beyond our control. BASF MAKES NO OTHER WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO ITS PRODUCTS. The sole and exclusive remedy of Purchaser for any claim concerning this product, including but not limited to, claims alleging breach of warranty, negligence, strict liability or otherwise, is shipment to purchaser of product equal to the amount of product that fails to meet this warranty or refund of the original purchase price of product that fails to meet this warranty, at the sole option of BASF. In the absence of an extended warranty issued by BASF, any claims concerning this product must be received in writing within one (1) year from the date of shipment and any claims not presented within that period are waived by Purchaser. BASF WILL NOT BE RESPONSIBLE FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFITS) OR PUNITIVE DAMAGES OF ANY KIND.

Purchaser must determine the suitability of the products for the intended use and assumes all risks and liabilities in connection therewith. This information and all further technical advice are based on BASF's present knowledge and experience. However, BASF assumes no liability for providing such information and advice including the extent to which such information and advice may relate to existing third party intellectual property rights, especially patent rights, nor shall any legal relationship be created by or arise from the provision of such information and advice. BASF reserves the right to make any changes according to technological progress or further developments. The Purchaser of the Product(s) must test the product(s) for suitability for the intended application and purpose before proceeding with a full application of the product(s). Performance of the product described herein should be verified by testing and carried out by qualified experts.

BASF Corporation
Construction Systems

889 Valley Park Drive, Shakopee, MN 55379
www.master-builders-solutions.basf.us

Customer Service 1(800)433.9517
Technical Service 1(800)243.6739

MASTER® BUILDERS SOLUTIONS

MasterSeal® AWB

Fluid-Applied Air/Water-Resistive Barriers with Silica Fortified Rubber™ Chemistry

BASF
We create chemistry

Creating High Performance Air / Water-Resistive Barriers

Silica Fortified Rubber™ is a unique air/water-resistive barrier chemistry from BASF. It has been designed to provide an optimal balance of properties that address the diverse needs of high-performance air/water-resistive barriers.

MasterSeal AWB Properties
MasterSeal AWB products are tough, self-sealing, abrasion-resistant and UV-stable. These properties are derived from the chemical makeup of MasterSeal AWB. A proprietary BASF elastomeric polymer backbone is combined with silica aggregate. Both aspects make important contributions to MasterSeal AWB performance.

The premium MasterSeal AWB polymer matrix is plasticizer-free. This provides improved compatibility and enhanced long-term performance, since there is no opportunity for loss of properties or contamination of adjacent materials due to plasticizer migration over time. MasterSeal AWB products offer six-month outdoor weather stability, and two-year shelf stability. Additional benefits include self-sealing properties with fasteners typically found on a jobsite, including screws, nails and staples.

The tenacious polymer matrix firmly holds the silica aggregate in place. Silica in the MasterSeal AWB formulation provides abrasion resistance, helping MasterSeal AWB manage the rigors of real world jobsite conditions. It also textures the surface, allowing sealants, adhesives and spray polyurethane foam to grab onto and firmly bond to MasterSeal AWB.

Application and Sustainability
Premium Silica Fortified Rubber chemistry creates notable in-use efficiencies. Since it offers excellent strength, durability and self-sealing properties, the amount of material needed to function effectively is reduced.

This allows MasterSeal AWB products to dry quickly and simplify application. It also allows MasterSeal AWB 660, 660 I and 665 to provide ASTM E84 Class A performance without relying on flame retardant additives. NFPA 285 fire tests and engineering analyses are available upon request for a range of wall assemblies.

Being water-based, MasterSeal AWB is non-flammable as applied. In addition, it offers low VOC content, low odor and low toxicity. So it is friendly to the people who apply it as well as the buildings it is applied to.

Sustainable development is a core strategic principle of BASF, and MasterSeal AWB is an example of this principle in action. Together with design professionals and contractors, BASF Construction Systems helps build and restore structures that perform to the highest standards while minimizing environmental impact.

Master Builders Solutions from BASF

The Master Builders Solutions brand brings all of BASF's expertise together to create chemical solutions for new construction, maintenance, repair and renovation of structures. Master Builders Solutions is built on the experience gained from more than a century in the construction industry.

The know-how and experience of a global community of BASF construction experts form the core of Master Builders Solutions. We combine the right elements from our portfolio to solve your specific construction challenges. We collaborate across areas of expertise and regions and draw on the experience gained from countless construction projects worldwide. We leverage global BASF technologies, as well as our in-depth knowledge of local building needs, to develop innovations that help make you more successful and drive sustainable construction. The comprehensive portfolio under the Master Builders Solutions brand encompasses concrete admixtures, cement additives, chemical solutions for underground construction, waterproofing solutions, sealants, concrete repair and protection solutions, performance grouts and performance flooring solutions.

Master Builders Solutions products from BASF for the Construction Industry:

MasterAir®
Solutions for air-entrained concrete

MasterBrace®
Solutions for concrete strengthening

MasterCast®
Solutions for manufactured concrete product industry

MasterCem®
Solutions for cement manufacture

MasterEmaco®
Solutions for concrete repair

MasterFinish®
Solutions for formwork treatment

MasterFlow®
Solutions for precision grouting

MasterFiber®
Comprehensive solutions for fiber reinforced concrete

MasterGlenium®
Solutions for high-performance concrete

MasterInject®
Solutions for concrete injection

MasterKure®
Solutions for concrete curing

MasterLife®
Solutions for enhanced durability

MasterMatrix®
Advanced rheology control solutions for self-consolidating concrete

MasterPel®
Solutions for water tight concrete

MasterPolyheed®
Solutions for high-performance concrete

MasterPozzolith®
Solutions for water-reduced concrete

MasterProtect®
Solutions for concrete protection

MasterRheobuild®
Solutions for super-plasticized concrete

MasterRoc®
Solutions for underground construction

MasterSeal®
Solutions for waterproofing and sealing

MasterSet®
Solutions for retardation control

MasterSure®
Solutions for workability control

MasterTop®
Solutions for industrial and commercial floors

MasterWeld®
Solutions for construction adhesives

Ucrete®
Flooring solutions for harsh environments

BASF Corporation
Construction Systems
889 Valley Park Drive
Shakopee, MN 55379 USA

Customer Service 1(800)433-9517
Technical Service 1(800)243-6739
master-builders-solutions.basf.us

SUBSTITUTION REQUEST

(During the Bidding/Negotiating Stage)

Project: Strong 21st Century Communication Magnet Lab School - All Trades #2

Substitution Request Number: 01 Of 01

From: Kyle Herion - Protecto Wrap Company

To: Pickard Chilton Architects - Nancy Clayton

Date: 03/20/2018

A/E Project Number: 093-0368N, H16040.00

Re: Substitution Request

Contract For: None

Specification Title: Self-Adhering Sheet Waterproofing

Description: Rubberized-Asphalt Sheet Waterproofing

Section: 071310 **Page:** 1182

Article/Paragraph: Section 2.1 Part A

Proposed Substitution: PW- 100/60

Manufacturer: Protecto Wrap Company **Address:** 1955 S. Cherokee St. Denver **Phone:** (303) 777-3001

Trade Name: PW 100/60 Waterproofing System **Model No.:** PW 100/60

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: Kyle Herion

Signed by:

Firm: Protecto Wrap Company

Address: 1955 S. Cherokee St. Denver, CO. 80223

Telephone: (303) 777-3001 Fax: (303) 777-9273

A/E's REVIEW AND ACTION

☒ Substitution approved - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: **Date:**

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ supporting letter

Form Version: September 2013
CSI Form 1.5C

Request For Information Detail
with Consultant Reviewers

Strong School
Project #: J02445.975

RFI-00004	Rev: 0	Stage: Awaiting CM Acceptance	Date Created: 03-19-2018

Author Reference Number:

Primary External Reviewer	Secondary Reviewer	Author Company	Authored By
Ayles, William		Giordano Construction Co	Rinaldi, Lou

Subject	Discipline	Category	Bid Package
PB - Footing Schedule			BP-03A-Concrete

Question **Date Required: 03-26-2018**

1. What is the retainage %?

2. In the footing schedule, F40 has 5 - #5 reinforcement each way. Is this a single layer or two layers of rebar (Top & Bottom)?

3. The SCD contractor list provided with the bid documents has many open shop (non-union companies) listed in it. If we subcontract part of our work to one these guys, how will it affect the PLA? The PLA does not require union affiliation to participate on this project.

4. Do you have a separate SCD list with just union affiliated contractors?

Suggestion

Answer **Answer Company: JCJ Architecture, PC** **Answered By: Ayles, William**

1. What is the retainage % ? - **5%**

2. In the footing schedule, F40 has 5 - #5 reinforcement each way. Is this a single layer or two layers of rebar (Top & Bottom)? - **2. BOTTOM REINFORCING ONLY UNLESS NOTED OTHERWISE.**

3. The SCD contractor list provided with the bid documents has many open shop (non-union companies) listed in it. If we subcontract part of our work to one these guys, how will it affect the PLA? **The PLA does not require union affiliation to participate on this project. - The PLA is included in the project manual for review.**

4. Do you have a separate SCD list with just union affiliated contractors? - **No, but as stated in #3, non-union companies can work on the project in compliance with the PLA.**

Cycle Dates

Date Issued	Date Sent for Review	Date Answered
03-19-2018	03-19-2018	03-20-2018

Date Returned to Author	Date Answer Acknowledged
03-20-2018	03-20-2018

Clarification Cycle Dates

Clarification Date Requested	Clarification Date Received

Disclaimer

If the information provided in the response to this RFI constitutes a change in contract price or time, the trade contractor shall not proceed with this work unless authorized to do so by the Construction Manager in writing. The trade contractor shall provide the Construction Manager written notice within five (5) working days from receipt of this Request for Information that this RFI constitutes a change, all in accordance with Article 8 of the Contract Agreement. Should no change be required, a no cost change will be issued to you incorporating this RFI into your contract.

RFI Coordination

Sent RFI For Answer	Answered RFI
	Grouten, Jr., Webster

One Time CC Notification List

Consultant Review

Stage	Date Answered	Answer Contact	Answer Company	Answer
Consultant Review Complete	03-19-2018	Diehl, Laura	Michael Horton Associates, Inc.	2. BOTTOM REINFORCING ONLY UNLESS NOTED OTHERWISE.

Request For Information Detail
with Consultant Reviewers

Strong School
Project #: J02445.975

RFI-00005 | Rev: 0 | Stage: Closed | Date Created: 03-19-2018

Author Reference Number: MJD RFIs #12~18

Primary External Reviewer	Secondary Reviewer	Author Company	Authored By
Ayles, William		Giordano Construction Co	Rinaldi, Lou

Subject	Discipline	Category	Bid Package
PB - Misc Mech #2			BP-15A-Mechanical

Question **Date Required: 03-26-2018**

12). Ref: Mechanical - Please verify in an upcoming addendum that the superintendent being requested in the scope of work (page 6-of-26) is a non-working superintendent, separate from the working foreman, so that all mechanical contractors are bidding this item similarly?

13). Ref: Mechanical - BP-15A Scope of Work #83 states to "supply and install 4” PVC gooseneck piping at all MEP roof penetrations." Is this with reference to the Radon detail (Detail #9, drawing M-500)? If so, please advise if the 6" Radon shown on that HVAC details should be changed to 4"? If not, please advise what this scope of work is referencing?

14). Ref: General - Please verify that this project has a third-party commissioning agent and who the commissioning agent is for this project?

15). Ref: Mechanical & Structural - Please confirm that this school is a Seismic Design Category C (as shown on S-700) building and not Design Category B building, which is typical for most schools in CT?

16). Ref: M-122 - Please verify the VAV box near the intersection of column 9.4 and column C.5 is a VAV-A type box and not a VAV-AHW box, as this VAV is currently not tagged?

17). Ref: Mechanical - Please advise if it will be acceptable to assume 3/4" lines for any HWS&R piping feeding CUHs, UHs & VAVs, where the sizes are not shown, and the GPM is at or below 3.5 GPM? Additionally, please advise if 1" is acceptible for any HWS&R piping feeding VAVs, where the sizes are not shown, and the GPM is at or below 7.5 GPM?

18). MP-122 - After the first VAV-GHW, there is 11 GPM of VAV boxes left to feed, but only 1" piping requested at that point? Additionally, the entire branch feeding all 7 VAV boxes is currently sized at 1-1/4", but has 20 GPM in total? Please advise if the 1-1/4" branch would be prefered @ 1-1/2", and if the 1" reduced section, would be prefered @ 1-1/4", to avoid high friction in the pipe?

Suggestion

Answer **Answer Company: JCJ Architecture, PC** **Answered By: Ayles, William**

12). Ref: Mechanical - Please verify in an upcoming addendum that the superintendent being requested in the scope of work (page 6-of-26) is a non-working superintendent, separate from the working foreman, so that all mechanical contractors are bidding this item similarly? - Mechanical Superintendent to be a non-working super in charge of supervising all field operations, quality control, coordination, safety, etc. of the mechanical contractors own crew and all subcontractors of the BP-15A Mechanical package. - The Mechanical Superintendent needs to have authority to make decisions on manpower, material deliveries and will be responsible for scheduling of all subcontractors of the BP-15A Mechanical package.

13). Ref: Mechanical - BP-15A Scope of Work #83 states to "supply and install 4" PVC gooseneck piping at all MEP roof penetrations." Is this with reference to the Radon detail (Detail #9, drawing M-500)? If so, please advise if the 6" Radon shown on that HVAC details should be changed to 4"? If not, please advise what this scope of work is referencing? - The 4" gooseneck piping is for the split systems. No pitch boxes will be allowed on the roof.

14). Ref: General - Please verify that this project has a third-party commissioning agent and who the commissioning agent is for this project? - Confirmed, BVH is the commissioning agent.

15). Ref: Mechanical & Structural - Please confirm that this school is a Seismic Design Category C (as shown on S-700) building and not Design Category B building, which is typical for most schools in CT? - Yes, the school is in a seismic design category C as shown on S-700.

16). Ref: M-122 - Please verify the VAV box near the intersection of column 9.4 and column C.5 is a VAV-A type box and not a VAV-AHW box, as this VAV is currently not tagged? - CES Response: Refer to Addendum #3

17). Ref: Mechanical - Please advise if it will be acceptable to assume 3/4" lines for any HWS&R piping feeding CUHs, UHs & VAVs, where the sizes are not shown, and the GPM is at or below 3.5 GPM? Additionally, please advise if 1" is acceptible for any HWS&R piping feeding VAVs, where the sizes are not shown, and the GPM is at or below 7.5 GPM? -

CES Response:

CUH's and UH's refer to 4/M501

VAV's refer to "VAV Terminal Unit Heating Coil Schedule", Note #1 on drawing M-601

18). MP-122 - After the first VAV-GHW, there is 11 GPM of VAV boxes left to feed, but only 1" piping requested at that point? Additionally, the entire branch feeding all 7 VAV boxes is currently sized at 1-1/4", but has 20 GPM in total? Please advise if the 1-1/4" branch would be prefered @ 1-1/2", and if the 1" reduced section, would be prefered @ 1-1/4", to avoid high friction in the pipe? - CES Response: Refer to Addendum #3

Cycle Dates

Date Issued	Date Sent for Review	Date Answered
03-19-2018	03-19-2018	03-23-2018

Date Returned to Author	Date Answer Acknowledged
03-23-2018	03-23-2018

Clarification Cycle Dates

Clarification Date Requested	Clarification Date Received

Disclaimer

If the information provided in the response to this RFI constitutes a change in contract price or time, the trade contractor shall not proceed with this work unless authorized to do so by the Construction Manager in writing. The trade contractor shall provide the Construction Manager written notice within five (5) working days from receipt of this Request for Information that this RFI constitutes a change, all in accordance with Article 8 of the Contract Agreement. Should no change be required, a no cost change will be issued to you incorporating this RFI into your contract.

RFI Coordination

Sent RFI For Answer	Answered RFI

One Time CC Notification List

Consultant Review

Stage	Date Answered	Answer Contact	Answer Company	Answer
Consultant Review Complete	03-23-2018	Durato, Michele	Consulting Engineering Services, Inc.	See Attached

Attachments

Novia Vib-Iso - SCP - Substitution Request Form_Backup.pdf

RFI-00005 - Bid Package misc mech questions - CES Response.pdf

Advancement of Construction Technology

SUBSTITUTION REQUEST

(During the Bidding Phase)

Project: Strong 21st Century Comm. Lab School
New Haven, CT

To: Consulting Engineering Services, Inc.

Re: 220516, 220548, 230516, 230548

Substitution Request Number: _____

From: SCP

Date: 03/16/2018

A/E Project Number: H16040.00

Contract For: Plumbing & HVAC

Specification Title: Vibration & Seismic Controls for HVAC Piping & Equipment

Description: Engineering, Hangers, Mounts, Curbs, Etc.

Section: 230548 Page: 1 > 29

Article/Paragraph: 2.1 (b)

Proposed Substitution: Hangers, Mounts, Pads, Restraints, Bases, Curbs, Flex Connectors, Exp. Loops, Etc.

Manufacturer: Novia; A Division of C&P Address: 1 Northwestern Dr. Salem, NH Phone: 603-898-8600

Trade Name: NH, SNH, SM, RSM, NPW, WFB, CIB, VIB-CURB Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: Thomas N. Colletti Jr.
Signed by: Thomas N. Colletti Jr.
Firm: Seismic Control Products, LLC
Address: 61-D Main Street
Hebron, Ct 06248
Telephone: (860) 530-1580

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01330.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01330.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: Date: 10/19/2017

Supporting Data Attached: ☒ Drawings X☒ Product Data ☐ Samples ☐ Tests ☒ Reports ☐ _____

SEISMIC CONTROL PRODUCTS, LLC
WE'RE SHAKIN' THINGS UP!

61-D Main Street
Hebron, CT 06248
Ph: 860-530-1580
Fax: 860-530-1574
email: Tom@seismiccontrolproducts.com

March 16, 2018

Consulting Engineering Services, Inc.
811 Middle St.
Middletown, CT 06457

Project: Strong 21st Century Communications Lab School - New Haven, CT

Subject: Substitution Request

- 220516 Expansion Fittings & Loops for Plumbing Piping
- 220548 Vibration Isolation & Seismic Controls for Plumbing Pipe & Equipment
- 230516 Expansion Fittings & Loops for HVAC Piping
- 230548 Vibration Isolation & Seismic Controls for HVAC Pipe & Equipment

Thank you for choosing Carpenter & Paterson as an approved manufacturer in section 26501 on this project. I am writing in hopes of NOVIA (A Carpenter & Paterson Company) being added to the HVAC & Plumbing division (220516, 220548 & 230548, 230516) of the same specification. We are confident that you will be very satisfied with the products and services that we offer.

The literature we have enclosed shows how NOVIA products meet & exceed the specified manufacturers' products.

Since our scope includes not only products, but also includes delegated design and field supervision, it is very important to note that all manufacturers listed are not equal. As you know, Seismic Control Products has been proudly servicing projects throughout CT and MA for more than 13 years. We make it a point to go to the site as many times as is needed to ensure code and specification compliance. I believe we are one of only two manufacturers in our industry that has local representation based in Connecticut. Seismic Control Products is also a certified Small Business Enterprise in the State of CT.

We have successfully completed hundreds of vibration isolation & seismic restraint projects. We've worked with CES on many similar successful State of CT projects. Some of these include CREC Public Safety Academy, Wallace Middle School and New Britain Police Dept.

NOVIA is a member of VISCMA (Vibration Isolation & Seismic Control Manufacturers Association) and is approved and listed with MasterSpec.

Please find a copy of our MasterSpec attached along with our catalog and comparison charts. I would be more than happy to host a meeting and bring physical samples of any of these products if need be. Please feel free to contact me with any questions or concerns.

With Best Regards,

Thomas N. Colletti Jr.
Company Founder

Purpose

- Educate the design and construction industries on the proper use and application of vibration isolation and seismic restraint.

- Develop standards to continually improve the industry.

Meeting Schedule

Meetings are normally held the Saturday just prior to the beginning of the ASHRAE semi-annual meetings in January and June.

VISCMA

VIBRATION ISOLATION & SEISMIC CONTROL MANUFACTURERS ASSOCIATION

Members

Kinetics Noise Control

Mason Industries, Inc.

M.W. Saussé & Co., Inc.

NOVIA a Division of Carpenter & Paterson

The VMC Group

Thybar Corporation

Vibration Eliminator Co., Inc.

Vibro-Acoustics

Associate Members

B-Line by Eaton

CalDyn

Visit our web site at:
www.viscma.com

Activities

VISCMA members work together to bring their collective professional knowledge, experience and expertise to develop educational resources, standards and best practices for design professionals, installing contractors and code officials.

An example fo this critical activity is the VISCMA (2014) Installing Seismic Restraints for Mechanical Equipment Manual, which supersedes our original manual funded by FEMA and produced in collaboration with the American Society of Civil Engineers (ASCE).

Membership Requirements

Any manufacturer engaged in the seismic restraint, vibration isolation or noise isolation industry for a minimum of one year, with a minimum of 5000 square feet of warehouse space devoted to the products of the industry, may be eligible for membership in VISCMA.
Our Associate members are companies that manufacture and supply materials to the industry.

If you are interested in becoming a member, contact Executive Director Robert H. Ecker at 610-971-4850.

For more information, contact:

VISCMA
994 Old Eagle School Road
Suite 1019
Wayne, PA 19087-1866
(610) 971-4850
fax: (610) 971-4859
email: info@viscma.com

VISCMA
VIBRATION ISOLATION & SEISMIC CONTROL MANUFACTURERS ASSOCIATION

Visit our web site at: www.viscma.com

VISCMA

Vibration Isolation and Seismic Control Manufacturers Association

The Vibration Isolation and Seismic Control Manufacturers Association (VISCMA) is a non-profit association, incorporated in 1999, representing the manufacturers of seismic restraint, vibration isolation and noise isolation equipment.

Novia
A Division of C&P
1 Northwestern Dr.
Salem, NH 03079
Ph: 603-898-8600
Fax: 603-898-2755
sales@cp-novia.com

PRODUCT COMPARISON CHART

SPECIFICATION DESIGNATION	*NOVIA*	MASON IND.	VIBRATION MOUNTINGS	KINETICS	VIBRATION ELIMINATOR	SEISMIC CONTROL PRODUCTS
SEISMIC RESTRAINT TYPE						
I	RSM	SSLR	AEQM	FYS	OST-SM	
II	SS	Z-1225, Z-1011	SR	HSSERIES	ADR-1,2	
III	ANGLE CLIPS	SCB				
IV	RNM	BR		RDQ		
VIBRATION ISOLATOR TYPES						
A	SM	SLF	AN	FDS	OST	
B	RSM	SLR	AWMR	FLSS	MOSL3	
C	SH	30	SH-30A	SH	SNC4	
D	RNM	BR		RDQ		
E	NH	HD	RHD	RH	1C,1CD,3C,3CTD,5CTD	
F	SNH	30N	RSH-30A	SRH-I	SNRC4	
G	NP	SW	SHEAR-FLEX	NGD	MULTIPLE LAYERS	
H	LNP	HL	FABRI-FLEX			
I	TR	WB	HTR	HSR	THRUST RESTRAINT	
J	TRG	VPA	PPG	RAF	VERA	
K	RAG	ADA	MDPA	KPA	VERG	
M	FRSM					
P	FMD	ND	RD	RD	T44	
BASE TYPES						
B-1	SB	MSL	AW,AD	KFB-A,SFB-C	UN	
B-2	CIB	KSL,BMK	WPF	CIB	SN	
B-3	VIBCURB	RSC	RIC	KSR,SSR	AR,VERC	
B-4	ERR-1, 2 or 3	RSR				
B-5	SEISCURB	RRC				
B-6	ERR-a					
B-7	SR	RND, ICS				
B-8	VIBCURB	RSC				
B-9	CRS	RSC				
FLEXIBLE CONNECTOR TYPES						
FC-1	EU302	MFTNC,MFTFU	VMT			
FC-2	EUPCS	BSS	MFE			
EC-3	EBPC	SDL				
FC-4	VIB	BBF				
SEISMIC "V" EXPANSION LOOP TYPES						
EJ-V BR	V-BF11	VCPS				V-CSW
EJ-V SS	V-SF21	VFL				V-SS--
EJ-V GAS	V-SF21AGA	N/A				V-SSAGA
EJ-V MED GAS	V-MED	N/A				V-CSW-MED
EJ-V FIRE	V-MED	N/A				V-NFPA

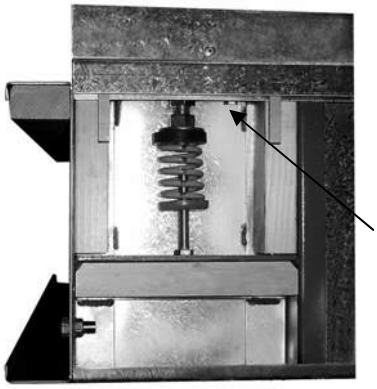
Novia
A Division of C&P
1 Northwestern Dr.
Salem, NH 03079
Ph: 603-898-8600
Fax: 603-898-2755
sales@cp-novia.com

Spring Roof Curb Comparison

Date: 02/01/08
Supercedes: 10/01/07

There are several manufacturers of roof curbs, each of which manufactures their products differently. This comparison will attempt to illuminate the differences with the best information available, typically from Web Sites. Some of the major differences are:

Vibration control:
One is better than four. A necessary feature of a spring curb is to have the top isolated or floating rail be attached in some manner to the fixed lower portion of the curb without short circuiting or bridging between the two. Four of the six manufacturer's have chosen to use a single restraining bolt or threaded rod of sufficient size to withstand the applied wind & / or seismic forces at each spring pack location. Mason's design uses two bolts, Amber Booth uses up to four. Practically speaking it is much easier to locate (center) one bolt during production as opposed to four. The significance gets clearer when you think about the total bolts required in a six pocket curb. 1 each = 6, 2 each = 12, 4 each = 24.



If all of the restraining bolts are not precisely aligned with the clearance hole in the fixed portion of the curb, then the bolts will rub against the neoprene grommets or worse have metal to metal contact. We feel that this is so important that we install an alignment bolt before connecting the floating to non-floating parts. This guarantees perfect centering of the restraining bolts.

The efficiency of a spring curb is based on the deflection of the spring isolator. Most well designed curbs have a feature to transfer the load of the equipment to the springs without affecting the overall height of the curb and to allow for the removal and replacement of the springs should the actual loads not be as predicted at design time. When curbs are designed without this load transfer feature, the entire floating portion of the curb simply deflects under the imposed load. When the equipment is not level under the load, manufacturers of this type of curb provide "additional" springs for leveling purposes. What this means in reality is that the unit would have to be rigged off the curb and through trial and error, additional springs would be added to the lowest side to bring the unit back up to level. This is all done in the field and there is typically no consideration whatsoever given to the effect on the isolation efficiency of the system. The singular goal is to level the unit and *get the crane off the job*! These curbs are typically called "insert" type curbs where the spring portion is mounted on top of a standard manufacturer's curb or in some cases can be provided as a package. We have chosen not to manufacture this type of curb because the economy of construction is not justified due to the potential installation problems and lack of ability to provide the deflection and efficiency of the system as specified.

Weather proofing & air seal:
The spring curb must keep the weather out and any airflow in. The weather seal must not have the ability to fail and allow water into the building. Only NAI & Mason have a fail safe approach to these two problems. Although Mason's approach causes other problems. (More on this later.)

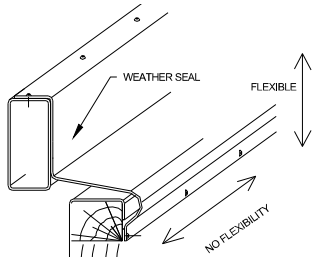
Amber Booth, **Kinetics & ThyCurb** use exposed exterior neoprene or some other elastomer material to seal the top floating rail from the base of the curb. We have never liked this concept for several reasons;

a) If the seal was penetrated, water could leak directly into the building. I've observed one installation where the contractor forgot to adjust the springs and instead of releasing the entire neoprene gasket which would have been a lot of work, simply cut though the gasket, adjusted the springs and siliconed the cut-out back in place. While I admit this is an extreme case, why even have it on the table?

b) These seals require contractors in the field, in all sorts of weather conditions to glue two ends together typically in the four corners and at any splices along sides or ends.

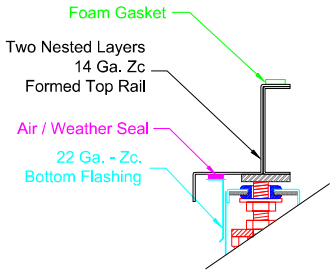
c) Replacement is very difficult because the flex is part of the top metal flashing that is trapped by the RTU.

d) These external elastomer air seals are problematic when a curb is used to separate supply and return air. Consider that in addition to a plenum divider sealing one air stream from another within the curb, the seal has to be made to the outermost part of the air / weather seal also. The inherent flexibility in an elastomer seal makes it almost impossible to seal air tight.



Mason bridges the floating top rail and the base of the curb with a galvanized rolled sheet metal exterior flashing and molded neoprene corner caps. The belief is that the design of the flashing allows it to *act* like a spring so any short circuiting of the vibration isolation is minimal. Consider that the flashing *may* in fact act like a spring vertically, but horizontally (along the axis of the flashing) it's nothing more than, well, a piece steel that can't flex at all. The floating portion of this curb is effectively snubbed out by this flashing design. While this concept does in fact make the seal air & watertight if installed properly, the degradation of the vibration isolation feature of the curb is in our opinion unnecessary. One more point, Mason's installation instructions require 1/8" drive screws 8" on center to attach the top flashing to the top rail – the RTU rides on these screw heads, not the top rail!

Vibration Mountings use a rubber gasket covered by formed galvanized sheet metal top flashing that overhangs the top wood nailer and galvanized bottom flashing. The overlapping effectively covers the rubber gasket so it is protected from the elements. Replacement is a problem as the gasket is trapped by the RTU.



NAI's concept is simple and effective. Our top flashing / support rail is 14 ga. G60–Zc steel formed with 90^0 bends that extend down to the wood nailer. We provide a counter flashing member with a sponge gasket attached that simply gets pressed up against the horizontal bend. (See sketch). The seal is replaceable, and protected from the elements and easy to install. As another insurance, when curbs are used as plenums, we provide a continuous internal perimeter flex connectors to seal off the plenum.

Curb side material:

Four of the six manufacturers reviewed in this report use galvanized steel in the construction of the curb sides and ends. We use 12 Ga. G60 galvanized steel which is the thickest of the bunch. This is preferable to painted steel as the preparation required for a good bond on raw steel is beyond the capacity of at least two of the manufacturers – (From personal observation) I've never seen a roof top manufacturer provide anything other than a galvanized curb as their standard. When there is airflow within the curb, there is moisture, galvanized material seems the best choice to me. **Vibration Mountings** *doesn't even provide solid sheet metal sides of any kind*, they use expanded metal!

Structural Capability:

In many installations the curbs are installed directly on metal decking and it is important to distribute the load, also when curbs are used plenums, the side material must be capable of handling the static pressure developed by the fans and not 'oil can'. Our 12 gauge material makes a very strong curb. Spanning bar joists is not a problem with our curbs, even when the spring pockets are center span. A continuous bottom tube steel member or side material of sufficient strength is better than pedestal spring supports with light weight sides which concentrate the loads over the length of the typical 12" spring pocket. Our curbs have been described as "Battleships" and rightly so.

Potential to fully insulate the sides of the curb:

Amber Booth, **Kinetics, Vibration Mountings & ThyCurb** all have un-insulated space around the entire perimeter of the curb of 4" to 7-13/16". This issue should not be overlooked. All spring curbs need a space between the floating and non-floating parts, but there are tremendous differences between the manufacturers on how this is accomplished. This is quite significant considering that all year long the inside curb and duct temperature will be affected by this heat gain or loss. The RTU's will have to compensate forever! This is unnecessary wasted energy due to poor curb design - for the life of the units and perhaps beyond should future equipment be retrofitted onto these curbs. THINK GREEN - Our standard spec calls for 3 ½" R22 faced Polyiscyanurate foam insulation to minimize heat gain or loss through the curb.

NAI & Mason have the minimum space required for operating clearances. Note; I haven't considered the top rail height in any of these comparisons but with our formed top rail / flashing design it is easy for us to insulate there as well. This factory insulation is included in our standard spec. Not as simple for **Mason & Vibration Mountings** as they both use tube steel for their top rails.

More differences

* Any time our curbs have factory installed internal or external insulation they are completely shrink-wrapped.
* We manufacture our curbs in Salem, NH – close to our primary markets. When a problem does arise, we can respond immediately with factory technicians on site, most times in one day or the same day!
* Factory direct means no middle man – which is why we can provide high quality at a very competitive price.

ROOF CURB COMPARISON

ITEM	*NOVIA*	AMBER-BOOTH	MASON	KINETICS	VIBRATION MOUNTINGS	THY CURB
Model	*VIBCURB*	RTIC-ER-1	RSC	ESR	P6100	Vibro-Curb II
Sides & ends	12 Ga.G60-Zc	16 Ga.-Zc	*Heavy* sheet metal - painted	*Heavy* galv. sheet metal	Expanded metal - painted	18 Ga.-Zc
Top Rail	Two Thicknesses of 14 ga.G60-Zc Nested	One Thickness of 16 Ga. Zc	TS 3" X 1-1/2" – 11 Ga.	Structural channel	TS 3" X 1-1/2" – 11 Ga.	Steel channel
Bottom Tube	None	None	None	None	Tube steel	None
Spring Pockets	Custom formed steel – tested to 6,000# @48" high - welded to sides	Welded Steel Isolator	Sheet metal "Z" section pedestals - painted	Sheet metal pedestal	Tube steel sections welded to T.S. bottom rail - painted	14ga. Sheet metal pedestal
Top Flashing	Galvanized 22 Ga.- sheet metal	16 Ga.-Zc	Galvanized 22 Ga. sheet metal	Exposed elastomeric material Difficult profile to blank off for plenum curbs	Galvanized sheet metal	Exposed elastomeric
Air seal	Exterior replaceable closed cell neoprene sponge. Interior flex connector for plenum curbs	Exposed elastomeric material Difficult profile to blank off for plenum curbs	Metal top flashing overlaps & is nailed to wood nailer (short circuiting spring isolators) Difficult profile to blank off for plenum curbs		Flexible membrane – outside curb. An additional full height internal *flexible membrane* is required for plenum curbs	Exposed elastomeric material
Lifting lugs	Yes	No	No	Yes	No	Yes
Duct Supports	Formed Galvanized sheet metal	Formed Galvanized sheet metal	Steel angles – painted	Formed Galvanized sheet metal	Steel angles – painted	Formed Galvanized sheet metal
Approx. <u>Un-insulated</u> Height around full perimeter	3/4"	7-13/16"	5/8"	6"	5"	4"
Local Factory	Yes	No	No	No	No	No
Factory Assembled	Yes	?	?	?	?	Yes

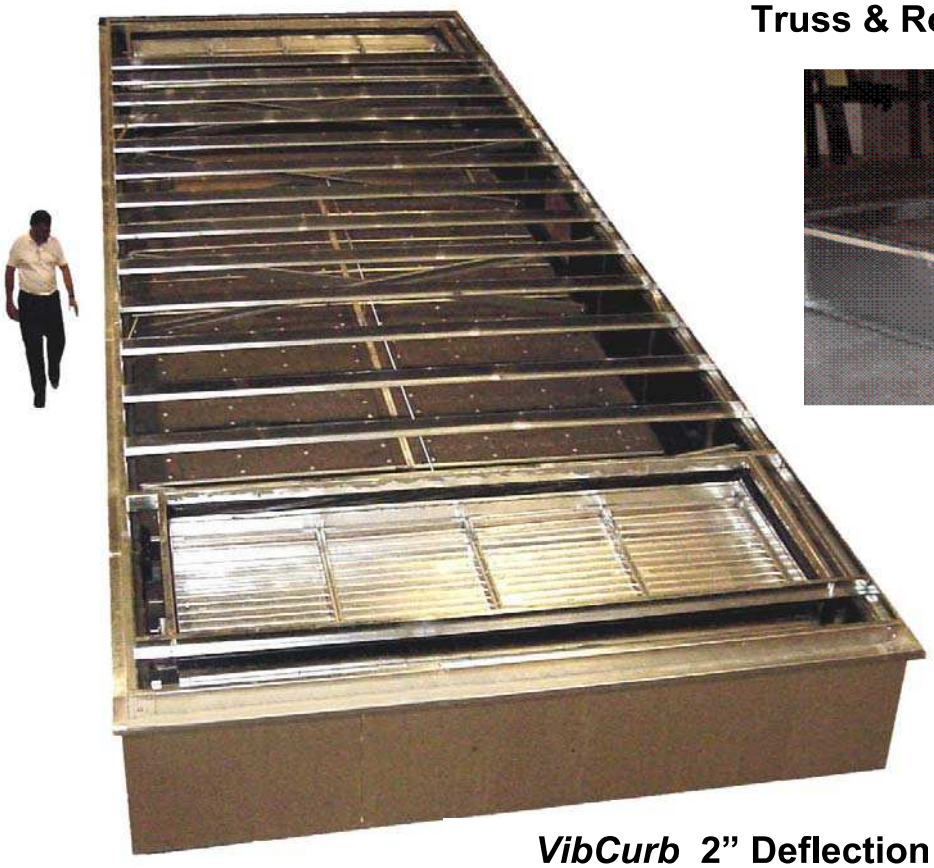
NOVIA; A Carpenter & Patterson Company

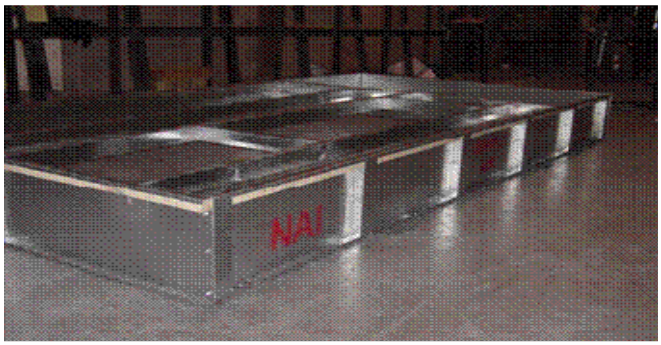
VibCurb
With Pipe Enclosure Pedestal

VibCurb II

VibCurb
With Internal Acoustical Insulation

Retrofit Plenum Curb With Built-in Structural Truss & Roof

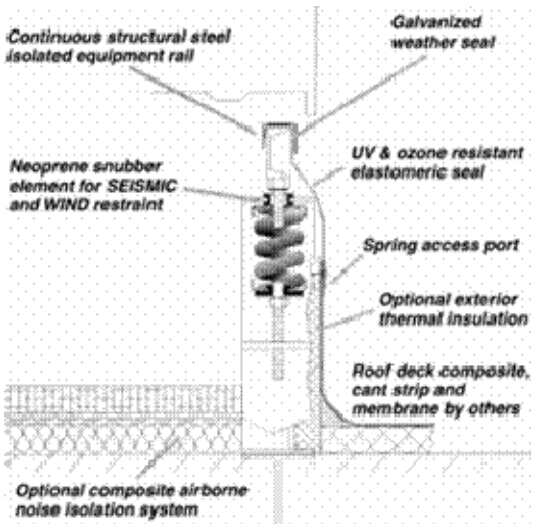


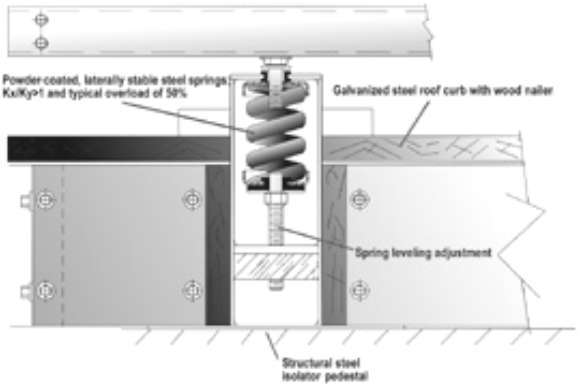


***SeisCurb* – Non Isolated Seismic Curb**

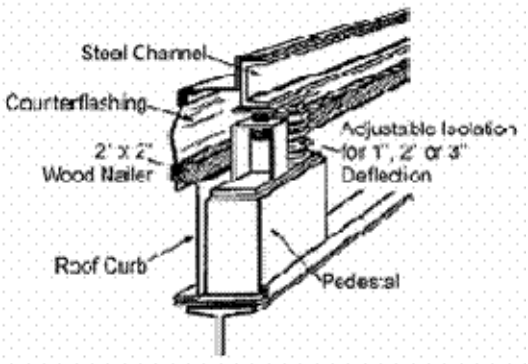
***VibCurb* 2" Deflection**
37' x 13' 6" x 3' High Insulated Plenum Curb with Smoke Dampers

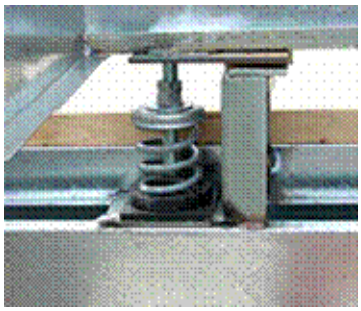
Kinetics



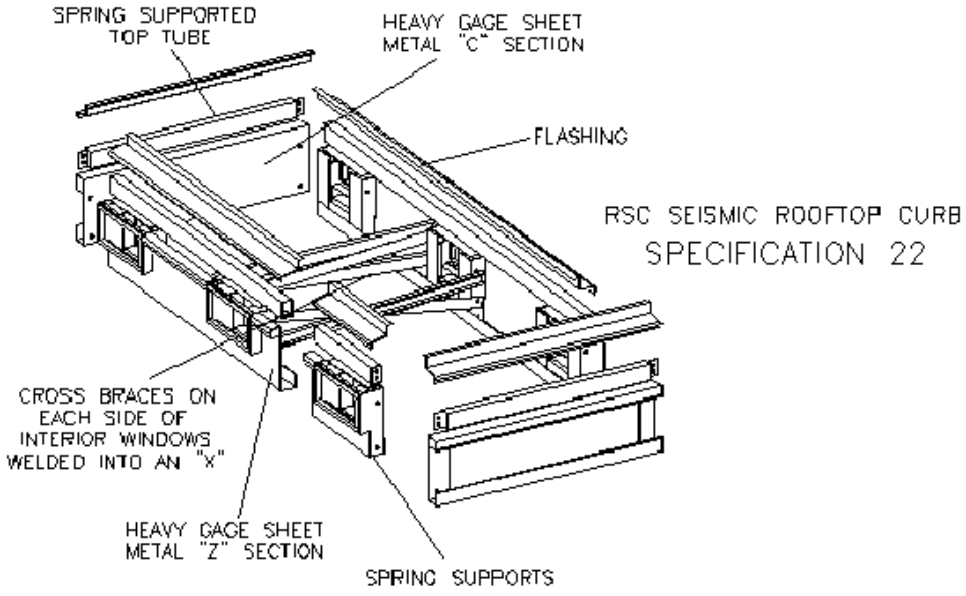


Thy Curb

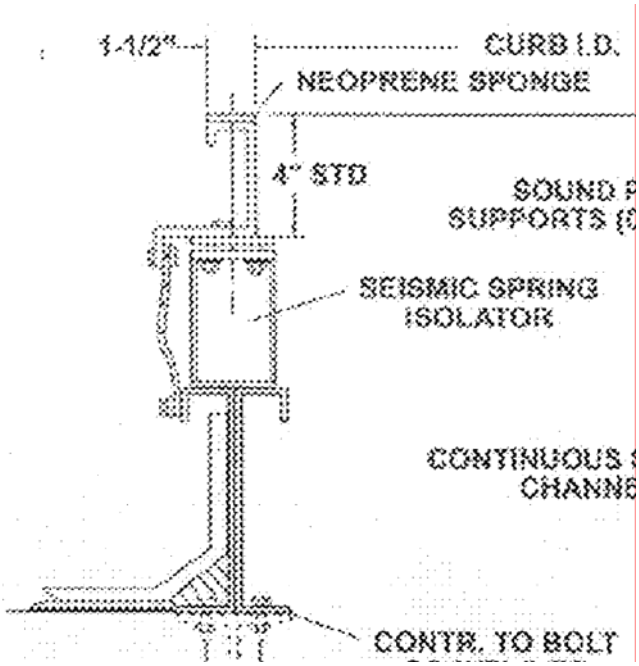




Mason Ind.



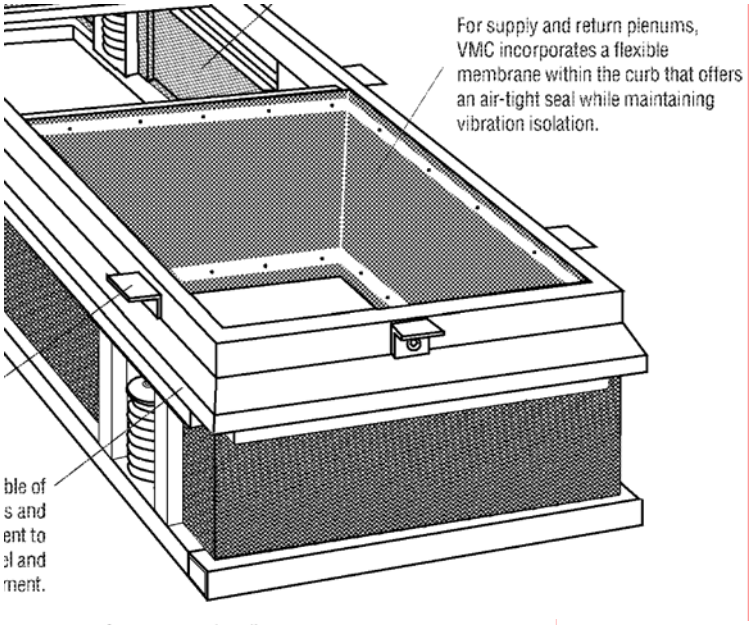
Amber Booth

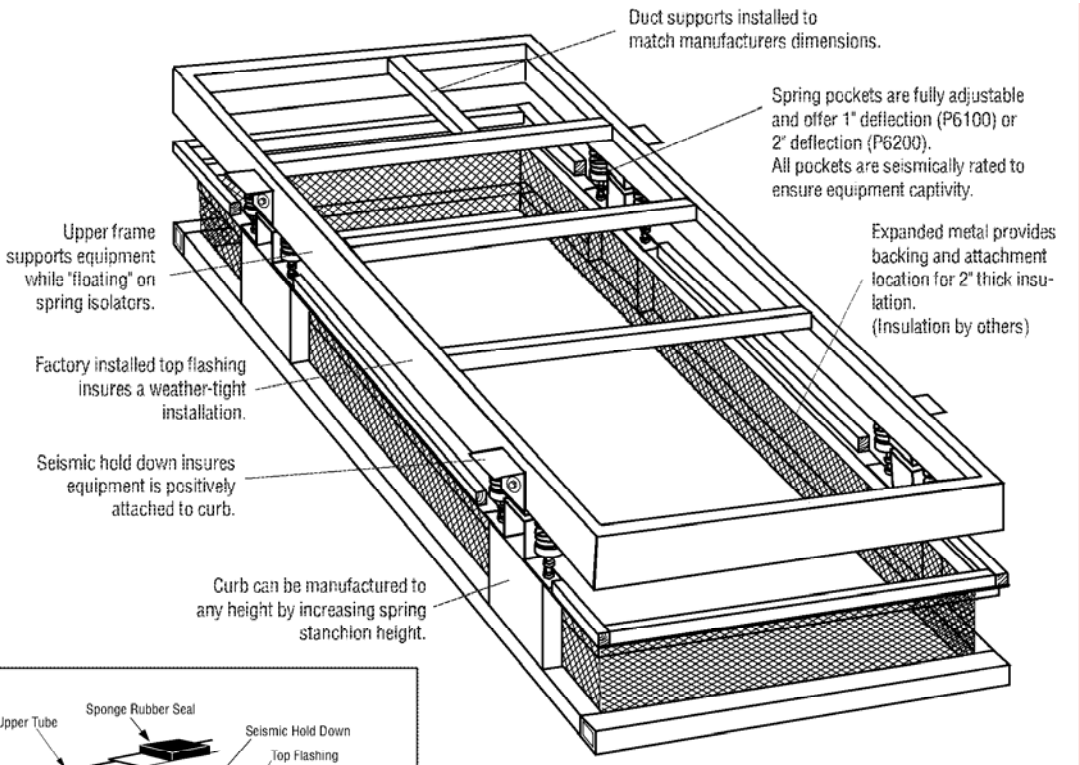


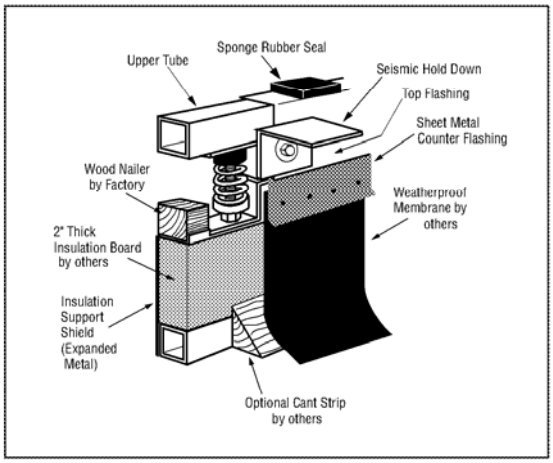
STANDARD FEATURES

- 16 GA GALVANIZED STEEL UPPER & LOWER CURB
- SEISMICALLY RATED SPRING ISOLATOR WITH ADJUSTABLE AND REMOVABLE SPRING PACKAGE
- CONTINUOUS SUPPORT CHANNELS DESIGNED FOR SEISMIC LOAD
- EPDM NYLON REINFORCED ELASTOMERIC WEATHER RESISTANT SEAL WITH ACCESS DOORS
- CONTINUOUS NEOPRENE SPONGE & WEATHER SEAL PAD

Vibration Mountings







P6100/P6200 Roofing Detail

A CASE STUDY

Expediting the Renovation Process:

Ferguson Mechanical Selects Seismic Control Products to Solve Vibration Isolation Challenges and Provide State-of-the Art Roof Curbs at Highland Park Elementary School.

PROJECT PROFILE

In 2012, the town of Manchester, Connecticut decided to invest in its growing student population by approving a referendum to renovate the Highland Park Elementary School. The project included:

- a new addition,
- renovations to all educational and administrative space,
- a full replacement of the outdated mechanical, electrical and plumbing equipment.

PROJECT CHALLENGES

The project posed several unique challenges.

- The planners of the project realized that the new rooftop HVAC equipment would generate sound and vibration that could enter the classrooms, disrupting the learning environment for the students.
- Since the building was originally constructed in 1928, the roof required current building code upgrades.
- In another part of the building, space constraints presented a challenge for the installers.

Thomas Wilt of Ferguson Mechanical Co., Inc., the project manager for the HVAC systems, made the decision to bring in Seismic Control Products to develop a solution.

THE RESULT

To alleviate the noise from the HVAC equipment, Seismic Control Products worked with suppliers to custom manufacture VibCurbs to isolate the vibrations.

To overcome the challenge posed by the weakness of the roof, Seismic Control Products offered suggestions to distribute the load on the roof, ensuring that it could support the heavy units.

Project: Highland Park Elementary School
397 Porter Street
Manchester, CT

Project Manager: Tom Wilt
Ferguson Mechanical
Plainville, CT

Engineer: Bemis Associates, LLC

Products: Seismic / Vibration Isolation Roof Curbs

Custom Options:

- 3” Static Deflection
- Double Pitch
- 48” Wide Catwalks
- External Pipe Chases
- Duct Supports
- Interior Wall Insulation
- Duct Side-Wall Penetration
- Factory Assembled & Shrink Wrapped

Where space constraints were an issue, Seismic Control Products worked together with a supplier to design a special custom platform to fit on the roof. In the future, this platform will allow maintenance workers to easily access the unit while staying away from the edge of the roof.

> *"By physically looking at the unique challenges of the building, Tom [Colletti] helped us plan before we started the install instead of just giving us a packaged drawing."*
>
> *- Thomas Wilt*
> *Ferguson Mechanical*

Throughout the project, Seismic Control Products communicated closely with the installation team over the phone, via email, and on site.

"By physically looking at the unique challenges of the building, Tom Colletti [President of Seismic Control Products] helped us plan before we started the install instead of just giving us a packaged drawing," said Thomas Wilt of Ferguson Mechanical. "Seismic Control Products absolutely provided a quality job."

IN CONCLUSION

Seismic Control Products' commitment, expertise and problem-solving skills helped to expedite the renovation process, bringing the project one step closer to completion. When the Highland Park Elementary School reopens, the students will enjoy a modern heating and air conditioning system without the distraction of noise and vibrations. Seismic Control Products' state-of-the-art roof curbs provide them with the quiet learning environment they need to succeed.

Energy Recovery Ventilator

Custom Energy Recovery Ventilator
Unit Weight = 6,300 Lbs.
18.5' x 7.5' x 6' H

Air Handling Unit

Custom Air Handling Unit
Unit Weight = 5,200 Lbs.
22' x 5' x 5' H

These large packaged units will not disturb the classrooms below because they are mounted on 3" Static Deflection Seismic / Vibration Isolation Roof Curbs. We have virtually separated the unit from the structure, providing a quiet learning environment for the students and the teachers.

NOVIA

A DIVISION OF CARPENTER & PATERSON

SEISMIC CONTROL PRODUCTS, LLC

WE'RE SHAKIN' THINGS UP!

About Novia

Novia was founded in 1990 as Novia Associates, Inc. and our headquarters are in Salem, NH. In April 2015, Novia was purchased by Carpenter & Paterson, Inc., an industry leading pipe support and pipe hanger provider for commercial and industrial applications for over 100 years founded in the greater Boston, MA area. In partnership with Carpenter & Paterson, Novia now has a presence in many of the major markets across the US and Canada.

We specialize in providing custom, engineered vibration isolation and seismic restraint systems to the HVAC industry with a complete line of spring and rubber mountings, isolation hangers, inertia bases, roof curbs, seismic restraints, and equipment support systems. With over 25 years of experience in designing and fabricating solutions to the HVAC industry, we have become an industry leader in vibration isolation, seismic, and sound control. Novia also has the ability to provide project-specific engineering on seismic and wind-load requirements that utilize the local and IBC codes with a PE stamp for the state in which your project resides.

TABLE OF CONTENTS

At Novia, **our mission is to provide well-designed, quality seismic and vibration isolation equipment** to our customers **while delivering world-class customer service** and getting it right the first time. **We strive to create products that embody innovation in the HVAC industry** with a “can do” attitude that lets our customers know that we are here to partner with them in **providing custom solutions for complex designs.**

ISOLATION HANGERS

Novia produces a full line of vibration isolation hangers ranging from neoprene to high deflection spring and neoprene models. Isolation hangers are used to support suspended rotating and reciprocating equipment in order to prevent unwanted vibration from entering occupied areas of the structure. Isolation hangers are also used to support duct near air handling equipment and pipe in mechanical equipment rooms to prevent vibration transmission through the buildings distributed systems. From a small unit heater to a several thousand pound suspended air-handling unit to an entire acoustical ceiling grid, Novia has the right hanger for the application.

NEOPRENE HANGER - NH

- Double Deflection Neoprene element contained within a steel hanger box.
- Rated capacity ranges from 59 lbs. to 2,450 lbs.
- Capable of supporting three times the rated load without failure.
- Rated deflection ranges from .35” to .5”

SPRING HANGER - SH

This spring element is contained within a steel hanger box, and is extremely powerful – capable of supporting three times the rated load without failure.

- Rated capacity ranges from 29 lbs. to 6,900 lbs.
- Available as pre-compressed.
- Rated deflection ranges from 1” to 3”
- Capable of 30-degree misalignment between the rod attachment to structure and the connection to the supported equipment.

SPRING & NEOPRENE HANGER - SNH

Spring & Double Deflection Neoprene element contained within a steel hanger box.

- Rated capacity ranges from 29 lbs. to 6,900 lbs.
- Capable of 30-degree misalignment between the rod attachment to structure and the connection to the supported equipment.
- Available as pre-compressed.
- Rated deflection ranges from 1” to 3”
- Capable of supporting three times the rated load without failure.

RESILIENT HANGER - ARH

- Neoprene hangers used with wire supports.
- Rated capacity – 65 lbs. to 200 lbs.
- Typically used for isolated suspended ceilings.

VERTICAL SLIDE GUIDE - VSG

- Used to prevent horizontal movement in riser systems, which are isolated for vibration or thermal expansion purposes.
- Rated capacity – 500 lbs. to 3,500 lbs.
- Can be preset for maximum upward movement, maximum downward movement, or for both upward and downward movement simultaneously.
- Used in pairs. Available with or without bolting plate.

ALL DIRECTIONAL ANCHOR - ADA

- Used to prevent movement caused by thermal expansion or contraction on isolated riser systems.
- Used in pairs. Available with or without bolting plate.
- riser systems. Rated capacity – 500 lbs. to 50,000 lbs.

THRUST RESTRAINTS - TR

When fan thrust exceeds 10% of the fan weight, we recommend thrust restraints to prevent over extension of flex connector between the duct and the fan.

- Can also be used in compression to prevent movement of duct toward fan on the return end.
- Rated capacity – 29 lbs. to 908 lbs.

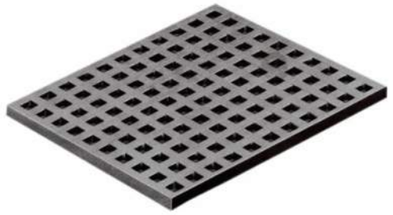
ISOLATION HANGER TYPES	DEFLECTION RANGES	CAPACITY RANGE	PART NUMBERS
Neoprene Hangers	.35" to .50"	59 lbs. to 2,450 lbs.	NH-A, B, C
Spring Hangers	1" to 3"	29 lbs. to 6,900 lbs.	SH-A, B, C, D, E
Spring & Neoprene Hangers	1" to 3"	29 lbs. to 6,900 lbs.	SNH-A, B, C, D, E
Resilient Hangers	.188" to .313"	65 lbs. to 200 lbs.	ARH
Vertical Slide Guide	.10"	500 lbs. to 3,500 lbs.	VSG, VSGP
All Directional Anchor	.10"	500 lbs. to 50,000 lbs.	ADA, ADAP
Thrust Restraints	1" to 3"	29 lbs. to 1,002 lbs.	TR

VIBRATION ISOLATION MOUNTS

Novia manufacturers and stocks a full line of vibration isolation mounting systems. From neoprene pad to seismically rated restrained spring mounts. Novia vibration isolation products are designed to reduce the transmission of noise and vibration from mechanical equipment onto a building structure. They support, isolate, and suspend mechanical equipment. Restrained spring and/or neoprene mounts protect equipment and systems from damage during a seismic event.

NEOPRENE PADS

Pads are available in various thicknesses and configurations and can be cut to size to meet project requirements.Rated deflection ranges from .04” to .20”



NEOPRENE MOUNTS & RESTRAINED NEOPRENE MOUNTS

FMD neoprene mounts with anti-skid top and bottom surfaces.

- Embedded steel plates for uniform loading.
- Rated Capacity ranges from 30 to 2200 lbs.
- Seismically capable neoprene mounts
- Rated Capacity ranges from 59 to 2500 lbs.
- Rated deflection .50”
- RNM Restrained Neoprene Mounts
- Rated deflection ranges from .35” to .50”

SPRING MOUNTS AND RESTRAINED SPRING MOUNTS

- SM Unhoused Spring Mounts
- Rated deflection ranges from 1” to 3”
- Rated Capacity ranges from 29 to 14,000 lbs.

RSM RESTRAINED SPRING MOUNTS

RSM mounts incorporate lateral restraints and hold-down bolts, which limit movement of equipment to approximately 1/8 inch in any direction from neutral position.

- Mounts are designed to withstand seismic / wind forces in all three axes.
- The RSM is equipped with resilient all-direction neoprene snubbers to prevent hard surface contact, which can amplify seismic input.
- Rated deflection ranges from 1” to 3” with higher deflection mounts available if requested.
- Rated Capacity ranges from 29 to 14,000 lbs.

ISOLATION MOUNT TYPES	DEFLECTION RANGES	CAPACITY RANGE	PART NUMBERS
Neoprene Pads	.05" to .25"	120 lbs to 19,440 lbs	NPW516, NPR38, NPW75
Neoprene Mounts	.5"	30 lbs. to 2,200 lbs.	FMD
Restrained Neoprene Mounts	.35" to .5"	59 lbs. to 2500 lbs.	RNM-A,B,C
Spring Mounts	1" to 3"	29 lbs. to 13,800 lbs.	SM-A,B,C,D,E
Restrained Spring Mounts	1" to 3"	29 lbs. to 13,800 lbs.	RSM-A,B,C,D,E

INERTIA BASES

Novia offers a variety of standard and custom inertia bases to reduce vibration and start-up torque for hvac equipment. Novia inertia bases are designed to be partnered with our isolation mounts in order to properly distribute the load while providing the maximum efficiency. We custom engineer our bases to your project-specific needs and challenges.

Air compressors – have a high center of gravity so the inertia base lowers the center of gravity of your air compressor in order to stabilize the equipment and uniformly load the isolators. The inertia base will double the frequency, which increases the efficiency of arresting the vibration frequency of the equipment.

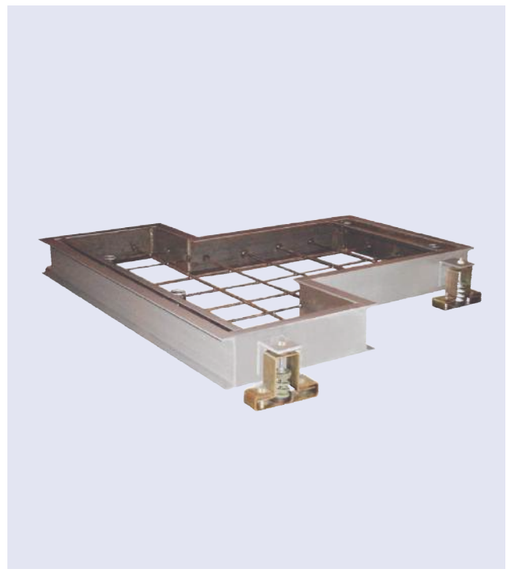
Pumps – most pump manufacturers require the base frame of the pump to be grouted to the attachment location. Using a novia inertia base will provide isolation and maintain the pump manufacturer's warranty requirements.

WE ALSO PROVIDE INERTIA BASES FOR:

- Chillers
- Air Handling Units
- Utility-Style Fans
- Centrifugal Fans
- Plenum Fans
- Condensers

And any other equipment as required for your project.

Novia inertia bases can be ordered in any size and can also be specially ordered as modular. We have the ability to design and manufacture any custom inertia base that your project requires. Please contact our inside sales team for more information.



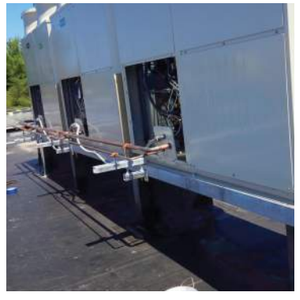
ROOFTOP EQUIPMENT SUPPORTS

Novia specializes in a wide range of support systems for roof-mounted HVAC equipment designed and engineered to provide roof structure attachment in compliance with your local and IBC codes. These support systems are offered in a variety of options to meet your specific project requirements. Each assembly is engineered to properly support your specific equipment based on the equipment location and unique building structure.

FLASHABLE ROOFTOP EQUIPMENT SUPPORTS (FRES)

Each project has its own individual challenges for supporting rooftop equipment. Our FRES are individually designed for your project's needs. The FRES are offered in any height and length and are designed to be flashed in by your roof membrane. The Equipment Supports are attached to your building structure so that your equipment is properly supported to meet the structural requirements of the project. Some of the most frequent uses of the FRES are:

- Rooftop Packaged Units
- Condensers
- Fans
- Chillers
- Solar Panels
- Rooftop Air Handling Units
- VRF Systems
- Compressors
- Cooling Towers



ISOLATION SUPPORT RAILS

Similar to the Novia VibCurb, we also offer our Flashable Equipment Supports with the addition of our RSM Spring Isolation System (see Isolation Mount product page). This option provides uniform support of the equipment along with effective means of vibration isolation while complying with wind-load and seismic restraint requirements. These rails can include custom seismic/wind-load engineering that includes a PE stamp for the state in which your project resides.

CUSTOM STEEL SUPPORT SYSTEMS

Whether your equipment is indoor or outdoor, Novia has the innovative design to fabricate a non-isolated equipment stand or isolation mount system to support the equipment when a custom steel support system is required. Our steel beam bases meet all specifications for equipment support bases and provide a rigid mounting and anchoring system for vibration isolated or non-isolated mechanical equipment.

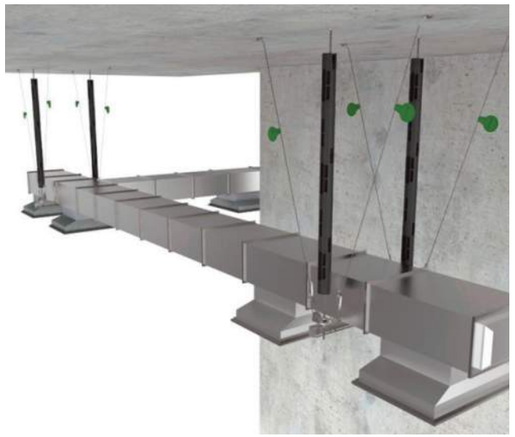
Novia is proud to be partnered with Carpenter & Paterson to provide a one-stop shop that will meet all of your equipment mounting and pipe support needs.

SEISMIC RESTRAINTS

Novia manufactures a full line of certified seismic, wind, and thermal restraint products for all mechanical, sheet metal, plumbing, electrical and architectural needs. Vibration isolation is the separation of rotating and reciprocating equipment form the structure to prevent unwanted vibration and noise from entering occupied spaces. Seismic restraint is the positive attachment of components to the building structure to resist primarily horizontal forces due to an earthquake.

DiagramWith vibration isolation and seismic restraint being diametrically opposed, Novia provides both options in a custom-engineered package. Vibration isolation is spec driven and there is no building code that dictates what should be isolated or how it should be isolated. Seismic restraint is code driven, but in many cases the spec can exceed the code requirements.

Novia is your partner in designing these systems to take the guesswork out of seismic restraint. We have seismic restraint solutions in the form of cable, solid bracing for distributed systems, custom roof curbs, restrained isolation mounts, pipe riser designs and much more. Novia has the product for your application and the experience to make sure your project meets all code requirements.



ROOF CURBS

Novia designs and manufactures roof curb solutions for your roof-mounted HVAC equipment including custom air handling units, packaged rooftop units, VRF systems, and any custom roof curb that you may need. The Novia roof curb line can be manufactured as insulated or uninsulated and are available fully assembled or knocked-down. We use fully welded seams on the curb panels and offer a detachable pipe enclosure that can be insulated on the inside or outside. Fabrication is completed using G90 galvanized steel in a variety of gauges based on the specific requirements of each project.

VIBCURBS

Vibration isolation roof curbs are designed and built to customer's specifications and to attach to the manufacturer's unit. VibCurbs are offered in a variety of heights and the springs are accessible for removal, replacement, or adjustment. The springs in the VibCurb are available with 1", 2", or 3" deflection and can be wind-load or seismic-rated including restraints and PE stamped. The Novia VibCurb offers an innovative construction with springs fully enclosed within the curb walls, avoiding a floating rail and flexible flashing.

SEISCURBS

Prefabricated roof curbs built to the latest code standards are available for both seismic and wind-load applications. These curbs come with internal bracing, heavy gauge construction, PE stamped based on the local building code, and restraints. Each SeisCurb is engineered specifically for the project requirements, not based on generic seismic and wind-load standards. Our SeisCurbs include a detailed seismic or wind-load calculation certifying the detailed attachment requirements. Concrete and steel attachments are provided as standard with other attachment options for wood or other surfaces are also available.

SPECIALTY CURBS

At Novia, we specialize in custom roof curb options for many applications.

- Adapter Curbs
- Sound attenuators
- Double-wall perforated insulated walls
- Plenum curbs
- Catwalks/Service Platforms
- Filter curbs
- Sound barrier packages
- Fully insulated or uninsulated floor pans
- Smoke dampers
- VRF curbs with piping enclosure
- Turning vanes
- Metal Building Curbs

SERVICES

CONSULTATION

Compliance with ever changing seismic and wind codes is a liability issue for contractors, engineers, and architects. Consultation with Novia ensures that your project will meet all code requirements, which assists by limiting your liability. Our engineers have the ability to handle your unique needs and the experience to recommend cost saving alternatives.

Novia, through affiliation with MasterSpec (American Institute of Architects), offers a comprehensive vibration isolation specification fully customizable to fit your needs. If you are unsure about your projects specific vibration isolation requirements Novia is always available for direct consultation. From engineered specifications to contract bidding, Novia will help you meet specification and code requirements while keeping your costs down.

ENGINEERING

Novia provides certified engineered solutions to complex problems; we routinely supply IBC, State, and Local building code certified designs for electrical, mechanical, and plumbing components and distributed systems. Novia has solutions form a simple unit heater requiring a set of neoprene hangers to a 200,000 lb. custom roof curb requiring built in sound attenuators and dampers. Why take chances with building code compliance or over-engineering your project? Consult with Novia to determine your project's specific needs.

INSPECTIONS

Upon completion of installation, Novia can prepare a certified report indicating that all vibration and seismic restraint devices are installed properly and in compliance with applicable codes and specifications. The inspection report will include an itemized list of all Novia products that are installed on the project including roof curbs, isolation hangers, isolation mounts, inertia bases, equipment supports, seismic restraints, and any other Novia products. A trained Novia team member will travel to the job site and provide a detailed inspection. This service is offered throughout the United States and Canada.

CARPENTER & PATERSON

For over 100 years, Carpenter & Paterson, Inc. has been the premier pipe hanger and support choice for the construction industry. Our manufacture and distribution of a complete line of pipe hangers and supports for commercial and industrial applications, in accordance with ASME B31.1 and MSS-SP58, have been specified and installed on major water treatment, pharmaceutical, process piping, petro-chemical, hospital, and school buildings as well as many other industrial projects throughout the world.

Our sales and engineering group offer a full range of experience in the areas of product design and value engineering and are available to discuss your project needs. With seven stocking locations in the continental United States, our products and services are always available to meet your requirements.

Carpenter & Paterson, Inc. products and the “Witch” trademark are synonymous in the pipe support industry for quality. Our mission is to support the mechanical industry with timely estimates, efficient designs, and full-line inventories that will allow us to meet our customers’ critical schedules.

With the acquisition of Novia Associates, Carpenter & Paterson further expands our offerings to include the quality engineered seismic and vibration products designed by an industry leading manufacturer.

ARE YOU READY TO HANG WITH THE BEST?

CLIENT PORTAL

As a partner of Novia we want to offer you an easily accessible Client Portal to product information, submittal pages, and IOMs on Novia’s products and services. Please feel free to use these documents in planning your jobs and providing submittals to your customers and partners in time sensitive situations. **Please visit our website at www.cp-novia.com and use the link for our Client Portal to sign up for an account.**

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EXECUTIVE OFFICE

CP WITCH
PIPE SUPPORT SYSTEMS®

Carpenter & Patterson, Inc.
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Woburn, MA 01801
Tel: 781-935-2950
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Request For Information Detail
with Consultant Reviewers

Strong School
Project #: J02445.975

RFI-00006 | Rev: 0 | Stage: Closed | Date Created: 03-19-2018

Author Reference Number: MJD RFIs #19~23

Primary External Reviewer	Secondary Reviewer	Author Company	Authored By
Ayles, William		Giordano Construction Co	Rinaldi, Lou

Subject	Discipline	Category	Bid Package
PB - Misc Mech #3			BP-15A-Mechanical

Question **Date Required: 03-26-2018**

19). Ref: M-300 & M-603 - Can you please add the scheduled data for AS-3 to the schedule for accurate vendor pricing?

20). Ref: 232113 Spec 232113 paragraph 2.2 specs - The underground chilled water system, and paragraph 3.5 states to install trace wire over the underground pipe? Please advise where (and if) any underground chilled water is located? After reviewing the drawings, UG CHW could not be found, but since it is spec'd, some clarification would be appreciated?

21). Ref: 232113 - Please advise if the Condenser Water System should follow the same piping material spec as the above ground chilled water system which is spec'd under 232113, paragraph 2.3?

22). Ref: 230700 - Please advise if the Condenser Water System should follow the same insulation spec as the chilled water system (both exterior and interior schedules spec'd under 230700, paragraph 3.5)?

23). Ref: 230700 - The 4" refrigerant relief (galvanized schedule 40) piping from the chillers to the roof are not spec'd under the insulation schedule? Please verify that bare piping is acceptable, or advise if this piping should be insulated as well?

Suggestion

Answer **Answer Company: JCJ Architecture, PC** **Answered By: Ayles, William**

CES Response: Refer to Addendum #3.

Cycle Dates

Date Issued	Date Sent for Review	Date Answered
03-19-2018	03-19-2018	03-23-2018

Date Returned to Author	Date Answer Acknowledged
03-23-2018	03-23-2018

Clarification Cycle Dates

Clarification Date Requested **Clarification Date Received**

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RFI Coordination

Sent RFI For Answer **Answered RFI**

One Time CC Notification List

Consultant Review

Stage	Date Answered	Answer Contact	Answer Company	Answer
Consultant Review Complete	03-23-2018	Durato, Michele	Consulting Engineering Services, Inc.	See Attached

Attachments

RFI-00006 - Bid Package misc mech questions - CES Response.pdf

Request For Information Detail
with Consultant Reviewers

Strong School
Project #: J02445.975

RFI-00007	Rev: 0	Stage: Awaiting CM Acceptance	Date Created: 03-20-2018

Author Reference Number:

Primary External Reviewer	Secondary Reviewer	Author Company	Authored By
Ayles, William		Giordano Construction Co	Rinaldi, Lou

Subject	Discipline	Category	Bid Package
PB - Plastic Glazing & Mock-Up			BP-08A-Windows and Curtainwall

Question — **Date Required: 03-27-2018**

1). Section 088400 calls for plastic glazing, glazing legend A-560 does not show any plastic. Please clarify.

2). Scope item #54 calls for a mock-up, please provide an outline for the mock-up requirements.

Suggestion

Answer — **Answer Company: JCJ Architecture, PC** — **Answered By: Ayles, William**

1. The plastic glazing DA-1 (decorative acrylic) is to be installed on the front of the reception desk in the main office room 101. Refer to millwork details on drawing A-583. CM NOTE: the DA-1 (decorative acrylic) glazing referenced in this RFI is to be included in the BP-06B Millwork scope of work.

2. Refer to attached added specification section 014339 - Mockups. Mockups shall contain both curtain wall and storefront jamb, head and sills. All exterior finishes shall be included with block and stud back ups. Mockups should indicate the air vapor barrier terminating into glazing pockets, sealant, backer rod, break metal closers angles, metal flashing, through wall flashing and counter flashing.

Cycle Dates

Date Issued	Date Sent for Review	Date Answered
03-20-2018	03-20-2018	03-21-2018
Date Returned to Author	**Date Answer Acknowledged**	
03-21-2018	03-21-2018	

Clarification Cycle Dates

Clarification Date Requested	Clarification Date Received

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RFI Coordination

Sent RFI For Answer	Answered RFI
Grouten, Jr., Webster	Grouten, Jr., Webster

One Time CC Notification List

Consultant Review

Stage	Date Answered	Answer Contact	Answer Company	Answer

Attachments

014339_Mockups.pdf

SECTION 014339

MOCKUPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. Section Includes:

1. Mockup requirements. Mock-ups are required for, but not limited to the following:

a. Build mockup of typical wall area as shown on Drawings, or if not indicated, as directed by Architect.
b. Build mockups for all typical exterior wall types in sizes approximately 10 feet high by 8 feet long by full thickness.

1) Include lower corner of curtain wall opening framed with sealant approximately 24 inches wide by 36 inches high in exterior wall mockup. It is important to demonstrate air vapor barrier flashing tie-ins to glazed aluminum curtain wall.
2) Include brick and metal panel mock up as selected by architect from manufacturer’s full range of standard colors.
3) Include through-wall flashing installed for a 24-inch length with a 12-inch length of flashing left exposed to view.
4) Include metal studs, sheathing, sheet waterproofing, anchors, insulation, and flashing in exterior wall mockup.
5) Clean one-half of exposed faces of mockups with masonry cleaner.

B. All mock-ups specified herein, under other Sections of the Specifications, and shown on drawings will be reviewed and approved by the Architect and Owner. Unaccepted mock-ups shall be replaced or reconstructed in part or in total and the extent of the replacement or reconstruction shall be at the discretion of the Architect and Owner. The Contractor shall carry forth mock-up replacement or reconstruction until Architect's acceptance is obtained. Mock-up costs, including as many replacements or reconstruction as necessary to gain Architect's acceptance, shall be included in the Contract Cost and Schedule.

1.3 RELATED SECTIONS:

A. Section 014500 - QUALITY CONTROL.

B. Section 033000 - CAST-IN-PLACE CONCRETE.

C. Section 042000 - UNIT MASONRY.

D. Section 047200 - CAST STONE MASONRY.

E. Section 054000 - COLD-FORMED METAL FRAMING.

F. Section 061600 - SHEATHING.

G. Section 072713 - MODIFIED BITUMINOUS SHEET AIR BARRIERS.

H. Section 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS.

I. Section 074210 - CONTINUOUS INSULATION WALL PANEL SUPPORT SYSTEM.

J. Section 074213.23 - METAL COMPOSITE MATERIAL WALL PANELS.

K. Section 079200 - JOINT SEALANTS.

L. Section 084413 - GLAZED ALUMINUM CURTAIN WALLS.

M. Section 088000 - GLAZING.

1.4 SUBMITTALS:

A. Submit the following under provisions of Section 013300 - SUBMITTAL PROCEDURES:

1. Submit shop drawing of mockup indicating sizes, finishes and method of construction and installation of each component

1.5 GENERAL:

A. Where requested by Architect, or as specified in individual specification sections, assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals, and finishes. Remove mock-up assemblies prior to date of Final Inspection, or as directed.

B. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Finishes, colors and textures of components shall be as specified for each component and shall be selected by the Architect.
2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.

C. Notify Architect a minimum of seven days in advance of dates and times when mockups will be constructed.

D. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

E. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.

F. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

G. Demolish and remove from site prior to requesting inspection for certification of Substantial Completion, all Mock-ups which are not permitted to remain as part of the finished work.

H. Demolish and remove mockups when directed unless otherwise indicated.

1.6 COORDINATION:

A. Coordinate work of trades and schedule elements to expedite the fabricating, furnishing, and installation of multiple component mock-ups specified herein, in other Sections of the Specifications, and as shown in the Contract Documents.

PART 2 - PRODUCTS

2.1 EXTERIOR WALL SECTION MOCK-UP:

A. Mockup Unit: Shall consist of one full size facsimile exterior wall section, as indicated on the Drawings using specified products as noted below. Mock-up shall be a minimum 10 feet high by 8 feet wide unless otherwise indicated.

1. General description: Mockup Unit shall include exterior masonry construction, with light gage steel stud framing backup and sheathing assembly. Mockup shall include all components specified and indicated which are typical to the exterior wall construction and additional components specified herein.

a. Fabricate mockup unit with face brick as specified, with selected mortar and backup consisting of 8 inch metal studs, exterior sheathing board on both sides of studs, and specified brick anchors.

1) Provide additional metal stud framing and cross-bracing required for construction of various components of the mockup panel.
2) Provide concealed various wood blocking, edgings, nailers, curbs, and cants required for receipt of various finishes and surfacing materials.

b. Fabricate aluminum facsimile window unit with glazing.

c. Include into mockup assembly all flashing, joint sealers, and all finish trim and accessories necessary to show typical completed construction including interior wall finish.

2. Finishes, colors and textures of components shall be as specified for each component and shall be selected by the Architect.

B. Components to be included in the mockup include, but are not limited to:

1. Section 033000 - CAST-IN-PLACE CONCRETE.

a. Provide a concrete foundation wall to a depth required to support wall mockup.

2. Section 042000 - UNIT MASONRY.

a. Provide type of brick and colored mortar specified, installed over gypsum sheathing with specified anchorage devices.
b. Provide one half of mockup with masonry backup.
c. Install architectural cast stone masonry units specified under Section 047200.

3. Section 054000 - COLD-FORMED METAL FRAMING:

a. Provide cold formed metal stud framing with bracing as required for construction and support of the mockup panel.

4. Section 061600 –SHEATHING:

a. Install sheathing board, on both sides of metal stud framing, with taped joints and membrane flashing.

5. Section 072713 - MODIFIED BITUMINOUS SHEET AIR BARRIER

a. Provide sheet applied air barrier over gypsum sheathing.

6. Section 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

a. Provide fluid-applied air barrier masonry back-up.

7. Section 074210 - CONTINUOUS INSULATION WALL PANEL SUPPORT SYSTEM

a. Install continuous insulation panel support system on upper section of cold formed metal stud framing.

8. Section 074213.23 - METAL COMPOSITE MATERIAL WALL PANELS

a. Install metal composite material wall panel over continuous insulation panel support system.

9. Section 079200 - JOINT SEALANTS:

    a. Provide joint sealant at perimeter of all components. Colors shall be selected by the Architect.

10. Section 084413 - GLAZED ALUMINUM CURTAIN WALLS: Provide glazed aluminum curtain wall with fixed glass, matching indicated luminum curtain wall unit profiles and dimensions.

    a. Fabricate with removable stop for installation of glass.
    b. Provide specified insulated glass into glazed aluminum curtain wall.
    c. Glazed aluminum curtain wall to be shop finished to match selected PVDF finish specified for aluminum curtain wall, matching color and sheen.
    d. Glazed aluminum curtain wall used in mock-up may not be incorporated into the Work.

11. Section 088000 - GLAZING:

    a. Provide glazing for curtain wall.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Construct mock-ups at locations indicated or, if not indicated, at locations directed by the Architect.

B. Construct mockup in time to make product and/or assembly modifications without delaying production work.

3.2 INSTALLATION:

A. Construct mockup to duplicate actual job conditions.

1. Locate at an area on site as directed by the Architect.
2. Provide foundations, bases, supports and braces adequate to make mockup stable and safe.

B. Provide weather protection for materials in mockups that are not exposed to weather in intended service. Protect accepted mockups from the elements with weather-resistant membrane.

3.3 REMOVAL:

A. Retain mock-ups during construction as a standard for judging completed work until time designated by the Architect and the Owner.

1. Completely demolish and remove mockups from the job site at time designated by Architect.
2. Accepted mock-ups (which are specifically identified by the Architect in other Sections to become part of the work) may be incorporated into the work provided they are not damaged during subsequent construction.

END OF SECTION 014339

Request For Information Detail
with Consultant Reviewers

Strong School
Project #: J02445.975

RFI-00008	Rev: 0	Stage: Closed	Date Created: 03-20-2018

Author Reference Number:

Primary External Reviewer	Secondary Reviewer	Author Company	Authored By
Ayles, William		Giordano Construction Co	Rinaldi, Lou

Subject	Discipline	Category	Bid Package
PB - Radiant Floor Slab Thickness			BP-02A-Sitework

Question — **Date Required: 03-27-2018**

The detail for the radiant floor on M-503 call for a 4” slab and the structural drawings call for a 5” slab overall including radiant slabs. Please clarify.

Suggestion

Answer	Answer Company: JCJ Architecture, PC	Answered By: Ayles, William

The slab is 5" per the structural drawings.

Cycle Dates

Date Issued	Date Sent for Review	Date Answered
03-20-2018	03-20-2018	03-21-2018

Date Returned to Author	Date Answer Acknowledged
03-21-2018	03-21-2018

Clarification Cycle Dates

Clarification Date Requested	Clarification Date Received

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RFI Coordination

Sent RFI For Answer	Answered RFI
Grouten, Jr., Webster	Grouten, Jr., Webster

One Time CC Notification List

Consultant Review

Stage	Date Answered	Answer Contact	Answer Company	Answer
Consultant Review Complete	03-21-2018	Diehl, Laura	Michael Horton Associates, Inc.	The slab is 5" per structural drawings.

Request For Information Detail
with Consultant Reviewers

Strong School
Project #: J02445.975

RFI-00009	Rev: 0	Stage: Closed	Date Created: 03-21-2018

Author Reference Number:

Primary External Reviewer	Secondary Reviewer	Author Company	Authored By
Ayles, William		Giordano Construction Co	Rinaldi, Lou

Subject	Discipline	Category	Bid Package
PB - Frame W7 Glass			BP-08A-Windows and Curtainwall

Question — **Date Required: 03-28-2018**

Frame W7 on A570 calls for glass type S62 which per section 08800 shows ¼" glass. Detail 8 on A-561 shows ½" glass. Which is correct?

Suggestion

Answer — **Answer Company: JCJ Architecture, PC** — **Answered By: Ayles, William**

Provide 1/4" glass for window type W7 per specification section 088000.

Cycle Dates

Date Issued	Date Sent for Review	Date Answered
03-21-2018	03-21-2018	03-21-2018

Date Returned to Author	Date Answer Acknowledged
03-21-2018	03-21-2018

Clarification Cycle Dates

Clarification Date Requested	Clarification Date Received

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RFI Coordination

Sent RFI For Answer	Answered RFI
Grouten, Jr., Webster	Grouten, Jr., Webster

One Time CC Notification List

Consultant Review

Stage	Date Answered	Answer Contact	Answer Company	Answer

Request For Information Detail
with Consultant Reviewers

Strong School
Project #: J02445.975

RFI-00010	Rev: 0	Stage: Closed	Date Created: 03-21-2018

Author Reference Number: Central Conn. Acoustics, Inc.

Primary External Reviewer	Secondary Reviewer	Author Company	Authored By
Ayles, William		Giordano Construction Co	Rinaldi, Lou

Subject	Discipline	Category	Bid Package
PB - Ceiling AC-2			BP-06A-Wall Systems and Specialties

Question **Date Required: 03-28-2018**

Regarding ceiling AC-2. Spec calls for it to be 2'x4' Armstrong Wood works Concealed but all the details and reflected ceiling plans call for AC-2 to be linear metal or wood ceilings. Which is correct?

Suggestion

Answer **Answer Company: JCJ Architecture, PC** **Answered By: Ayles, William**

The specification is correct. Provide 2'x4' Armstrong Wood Works Concealed as basis of design.

Cycle Dates

Date Issued	Date Sent for Review	Date Answered
03-21-2018	03-21-2018	03-21-2018

Date Returned to Author	Date Answer Acknowledged
03-21-2018	03-21-2018

Clarification Cycle Dates

Clarification Date Requested	Clarification Date Received

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RFI Coordination

Sent RFI For Answer	Answered RFI
Grouten, Jr., Webster	Grouten, Jr., Webster

One Time CC Notification List

Consultant Review

Stage	Date Answered	Answer Contact	Answer Company	Answer

Request For Information Detail
with Consultant Reviewers

Strong School
Project #: J02445.975

RFI-00011 | Rev: 0 | Stage: Closed | Date Created: 03-22-2018

Author Reference Number: Ducci Electrical

Primary External Reviewer	Secondary Reviewer	Author Company	Authored By
Ayles, William		Giordano Construction Co	Rinaldi, Lou

Subject	Discipline	Category	Bid Package
PB - Homeruns & Circuit Raceway			BP-16A-Electrical

Question **Date Required: 03-29-2018**

- Spec section 260501-11 L.3. says EMT shall be utilized for Light Fixture branch wiring. However, note #7 indicates MC Cable can be utilized in dry walls and accessible ceilings. Please confirm the intent is for Homeruns from the panel to the area served are to be in conduit, with MC Cable continuing from junction boxes, daisy chaining lights and receptacles in dry walls and accessible ceilings.

Suggestion

Answer **Answer Company: JCJ Architecture, PC** **Answered By: Ayles, William**

CES Response: The intent is Homeruns shall be in conduit, MC after the first device.

Cycle Dates

Date Issued	Date Sent for Review	Date Answered
03-22-2018	03-22-2018	03-23-2018

Date Returned to Author	Date Answer Acknowledged
03-23-2018	03-23-2018

Clarification Cycle Dates

Clarification Date Requested	Clarification Date Received

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RFI Coordination

Sent RFI For Answer	Answered RFI
Grouten, Jr., Webster	Grouten, Jr., Webster

One Time CC Notification List

Consultant Review

Stage	Date Answered	Answer Contact	Answer Company	Answer
Consultant Review Complete	03-23-2018	Durato, Michele	Consulting Engineering Services, Inc.	See Attached

Attachments

RFI-00011 - Bid Package misc mech questions - CES Response.pdf

Request For Information Detail
with Consultant Reviewers

Strong School
Project #: J02445.975

RFI-00013 | Rev: 0 | Stage: Closed | Date Created: 03-22-2018

Author Reference Number: Silktown Roofing

Primary External Reviewer	Secondary Reviewer	Author Company	Authored By
Ayles, William		Giordano Construction Co	Rinaldi, Lou

Subject	Discipline	Category	Bid Package
PB - VP/IP Vapor barrier			BP-07A-Roofing

Question **Date Required: 03-29-2018**

Can you please confirm the “VP Vapor barrier” as shown in typical detail 4/A521 is by others and the “IP Vapor barrier” is by the roofer?

Suggestion

Answer **Answer Company: JCJ Architecture, PC** **Answered By: Ayles, William**

Refer to drawings A-520, A-521 & A-522 which will be included in the next addendum #3. The "Cont. PVC roof system vapor retarder on coverboard" and "Lap single-ply roof membrane over air & vapor barrier (VP AVB) is part of the roofing system. Also continuously wrapped AVB at parapets and copings shall be part of the roofing system.

CM to clarify bid packages.

CM Scope Clarification:

BP-07A Roofing owns the Vapor Retarder (Specified in 075419 PVC Roofing 2.3 VAPOR RETARDER - Self-Adhering-Sheet Vapor Retarder) under all the PVC roofing and copings and it should lap 6” down vertically at all exterior walls. This vapor retarder has been re-labeled on the drawings as “PV Roof System Vapor Retarder” for clarity.

The sheet applied AVBs on the exterior skin of the building, both VP (072715 - NONBITUMINOUS SELF-ADHERING SHEET AIR BARRIERS) and IP (072713 Modified Bituminous Sheet Air Barriers) are to be furnished and installed by the BP-04A Masonry Contractor and in addition to where shown on the CDs at all vertical and horizontal areas of the exterior walls, a these AVBs should extend over the top of the exterior walls and terminate at the back side of the parapet/coping framing, so it laps under the PVC roofing system.

Cycle Dates

Date Issued	Date Sent for Review	Date Answered
03-22-2018	03-22-2018	03-23-2018

Date Returned to Author	Date Answer Acknowledged
03-23-2018	03-23-2018

Clarification Cycle Dates

Clarification Date Requested	Clarification Date Received

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RFI Coordination

Sent RFI For Answer	Answered RFI
Grouten, Jr., Webster	Grouten, Jr., Webster

One Time CC Notification List

Consultant Review

Stage	Date Answered	Answer Contact	Answer Company	Answer

Request For Information Detail
with Consultant Reviewers

Strong School
Project #: J02445.975

RFI-00014 | Rev: 0 | Stage: Closed | Date Created: 03-23-2018

Author Reference Number: Camputaro & Son

Primary External Reviewer	Secondary Reviewer	Author Company	Authored By
Ayles, William		Giordano Construction Co	Rinaldi, Lou

Subject	Discipline	Category	Bid Package
PB - Concrete Stair Pan			BP-03A-Concrete

Question **Date Required: 03-30-2018**

Please provide a concrete strength for stair pan infill and state if it requires MVRA.

Suggestion

Answer **Answer Company: JCJ Architecture, PC** **Answered By: Ayles, William**

Spec section 055113 2.2E Metal Pan Stairs calls for 3000 psi concrete infill. Provide MVRA in the stair slabs

Cycle Dates

Date Issued	Date Sent for Review	Date Answered
03-23-2018	03-23-2018	03-23-2018

Date Returned to Author	Date Answer Acknowledged
03-23-2018	03-23-2018

Clarification Cycle Dates

Clarification Date Requested	Clarification Date Received

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RFI Coordination

Sent RFI For Answer	Answered RFI
Grouten, Jr., Webster	Grouten, Jr., Webster

One Time CC Notification List

Consultant Review

Stage	Date Answered	Answer Contact	Answer Company	Answer

Request For Information Detail

Strong School
Project #: J02445.975

RFI-00015	Rev: 0	Stage: Closed	Date Created: 03-23-2018
Primary External Reviewer	**Secondary Reviewer**	**Author Company**	**Authored By**
Ayles, William		Giordano Construction Co	Rinaldi, Lou
Subject	**Discipline**	**Category**	**Bid Package**
PB - Misc Mech #4			BP-15A-Mechanical

Question **Date Required: 03-30-2018**

24). Ref: 230995 - Local Yaskawa rep has asked me to officially RFI if Yaskawa can be added as an approved manufacturer for the Variable Frequency Drives? Substitution Request w/ backup sent with RFI.

25). Ref: 232116 & 232123 - Please advise if Taco can be added as an approved manufacturer for the pumps (spec 232123) as they are currently already approved for all the pump specialties (spec 232116).

26). Ref: M-501 - For the Chilled & Hot Water details that show a diverting three way valve, please advise if the tee and manual balancing valve tying into the 3-way valve are full-sized?

27). Ref: M-502 & M-503 - Please verify that the contractor prepping and pouring the floors over the radiant floor heating PEX piping is also responsible for the vapor barriers and rigid insulation installation as shown on detail #2 on drawing M-502 and detail #1 & #2 on drawing M-503?

28). Ref: M-300 - Would it be possible to provide an elevation view of the Thermaduct system for the ductwork attaching to SA-AHU-2-S & SA-AHU-2-R. Duct is shown in plan view on drawings M-300 and MEP-142, but after reviewing the architectural drawings and other mechanical drawings it is not 100% clear how much Thermaduct is needed. An elevation view would help clear this up for sheet metal vendor pricing and sheet metal labor.

29). Ref: MP-122 & MP-132 - Note #4 on HWS&R riser states 4" HWS&R up to third floor (See drawing MP-122). However, 3rd floor plan (MP-132) shows 6" HWS&R piping coming out of this riser? Please verify if 4" or 6" is correct for this piping?

30). M-300 & M-301 - Construction Logistics question regarding the Penthouses. What will our access be for the North and South Penthouses where the AHUs and DOAs are being installed? Will a portion of the roof or a wall be left open so that the crane and rigging subs and drop the units in from overhead, or will the access be through the double doors and we would have to deliver and rig in sections?

Suggestion

Answer **Answer Company: JCJ Architecture, PC** **Answered By: Ayles, William**

24). Ref: 230995 - Local Yaskawa rep has asked me to officially RFI if Yaskawa can be added as an approved manufacturer for the Variable Frequency Drives? Substitution Request w/ backup sent with RFI. - **CES Response: Yes submit equal product during submittal for review.**

25). Ref: 232116 & 232123 - Please advise if Taco can be added as an approved manufacturer for the pumps (spec 232123) as they are currently already approved for all the pump specialties (spec 232116). - **CES Response: Yes submit equal product during submittal for review.**

26). Ref: M-501 - For the Chilled & Hot Water details that show a diverting three way valve, please advise if the tee and manual balancing valve tying into the 3-way valve are full-sized? - **CES Response: Yes full-sized.**

27). Ref: M-502 & M-503 - Please verify that the contractor prepping and pouring the floors over the radiant floor heating PEX piping is also responsible for the vapor barriers and rigid insulation installation as shown on detail #2 on drawing M-502 and detail #1 & #2 on drawing M-503? **GCC Response: Vapor barriers and rigid insulation are by others, not by BP-15A Mechanical.**

28). Ref: M-300 - Would it be possible to provide an elevation view of the Thermaduct system for the ductwork attaching to SA-AHU-2-S & SA-AHU-2-R. Duct is shown in plan view on drawings M-300 and MEP-142, but after reviewing the architectural drawings and other mechanical drawings it is not 100% clear how much Thermaduct is needed. An elevation view would help clear this up for sheet metal vendor pricing and sheet metal labor. - **CES Response: Refer to Addendum #3.**

29). Ref: MP-122 & MP-132 - Note #4 on HWS&R riser states 4" HWS&R up to third floor (See drawing MP-122). However, 3rd floor plan (MP-132) shows 6" HWS&R piping coming out of this riser? Please verify if 4" or 6" is correct for this piping? - **CES Response: Refer to Addendum #3.**

30). M-300 & M-301 - Construction Logistics question regarding the Penthouses. What will our access be for the North and South Penthouses where the AHUs and DOAs are being installed? Will a portion of the roof or a wall be left open so that the crane and rigging subs and drop the units in from overhead, or will the access be through the double doors and we would have to deliver and rig in sections? **GCC Response: Assume access is thru the doors openings shown on the plans (Note that the south penthouse has an overhead coiling door). If the BP-15A Mechanical contractor can get the equipment submitted, approved, fabricated and delivered prior to the scheduled date for enclosing the penthouses we may be able to make accommodations for better access, but we will not delay the enclosure of the building to wait for equipment.**

Cycle Dates

Date Issued	Date Sent for Review	Date Answered
03-23-2018	03-23-2018	03-26-2018

Date Returned to Author	Date Answer Acknowledged
03-26-2018	03-26-2018

Clarification Cycle Dates

Clarification Date Requested	Clarification Date Received

Disclaimer

If the information provided in the response to this RFI constitutes a change in contract price or time, the trade contractor shall not proceed with this work unless authorized to do so by the Construction Manager in writing. The trade contractor shall provide the Construction Manager written notice within five (5) working days from receipt of this Request for Information that this RFI constitutes a change, all in accordance with Article 8 of the Contract Agreement. Should no change be required, a no cost change will be issued to you incorporating this RFI into your contract.

RFI Coordination

Sent RFI For Answer	Answered RFI
Grouten, Jr., Webster	Grouten, Jr., Webster

One Time CC Notification List

Attachments

RFI-00015 - Bid Package misc mech questions - CES Response.pdf

Request For Information Detail
with Consultant Reviewers

Strong School
Project #: J02445.975

RFI-00017 Rev: 0 Stage: Awaiting CM Acceptance Date Created: 03-23-2018

Author Reference Number: Cherry Hill Glass

Primary External Reviewer	Secondary Reviewer	Author Company	Authored By
Ayles, William		Giordano Construction Co	Rinaldi, Lou

Subject	Discipline	Category	Bid Package
PB - Security Frames & Glass			BP-08A-Windows and Curtainwall

Question **Date Required: 03-30-2018**

See attached from specified manufacturer for section 084113.13. Frames on drawing A324 exceed their max height size.

Please review and advise.

Suggestion

Answer **Answer Company: JCJ Architecture, PC** **Answered By: Ayles, William**

The curtainwall entry will be revised to have horizontal mullions on the panels that exceed 10'-0". The 8 panels that are currently shown as 11'-6" high will be revised to be 7'-0" on the lower portion and 4'-6" on the upper portion. The added horizontal mullion will be at the same height as the mullion over the entry doors.

The same revision will be made to SF-1 which is the interior vestibule entry.

Revised drawings will be issued in the next addendum.

Cycle Dates

Date Issued	Date Sent for Review	Date Answered
03-23-2018	03-23-2018	03-23-2018

Date Returned to Author **Date Answer Acknowledged**

Clarification Cycle Dates

Clarification Date Requested **Clarification Date Received**

Disclaimer

If the information provided in the response to this RFI constitutes a change in contract price or time, the trade contractor shall not proceed with this work unless authorized to do so by the Construction Manager in writing. The trade contractor shall provide the Construction Manager written notice within five (5) working days from receipt of this Request for Information that this RFI constitutes a change, all in accordance with Article 8 of the Contract Agreement. Should no change be required, a no cost change will be issued to you incorporating this RFI into your contract.

RFI Coordination

Sent RFI For Answer	Answered RFI
Grouten, Jr., Webster	Grouten, Jr., Webster

One Time CC Notification List

Consultant Review

Stage	Date Answered	Answer Contact	Answer Company	Answer

Attachments

TSS Email.pdf

Request For Information Detail

Strong School
Project #: J02445.975

RFI-00018	Rev: 0	Stage: Awaiting CM Acceptance	Date Created: 03-26-2018
Primary External Reviewer	**Secondary Reviewer**	**Author Company**	**Authored By**
Ayles, William		Giordano Construction Co	Rinaldi, Lou
Subject	**Discipline**	**Category**	**Bid Package**
PB - Misc Ductwork			BP-15A-Mechanical

Question

Date Required: 04-02-2018

1). Mechanical notes #10 calls for 6 of duct liner downstream of the VAV boxes however note # 14 calls for 10 of duct liner. Please confirm which is the case.

2). Please provide a spec for the type and thickness on the duct liner required.

3). Is duct liner required for the FCUs?

Suggestion

Answer

Answer Company: JCJ Architecture, PC **Answered By: Ayles, William**

1). Mechanical notes #10 calls for 6 of duct liner downstream of the VAV boxes however note # 14 calls for 10 of duct liner. Please confirm which is the case. - **CES Response: Keynote #10 does not apply, keynote #14 applies.**

2). Please provide a spec for the type and thickness on the duct liner required. - **CES Response: Refer to 230700 section 2.8-D and 3.5-D for "internally insulated" items.**

3). Is duct liner required for the FCUs? - **CES Response: Yes, refer to drawing M-604 fan coil unit schedule remark #2.**

Cycle Dates

Date Issued	Date Sent for Review	Date Answered
03-26-2018	03-26-2018	03-26-2018
Date Returned to Author	**Date Answer Acknowledged**	

Clarification Cycle Dates

Clarification Date Requested	Clarification Date Received

Disclaimer

If the information provided in the response to this RFI constitutes a change in contract price or time, the trade contractor shall not proceed with this work unless authorized to do so by the Construction Manager in writing. The trade contractor shall provide the Construction Manager written notice within five (5) working days from receipt of this Request for Information that this RFI constitutes a change, all in accordance with Article 8 of the Contract Agreement. Should no change be required, a no cost change will be issued to you incorporating this RFI into your contract.

RFI Coordination

Sent RFI For Answer	Answered RFI
Grouten, Jr., Webster	Grouten, Jr., Webster

One Time CC Notification List

Attachments

RFI-00018 - Bid Package misc mech questions - CES Response.pdf

BP #07A – Roofing Breakdown, Unit Prices & Allowances

BID BREAKDOWN

Bid breakdown totals are for bid comparison and scope review, totals below should include OH&P.

General Conditions & Miscellaneous Items	$_____
PVC Roofing System	$_____
Green Roof Trays	$_____
Roof Ballast	$_____
Roof Blocking	$_____
Roof Flashing, Fascias & Trim	$_____
Metal Roof Copings	$_____
Roof Curbs & Penetrations	$_____
Walkway Pads (shown on Roof Plans)	$_____
Walkpads Under PV Panel Areas	$_____
EFVM leak testing	$_____
TOTAL	$_____

GENERAL UNIT PRICES:

The Unit Prices shall remain valid for the entire life of the project and are to include all costs for labor, materials, tools, equipment, shipping, handling, storage, hoisting, rigging, distribution, protection of materials, wages, benefits, applicable taxes, insurance and any other required matters in order to achieve completion of the work. Overhead & profit should not be included in the unit prices. Further, the prices below will be used as a basis of additions and deletions to the scope of work, as applicable.

Unit Price 7A-1:

Description: Walkpads - furnish and install **$_____SF**

Unit Price 7A-2:

Description: Sealing of roof penetrations per roof manufacturer's typical details

Electrical Conduit / Piping less than 2" **$_____Each**

Electrical Conduit / Piping 2"-4" **$_____Each**

NEW HAVEN PUBLIC SCHOOLS
SCHOOL CONSTRUCTION PROGRAM

ADDENDUM NO. 3

DATE: March 27, 2018

PROJECT: Strong 21st Century Communications Lab School
Farnham Avenue
New Haven, 06515

FROM: JCJ Architecture, Inc.
120 Huyshope Avenue, Suite 400
Hartford, Connecticut 06106
(860) 247-9226

TO: Bidders of Record

This Addendum forms a part of the Contract Documents and modifies the original Bidding Documents dated September 8, 2017. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

This Addendum consists of four (4) pages and the following attached documents:

1. Drawings.
2. Specification Sections.

PROJECT MANUAL

1. TABLE OF CONTENTS: Add new Section
   "014339 MOCKUPS"

2. Section 014339 – MOCKUPS
   a. Add new Section. 6 pages.

Plumbing:

3. **REVISE**: Specification 220503
   a. Section 2.3-A: Sanitary piping: PVC shall be Schedule 40.
   b. Section 2.5-A: Storm water piping: PVC shall be Schedule 40.
   c. Section 2.11-C: Unions and flanges: PVC shall be Schedule 40.

Mechanical:

4. **CLARIFICATION**:
   a. Boiler flues refer to 235100 section 2.1.
   b. Boiler combustion air intake refer to 232113 section 2.6.

5. Specification 230700
   a. **REVISE**: Heat tracing: Specification 230700 section 2.11-A Manufacturers: BriskHeat Type SLM-Cable by Raychem or approved equal.

b. **REVISE:** Section 3.5 “Schedules” in Specification 230700- HVAC Insulation, shall read as follows: “Chilled water & condenser water supply and return”, Chilled water & condenser water supply and return cooling tower piping (outside of building).
c. **REVISE:** Section 3.5 “Schedules” in Specification 230700- HVAC Insulation, shall read as follows: “Refrigerant Liquid, Suction, Relief or Hot Gas”.

6. **ADD**: Specification 230900: All automatic control damper actuators and control valves, Belimo is an acceptable equal.
7. Specification 230993
   a. **CLARIFICATION:** Dewpoint sensors (D1 and D2) on MP Series drawings can be provided as single combination Temperature and Humidity sensors where BMS calculates space dewpoint as required within sequence of operations specifications 230993.
   b. **ADD:** Section 3.1-I: Provide additional control points for BMS devices as shown on M-700 series drawings.
   c. **ADD**: Section 3.33: Heat Trace Interface
   d. **CLARIFICATION:** Specification 230993 section 3.32 Utility monitoring revised per attached specification.
   e. **ADD:** Section 4.11 points list for chilled beam loop modulating control valve
   f. **REVISE**: Section 4.15 points listed for Condenser Water Isolation Valves Status & Condenser Water Isolation Valves.
   g. **ADD:** Section 4.19 points list
      1. Heat tracing at cold water makeup piping
      2. Expansion tank control valve

8. Specification 232113

   a. **REMOVE:** Section 2.2 “Chilled Water Piping, Buried” from Specification 232113- Hydronic Piping
   b. **REVISE:** Section 2.3 in Specification 232113- Hydronic Piping, shall read as follows: “Chilled Water & Condenser Water Piping”.
   c. **REVISE**: Combustion Air Piping: Specification 232113 section 2.6-A CPVC shall be schedule 40.

9. **ADD**: Plate and Frame HX: Specification 232116 section 2.17

10. **ADD**: Specification 235100 Section 2.1-A-5: Heat Fab Model CI Vent.

Electrical:

1. **CLARIFICATION:** Artis energy meters to be installed refer to Specification 230993 section 3.32 Utility monitoring revised per attached specification for additional information.

   a. Meters serving Artis energy system shall be installed by Division 26.

DRAWINGS

Fire Protection:

1. **ADD**: Sprinklers within soffit as indicated on drawing FP-111 an FP-112. Sidewall concealed sprinklers cover plates shall be custom colored to match architectural soffit.

Mechanical:

2. Women 110 and Men 112

    a. **CLARIFICATION:** Drawing M-112 & MP-112 VAV box serving Women 110 and Men 112 shall be type VAV-DHW.
    b. **ADD:** 1" Hot water supply and return piping to serve VAV-DHW within Women 110 and Men 112 .

3. Boys 204B & Girls 204A

    a. **CLARIFICATION:** Drawing M-122 & MP-122 VAV box serving Boys 204B & Girls 204A shall be type VAV-BHW
    b. **ADD:** 1" Hot water supply and return piping to serve VAV-BHW within Boys 204B & Girls 204A.

4. Boys 304B & Girls 304A

    a. **CLARIFICATION:** Drawing M-132 & MP-132 VAV box serving Boys 304B & Girls 304A shall be type VAV-BHW
    b. **ADD:** 1" Hot water supply and return piping to serve VAV-BHW within Boys 304B & Girls 304A.

5. **ADD:** Drawing M-601: add VAV-BHW to "Variable Air Volume Terminal Unit Schedule".
6. **REVISE:** Hot water supply and return pipe sizes serving Cafeteria area VAV boxes. Refer to revised drawing MP-122 for updated pipe sizes.
7. **ADD:** Air separator (AS-3) to "Chiller Hydronic System Equipment and Accessories" on drawing M-603
8. **CLARIFICATION:** Note on drawing M702 has been clarified.
9. **CLARIFICATION**: Section 4/M-300 was added to drawings to clarify the extent of work for Thermaduct exterior ductwork system.
10. **CLARIFICATION**: Hot water supply and return piping serving third floor was changed to 4" in lieu of 6" as shown on construction documents.

Electrical:

1. **DELETE**: Sheets EP-121, EP-122 and EP-131
2. **ADD**: Sheets EP-121, EP-122 and EP-131

a. Power and fire alarm connections to folding partition around main staircase.
b. Added and shifted fire alarm speaker/strobes.

3. **DELETE**: Drawing EL-112, wall mounted exit signs in the Main Lobby 102.
4. **ADD**: Drawing EL-112, Ceiling mounted exit signs in the Main Lobby 102

5. **CLARIFICATION**: Refer to contract documents drawing EP-131 for power and fire alarm connections to folding partition around main staircase.
6. **ADD:** Provide emergency Blue Light device, along with power and phone cabling/conduit as indicated on attached revised drawing SU-100.

RE-ISSUED DRAWINGS

1. L-102: Added blue light location.
2. L-610: Added detail 10 blue light foundation.
3. A-111: Changed wall type between Toilet 131A and Storage 131B to wall type Q.
4. A-111: Deleted 1 shelving unit in Storage 131B.
5. A-202: Deleted roof access ladder on elevation 1.
6. A-210: Revised elevation 4, SF-1 to add horizontal mullions at glazing panels and lower overall height of storefront.
7. A-210: Revised location of exit signs to be ceiling in lieu of wall mounted.
8. A-324: Revised elevation 2 to add horizontal mullions at glazing panels.
9. A-327: Added call out for detail 21/A-550.
10. A-327: Revised detail 1 to match blow up detail 4/A-503 and added call out on typical condition.
11. A-520: Revised details to clarify roof system AVB
12. A-521: Revised details to clarify roof system AVB
13. A-522: Revised details to clarify roof system AVB
14. A-550: Modified details 13, 16 & 18 to indicate correct ceiling type.
15. A-550: Added detail 21 for soffit condition at east gym/café curtain wall.
16. A-560: Revised glazing type in frame type C.
17. A-560: Modified detail 4 to indicate correct ceiling type.
18. A-561: Revised details 6, 7 & 8 to indicate correct 1/4" glazing thickness.
19. A-570: Revised SF-1 elevation to add horizontal mullions at glazing panels and lower overall height of storefront.
20. A-581: Revised section 3 mailbox slot depths.
21. SU-100: Added power for blue light.
22. FP-111
23. FP-112
24. M-112
25. M-122
26. M-132
27. MP-112
28. MP-122
29. MP-132
30. M-300
31. M-601
32. M-603
33. M-702
34. EL-112
35. EP-121
36. EP-122
37. EP-131
38. SU-100
39. L-102
40. L-610

END OF ADDENDUM NO. 3

Consulting Engineering Services, Inc.

Addendum

Addendum Number: 3

Addendum Date: March 27, 2018

Written To: Bruce Kellogg

Project Name: Strong School

CES Project Number: 2016387.00

Written By: Eric Romeo

The work shall be carried out in accordance with the following supplemental instructions and in accordance with the Contract Documents.

Description:

Fire Protection:

1. **ADD:** Sprinklers within soffit as indicated on drawing FP-111 an FP-112. Sidewall concealed sprinklers cover plates shall be custom colored to match architectural soffit.

Plumbing:

1. **REVISE**: Specification 220503
   a. Section 2.3-A: Sanitary piping: PVC shall be Schedule 40.
   b. Section 2.5-A: Storm water piping: PVC shall be Schedule 40.
   c. Section 2.11-C: Unions and flanges: PVC shall be Schedule 40.

811 Middle Street, Middletown, CT 06457 T 860.632.1682 F. 860.632.1768 ces@cesct.com cesct.com

Mechanical:

1. **CLARIFICATION**:
    a. Boiler flues refer to 235100 section 2.1.
    b. Boiler combustion air intake refer to 232113 section 2.6.
2. Specification 230700
    a. **REVISE**: Heat tracing: Specification 230700 section 2.11-A Manufacturers: BriskHeat Type SLM-Cable by Raychem or approved equal.
    b. **REVISE:** Section 3.5 "Schedules" in Specification 230700- HVAC Insulation, shall read as follows: "Chilled water & condenser water supply and return", Chilled water & condenser water supply and return cooling tower piping (outside of building).
    c. **REVISE:** Section 3.5 "Schedules" in Specification 230700- HVAC Insulation, shall read as follows: "Refrigerant Liquid, Suction, Relief or Hot Gas".
3. **ADD**: Specification 230900: All automatic control damper actuators and control valves, Belimo is an acceptable equal.
4. Specification 230993
    a. **CLARIFICATION:** Dewpoint sensors (D1 and D2) on MP Series drawings can be provided as single combination Temperature and Humidity sensors where BMS calculates space dewpoint as required within sequence of operations specifications 230993.
    b. **ADD:** Section 3.1-I: Provide additional control points for BMS devices as shown on M-700 series drawings.
    c. **ADD**: Section 3.33: Heat Trace Interface
    d. **CLARIFICATION:** Specification 230993 section 3.32 Utility monitoring revised per attached specification.
    e. **ADD:** Section 4.11 points list for chilled beam loop modulating control valve
    f. **REVISE**: Section 4.15 points listed for Condenser Water Isolation Valves Status & Condenser Water Isolation Valves.
    g. **ADD:** Section 4.19 points list
        i. Heat tracing at cold water makeup piping
        ii. Expansion tank control valve
5. Specification 232113
    a. **REMOVE:** Section 2.2 "Chilled Water Piping, Buried" from Specification 232113- Hydronic Piping
    b. **REVISE:** Section 2.3 in Specification 232113- Hydronic Piping, shall read as follows: "Chilled Water & Condenser Water Piping".
    c. **REVISE**: Combustion Air Piping: Specification 232113 section 2.6-A CPVC shall be schedule 40.
6. **ADD**: Plate and Frame HX: Specification 232116 section 2.17
7. **ADD:** Specification 235100 Section 2.1-A-5: Heat Fab Model CI Vent.
8. Women 110 and Men 112
    a. **CLARIFICATION:** Drawing M-112 & MP-112 VAV box serving Women 110 and Men 112 shall be type VAV-DHW
    b. **ADD:** 1" Hot water supply and return piping to serve VAV-DHW within Women 110 and Men 112 .
9. Boys 204B & Girls 204A
    a. **CLARIFICATION:** Drawing M-122 & MP-122 VAV box serving Boys 204B & Girls 204A shall be type VAV-BHW
    b. **ADD:** 1" Hot water supply and return piping to serve VAV-BHW within Boys 204B & Girls 204A.
10. Boys 304B & Girls 304A
    a. **CLARIFICATION:** Drawing M-132 & MP-132 VAV box serving Boys 304B & Girls 304A shall be type VAV-BHW
    b. **ADD:** 1" Hot water supply and return piping to serve VAV-BHW within Boys 304B & Girls 304A.

11. **ADD:** Drawing M-601: add VAV-BHW to "Variable Air Volume Terminal Unit Schedule".
12. **REVISE:** Hot water supply and return pipe sizes serving Cafeteria area VAV boxes. Refer to revised drawing MP-122 for updated pipe sizes.
13. **REVISE:** Drawing M-122 shift duct serving toilet 209A away from motorized door.
14. **ADD:** Air separator (AS-3) to "Chiller Hydronic System Equipment and Accessories" on drawing M-603
15. **CLARIFICATION:** Note on drawing M702 has been clarified.
16. **CLARIFICATION:** Section 4/M-300 was added to drawings to clarify the extent of work for Thermaduct exterior ductwork system.
17. **CLARIFICATION:** Hot water supply and return piping serving third floor was changed to 4" in lieu of 6" as shown on construction documents.

Electrical:

1. **DELETE:** Sheets EP-121, EP-122 and EP-131
2. **ADD:** Sheets EP-121, EP-122 and EP-131
    - **a.** Power and fire alarm connections to folding partition around main staircase.
    - **b.** Added and shifted fire alarm speaker/strobes.
3. **DELETE:** Drawing EL-112, wall mounted exit signs in the Main Lobby 102.
4. **ADD:** Drawing EL-112, Ceiling mounted exit signs in the Main Lobby 102.
5. **ADD:** Provide emergency Blue Light device, along with power and phone cabling/conduit as indicated on attached revised drawing SU-100.
6. **CLARIFICATION:** Artis energy meters to be installed refer to Specification 230993 section 3.32 Utility monitoring revised per attached specification for additional information.
    a. Meters serving Artis energy system shall be installed by Division 26.

Attachments:

1. 220503
2. 230700
3. 230993
4. 232113
5. 232116
6. 235100

1. FP-111
2. FP-112
3. M-112
4. M-122
5. M-132
6. MP-112
7. MP-122
8. MP-132
9. M-300
10. M-601
11. M-603
12. M-702
13. EL-112
14. EP-121
15. EP-122
16. EP-131
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NEW HAVEN PUBLIC SCHOOLS
SCHOOL CONSTRUCTION PROGRAM

SECTION 000100

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SCD Contractors List
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VOLUME 2 of 3

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DIVISION 31 – EARTHWORK

DIVISION 32 – EXTERIOR IMPROVEMENTS

DIVISION 33 – UTILITIES

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SECTION 014339

MOCKUPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. Section Includes:

1. Mockup requirements. Mock-ups are required for, but not limited to the following:

a. Build mockup of typical wall area as shown on Drawings, or if not indicated, as directed by Architect.
b. Build mockups for all typical exterior wall types in sizes approximately 10 feet high by 8 feet long by full thickness.

1) Include lower corner of curtain wall opening framed with sealant approximately 24 inches wide by 36 inches high in exterior wall mockup. It is important to demonstrate air vapor barrier flashing tie-ins to glazed aluminum curtain wall.
2) Include brick and metal panel mock up as selected by architect from manufacturer’s full range of standard colors.
3) Include through-wall flashing installed for a 24-inch length with a 12-inch length of flashing left exposed to view.
4) Include metal studs, sheathing, sheet waterproofing, anchors, insulation, and flashing in exterior wall mockup.
5) Clean one-half of exposed faces of mockups with masonry cleaner.

B. All mock-ups specified herein, under other Sections of the Specifications, and shown on drawings will be reviewed and approved by the Architect and Owner. Unaccepted mock-ups shall be replaced or reconstructed in part or in total and the extent of the replacement or reconstruction shall be at the discretion of the Architect and Owner. The Contractor shall carry forth mock-up replacement or reconstruction until Architect's acceptance is obtained. Mock-up costs, including as many replacements or reconstruction as necessary to gain Architect's acceptance, shall be included in the Contract Cost and Schedule.

1.3 RELATED SECTIONS:

A. Section 014500 - QUALITY CONTROL.

B. Section 033000 - CAST-IN-PLACE CONCRETE.

C. Section 042000 - UNIT MASONRY.

D. Section 047200 - CAST STONE MASONRY.

E. Section 054000 - COLD-FORMED METAL FRAMING.

F. Section 061600 - SHEATHING.

G. Section 072713 - MODIFIED BITUMINOUS SHEET AIR BARRIERS.

H. Section 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS.

I. Section 074210 - CONTINUOUS INSULATION WALL PANEL SUPPORT SYSTEM.

J. Section 074213.23 - METAL COMPOSITE MATERIAL WALL PANELS.

K. Section 079200 - JOINT SEALANTS.

L. Section 084413 - GLAZED ALUMINUM CURTAIN WALLS.

M. Section 088000 - GLAZING.

1.4 SUBMITTALS:

A. Submit the following under provisions of Section 013300 - SUBMITTAL PROCEDURES:

1. Submit shop drawing of mockup indicating sizes, finishes and method of construction and installation of each component

1.5 GENERAL:

A. Where requested by Architect, or as specified in individual specification sections, assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals, and finishes. Remove mock-up assemblies prior to date of Final Inspection, or as directed.

B. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Finishes, colors and textures of components shall be as specified for each component and shall be selected by the Architect.
2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.

C. Notify Architect a minimum of seven days in advance of dates and times when mockups will be constructed.

D. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

E. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.

F. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

G. Demolish and remove from site prior to requesting inspection for certification of Substantial Completion, all Mock-ups which are not permitted to remain as part of the finished work.

H. Demolish and remove mockups when directed unless otherwise indicated.

1.6 COORDINATION:

A. Coordinate work of trades and schedule elements to expedite the fabricating, furnishing, and installation of multiple component mock-ups specified herein, in other Sections of the Specifications, and as shown in the Contract Documents.

PART 2 - PRODUCTS

2.1 EXTERIOR WALL SECTION MOCK-UP:

A. Mockup Unit: Shall consist of one full size facsimile exterior wall section, as indicated on the Drawings using specified products as noted below. Mock-up shall be a minimum 10 feet high by 8 feet wide unless otherwise indicated.

1. General description: Mockup Unit shall include exterior masonry construction, with light gage steel stud framing backup and sheathing assembly. Mockup shall include all components specified and indicated which are typical to the exterior wall construction and additional components specified herein.

a. Fabricate mockup unit with face brick as specified, with selected mortar and backup consisting of 8 inch metal studs, exterior sheathing board on both sides of studs, and specified brick anchors.

1) Provide additional metal stud framing and cross-bracing required for construction of various components of the mockup panel.
2) Provide concealed various wood blocking, edgings, nailers, curbs, and cants required for receipt of various finishes and surfacing materials.

b. Fabricate aluminum facsimile window unit with glazing.

c. Include into mockup assembly all flashing, joint sealers, and all finish trim and accessories necessary to show typical completed construction including interior wall finish.

2. Finishes, colors and textures of components shall be as specified for each component and shall be selected by the Architect.

B. Components to be included in the mockup include, but are not limited to:

1. Section 033000 - CAST-IN-PLACE CONCRETE.

a. Provide a concrete foundation wall to a depth required to support wall mockup.

2. Section 042000 - UNIT MASONRY.

a. Provide type of brick and colored mortar specified, installed over gypsum sheathing with specified anchorage devices.
b. Provide one half of mockup with masonry backup.
c. Install architectural cast stone masonry units specified under Section 047200.

3. Section 054000 - COLD-FORMED METAL FRAMING:

a. Provide cold formed metal stud framing with bracing as required for construction and support of the mockup panel.

4. Section 061600 –SHEATHING:

a. Install sheathing board, on both sides of metal stud framing, with taped joints and membrane flashing.

5. Section 072713 - MODIFIED BITUMINOUS SHEET AIR BARRIER

a. Provide sheet applied air barrier over gypsum sheathing.

6. Section 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

a. Provide fluid-applied air barrier masonry back-up.

7. Section 074210 - CONTINUOUS INSULATION WALL PANEL SUPPORT SYSTEM

a. Install continuous insulation panel support system on upper section of cold formed metal stud framing.

8. Section 074213.23 - METAL COMPOSITE MATERIAL WALL PANELS

a. Install metal composite material wall panel over continuous insulation panel support system.

9. Section 079200 - JOINT SEALANTS:

    a. Provide joint sealant at perimeter of all components. Colors shall be selected by the Architect.

10. Section 084413 - GLAZED ALUMINUM CURTAIN WALLS: Provide glazed aluminum curtain wall with fixed glass, matching indicated luminum curtain wall unit profiles and dimensions.

    a. Fabricate with removable stop for installation of glass.
    b. Provide specified insulated glass into glazed aluminum curtain wall.
    c. Glazed aluminum curtain wall to be shop finished to match selected PVDF finish specified for aluminum curtain wall, matching color and sheen.
    d. Glazed aluminum curtain wall used in mock-up may not be incorporated into the Work.

11. Section 088000 - GLAZING:

    a. Provide glazing for curtain wall.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Construct mock-ups at locations indicated or, if not indicated, at locations directed by the Architect.

B. Construct mockup in time to make product and/or assembly modifications without delaying production work.

3.2 INSTALLATION:

A. Construct mockup to duplicate actual job conditions.

1. Locate at an area on site as directed by the Architect.
2. Provide foundations, bases, supports and braces adequate to make mockup stable and safe.

B. Provide weather protection for materials in mockups that are not exposed to weather in intended service. Protect accepted mockups from the elements with weather-resistant membrane.

3.3 REMOVAL:

A. Retain mock-ups during construction as a standard for judging completed work until time designated by the Architect and the Owner.

1. Completely demolish and remove mockups from the job site at time designated by Architect.
2. Accepted mock-ups (which are specifically identified by the Architect in other Sections to become part of the work) may be incorporated into the work provided they are not damaged during subsequent construction.

END OF SECTION 014339

NEW HAVEN PUBLIC SCHOOLS
SCHOOL CONSTRUCTION PROGRAM

SECTION 220503

PIPES AND TUBES FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Pipe and pipe fittings for the following systems:
1. Domestic water piping, within 5 feet of building.
2. Sanitary sewer piping, within 5 feet of building.
3. Storm water piping, within 5 feet of building.
4. Gas piping, within 5 feet of building.
5. Equipment drains and over flows.
6. Unions and flanges.
7. Underground pipe markers.
8. Bedding and cover materials.
9. Radon piping, within 5 feet of building.

B. Related Sections:
1. Section 23 04 00 – General Conditions for Mechanical Trades
2. Section 07 84 46 - Firestopping: Product requirements for firestopping for placement by this section.
3. Section 08 31 13 - Access Doors and Frames: Product requirements for access doors for placement by this section.
4. Section 09 91 23 - Painting and Coating: Product and execution requirements for painting specified by this section.
5. Section 22 05 16 - Expansion Fittings and Loops for Plumbing Piping: Product requirements for piping expansion compensation devices for placement by this section.
6. Section 22 11 00 - Facility Water Distribution: Product requirements for valves for placement by this section.
7. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment: Product requirements for pipe hangers and supports and firestopping for placement by this section.
8. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment: Product requirements for vibration isolation for placement by this section.
9. Section 22 07 00 - Plumbing Insulation: Product requirements for piping insulation for placement by this section.
10. Division 31 - Earthwork
11. Division 33 - Utilities

1.2 REFERENCES

A. American Society of Mechanical Engineers:
1. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
2. ASME B16.3 - Malleable Iron Threaded Fittings.
3. ASME B16.4 - Gray Iron Threaded Fittings.
4. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

5. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
6. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings (DWV).
7. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
8. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
9. ASME B31.9 - Building Services Piping.
10. ASME B36.10M - Welded and Seamless Wrought Steel Pipe.
11. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

B. ASTM International:
1. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.
2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
4. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
5. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
6. ASTM A536 - Standard Specification for Ductile Iron Castings.
7. ASTM B32 - Standard Specification for Solder Metal.
8. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
9. ASTM B43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes.
10. ASTM B75 - Standard Specification for Seamless Copper Tube.
11. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
12. ASTM B251 - Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.
13. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
14. ASTM B302 - Standard Specification for Threadless Copper Pipe, Standard Sizes.
15. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV).
16. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
17. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
18. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
19. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
20. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
21. ASTM C1053 - Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications.

22. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
23. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
24. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameters.
25. ASTM D2241 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
26. ASTM D2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.
27. ASTM D2464 - Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
28. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
29. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
30. ASTM D2513 - Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.
31. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
32. ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe.
33. ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.
34. ASTM D2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
35. ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
36. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
37. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
38. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
39. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems.
40. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
41. ASTM D2996 - Standard Specification for Filament-Wound Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pipe.
42. ASTM D2997 - Standard Specification for Centrifugally Cast Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
43. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
44. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
45. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

46. ASTM D3262 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.
47. ASTM D3517 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe.
48. ASTM D3754 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe.
49. ASTM D3840 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Nonpressure Applications.
50. ASTM F437 - Standard Specification for Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
51. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
52. ASTM F439 - Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
53. ASTM F441/F441M - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
54. ASTM F442/F442M - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).
55. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
56. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
57. ASTM F628 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core.
58. ASTM F679 - Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
59. ASTM F1281 - Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe.
60. ASTM F1282 - Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe.
61. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

C. American Welding Society:
   1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
   2. AWS D1.1 - Structural Welding Code - Steel.

D. American Water Works Association:
   1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
   2. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
   3. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.

4. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
6. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.
7. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service.
8. AWWA C950 - Fiberglass Pressure Pipe.

E. Cast Iron Soil Pipe Institute:
1. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
2. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

F. National Fire Protection Association:
1. NFPA 99 - Standard for Health Care Facilities.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate layout of piping systems, including equipment, critical dimensions, and sizes.

C. Product Data: Submit data on pipe materials and fittings. Submit manufacturers catalog information.

D. Design Data: Indicate pipe sizes. Indicate pipe sizing methods. Indicate calculations used. Submit calculations sealed by registered professional engineer.

E. Welders' Certificate: Include welders' certification of compliance with ASME Section IX.

1.4 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. All cast iron soil pipe and fittings shall be marked with the collective trademark of the cast iron soil pipe institute

C. Maintain one copy copies of each document on site.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing work of this section with minimum 3 years experience.

C. Design piping systems pipe hangers and supports under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location: State of Connecticut.

1.6 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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 61 00 – Basic Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01 61 00 – Basic Product Requirements: Environmental conditions affecting products on site.

B. Do not install underground piping when bedding is wet or frozen.

1.9 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate installation of buried piping with trenching.

PART 2 PRODUCTS

2.1 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Ductile Iron Pipe: AWWA C151.
1. Fittings: AWWA C110, ductile iron, standard thickness.
2. Joints: AWWA C111, rubber gasket with rods.
3. Jackets: AWWA C105 polyethylene jacket.

2.2 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L, drawn.
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder
3. Alternate NO 12: 2" and Smaller piping only. Press Fittings: IAPMO PS 117, ANSI LC1002, NSF61-G, EPDM sealing element and leak detection feature
a. Contractor must provide certification letter from press fitting manufacture indicating installer(s) compliance with manufactures practices.
b. Contractor shall log each fitting which shall reflect installer's initials. Each fitting shall provider permanent tag for each fitting installed. Tag shall indicate log number, installer initials, and date of install.

2.3 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. PVC Pipe: ASTM D1785, Schedule ~~80~~ ***40***, polyvinyl chloride (PVC) material, bell and spigot style solvent sealed joint ends.
1. Fittings: ASTM D2467, Schedule ~~80~~ ***40***, PVC.
2. Joints: ASTM D2855, solvent weld with ASTM D2564 Solvent cement.

2.4 SANITARY SEWER & VENT PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.
1. Fittings: Cast iron, ASTM A74.
2. Joints: ASTM C564, rubber gasket joint devices or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hub-less, service weight.
1. Fittings: Cast iron, CISPI 301.
2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.5 STORM WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. PVC Pipe: ASTM D1785, Schedule ~~80~~ ***40***, polyvinyl chloride (PVC) material, bell and spigot style solvent sealed joint ends.
1. Fittings: ASTM D2467, Schedule ~~80~~ ***40***, PVC.
2. Joints: ASTM D2855, solvent weld with ASTM D2564 Solvent cement.

2.6 STORM WATER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74 service weight, bell and spigot ends.
   1. Fittings: Cast iron, ASTM A74.
   2. Joints: ASTM C564, neoprene gasket system or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron, CISPI 301.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.7 GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53, Schedule 40, black steel, hot dipped, zinc coated, welded and seamless.
   1. Fittings: ASTM A234, forged steel welding type, with AWWA C105 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.
   2. Joints: ANSI B31.1, ANSI B31.2, ANSI B31.9, ASME Sec 1, welded.

2.8 GAS PIPING ABOVE GRADE

A. Steel Pipe: ASTM A53, Schedule 40, black steel, hot dipped, zinc coated, welded and seamless.
   1. Fittings: ASME B16.3, malleable iron screwed up to 3" size and ASTM A234, forged steel welding type for sizes over 3”.
   2. Joints: NFPA 54, threaded or welded to ANSI B31.2, ANSI B31,9 and ASME Sec 9.

B. Stainless Braided Flexible Gas Connector for final connection to appliance
   1. Stainless steel braided flexible gas hose connector, spinning and fittings, welded fitting connections with extruded coating. T & S Model HG-2 or approved equal.

2.9 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized.
   1. Fittings: ASME B16.3, malleable iron or ASME B16.4, cast iron.
   2. Joints: Threaded for pipe 2 inch and smaller; flanged for pipe 2-1/2 inches and larger.

2.10 CONDENSATE DRAIN PIPING

A. Copper Tubing: ASTM B88, Type L hard drawn.
   1. Fittings: ASME B16.18, cast bronze, or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, solder, Grade 95TA.

2.11 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:
   1. Ferrous Piping: Class 250, malleable iron, threaded.
   2. Copper Piping: Class 150, bronze unions with soldered.
   3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
   4. PVC Piping: PVC.
   5. CPVC Piping: CPVC.

B. Flanges for Pipe 2-1/2 inches and Larger:
   1. Ferrous Piping: Class 250, forged steel, slip-on flanges.
   2. Copper Piping: Class 150, slip-on bronze flanges.
   3. PVC Piping: PVC flanges.
   4. CPVC Piping: CPVC flanges.
   5. Gaskets: 1/16 inch thick preformed neoprene gaskets.

C. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions, or ASTM D2464, Schedule ~~80~~ **40**, threaded, PVC pipe.

2.12 UNDERGROUND PIPE MARKERS

A. Manufacturers:
   1. Seton
   2. Northtown
   3. Kolbi
   4. Substitutions: Section 01 60 00 - Product Requirements.

2.13 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type as specified in Section 31 23 33.

B. Cover: Fill Type, as specified in Section 31 23 33.

C. Soil Backfill from Above Pipe to Finish Grade: Soil Type, as specified in Section 31 23 33.

2.14 RADON PIPING

A. PVC Pipe: ASTM D1785, Schedule 40, polyvinyl chloride (PVC) material, bell and spigot style solvent sealed joint ends.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavated.

B. Verify trenches are ready to receive piping.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

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.

3.3 INSTALLATION - BURIED PIPING SYSTEMS

A. Install natural gas piping in accordance with NFPA 54.

B. Verify connection to existing piping system size, location, and invert are as indicated on Drawings.

C. Verify connection size, location, and inverts are as indicated on Drawings.

D. Establish elevations of buried piping with not less than 4 ft of cover.

E. Establish minimum separation of 4 from other services.

F. Excavate pipe trench in accordance with Section 31 23 33.

G. Install pipe to elevation as indicated on Drawings.

H. Install pipe on prepared bedding.

I. Route pipe in straight line.

J. Install pipe to allow for expansion and contraction without stressing pipe or joints.

K. Install shutoff and drain valves at locations indicated on Drawings in accordance with Section 22 11 00.

L. Install plastic ribbon tape continuous above pipe line; coordinate with Section 31, 23, 23, 31, 23, 17. Refer to Section 22 05 53.

3.4 INSTALLATION - ABOVE GROUND PIPING

A. Install natural gas piping in accordance with NFPA 54.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient.

D. Where required, bend pipe with pipe bending tools in accordance with procedures intended for that purpose.

E. Size and install gas piping to provide sufficient gas to supply maximum appliance demand at pressure higher than appliance minimum inlet pressure.

F. Install vent piping from gas pressure reducing valves to outdoors and terminate in weatherproof hood. Protect vent against entry of insects and foreign material.
1. Minimum Vent Size: Connection size at regulator vent connection.
2. Run individual vent line from each relief device, independent of breather vents.
3. Breather vents may be manifolded together with piping sized for combined appliance vent requirements.

G. Install gas pressure regulator with tee fitting not less than 10 pipe diameters down stream of regulator. Cap or plug one opening of tee fitting.

H. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 11 inch wg . Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

I. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

J. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

K. Group piping whenever practical at common elevations.

L. Sleeve pipe passing through partitions, walls and floors. Refer to Section 22 05 29.

M. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 21 05 16.

N. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 00.

O. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors with Section 08 31 13.

P. Install non-conducting dielectric connections wherever jointing dissimilar metals.

Q. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.

R. Slope piping and arrange systems to drain at low points.

S. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

T. Install piping penetrating roofed areas to maintain integrity of roof assembly.

U. Install valves in accordance with Section 22 11 00.

V. Install piping specialties in accordance with Section 23 21 16.

W. Insulate piping. Refer to Section 22 07 00.

X. Install pipe identification in accordance with Section 22 05 53.

3.5 INSTALLATION - DOMESTIC WATER PIPING SYSTEMS

A. Install domestic water piping system in accordance with ASME B31.9.

3.6 INSTALLATION - SANITARY WASTE AND VENT PIPING SYSTEMS

A. Install sanitary waste and vent piping systems in accordance with ASME B31.9.

3.7 INSTALLATION - STORM DRAINAGE PIPING SYSTEMS

A. Install storm drainage piping systems piping in accordance with ASME B31.9.

3.8 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements, Section 01 77 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Test domestic water piping system in accordance with local authority having jurisdiction.

C. Test sanitary waste and vent piping system in accordance with local authority having jurisdiction.

D. Test storm drainage piping system in accordance with local authority having jurisdiction.

3.9 CLEANING

A. Section 01 77 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. Clean and disinfect domestic water distribution system in accordance with Section 33 10 00.

END OF SECTION

NEW HAVEN PUBLIC SCHOOLS
SCHOOL CONSTRUCTION PROGRAM

SECTION 230700

HVAC INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. HVAC piping insulation, jackets and accessories.
2. HVAC equipment insulation, jackets and accessories.
3. HVAC ductwork insulation, jackets, and accessories.

B. Related Sections:
1. Section 07 84 46 - Firestopping: Product requirements for firestopping for placement by this section.
2. Section 09 91 23 - 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

1.2 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 C1071 - Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material).
18. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
19. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
20. ASTM D1785 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
21. ASTM D4637 - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane.
22. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
23. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

B. Sheet Metal and Air Conditioning Contractors':
1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

C. Underwriters Laboratories Inc.:
1. UL 1978 - Standard for Safety for Grease Ducts.

1.3 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. Samples: Submit two samples of representative size illustrating each insulation type.

D. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 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. Duct insulation, Coverings, and Linings: Maximum 25/50 flame spread/smoke developed index, when tested in accordance with ASTM E84, using specimen procedures and mounting procedures of ASTM E 2231.

E. Maintain one copy of each document on site.

1.5 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 approved by manufacturer.

1.6 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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 61 00 – Basic 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.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01 61 00 – Basic 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.

1.9 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 WARRANTY

A. Section 01 77 00 - Closeout Procedures: Product warranties and product bonds.

B. Furnish five year manufacturer warranty for man-made fiber.

C. Warranty shall include labor and materials for a minimum period of two (2) years unless otherwise specified. Warranty starts at date of Commissioning acceptance of a complete system and Owner approval

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.

B. Manufacturers for Closed Cell Elastomeric Insulation Products:
1. Aeroflex. Aerocell.
2. Armacell, LLC. Armaflex.
3. Nomaco. K-flex.

C. Manufacturers for Polyisocyanurate Foam Insulation Products:
1. Dow Chemical Company.
2. Substitutions: Section 01 60 00 - Product Requirements.

D. Manufacturers for Extruded Polystyrene Insulation Products:
1. Dow Chemical Company.
2. Johns Manville
3. Green Poly ISO

2.2 PIPE INSULATION

A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation.
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-2: 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: 10 mil.
   3. Connections: Brush on welding adhesive.

C. Aluminum Pipe Jacket:
   1. ASTM B209.
   2. Thickness: 0.020 inch thick sheet.
   3. Finish: Smooth.
   4. Joining: Longitudinal slip joints and 2 inch laps.
   5. Fittings: 0.02 inch thick die shaped fitting covers with factory attached protective liner.
   6. Metal Jacket Bands: 3/8 inch wide; 0.016 inch thick aluminum.

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 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 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

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: 10 mil.
   6. Connections: Pressure sensitive color matching vinyl tape.

B. Aluminum Equipment Jacket:
   1. ASTM B209 Thickness: 0.020 inch thick sheet.
   2. Finish: Smooth.
   3. Joining: Longitudinal slip joints and 2 inch laps.
   4. Fittings: 0.02 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.02 inch thick aluminum.

C. Canvas Equipment Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric with fire retardant lagging adhesive compatible with insulation.

D. 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.

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.

2.8 DUCTWORK INSULATION

A. TYPE D-1: ASTM C1290, Type III, flexible glass fiber, commercial grade with factory applied reinforced aluminum foil jacket meeting ASTM C1136, Type II.
   1. Thermal Conductivity: 0.27 at 75 degrees F.
   2. Maximum Operating Temperature: 250 degrees F.
   3. Density: 1.0 pound per cubic foot.

B. TYPE D-2: ASTM C612, Type IA or IB, rigid glass fiber, with factory applied all service facing meeting ASTM C1136, Type II.
   1. Thermal Conductivity: 0.23 at 75 degrees F.

2. Density: 6.0 pound per cubic foot.

C. TYPE D-3: Inorganic blanket encapsulated with scrim reinforced foil meeting UL 1978.
1. Thermal Conductivity: 0.42 at 500 degrees F.
2. Weight: 1.4 pound per square foot.
3. Surface Burning Characteristics: Maximum 0/0 flame spread/smoke developed index when tested in accordance with ASTM E84.

D. TYPE D-4: Closed Cell Elastomeric Liner
1. Insulation: ASTM C1534; flexible, polymeric foam sheet.
2. 'R' Valve: Minimum 4.0.
3. 'K' value: ASTM C518, 0.27 at 75 degrees F.
4. Maximum Service Temperature: 250 degrees F.
5. Maximum Velocity on Coated Air Side: 6,000 ft/min.
6. Thickness: 1 inch.
7. Noise Reducing Coefficient: NRC shall not exceed 0.3.
8. Adhesive: Waterproof, fire retardant type.
9.

E. TYPE D-5: ASTM C534, Type II, flexible, closed cell elastomeric insulation, sheet.
1. Thermal Conductivity: 0.27 at 75 degrees F.
2. Service Temperature Range: Range: Minus 58 to 180 degrees F.

2.9 DUCTWORK INSULATION JACKETS

A. Aluminum Duct Jacket:
1. ASTM B209.
2. Thickness: 0.020 inch thick sheet.
3. Finish: Smooth.
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.

B. Vapor Retarder Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film 0.0032 inch vinyl.
2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.
3. Secure with pressure sensitive tape.

C. Canvas Duct Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric with fire retardant lagging adhesive compatible with insulation.

2.10 DUCTWORK INSULATION ACCESSORIES

A. Vapor Retarder Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

B. Vapor Retarder Lap Adhesive: Compatible with insulation.

C. Adhesive: Waterproof, ASTM E162 fire-retardant type.

D. Liner Fasteners: Galvanized steel, self-adhesive pad with head.

E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

F. Lagging Adhesive: Fire retardant type with maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

G. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.

H. Adhesives: Compatible with insulation.

I. Membrane Adhesives: As recommended by membrane manufacturer.

2.11 ELECTRIC HEAT TRACING

A. Manufacturers: ~~*BriskHeat Type SLM-Cable or approved by Raychem or Heat-Trace.*~~ ***BriskHeat Type SLM-Cable by Raychem or approved equal***

B. Characteristics:
1. Self-limiting, parallel circuit type which automatically self regulates heat output. Cable shall be acceptable for operating temperatures to 250 degrees F. Product shall be Factory Mutual approved or UL listed.
2. Construction: 16 gauge nickel plated copper conductor, self-regulating conductive core, thermoplastic elastomer inner jacket, metallic over-braid and thermoplastic outer jacket.

C. Temperature Controller: BriskHeat Model TB250N controller with bulb type sensor and 10’0” long capillary, NEMA 3R enclosure, 22 amp SPDT switch and adjustable range of 0 to 150 degrees F.

D. Provide (3) circuits with individual temperature controllers as follows (maximum 20A C/B):
1. CWS Piping to cooling towers: Capacity shall 5 watts per foot with 208 volt / 1 phase electrical power. Maximum length per circuit shall be 100feet
2. CWR Piping to cooling towers: Capacity shall be 5 watts per foot with 208 volt / 1 phase electrical power. Maximum length per circuit shall be 100 feet
3. Cold Water Piping to cooling towers: Capacity shall be 5 watts per foot with 208 volt / 1 phase electrical power. Maximum length per circuit shall be 100 feet.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify piping, equipment and ductwork 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 Provide with PVC Plastic pipe jacketing for additional protection. 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 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. Hot Piping Systems:
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.

F. 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.

G. 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.

H. 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.

I. Pipe Exposed in Mechanical Equipment Rooms and similar spaces or Finished Spaces less than 10 feet above finished floor: Finish with PVC jacket and fitting covers.

J. 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 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.

K. 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.

L. 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.

M. 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 jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water.

N. 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.

H. Equipment Located Exterior to Building: Install vapor barrier jacket or finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal equipment.

I. Cover glass fiber, cellular glass, cellular foam insulation with metal mesh and finish with heavy coat of insulating cement.

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.

3.4 INSTALLATION - DUCTWORK SYSTEMS

A. Duct dimensions indicated on Drawings are finished inside dimensions.

B. Insulated ductwork conveying air below ambient temperature:
1. Provide insulation with vapor retarder jackets.
2. Finish with tape and vapor retarder jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. Insulated ductwork conveying air above ambient temperature:
1. Provide with or without standard vapor retarder jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. Ductwork Exposed in Mechanical Equipment Rooms or Finished Spaces below 10 feet above finished floor: Finish with canvas jacket sized for finish painting.

E. External Glass Fiber Duct Insulation:
1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.
2. Secure insulation without vapor retarder with staples, tape, or wires.
3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

F. External Elastomeric Duct Insulation:
1. Adhere to clean oil-free surfaces with full coverage of adhesive.
2. Seal seams and butt joints with manufacturer’s recommended adhesive.
3. When application requires multiple layers, apply with joints staggered.

4. Insulate standing metal duct seams with insulation of like material and thickness as adjacent duct surface. Apply adhesive at joints with flat duct surfaces.
5. Lift ductwork off trapeze hangers and insert spacers.

G. Duct and Plenum Liner:
1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Comply with SMACNA Standards for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Cut insulation for tight overlapped corner joints. Support top pieces of liner at edges with side pieces.

H. Kitchen Exhaust Ductwork:
1. Cover duct by wrapping with insulation using overlap method and butt joint with collar method.
2. Overlap seams of each method by 3 inches.
3. Attach insulation using steel banding or by welded pins and clips.
4. Install insulation without sag on underside of ductwork. Use additional fasteners to prevent sagging.

I. Ducts Exterior to Building:
1. Install insulation according to external duct insulation paragraph above.
2. Provide external insulation with vapor retarder jacket. Cover with outdoor jacket finished with caulked aluminum jacket with seams located on bottom side of horizontal duct section.
3. Finish with aluminum duct jacket.
4. Calk seams at flanges and joints. Located major longitudinal seams on bottom side of horizontal duct sections.

J. Prepare duct insulation for finish painting. Refer to Section 09 90 00.

3.5 SCHEDULES

A. Cooling Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Chilled Water ***& Condenser Water*** Supply and Return	P-1	1-1/4 inches and smaller 1-1/2 inches inch and larger	1.5 2.0
Chilled Water ***& Condenser Water*** Supply and Return, Cooling tower piping (outside of building)	P-2	1-1/2 inches and smaller 2 inches and larger	2.0 3.0
Condensate piping from cooling coils	P-2	All sizes	0.5
Refrigerant Liquid, Suction, ***Relief*** or Hot Gas	P-2	All sizes	1.5

B. Heating Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Heating Water Supply and Return	P-1	1.5 inches and smaller 2 inches and larger	1.5 2.0
Heating Water Supply and Return (outside of building)	P-2	1-1/2 inches and smaller 2 inches and larger	2.0 3.0

C. Equipment Insulation Schedule:

EQUIPMENT	INSULATION TYPE	INSULATION THICKNESS inches
Chilled Water Pump Bodies	E-1	1.0
Chilled Water Air Separators	E-1	1.0
Chilled Water Expansion Tanks	E-1	1.0
Chiller cold surfaces (not factory insulated)	E-1	1.0

D. Ductwork Insulation Schedule:

DUCTWORK SYSTEM	INSULATION TYPE	INSULATION THICKNESS inches
Combustion Air	D-2	2.0
Outside Air Intake	D-2	2.0
Equipment Casings	D-2	2.0
Supply Ducts/Conditioned OA (internally insulated)	D-4	1.5
Return Ducts/Exhaust Ducts (internally insulated)	D-4	1.0
Supply Ducts/Conditioned OA (externally insulated)	D-1 or D-2	1.5
Return Ducts/Exhaust Ducts (externally insulated)	D-1 or D-2	1.5
Transfer air ducts (internally insulated)	D-4	1.0
Duct Coils	D-1	1.5

Kitchen Exhaust Duct (2 layers of 1-1/2 inch each)	D-3	3.0
Supply Air, Return Air, Outside Air, Exhaust Air (exterior to building on roof)	D-2	2.0
Supply Air, Return Air, Outside Air, Exhaust Air (within a ventilated attic or ceiling space or exterior to building on roof)	D-2	2.0
Exhaust Ducts Within 10 feet of Exterior Openings	D-1 & D-2	1.5
Rectangular Supply Ducts Downstream of Variable Air Volume Boxes (internally insulated)	D-4	1.0
Supply and Return Ducts Downstream/Upstream of Variable Refrigerant Volume Unit (internally insulated)	D-4	1.0
Supply Air and Return Air Ducts installed outside the building envelope.	D-5	(2) layers of 2.0” with staggered seams

END OF SECTION

SECTION 230993

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:
   1. Section 23 0400 – General Conditions for Mechanical Trades
   2. Section 23 09 00 - Direct-Digital Control System for HVAC
   3. Division 26 - Electrical
   4. Division 27 - Communication
   5. Division 28 - Electronic Safety and Security.

1.2 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate mechanical system controlled and control system components.
   1. Label with settings, adjustable range of control and limits. Submit written description of control sequence.
   2. Submit flow diagrams for each control system, graphically depicting control logic.
   3. Submit draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.
   4. Coordinate submittals with information requested in Section 23 0900 and 23 0993.

1.3 CLOSEOUT SUBMITTALS

A. Section 01 7700 - Closeout Procedures.

B. Project Record Documents: Record actual locations of components and set points of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 GENERAL

A. Provide all controls, low voltage control wiring, hardware points (analog in, analog out, binary in, binary out) and accessories as required to perform the

control sequences indicated. Additionally, provide hardware points indicated regardless that such points may not be required to perform the control sequences indicated.

B. Unless otherwise indicated, setpoints and values listed in the sequence of controls shall be adjustable by the Owner thru the DDC (direct digital controls) or BMS (Building Management System) (BMS and DDC are used interchangeably and share same meaning) graphical interface; the Owner shall not be required to edit operating code in order to change any of the setpoints and values.

C. Heating shall only be enabled when the system is indexed to heating mode (shall occur when outside air temperature is below 65°F) OR by call from the DOA's per the DOA sequence of operations (section 3.20) and matrix; during condition 01B (full recovery, dehumidify stage 2) After the chilled water valve has been at 100% open for a time of 10 mins, the preheat coil will modulate to satisfy the conditioned air target dew point.

D. Devices such as CUH and UH shall operate on a soft permissive, only allowing fans to start and control valves to open when system is in heating mode, use of aquastats is not acceptable.

E. Temperature Sensors
   1. General
      a. Where temperature ranges, reset temperatures, setback temperatures, setup temperatures, deadbands, override times, etc. are indicated, those values shall be adjustable both globally and locally.
      b. There shall be two independent interfaces for global settings for the following space categories.
         1) Corridors, restrooms, vestibules, storage rooms, janitor closets, electrical closets, data closets/rooms, and mechanical rooms
         2) Other spaces
      c. Each temperature control zone shall be initially set to default to the global settings, with a flag or similar to override the global setting for each of the values for that zone.
      d. The values indicated herein shall be the initial global settings.

   2. Corridors, restrooms, vestibules, storage rooms, janitor closets, electrical closets, data closets/rooms, and mechanical rooms
      a. Unless otherwise indicated, temperature sensors shall be the Stainless Steel dead front type sensors. Initial setpoints for dead front sensors shall be as follows:

b. Occupied
   1) Heating (defined as outside air temperature is below 65°F): 68°F.
   2) Cooling (defined as outside air temperature is above 68°F): 75°F.
c. Unoccupied
   1) Heating: 55°F.
   2) Cooling: 82°F.

3. Other spaces
   a. Unless otherwise indicated, temperature sensors shall be the Stainless Steel dead front type sensors. Initial setpoints for dead front sensors shall be as follows:
   b. Occupied
      1) The space temperature setpoint shall be at 68°F when the outside air temperature is below 65°F, and shall be at 75°F when the outside air temperature is above 68°F.
   c. Unoccupied
      1) Heating: 60°F.
      2) Cooling: 82°F.

F. Occupied Override
   1. Where occupancy sensors (refer to electrical drawings for occupancy sensor quantities and locations) are located in the same space as a temperature sensor, the auxiliary contacts of the occupancy sensors shall be connected to the BMS for occupied override purposes.
   2. Occupied mode
      a. Spaces indexed to occupied mode shall remain in occupied mode unless the occupancy sensors do not detect occupancy for 10 minutes continuously. At 10 minutes since the last detection of occupancy, the cooling and heating setpoints of the spaces shall be reset to 2°F higher and 2°F lower than the setpoint respectively.
      b. Once in unoccupied mode, the cooling and heating setpoints shall remain at the reset temperatures (2°F higher and lower) until the occupancy sensors detect occupancy for 5 minutes continuous. At 5 minutes continuous occupancy, the occupied setpoint shall be restored.
   3. Unoccupied mode
      a. Spaces indexed to unoccupied mode shall remain in unoccupied mode unless the occupancy sensors detect occupancy for 10 minutes continuously. At 10 minutes continuous occupancy, the occupied setpoint shall be used.
      b. Once in the occupied mode, the setpoint shall remain at the occupied setpoint until the occupancy sensors do not detect occupancy for 5 minutes continuous. At 5 minutes since the last detection of occupancy, the unoccupied setpoints shall be restored.
   4. See the lighting plans for the locations of the occupancy sensors.

G. Occupied/Unoccupied Programming
   1. The HVAC equipment shall be programmed with optimal start/stop for all equipment so that equipment start and start times are determined BMS based on outside air conditions and system learns BMS based on past building history. The operator station software configuration shall allow the Owner to easily select the occupied and unoccupied hours by individual zone, global by air handler, or global by building. The BMS shall trend the outside air temperature with respect to the warm-up times, and shall optimize the warm-up times such that the spaces reach occupied temperature by the time selected.

H. Air handling units: Shall remain in the unoccupied mode until all spaces served reach occupied setpoints, at which point the units shall be indexed to occupied mode.

I. Provide additional control points for BMS devices as shown on M-700 series drawings.

3.2 CONTROL DEVICES

A. All devices and sensors shall be adjustable. BMS shall display setpoints and actual conditions/status of all control devices and position of all actuators (damper and valve feedback, with the exception of at Fin Tube, Radiant Floor, Radiant Panels, CUH and UH where position/status of actuators is not required at control valve) at the Operator Workstation thru the use of end switches and potentiometers integral to actuators.

3.3 ECONOMIZER COOLING

A. Where economizer cooling is indicated as the first stage of cooling, the economizer cooling sequence of control shall be as follows:
   1. Economizer cooling shall be enabled when all of the following are true (see also paragraph 2.):
      a. The outside air temperature is less than 65°F.
      b. The outside air temperature is less than the return air temperature.
      c. The outside air enthalpy is less than 22 btu/lb.
      d. The outside air enthalpy is less than the return air enthalpy.
   2. The BMS system operator shall, via single click editing, be easily able to select any or all of items a. thru d. of the previous paragraph for economizer enabling, for individual air handling systems and for air handling systems globally. Additionally, the BMS system operator shall be easily able to globally change the setpoints for items a. and c. of the previous paragraph.
   3. Economizer cooling shall be integrated; economizer cooling shall continue to operate during stages of mechanical cooling as long as all four of the conditions indicated in paragraph 1 are true (or as selected by the system operator per paragraph 2).
   4. When both mechanical cooling is anticipated to be required the next day (by trending the outside air enthalpy), and economizer cooling is available during the unoccupied cycle, economizer cooling shall be

operated during the unoccupied cycle to pre-cool the spaces served by the air handler to 70°F.

3.4 HEATING HOT WATER COILS

A. Integral to Air Handling Units & Dedicated Outdoor Air Units: See sequence of operation for air handling units and dedicated outdoor air units.

3.5 CHILLED WATER COILS

A. Integral to Air Handling Units & Dedicated Outdoor Air Units: See sequence of operation for air handling units and dedicated outdoor air units.

3.6 CHILLED BEAMS

A. General: The chilled beam valves shall be disabled from flowing chilled water during morning warm-up until such time that dewpoint sensor in space (associated with beams that are served by valve in question) achieve a reading of 56 degrees F or less at which time valves shall be enabled.
   1. Heating Mode – The radiant panels or fin tube radiation or radiant floor (where installed) shall operate as the first stage of heating in both occupied and unoccupied modes. If the radiant panel, or fin tube radiation, or radiant floor valve has been commanded to modulate to full open, and the space temperature remains below setpoint for 10 minutes (adjustable), the BMS shall command the associated chilled beam control valves to heat mode during occupied periods and flow heating hot water. The valve serving chilled beam shall modulate to maintain space setpoint temperature.

B. If unacceptable above 56 degrees F (setpoint adjustable) dewpoint level is sensed during cooling mode operation by space dewpoint sensor located on wall, associated chilled beam control valve shall be disabled from flowing chilled water until such point that acceptable dewpoint is sensed in space. Space dewpoint shall be displayed at BMS graphic.

3.7 CHWS/HWS EQUALIZING VALVE CONTROL

A. Once per day (adj.), during unoccupied periods, the equalizing valve located between the CHWS and HWS shall be commanded open for 5 minutes (adj.) the chilled and hot water pumps shall be commanded off during equalizing time. The valve then shall be commanded to the normally closed position. Time schedule and duration of system pressure equalization sequence shall be adjustable by at the operator workstation interface.

3.8 CHILLED BEAM AND VAV ZONE CONTROL

A. General: The chilled beam control valves shall not open during cooling mode until proof (by space dewpoint sensor) that space dew point is at acceptable level to support flow of chilled water through chilled beam coil. If unacceptable dewpoint level is sensed during cooling operation, the chilled beam control valves shall close.

B. Occupancy – The occupancy mode shall be communicated by the BMS. Valid Occupancy modes for the Chilled Beam shall be:
   1. Occupied: Normal operating mode for occupied spaces or daytime operation. When the DOA unit is in the occupied mode the chilled beam shall maintain the space temperature at the active occupied heating or cooling setpoint. The occupied mode shall be the default mode of the chilled beam controllers.
   2. Unoccupied: Normal operating mode for unoccupied spaces or nighttime operation. When the DOA unit is in unoccupied mode the chilled beam shall maintain the space temperature at the stored unoccupied heating or cooling setpoint. The local space temperature sensor setpoint shall not be used in unoccupied. When the space temperature exceeds the active unoccupied setpoint the chilled beam controller shall bring on 100% of the primary heating or cooling capacity.
      a. In unoccupied cooling mode, the DOA shall temper air as first stage of cooling. If zone setpoint is not met after 30 minutes (adjustable) the chilled beam cooling valve shall modulate to maintain space temperature.

   3. Occupied Standby (zones where Chilled beams are served by VAV's): During occupied periods, if the local occupancy sensor indicates that the zone is unoccupied, the BMS zone controller shall command the Control Module to maintain the occupied outdoor air CFM setpoint minus 30%, and the chilled beam valve shall modulate to maintain the occupied space temperature setpoint +2F during cooling operation, and -2F for during heating operation.

C. On call for heating from the zone temperature sensor, the chilled beam control valve shall modulate open in the heating position.

D. On call for cooling from the zone temperature sensor, the chilled beam control valve shall modulate open in the cooling position.

E. VAV Box Operation - Each chilled beam zone served by a variable volume terminal unit.
   1. During Occupied Periods:
      a. First stage VAV box operation: The BMS zone controller shall control the VAV damper to modulate airflow BMS based on demand control ventilation to maintain CO2 levels.
      b. Second stage VAV box operation: If ventilation CO2 levels are satisfied but the temperature is not satisfied the BMS zone controller shall modulate the VAV damper up to 100% opened to maintain zone occupied design outdoor air CFM setpoint via a modulating signal (i.e. 0-10v.) The BMS shall modulate the control air damper to maintain the required CFM setpoint and temperature setpoint to the chilled beam zone.
   2. During Unoccupied periods:
      a. DOA shall maintain space temperature and humidity.
      b. The BMS zone controller shall control the VAV damper to the occupied design outdoor air CFM minus 30% (adj.) via the

modulating signal (i.e. 0-10v.). The BMS shall then modulate the control air damper to maintain the required CFM setback setpoint.

3.9 FANS

A. General: Each fan shall have status provided at the DDC (direct digital controls system) display as well as generate an alarm at the DDC display if fan failure occurs.

B. EF-1: Constant Operation Exhaust Fan: Shall operate continuously during both occupied and unoccupied periods.

C. Exhaust Fan EF-2: See refrigeration monitoring and control sequence below.

D. Radon Exhaust Fan- REF-1,2,3:
1. Constant Operation Exhaust Fan: Shall operate continuously during both occupied and unoccupied periods. Fan shall create negative pressure below slab.
2. Alarms: pressure switch/alarm, with warning signal relay, mounted in each main radon exhaust riser to roof.

E. Circulation Fans CF-1 thru 3: Run Conditions – Scheduled Occupancy: The unit shall run according to a user definable time schedule. Fans shall be enabled during occupied period heating mode, fan shall be disabled during cooling mode and unoccupied mode.
1. Occupied: When the unit is in the occupied mode, the Fans shall run continuously. Fan Status Shall be monitored by the BMS. If Fan Status does not match the commanded value, an alarm shall be generated at the Operator Workstation.
2. Unoccupied: When the unit is in the unoccupied mode, the Fans shall be off. Fan Status Shall be made available to BMS. If Fan Status does not match the commanded value, an alarm shall be generated at the Operator Workstation.
3. Occupied Override: An authorized user at the Operator Workstation shall be able to override the current mode of operation.

F. Kitchen Exhaust Fan KEF-1: Shall operate based on the interlocked heat sensor and based on schedule (adjustable) provided by BMS.

3.10 CABINET UNIT HEATERS AND FAN COIL UNITS – LOCATED IN VESTIBULES

A. General: Each CUH or FCU shall have fan status provided at the DDC display. Each CUH or FCU shall have stainless steel sheath thermistor double tie wrapped to return piping adjacent to CUH or FCU control valve, temperature reading from thermistor shall be displayed at the Operator Workstation for monitoring/troubleshooting purposes; thermistor reading shall not be used for control.

B. Heating mode: The heating control valve shall be closed when outdoor air temperatures are above 45°F. Vestibule heating systems shall also be controlled by a thermostat in the vestibule with a setpoint limited to a maximum of 60°F.

C. Occupied: On call for heating, the control valves shall be open and the fan shall be on.

D. Unoccupied: On call for heating, the control valves shall be open and the fan shall be on.

3.11 CABINET UNIT HEATERS

A. General: Each CUH shall have fan status provided at the DDC display. Each CUH shall have stainless steel sheath thermistor double tie wrapped to return piping adjacent to CUH control valve, temperature reading from thermistor shall be displayed at the Operator Workstation for monitoring/troubleshooting purposes; thermistor reading shall not be used for control.

B. Occupied: On call for heating, the control valves shall be open and the fan shall be on.

C. Unoccupied: On call for heating, the control valves shall be open and the fan shall be on.

3.12 UNIT HEATERS (HYDRONIC AND ELECTRIC)

A. General: Each UH shall have fan status provided at the DDC display. Each UH shall have stainless steel sheath thermistor double tie wrapped to return piping adjacent to UH control valve, temperature reading from thermistor shall be displayed at the Operator Workstation for monitoring/troubleshooting purposes, and thermistor reading shall not be used for control.

B. Occupied: On call for heating, the control valve shall be open and the fan shall be on.

C. Unoccupied: On call for heating, the control valve shall be open and the fan shall be on.

D. Electric Unit Heater Only:
   1. Electric unit heaters shall be set at 40F (adj) to prevent piping from freezing in the event of boiler failure, on call for heating (when temperature drops below 40), coil shall be energized and fan shall start.
   2. In lieu of thermistor, BMS shall monitor space temperature and alarm if space temperature drops below 34F (adj).

3.13 FIN TUBE RADIATION

A. General: Each piece of Fin Tube Radiation shall have stainless steel sheath thermistor double tie wrapped to return piping adjacent to Fin Tube Radiation control valve, temperature reading from thermistor shall be displayed at the

Operator Workstation for monitoring/troubleshooting purposes, thermistor reading shall not be used for control.

B. R1 & R2 (Fin Tube Radiation shall be the first stage of heating.)
   1. Occupied: On call for heating the control valve shall be open.
   2. Unoccupied: On call for heating the control valve shall be open.

3.14 RADIANT CEILING PANELS

A. General: Each Radiant Ceiling Panel zone shall have stainless steel sheath thermistor double tie wrapped to return piping adjacent to Radiant Ceiling Panel control valve, temperature reading from thermistor shall be displayed at the Operator Workstation for monitoring/troubleshooting purposes; thermistor reading shall not be used for control.

B. Radiant Ceiling Panel (shall be the first stage of heating.)
   1. Occupied: On call for heating the control valve shall be open.
   2. Unoccupied: On call for heating the control valve shall be open.

3.15 GLYCOL MAKE UP PACKAGES

A. Connect to the alarm contacts of the glycol make-up package. Upon closure of contacts an alarm condition shall be generated at the DDC display.
   1. Provide the following points and controls for the glycol make-up package.
      a. System enable.
      b. Low glycol level (float).
      c. Pump operation.
      d. Alarm.

3.16 GLYCOL REFRACTOMETER

A. Glycol Refractometer (GR) shall be AFAB Enterprises Model PR-111, Misco Model M-111 or approved equal. Power supply shall be 120V, 1 phase or 24 VAC, 1 phase. BMS contractor shall provide branch circuit power to device. GR shall be provided with stainless steel sensing element, 4-20 mA output and 0-100% analog display meter. Provide adapters for varying pipe sizes. GR shall be calibrated over a 60ºF range for types of glycol and % of solution as shown on the drawings

B. Connect glycol refractometer to DDC system for both heating hot and chilled water systems. Upon reading of 27% or less glycol in system an alarm condition shall be generated at the DDC display. Refractometer's for both systems shall be installed per piping details and furnished by this specification section.

3.17 VARIABLE AIR VOLUME TERMINAL UNITS

A. General: Each VAV box shall display airflow (CFM), discharge air temperature, damper position.
   1. VAV minimum airflow shall be 30% less than sum of diffusers served.
   2. VAV maximum airflow shall be sum of diffusers served.

B. Single duct, air only
   1. Occupied: The damper shall be open and modulate BMS based on wall mounted space pressure sensor located in space which they serve to maintain a space pressure of 0.02" wg positive with respect to the outside air pressure.
   2. Unoccupied: The damper shall be at minimum position.

C. Single duct, air only, CO2 controlled
   1. Damper
      a. Occupied: The damper shall modulate to provide outside air to satisfy the wall mounted CO2 sensor in associated space. Wall mounted CO2 sensor shall maintain the CO2 level of the associated space at a fixed CO2 level of 900 ppm (adj.) or less.
      b. Unoccupied: The damper shall be at minimum position.

D. Single duct, air only, and CO2 (VAV serving chilled beam)
   1. Refer to section 3.8 for VAV with chilled beam sequence.

E. Single duct, air only, heating coil, and CO2
   1. Damper
      a. Occupied (Heating): The damper shall modulate to provide outside air to satisfy the wall mounted CO2 sensor in associated space. Wall mounted CO2 sensor shall maintain the CO2 level of the associated space at a fixed CO2 level of 900 ppm (adj.) or less.
      b. Occupied: The damper shall be at minimum position except on call for cooling. On call for cooling, damper shall modulate between minimum and maximum positions as required to maintain the space cooling temperature setpoint.
      c. Unoccupied: The damper shall be at minimum position except on call for cooling or heating. On call for cooling, damper shall modulate between minimum and maximum positions as required to maintain the space cooling temperature setpoint. On call for heating, damper shall modulate to maintain the minimum position
   2. Heating
      a. Occupied: The reheat will be enabled when the space temperature drops below the active cooling setpoint and the airflow is in the minimum cooling airflow setpoint. During reheat the VAV shall operate at its minimum heating airflow setpoint and modulate the hot water control valve as required to maintain the active heating setpoint.
      b. Unoccupied: The damper shall be at minimum position. Upon call for heating the control valve shall modulate to maintain a discharge air temperature of 95°F

F. Single duct, air only, heating coil (Kitchen)
   1. Damper
      a. KEF-1 On: The dampers shall be open and modulate BMS based on wall mounted space pressure sensor located in Kitchen to maintain a space negative pressure of 0.02" wg with respect to the outside air pressure. Within the Cafeteria, maintain a space

positive pressure of 0.02" wg with respect to the outside air pressure. Dampers shall open and close independent of each other.

b. KEF-1 Off: The VAV box shall follow sequence for regular type 4 box put forth above.

2. Heating
   a. KEF-1 On:
      1) Control Valve: The control valve shall modulate to maintain a discharge air temperature of 75°F.
   b. KEF-1 Off: The VAV box shall follow sequence for regular type 4 box put forth above.

3.18 RADIANT FLOOR SYSTEM

A. Radiant Floor Zone Pumps
   1. When space temperature set point drops below set point, the radiant floor zone pump shall operate continuously.

B. Three Way Mixing Radiant Slab Control Valve
   1. General: Radiant Slab heating shall be first stage of heating.
   2. Provide a temperature sensors in the floor slab at representative locations (1 per zone). The temperature sensors shall be used for modulating the radiant slab control valve.
   3. Each of the three way control valves shall modulate to maintain an average slab temperature on a reset schedule, such that the unoccupied space temperature of the radiant floor spaces is maintained at 60°F. The reset schedule shall be set initially to reset the average floor temperature from 70°F to 80°F from outside air temperatures of 55°F to 0°F, but shall be adjusted by trending the space temperatures during the unoccupied cycle to optimize the 60°F average unoccupied space temperature setpoint. The radiant floor supply (RFS) water temperature shall be limited to 130°F.

C. Alarms
   1. High radiant floor supply (RFS) water temperature: 135°F.

D. Hardware Points (in addition to those required by the sequence of control)
   1. Binary In: Pump failure, by current sensor or by differential water pressure switch.
   2. Analog In: Radiant floor return (RFR) water temperature.

E. If the radiant floor heating system is unable to maintain space temperatures the VAV units, or chilled beams shall operate as a second stage of heating, subject to their control sequence.

F. In cooling mode the radiant floor system shall be disabled.

3.19 AIR HANDLING UNITS

A. General

1. ATC shall be responsible for providing all controls on air handling unit. Intent is to have ATC provide and field mount all controllers and end devices required to provide the sequence of operation.
2. Units shall be indexed to occupied mode via the BMS.
3. Upon detection of smoke by either of the duct mount smoke detectors or by any other signal from the fire alarm system, the supply fan and the exhaust fan shall be shut off, the outside air and exhaust air dampers shall close, and the control valves shall close.
4. Each AHU shall have position of valve and damper actuators at the Operator Workstation thru the use of end switches or potentiometers integral to actuators.
5. Economizer shall be first stage of cooling, refer to 3.3/230993 for economizer conditions.
6. Provide with static pressure sensor at discharge of supply fan, display reading on BMS graphic.
7. Freezestat sequence: Unit shall shut down and alarm at BMS. HW valve shall fail open.
8. Alarms
   a. Low supply air temperature: 45°F (adj).
      1) Freezestat shall be able to adjust down to 14°F
   b. High filter static pressure drop: 0.50" wg above clean filter pressure drop.
9. Hardware Points (in addition to those required by the sequence of control)
   a. Analog In: Filter differential pressure.
10. Display at DDC workstation, outside airflow and exhaust airflow read via airflow monitoring stations provided and installed by this division.
11. Provide with static pressure sensor at discharge of supply fan in addition to the duct mounted static pressure sensor 2/3 the distance from the supply fan to the furthest VAV terminal unit served by the air handling unit, display reading on DDC workstation.

B. AHU-1 (Gym)
   1. Supply Fan
      a. General: Unit shall operate as single zone VAV unit. When operating, a variable frequency drive shall modulate the supply fan to maintain a constant space temperature.
      b. Occupied OA Damper: Outside air damper shall be closed when the supply fan is off and open when the supply fan is on. The supply fan shall not start until proof (by end switch) that the outside air control damper is open.
      c. Unoccupied OA Damper: Outside air damper shall be closed.
      d. Occupied: The supply fan shall be on and run at minimum speed (4,000 cfm with minimum outside air of 900 CFM). If, after 10 minutes the temperature in the space is still departing from setpoint, VFD shall modulate fan power between minimum and maximum positions as required to maintain space temperature setpoint. Supply fan shall deliver CFM needed to satisfy:
         1) Space temperature
      e. Unoccupied: The supply fan shall be on call for cooling or heating.

2. Return Fan And Exhaust Air Control Damper
   a. General
      1) The exhaust air control damper shall be closed when the return fan is off.
      2) When operating, a variable frequency drive shall modulate the exhaust damper and return fan to maintain a space pressure of 0.02" wg positive with respect to the outside air pressure. Provide a space pressure sensor at a representative location.
   b. Occupied: The return fan shall be on when the space pressure exceeds 0.02" wg positive with respect to the outside air pressure.
   c. Unoccupied: The return fan shall be on when the space pressure exceeds 0.02" wg positive with respect to the outside air pressure.

3. Heating Coil
   a. Radiant floor shall be first stage of heating.
   b. Occupied: The control valve shall modulate to maintain a discharge air temperature of 70°F. On call for heating, the heating three way hot water control valve shall modulate to maintain the supply air temperature at the minimum temperature such that the space served is at or above heating setpoint.
   c. Unoccupied: The control valve shall be closed except the control valve shall modulate to maintain a discharge air temperature of 85°F until the space served is at heating setpoint.

4. Whenever the unit is off, the HW valve shall maintain minimum of 80°F when outside ambient temperature is <36F. The hot water valve shall modulate to maintain 80°F within case of unit if the freezestat goes into alarm mode. Provide an alarm at the BMS if temperature exceeds exceed 100°F

5. Chilled Water Coil Cooling
   a. Economizer shall be first stage of cooling.
   b. Chilled water coil cooling shall be enabled only when the economizer, if enabled, is at 100% outside air, the hot water control valve is closed, and the outside air is above 55°F.
   c. On call for second stage cooling, the chilled water control valve shall modulate to maintain the supply air temperature at the maximum temperature such the space served is at or below cooling setpoint, except that a return duct mounted humidity sensor shall limit the supply air temperature such that the return air relative humidity is maximum 60%.
      1) Occupied: Chilled water cooling shall be enabled.
      2) Unoccupied: Chilled water cooling shall be enabled

6. Freezestat sequence: Unit shall shut down and alarm at BMS. HW valve shall fail open.

7. Alarms
   a. Low supply air temperature: 45°F (adj).
      1) Freezestat shall be able to adjust down to 14°F

b. High filter static pressure drop: 0.50" wg above clean filter pressure drop.

C. AHU-2 (Cafeteria)

1. Supply Fan

a. General: When operating, a variable frequency drive shall modulate the supply fan to maintain a constant supply duct static pressure of 1.0" wg (adj.). The supply duct static pressure sensor shall be located approximately 2/3 the distance from the supply fan to the furthest VAV terminal unit served by the air handling unit. A hardwired, high static pressure cut-off switch is tripped the supply fan shall stop and an alarm shall be generated. A manual reset of the high static pressure cut-off switch will be required to restart the supply fan. The duct static pressure setpoint is sent by the BMS and is reset by the DISCHARGE DUCT STATIC PRESSURE SETPOINT OPTIMAZATION sequence.

b. Occupied: The supply fan shall be on.

2. Discharge Duct Static Pressure Set Point Optimization

a. General: The following Discharge Duct Static Pressure Set Point Optimization Sequence applies during heating and cooling modes to AHU and all VAV boxes associated with AHU with the exception of when KEF-1 is on, during KEF-1 run times the sequence for the outside air and exhaust air damper as well as the supply and return fan shall simply maintain a duct static pressure but not reset damper position is an attempt to optimize.

b. When any VAV damper is more than 90% (adj.) open, the supply fan discharge duct static pressure setpoint shall be reset upward by 0.1 in W.C. (adj.), at a frequency of 15 minutes (adj.), until no damper is more than 90% open or the static pressure setpoint has reset upward to the system maximum duct static pressure setpoint or the AHU variable-frequency drive is at the maximum speed setting.

c. When all VAV dampers are less than 75% (adj.) open, the supply fan discharge duct static pressure setpoint shall be reset downward by 0.1 in W.C. (adj.), at a frequency of 15 minutes (adj.), until at least one damper is more than 75% open or the static pressure setpoint has reset downward to the system minimum duct static pressure setpoint or the AHU variable-frequency drive is at the minimum speed setting.

d. The control bands, setpoint increment values, setpoint decrement values and adjustment frequencies shall be adjusted to maintain maximum static pressure optimization with stable system control and maximum comfort control.

e. The BMS shall have the capability to allow the operator to exclude "problem" zones that should not be considered when determining the optimized setpoint.

f. The BMS shall also read the status of the supply air static pressure sensor and display the active duct static pressure reading on the status screen.

g. The BMS shall have the ability to identify, and display to the user, the VAV box that serves the Critical Zone (that is, the zone with the most wide-open VAV damper). This information shall update dynamically as the location of the Critical Zone changes BMS based on building load, and duct static pressure setpoint optimization control.

h. During the commissioning process, the controls contractor shall demonstrate the performance of static pressure optimization.

3. Return Fan And Exhaust Air Control Damper

a. General

1) The exhaust air control damper shall be closed when the return fan is off.

2) When operating, a variable frequency drive shall modulate the exhaust damper and return fan to maintain a space pressure of 0.02" wg positive with respect to the outside air pressure. Provide a space pressure sensor at a representative location.

b. Occupied: The return fan shall be on when the space pressure exceeds 0.02" wg positive with respect to the outside air pressure.

c. Unoccupied: The return fan shall be on when the space pressure exceeds 0.02" wg positive with respect to the outside air pressure.

4. Heating Coil

a. Radiant floor shall be first stage of heating.

b. Occupied: The control valve shall modulate to maintain a discharge air temperature of 70°F. On call for heating, the heating three way hot water control valve shall modulate to maintain the supply air temperature at the minimum temperature such that the space served is at or above heating setpoint.

c. Unoccupied: The control valve shall be closed except the control valve shall modulate to maintain a discharge air temperature of 85°F until the space served is at heating setpoint.

5. Whenever the unit is off, the HW valve shall maintain minimum of 80°F when outside ambient temperature is <36F. The hot water valve shall modulate to maintain 80°F within case of unit if the freezestat goes into alarm mode. Provide an alarm at the BMS if temperature exceeds exceed 100°F.

6. Ventilation

a. Occupied: Mixing dampers shall modulate to provide outside air to satisfy the largest ventilation demand of the following:

1) Minimum outside air position per schedule.

2) When KEF-1 indexed on. (1,800 CFM)

3) Wall mounted CO2 sensor shall maintain the CO2 level of Cafeteria at 900 ppm (adj.) or less.

4) As required for economizer cooling.

b. Unoccupied: Mixing dampers shall modulate to 100% return air, 0% outside air except on call for economizer cooling.

7. Chilled Water Coil Cooling
   a. Economizer shall be first stage of cooling.
   b. Chilled water coil cooling shall be enabled only when the economizer, if enabled, is at 100% outside air, the hot water control valve is closed, and the outside air is above 55°F.
   c. On call for second stage of cooling, the chilled water control valve shall modulate to maintain the supply air temperature at the maximum temperature such the critical space (most demanding) served is at or below cooling setpoint, except that a return duct mounted humidity sensor shall limit the supply air temperature such that the return air relative humidity is maximum 60%.
      1) Occupied: Chilled water cooling shall be enabled.
      2) Unoccupied: Chilled water cooling shall be enabled.

8. Freezestat sequence: Unit shall shut down and alarm at BMS. HW valve shall fail open.

9. Alarms
   a. Low supply air temperature: 45°F (adj).
      1) Freezestat shall be able to adjust down to 14°F
   b. High filter static pressure drop: 0.50" wg above clean filter pressure drop.

3.20 DEDICATED OUTSIDE AIR HANDLING UNITS (DOA-1 & DOA-2)

A. General:
   1. ATC shall be responsible for providing all controls on air handling unit. Intent is to have ATC provide and field mount all controllers and end devices required to provide the sequence of operation.
   2. Upon detection of smoke by any of the duct mount smoke detectors or by any other signal from the fire alarm system, the supply fan and the exhaust fan shall be shut off, the energy recovery core shall be shut off, the outside air dampers shall close, the exhaust air dampers shall close, and the control valves shall close.
   3. Display at DDC workstation, outside airflow and exhaust airflow read via airflow monitoring stations provided and installed by this division.
   4. Provide with static pressure sensor at discharge of supply fan and exhaust fan, display reading on BMS graphic.
   5. Freezestat sequence: Unit shall shut down and alarm at BMS. HW valve shall fail open.
   6. Alarms
      a. Low supply air temperature: 45°F (adj.)
         1) Freezestat shall be able to adjust down to 14°F
      b. High filter static pressure drop: 0.50" wg. above clean filter pressure drop.
   7. Hardware Points (in addition to those required by the sequence of control)
   8. Analog In: Filter differential pressure.

B. Supply fan control:
   1. General:

a. The outside air damper shall be open when the supply fan is on during occupied and unoccupied mode. The supply fan shall not start until proof (by end switch) that the outside air control damper is open.
b. When operating in unoccupied mode, a variable frequency drive shall modulate the supply fan to maintain a constant supply duct static pressure of 1.0" wg. The supply duct static pressure sensor shall be located approximately 2/3 the distance from the supply fan to the furthest motorized damper served by the air handling unit. Under normal occupied mode, supply fan shall be controlled to maintain duct static pressure determined during testing and balancing.

2. Occupied: The supply fan shall be on.
3. Unoccupied: The supply fan shall be on at minimum speed except upon a call for 2nd stage of heating (any chilled beam heating control valve open for 10 minutes or greater shall be 1st stage) at which point the variable frequency drive shall modulate the supply fan to 30% power. If, after 10 minutes, the temperature in the critical space is still dropping, VFD shall modulate fan between minimum and maximum power to maintain the space heating setpoint.
4. Outside Air Damper operation when outside ambient temperature is <36F. Sequence below is in order of operation:
   a. Open heating valve to 80% for 3 minutes (adj.).
   b. Open OA damper.
   c. Start supply fan.
   d. Release heating valve to normal heating operation.

5. Whenever the unit is off, the HW valve shall maintain minimum of 80°F when outside ambient temperature is <36F. The hot water valve shall modulate to maintain 80°F within case of unit if the freezestat goes into alarm mode. Provide an alarm at the BMS if temperature exceeds exceed 100°F.

C. Exhaust Fan And Exhaust Air Control Damper
   1. General
      a. The exhaust air control damper shall be closed when the exhaust fan is off and open when the exhaust fan is on. The exhaust fan shall not start until proof (by end switch) that the exhaust air control damper is open.
      b. When operating, the variable frequency drive shall modulate the exhaust fan to maintain a space pressure of 0.01" wg positive with respect to the outside air pressure. Three space pressure sensors for both DOA-1 and DOA-2 (furnished and installed by ATC Contractor), one on each floor (first, second and third), at representative locations. The three space pressure sensors shall be averaged.

   2. Occupied: The exhaust fan shall be on.
   3. Unoccupied: The exhaust fan shall be on at minimum speed.

D. Return Air and Exhaust Air Bypass Control Dampers

1. Occupied: The return air bypass damper and the exhaust air bypass damper shall be closed, except upon the following conditions:
   a. When the air is passing through the energy core, the exhaust air bypass damper shall operate to limit the exhaust air temperature to minimum 25°F, for frost control. The return air bypass damper shall remain closed during frost control.
   b. When the air is bypassed by the energy core, the exhaust air bypass damper shall be open.
2. Unoccupied: The exhaust fan shall be on at minimum speed.

E. Occupied mode: the unit will operate with 100% outside and exhaust air.

F. Supply Air Temperature Control
1. General: The heating coil control valve, the chilled water control valve, the energy core and passive dehumidification core shall be controlled to maintain a supply air temperature/dewpoint sequence.
2. Heating Mode:
   a. Hot Water valve operation when outside ambient temperature is <36F. HW valve shall maintain minimum 25% open when outside ambient temperature is <36F.
   b. Occupied Heating Mode: The return air sensor shall reset discharge air temperature to maintain the following schedule:
      1) An inversely proportional linear algorithm shall modulate the heating coil control valve to maintain a discharge air temperature of 55°F at 75°F return air temperature and 62°F at 70°F return air temperature.
   c. Unoccupied: The control valve shall be closed except upon call for unoccupied heating; the control valve shall modulate to maintain a discharge air temperature of 90°F until the spaces served are at heating setpoint.
      1) The supply fan shall cycle as needed to maintain CO2 levels below 900 ppm (adj), maintain the heating setback temperature at 60°F (adj) when economizer is available.

3. Cooling Mode:
   a. General: Chilled water coil cooling shall be enabled only when the economizer, if enabled, is at 100% outside air, the hot water control valve is closed, the building is indexed to cooling mode and the outside air is above 55°F.
      1) The control valve shall modulate as the passive dehumidification core so that supply air dewpoint of 52°F is achieved. Overall building dewpoint, three space dewpoint sensors (provided by DOA manufacturer and installed by ATC Contractor), one on each floor per unit (first, second, and third), at representative locations.
   b. Occupied Cooling Mode: The return air sensor shall reset discharge air temperature to maintain the following schedule:
      1) An inversely proportional linear algorithm shall modulate the chilled water coil control valve to maintain a discharge air temperature of 55°F at 75°F return air temperature and 62°F at 70°F return air temperature.

2) Should the supply air dewpoint exceed 52°F, a dewpoint algorithm shall modulate the chilled water coil control valve to maintain 52°F supply air dewpoint.

c. Unoccupied: The chilled water control valve shall be closed.
1) The supply fan shall cycle as needed to maintain and CO2 levels below 900 ppm (adj.), maintain the cooling setback temperature at 82°F (adj) when economizer is available.

G. Transition from Unoccupied to Occupied - When the unit transitions from unoccupied mode to the occupied mode, if the building has reached the occupied temperature before the 1 hour minimum time has elapsed, the DOA shall continue to operate the supply fan to maintain duct static pressure, keep the VAV boxes open 100%, and control Supply Air Temperature to the building temperature setpoint to avoid over heating or cooling the building. The unoccupied routines shall terminate when the building is indexed to occupied mode.

1. Occupied Morning (heating) - When there is a call for heating and space temperature is 2°F or more below the occupied heating setpoint, the supply fan shall be turned on and shall modulate to maintain the supply air static pressure, the exhaust fan shall remain off, the outside air damper shall remain closed, the recirculation damper shall be commanded open, and the heating capacity shall be enabled at full capacity, and the VAV zone dampers shall be commanded to 100% open.

a. Outside Air Damper operation when outside ambient temperature is <36F. Sequence below is in order of operation:

1) Open heating valve to 80% for 3 minutes.
2) Open OA damper.
3) Start supply fan.
4) Release heating valve.

b. Hot Water valve operation when outside ambient temperature is <36F. HW valve shall maintain minimum 25% open when outside ambient temperature is <36F.

2. Occupied Morning (cooling) - When there is a call for cooling and space temperature is 2°F or more over the occupied cooling setpoint, the supply fan shall be turned on and shall modulate to maintain the supply air static pressure, the exhaust fan shall remain off, the outside air damper shall remain closed, the recirculation damper shall be commanded open, and the cooling capacity shall be enabled at full capacity, and the VAV zone dampers shall be commanded to 100% open.

H. Economizer control – Flat Plate Exchanger: The Unit controller will monitor the supply air temperature, and modulate the exchanger's Face & Bypass damper to the bypass position to maintain the supply air temperature set point. If the set point cannot be maintained, additional cooling (if provided) will be energized. Once cooling is energized, the Face & Bypass damper is set to full bypass. The

Face & Bypass damper will be set to full face when the outside air temperature is greater than the return air temperature

I. Reheat Control – dPoint Heat Exchanger:
   1. Reheat is accomplished through a 2nd exchanger. In dehumidification mode, Face & Bypass Damper will modulate to maintain the supply air temperature set point. The amount of reheat is reduced by bypassing air around the exchanger. When dehumidification is inactive or during heating mode, Face & Bypass Damper will be in the full bypass position.
   2. During cooling mode, Face & Bypass Damper shall be in the full face position. During heating mode, Face & Bypass Damper shall be in the full bypass position

J. Dehumidification Control: The Air Handling Unit Controller Shall Operate the Chilled Water Coil Control Valve, and Heating Coil Control Valve in series to maintain zone relative humidity.
   1. When Outside Air Dewpoint Temperature is above Supply Air Dewpoint Setpoint (52F adj.), and the economizing mode is not active, The Energy Core bypass damper shall be open to the Recovery core position. If the energy recovery core status does not match the commanded value after a delay (30 sec. adj.) the core shall be commanded off, the bypass dampers shall be commanded open to the bypass position, and an alarm shall be generated at the OWS. If the Dehumidification core status does not match the commanded value after a delay (30 sec. adj.) an alarm shall be generated at the OWS. The Chilled Water Coil shall modulate to maintain the Supply Air Dewpoint at Setpoint (52F adj.) and the Reheat Coil Control Valve shall modulate to maintain the Supply Air Temperature at Setpoint (55F cooling, adj., 80F heating, adj.)
   2. When Outside Air Dewpoint Temperature is above Supply Air Dewpoint Setpoint (52F adj.), and the economizing mode is active, the Energy Recovery core bypass damper shall be open to the bypass position. The dehumidification core shall be commanded on. If the Dehumidification core status does not match the commanded value after a delay (30 sec. adj.) an alarm shall be generated at the OWS. The Chilled Water Coil shall modulate to maintain the Supply Air Dewpoint at Setpoint (52F adj.) and the Reheat Coil Control Valve shall modulate to maintain the Supply Air Temperature at Setpoint (55F cooling, adj., 80F heating, adj.) If Chilled Water Coil Control Valve is 100% open for 10 min. (adj.) and Supply Air Dewpoint remains above setpoint. And the bypass dampers will modulate open to the energy recovery core to maintain Supply Air Dewpoint at setpoint. If the energy recovery core status does not match the commanded value after a delay (30 sec. adj.) the bypass dampers shall be commanded open to the bypass position, and an alarm shall be generated at the OWS.
   3. When Outside Air Dewpoint Temperature is below Supply Air Dewpoint Setpoint (52F adj.), and the economizing mode is not active, the Energy Recovery Core bypass damper shall modulate to maintain the Supply Air Dewpoint at Setpoint (52F adj.) If the energy recovery core status does not match the commanded value after a delay (30 sec. adj.) the bypass dampers shall be commanded open to the bypass position, and an alarm shall be generated at the OWS. The Chilled Water and Hot Water Coils

shall modulate to maintain the Supply Air Temperature at Setpoint (55F cooling, adj., 80F heating, adj.)

4. When Outside Air Dewpoint Temperature is below the Supply Air Dewpoint Setpoint (52F adj.), and the economizing mode is active, the Energy Recovery Core bypass damper shall modulate in series with the Chilled Water and Hot Water Coil Control Valves to maintain Supply Air Temperature at Setpoint (55F cooling, adj., 80F heating, adj).
5. When both the Outside Air Dewpoint and Drybulb Temperatures are below the Supply Air Setpoints, the Energy Recovery Core bypass damper shall modulate to maintain the Supply Air Temperature at Setpoint (55F cooling, adj., 80F heating, adj.) and Supply Air Dewpoint at or below Setpoint (52F, adj.). If the energy recovery core status does not match the commanded value after a delay (30 sec. adj.) the bypass dampers shall be commanded open to the bypass position, and an alarm shall be generated at the OWS. The dehumidification core shall be commanded off. If the Energy Core Bypass Damper is 100% open to the Energy Recovery Core, and Supply Air Temperature remains below Setpoint, the Heating Coil Control valve shall modulate to maintain the Supply Air Temperature Setpoint.

K. Additional points monitored by the BMS:
   1. Exhaust air humidity
   2. Exhaust air temperature
   3. Supply air temperature
   4. Supply air dew point
   5. Supply air static pressure transmitter.
   6. Return air temperature sensor
   7. Return air humidity sensor
   8. Pre-filter and final filter differential pressure
   9. Return air filter differential pressure
   10. Low temperature alarm
   11. Temperature and dew point Sensors
      a. (2) Case temperature sensors. (1) at chilled water coil (1) at hot water coil
      b. Discharge of chilled water coil dew point sensor
      c. Return air dew point sensor.
      d. Discharge of energy core at exhaust fan dew point sensor.
   12. High limit pressure switch.
   13. Exhaust fan status
   14. Supply air CFM
   15. Exhaust air CFM
   16. Outdoor air CFM
   17. Fire alarm status, supply and return air smoke detector.

L. dPoint Core and ERV core controls: Occupied Control Modes for dPoint in a Dedicated Outdoor-Air System with Total-Energy Recovery and Preheat. Refer to the following table.

Control Mode		**Psychrometric Conditions[1]**	**Control Actions**
O1a	Full recovery, dehumidification[8] (stage 1)	*h*oa > *h*ra DPToa > target DPTca	• Close both the supply-side and exhaust-side total-energy core bypass dampers • Close the dPoint core bypass dampers • Modulate the cooling coil to meet target DPTca • Preheat coil is off
O1b	Full recovery, dehumidification[8] (stage 2)	*h*oa > *h*ra DPToa > target DPTca and Cooling valve is 100% open for 10 min[8]	• Close both the supply-side and exhaust-side total-energy core bypass dampers • Close the dPoint core bypass dampers • Open the cooling coil valve to 100% • Modulate the preheat coil to meet target DPTca, but do not allow DBTcc > DBTcc,design • Operate in this mode until preheat coil valve has been closed for 10 minutes
O2b	Full recovery, dehumidification[8] (stage 1)	*h*oa < *h*ra DPToa > target DPTca	• Close both the supply-side and exhaust-side total-energy core bypass dampers • Close the dPoint core bypass dampers • Modulate the cooling coil to meet target DPTca • Preheat coil is off
O2c	Full recovery, dehumidification[8] (stage 2)	*h*oa < *h*ra DPToa > target DPTca and Cooling valve is 100% open for 10 min[8]	• Close both the supply-side and exhaust-side total-energy core bypass dampers • Close the dPoint core bypass dampers • Open the cooling coil valve to 100% • Modulate the preheat coil to meet target DPTca, but do not allow DBTcc > DBTcc,design • Operate in this mode until preheat coil valve has been closed for 10 minutes

03	Partial recovery, cooling	DPToa < target DPTca DBToa > DBTra	• Modulate the exhaust-side bypass damper to control core capacity and maintain target DPTca • Keep the dPoint core bypass dampers closed • Modulate the cooling coil to meet target DBTca • Preheat coil is off
O4	No recovery, cooling	DPToa < target DPTca DBTca < DBToa < DBTra	• Fully open both the supply-side and exhaust-side bypass dampers[4] • Keep the dPoint core bypass dampers closed • Modulate the cooling coil to meet target DBTca • Preheat coil is off
O5	Partial recovery (heating)	DPToa < target DPTca DBToa < DBTca	• Close the supply-side total-energy core bypass damper • Modulate the exhaust-side total-energy core bypass damper to control core capacity and maintain target DBTca, and maintain DPTca at or below target • Open the dPoint core bypass dampers • Cooling coil is off • Preheat coil is off
O6	Full recovery, supplemental heating	DPToa < target DPTca and exhaust-side bypass damper has reached the fully-closed position	• Close both the supply-side and exhaust-side total-energy core bypass dampers • Open the dPoint core bypass dampers • Cooling coil is off • Modulate the preheat coil as needed to meet target DBTca
O7	Full recovery, supplemental heating, frost prevention	DBToa <= DBT frost threshold	• Close the exhaust-side total-energy core bypass damper • Modulate the supply-side total-energy core bypass damper to maintain the DBT leaving the exhaust side of the total-energy core at setpoint • Open the dPoint core bypass dampers • Cooling coil is off • Modulate the preheat coil as needed to meet target DBTca

M. Unoccupied Control Modes for dPoint Core in a Dedicated Outdoor-Air System with Total-Energy Recovery and Preheat

Control Mode		**Psychrometric Conditions[1]**	**Control Actions**
U1	Off	DPTspace < unoccupied DPTsetpoint[2]	• Stop both supply and exhaust fans • Close the OA and EA dampers • Open the RA damper • Stop the total-energy core • Stop the dPoint core • Cooling coil is off • Preheat coil is off
U2a	Unoccupied dehumidification (stage 1)	DPTspace > unoccupied DPTsetpoint[3] and DPToa > target DPTca	• Turn on the supply fan • Stop the exhaust fan • Close the OA and EA dampers • Open the RA damper • Stop the total-energy core • Rotate the dPoint core • Close the dPoint core bypass dampers • Open cooling coil valve to 100% • Preheat coil is off • Operate in this mode until DPTspace drops 3°F below the unoccupied DPTsetpoint
U2b	Unoccupied dehumidification (stage 2)	DPTspace > unoccupied DPTsetpoint + 2°F[3] and DPToa > target DPTca	• Turn on the supply fan • Stop the exhaust fan • Close the OA and EA dampers • Open the RA damper • Stop the total-energy core • Rotate the dPoint core • Close the dPoint core bypass dampers • Open cooling coil valve to 100% • Open preheat coil valve to 100% • Operate in this mode until DPT space drops 3°F below the unoccupied DPT setpoint

U3	Unoccupied economizer dehumidification	DPTspace > unoccupied DPTsetpoint and DPToa < target DPTca[4]	• Turn on both the supply and exhaust fans • Open both the OA and EA dampers • Close the RA damper • Stop the dPoint core • Open the dPoint core bypass dampers • Cooling coil is off • Modulate the preheat coil as needed to meet target DBTca • Operate in this mode until DPT space drops 3°F below the unoccupied DPT setpoint
U4	Unoccupied cooling	DBTspace > unoccupied cooling setpt and DPTspace < unoccupied DPTsetpoint	• Turn on the supply fan • Stop the exhaust fan • Close the OA and EA dampers • Open the RA damper • Stop the total-energy core • Rotate the dPoint core • Close the dPoint core bypass dampers • Cooling coil if off • Preheat coil is off
U5	Unoccupied heating	DBTspace < unoccupied heating setpt and DPTspace < unoccupied DPTsetpoint	• Turn on the supply fan • Stop the exhaust fan • Close the OA and EA dampers • Open the RA damper • Stop the total-energy core • Rotate the dPoint core • Close the dPoint core bypass dampers • Cooling coil if off • Preheat coil is off

[1] OA = outdoor air, RA = return air, CA = air leaving cooling coil, SA = supply air, PH = preheat, DBT = dry-bulb temperature, DPT = dew-point temperature, RH = relative humidity

[2] The primary concern with humidity during unoccupied periods is to avoid condensation on surfaces of the chilled beams upon startup. Keeping the space dew point from becoming extremely high during the unoccupied mode helps minimize the risk of condensation when the system starts back up in cooling mode.

[3] This system has two stages of dehumidification: Stage 1 is to turn on the dPoint core, Stage 2 is to activate the preheat coil to increase the dehumidification capacity of the dPoint core. Stage 1 is activated when the space DPT reach a certain threshold, defined here as unoccupied DPT setpoint. Stage 2 is activated when the space DPT reaches unoccupied DPT setpoint + 2°F, which occurs because stage 1 did not provide enough dehumidification under the current conditions. The 2°F offset is only suggestions and can be adjusted for the specific application.

[4] When the outdoor dewpoint is dry, it can be used to dehumidify the space. How much drier the

outdoor air needs to be depends on the current latent load in the space and the airflow.

3.21 BOILERS (B-1, B-2 and B-3)

A. Heating shall only be enabled when the system is indexed to heating mode (shall occur when outside air temperature is below 65°F) OR by call from the DOA's per the DOA sequence of operations (section 3.20) and matrix; during condition 01B (full recovery, dehumidify stage 2) After the chilled water valve has been at 100% open for a time of 10 mins, the preheat coil will modulate to satisfy the conditioned air target dew point.

B. Devices such as fin tube radiators, radiant ceiling panels, CUH and UH shall operate on a soft permissive, only allowing fans to start and control valves to open when system is in heating mode, use of aquastats is not acceptable.

C. The Building Automation System will communicate with Boiler Manufacturer Supplied Control Panels (ATC and Boiler valve Controller) via BacNet.

D. This division shall wire manufacturer supplied control panels and boiler isolation valves so as to provide a complete and operational system.

E. The following points will be made available for monitoring/control of each boiler:
1. Status
2. Outlet Temp
3. Firing Rate out
4. Run cycles low
5. Run hours low
6. Fire rate in
7. Fault log code
8. # of boilers firing
9. Header water temperature
10. % rate of fire
11. OA temp

F. Boilers B-1, B-2 & B-3 shall be configured by on board integral boiler controls in a defined by manufacturer. The first boiler unit comes online and will gradually increase its air-fuel valve position to meet demand. When it reaches 50% – a second unit is called into service. The two boilers will split the load – each firing at 30% air-fuel valve position to meet demand. If additional heat is required, a third unit is called into service. Three boilers, each firing at 30% air-fuel valve position, satisfies the demand more efficiently than either two units at 50% or one unit at 100%. This same principle applies to much larger plants.
1. Boilers shall maintain heating hot water supply temperature in accordance with water reset schedule below.

G. Alarms: Boiler failure alarm condition from the boiler internal control panel.

H. The heating hot water supply temperature shall be reset BMS based on outside air temperature in accordance with:
1. Warm Up: Heating hot water supply temperature shall be 180°F at 0°F (and below) and shall reset to 150°F at 60°F (adjustable).

2. Occupied: Heating hot water supply temperature shall be 150°F at 0°F (and below) and shall reset to 110°F at 60°F (adjustable).
3. Unoccupied: Heating hot water supply temperature shall be 140°F at 0°F (and below) and shall reset to 110°F at 60°F (adjustable).

3.22 WATER HEATERS (WH-1 and WH-2)

A. The Building Automation System will communicate with Water Heater Manufacturer Supplied Control Panel via Bacnet.

B. This division shall wire manufacturer supplied control panels so as to provide a complete and operational system.

C. ATC shall show readable points on operator workstation graphics, this tie in is for monitoring purposes only not for writing ability. The points which shall be shown on the graphics are:
1. Water Heater Setpoint
2. Water Heater Water Temp
3. Current Modulation Level
4. OEM Fault Code
5. DHW Set Point upper bound
6. DHW Set Point lower bound
7. Boiler Fault
8. Flame Status

3.23 PUMPS

A. Pumps P-1AB (Building Heating Hot Water Pumps)
1. General
a. Pumps P-1AB shall be configured in a lead/lag configuration. The lead and lag designations shall be rotated weekly.
b. The lead pump shall operate continuously at temperatures below 65 degrees F.
c. The speed of the lead pump shall modulate to “ride” control curve which is preprogrammed in pump controller and field adjustable based on final installed conditions.
d. The lag pump shall be off, except shall operate upon failure of the lead pump. BMS shall monitor pump failure from pump drive.
2. Alarms
a. High hot water temperature supply (HWS) temperature: 180°F.
b. Low hot water temperature supply (HWS) temperature: 60°F.
c. High hot water supply/return pressure difference: 25% greater than setpoint.
d. Low hot water supply/return pressure difference: 25% lower than setpoint.
e. Lead pump failure.

3. Hardware Points (in addition to those required by the sequence of control)
a. Binary In: Pump P-1A variable frequency drive fault.
b. Binary In: Pump P-1B variable frequency drive fault.

c. Analog In: Pump P-1A variable frequency drive speed.
d. Analog In: Pump P-1B variable frequency drive speed.

B. Pumps P-2AB (Chilled Water Pumps)
1. General
a. Pumps P-2A & P-2B shall be configured in a lead/lag configuration. The lead and lag designations shall be rotated weekly.
b. The speed of the lead pump shall modulate to "ride" control curve which is preprogrammed in pump controller and field adjustable based on final installed conditions.
c. The lag pump shall be off, except shall operate upon failure of the lead pump. BMS shall monitor pump failure from pump drive.
d. Minimum pump speed shall be limited using pressure sensors across chiller barrels shown on piping diagrams (M7.01), curves from specific chiller shall be utilized to determine minimum flow, minimum flow thru chillers shall be manufactures recommendation plus 10%.
e. Pump shall run continuously to maintain chiller supply water temperature of 41degrees F (adj.) and return water temperature of 57 degrees F (adj.).
2. Alarms
a. Pump failure.

3. Hardware Points (in addition to those required by the sequence of control)
a. Binary In: Pump P-2A variable frequency drive fault.
b. Binary In: Pump P-2B variable frequency drive fault.
c. Analog In: Pump P-2A variable frequency drive speed.
d. Analog In: Pump P-2B variable frequency drive speed.

C. Pumps P-3AB (chilled beam chilled water system pumps)
1. General
a. Pump P-3A and 3B shall be configured in a lead/lag configuration. The lead and lag designations shall be rotated weekly.
b. The speed of the lead pump shall modulate to "ride" control curve which is preprogrammed in pump controller and field adjustable based on final installed conditions.
c. The lag pump shall be off, except shall operate upon failure of the lead pump. BMS shall monitor pump failure from pump drive.
d. Heat Exchanger Control: The modulating control valve serving the chilled beams heat exchanger shall modulate to maintain chilled beam water supply setpoint (57F cooling, adjustable.)
2. Alarms
a. High chilled beam chilled water supply (CBCS) temperature: 65°F.
b. Low chilled beam chilled water supply (CBCS) temperature: 54°F.
c. Dual supply temperature sensor error: If two temperature sensors on CBCS before pumps read greater that 10% different.
d. High chilled beam chilled water supply/return pressure difference: 25% greater than setpoint.

e. Low chilled beam chilled water supply/return pressure difference: 25% lower than setpoint.

3. Hardware Points (in addition to those required by the sequence of control)
   a. Binary In: Pump P-3A&3B variable frequency drive fault.
   b. Analog In: Pump P-3A&3B variable frequency drive speed.

D. Pumps-4AB (Condenser Water Pumps)
1. General
   a. Pumps P-4A & P-4B shall be configured in a lead/lag configuration. The lead and lag designations shall be rotated weekly.
   b. The speed of the lead pump shall modulate to "ride" pump curve which is preprogrammed in pump controller.
   c. Minimum pump speed shall be limited using pressure sensors across chiller barrels shown on piping diagrams (M7.02), curves from specific chiller shall be utilized to determine minimum flow, minimum flow thru chillers shall be manufactures recommendation plus 10%.
2. Alarms
   a. Pump failure.

3. Hardware Points (in addition to those required by the sequence of control)
   a. Binary In: Pump P-4A variable frequency drive fault.
   b. Binary In: Pump P-4B variable frequency drive fault.
   c. Analog In: Pump P-4A variable frequency drive speed.
   d. Analog In: Pump P-4B variable frequency drive speed.

E. RP-1 (domestic water recirculation pump)
1. General
   a. Pump shall be indexed on during occupied hours.
2. Alarms
   a. Pump Failure.

3.24 CHILLER PLANT

A. General
1. The chiller plant shall be enabled when the system is indexed to cooling mode.

B. System Control Configuration Overview – Control of the system components shall be as follows:
1. The chillers shall receive enable/disable signals through a command via a BACnet communication link.
2. The BMS shall modulate the chillers isolation valves and control pumps operation.
3. The pump(s) speed shall be modulated to control the chilled water system supply / return pressure differential to the required set point.
4. Primary Chilled Water Pumps: VFD's are for balancing purposes only. In addition, SOP programming shall be provided but not activated, to: BMS

shall modulate BMS based upon system load. Flow rate fluctuation through the chiller shall not exceed 30 percent of the design flow rate per minute. Minimum flow rate through each chiller shall be set to 40 %(adj.)

5. During cold start-up the condenser water flow through the chiller shall be modulated per the manufacturer's recommendations to maintain the no less than the minimum condenser/evaporator refrigerant pressure differential.

C. System Start/Stop - The chilled water system shall start in response to a cooling demand with the option to use outside ambient temperature lockout.

D. Sequencing – BMS shall start and stop the chilled water pumps and chillers BMS based upon system load.

1. When the chilled water system is enabled the BMS shall:
    a. Start the lead chilled water pump. Once the pump is confirmed as operating, the BMS shall command the lead chiller pump on.
    b. Once the flow is established through the evaporator via flow switch status, the BMS shall send an Enable signal to the lead chiller.
    c. The chilled water pump shall be controlled to maintain the design pressure setpoint for the system.
    d. Upon confirmation of evaporator water flow the BMS shall enable the condenser isolation valve and call for the lead condenser pump operation. Lead cooling tower shall be "activated".
    e. Upon confirmation of condenser water flow via flow switch status, the chiller shall continue its pre-start sequence and start its compressor(s).
2. The BMS shall initiate the shutdown of the next system chilled water pump whenever excess pump capacity exists for 5 minutes as determined by the pump speed, the system pressure, and the number of pumps running.
3. The BMS shall initiate the start of the next chiller in the sequence whenever the chilled water load, as determined by the system supply water temperature, is not met for 20 minutes (adj). Lag chillers shall start in a similar manner to the lead chiller start sequence.
4. The BMS shall initiate the shutdown of the next chiller in the sequence whenever excess chilled water capacity exists, as determined by percent run load amps, for 20 minutes.
5. Upon sensing a chiller failure the BMS shall shut down the failed chiller immediately and initiate the start of the next chiller in the rotation sequence.
6. The BMS shall control individual chiller setpoints to maintain the system supply water temperature at setpoint.
7. The design system chilled water setpoint shall be 42 degrees F and editable by the operator.

E. System Soft Start - The chiller plant control system will initiate a "soft start" mode whenever the system chilled water temperature exceeds the specified chilled water system setpoint by 20 degrees F at system start-up. The chiller plant control application will add cooling capacity during soft start mode only if return water temperature is not declining at a rate of at least 0.5 degrees F per

minute. This prevents the unnecessary operation of chillers and limits system electrical demand during chilled water loop pull down.

F. Automatic rotation of chillers and pumps.
1. Chiller rotation shall be initiated BMS based on an operator entered day interval or by the cycling of a binary point. The method of sequence shall be operator selectable.
2. Chiller cycling caused by normal system load fluctuations shall cause the chillers to change rotation sequence or at the operator's option chillers may be forced into the new rotation sequence at the time of sequence change.
3. Pump rotation shall be initiated by a schedule or by the cycling of a binary point.

G. Diagnostics/Protection: The BMS shall be able to alarm from all sensed points and diagnostic alarms monitored by the chiller controller.

H. Chiller Status Report - Provide an operating status report for each chiller. The report(s) shall provide the present for the following information to provide the operator with critical chiller operating data.
1. Compressor On/Off Status
2. Compressor Starts/Run Hours
3. Compressor Phase 1/2/3 Percent RLA - separate for each compressor
4. Compressor Current Draw - RLA Percent
5. Active Chiller Diagnostics or Alarms
6. Leaving Chilled Water Temperature
7. Entering Chilled Water Temperature
8. Evaporator Flow Rate
9. Condenser Water Entering/Leaving Temperatures
10. Chilled Water Setpoint
11. Refrigerant Temperature Evaporator/Condenser - Separate for each circuit
12. Operating Mode
13. Chiller Model and Serial Number
14. Outside Air Dry Bulb
15. Outside Air Wet Bulb
16. The DDC display shall also show KW per ton while the chiller is operational.
17. Four additional points of monitoring shall be made available for owner.

3.25 COOLING TOWER

A. Cooling Towers Sequencing and Control - The BMS shall monitor the leaving water temperature for each chiller's evaporator and condenser. The BMS shall control the cooling towers bypass and isolation valves to maintain no less than the minimum temperature differential specified by the chiller manufacturer.
1. Cooling Tower Fan Control - When a chiller is operating and the cooling tower BMS in temperature rises to 2 degrees F above the current tower leaving water leaving water setpoint, the cooling tower lead tower isolation valve shall modulate open. Once the isolation valve is 100%

open and water temperature remains above setpoint, the fan shall be turned on at minimum speed and the control loop shall be enabled.

a. The cooling towers fan speeds shall be modulated to maintain the desired cooling tower leaving water temperature.
b. When the operating fan(s) are operating at 50 percent speed an additional fan shall be enabled and controlled at the same speed as the operating fans until all active cooling tower cell fans are enabled.
c. When operating fans are running at minimum speed and the tower supply water temperature is 5 degrees F below the current tower leaving water leaving water setpoint, the most lag tower fan shall be turned off.
d. Cooling tower fans shall have 5 minute minimum on and off time delays.
e. Cooling tower fan sequence shall be rotated on a 7 day BMS is to equalize fan run time.
f. If vibration switch detects excessive vibration, BMS shall shut down the tower's fan and an alarm shall occur at the Operator Workstation. Contractor shall provide fan vibration switch and alarm

2. Economizer cooling mode shall allow chillers to operate simultaneously with the water side economizer operation. Water side economizer to be disabled above 65 degrees F outdoor dry bulb temperature. Economizer to be disable when condenser water supply temperature is above 50 degrees F. The condenser water supply temperature for the cooling tower in economizer mode shall be 45 degrees F
3. The BMS will monitor the outside wet bulb temperature and "initiate" a "Economizer" mode when outside air wet bulb temperature drops below 45°F (adjustable).
4. Transition mode to "Economizer" When enabling the "Economizer" mode, the following sequences will be initiated:

a. The condenser water supply setpoint will be set to 48°F (adjustable). The cooling towers, tower fans and the tower bypass valve will be controlled as listed above.

b. The condenser water supply temperature setpoint will be reset as the outside air wet bulb temperature falls. The minimum value will be 38°F (adjustable) at 35°F outside wet bulb temperature. The free cooling Condenser water isolation valve will be commanded open.

c. The BMS will monitor condenser water flow through the cooling tower via flow switch. The chilled water bypass/diverting valves will be modulated to maintain a chilled water setpoint.

d. The chiller will be disabled (subtracted) through the BMS application if cooling loads permits

e. If mechanical cooling is required, the chiller condenser isolation valve will be modulated to ensure the evaporator/condenser

refrigerant differential pressure does not drop below the manufacturer's recommended minimum value.

5. Transition mode out of "Economizer"

   a. When disabling the "Free cooling" mode, the following sequences will be initiated:

   b. When outside air wet bulb rises 2°F above the free cooling Wet Bulb enable setpoint the "Free cooling" mode will be disabled.

   c. The chiller will be enabled through the BMS system through the Chilled Water System Controller.

   d. The condenser water supply temperature setpoint will be set to the required "Optimized" setpoint value. Tower fan and "Startup" tower bypass valve control will be as listed above.

   e. The chiller condenser water isolation valve will be modulated to ensure the evaporator/condenser refrigerant differential pressure does not drop below the manufacturer's recommended minimum value.

6. Cooling Tower BMS in Heater & Piping Heat Tape Control
   a. When the outside air temperature drops below 35 degrees F, the heat tape on the condenser water piping shall be enabled. When the outside air temperature rises above 39 degrees F, the heat tape on the condenser piping shall be disabled.
   b. When the cooling tower sump temperature drops below 40 degrees F, the sump heater shall be enabled. When the sump temperature rises above 42 degrees F, the sump heater shall be disabled.
7. Cooling Tower Level Control
   a. The BMS shall monitor water level in each of the cooling towers. When level drops below setpoint, the BMS shall command the cooling tower's make up water valve open until water level reaches setpoint.

3.26 CENTRIFUGAL SEPARATOR / CHEMICAL TREATMENT CONTROLLERS:

A. The ATC shall provide installation and wiring for the manufacturer supplied controllers and sensors. The BMS shall monitor the dry contacts on the control panels.

B. When a cooling tower is activated, BMS shall allow systems to be activated and BMS shall command pump CSP-1. Backwash valve shall be controlled by a timed cycle to open every 30 minutes. The BMS shall monitor pump status, if status does not match the commanded value, the backflow valve shall be commanded closed, and an alarm shall be generated at the OWS.

C. Connect chemical treatment to DDC system for cooling tower water systems. Provide piping for metering pump, conductivity meter probe and accessories. Chemical treatment systems shall be installed per piping details and furnished by Division 23.

D. Automatic purge valve shall open on a timer to purge the separator of collected solids. Valve shall open once per day for 30 seconds (adj.)

3.27 SPLIT SYSTEM AC UNIT SYSTEMS (AC-1 thru AC-4/CU-1 thru CU-4)

A. General: Units shall maintain space temperature setpoint through manufacturers supplied controllers. ATC shall furnish and install all low voltage control wiring and accessories between the outdoor units, indoor air handlers and wall mount controllers necessary to provide a complete and operational system. ATC shall also program all controllers to maintain setpoints and schedules put forth in 3.1/General section of specification 230993 as well as provide water sensing device at overflow pan to alarm at BMS user interface is water is sensed due to condensate pump failure. Upon sensing of water split system air handler shall be disabled.

1. Hardware Points (in addition to those required by the sequence of control)
   a. Analog Variable: Space Temperature
   b. Binary Variable: A/C unit Status

3.28 DUCT MOUNTED FIRE/ SMOKE DAMPERS

A. Sequences of Operation listed below shall apply to all other smoke dampers and fire-smoke dampers.

B. BMS shall monitor status of the air handling unit (AHU / ERV / DOA / VRV) served by duct mounted smoke damper.

C. When a unit is signaled to stop, BMS shall close all smoke dampers served by this unit. When a unit is signaled to start, BMS shall open respective smoke dampers.

D. At each smoke damper, BMS shall monitor end switch indicating damper open/close status. If a unit has been signaled to start and feedback from respective end switches does not indicate respective dampers are open after 30 seconds, an alarm shall be activated at the Operator Workstation. Conversely, after 30 seconds, if feedback indicates a damper is open when a unit is signaled to stop, an alarm shall be activated at the Operator Workstation.

E. Operation of each smoke damper shall also be controlled by fire alarm system. Refer to electrical drawings and Specification Section 28 3100

3.29 LIGHTING CONTROLS INTERLOCK

A. Corridor, Stairwell and Exterior Lighting: ATC to install a control wire and BMS needs to send occupied and unoccupied signal to BACNET gateway device located at head-end networked lighting control panel in main electrical room.

B. Classroom only: ATC to install a control wire and BMS to monitor vacancy sensor in classroom so BMS can know when the classroom is occupied and unoccupied.

C. During occupied mode occupancy sensor shall be overridden and lights on for all of occupied time schedule. Upon system entering unoccupied mode occupancy sensor shall revert back to method of control for corridor lighting (when no motion is sensed lights will be off).

D. Interior lighting shall be commanded on a minimum of one hour (adjustable) before occupied time schedule to allow for photo-luminescent strip charging. Coordinate with photo-luminescent strip manufacturer requirements.

E. Exterior lights shall be indexed on upon photocell detection of low lumen condition, at 11:59pm exterior lights shall be indexed off and remain off until 4:30am at which time exterior lights shall be indexed on and exterior lights shall remain on until photocell senses acceptable lumen level. During hours between 4:30am and 11:59pm exterior lights shall be enabled by BMS but only turn on upon low lumen condition as determined by photocell. Division 26 shall provide photocells (KELE MK&-B-CR or equal) necessary to accomplish above sequence on operation for exterior lights. Coordinate location of all necessary interconnections and photocell placement with Division 26.

3.30 REFRIGERATION MONITORING AND CONTROL:

A. BMS shall monitor the refrigerant monitor alarms.

B. Upon Sensing Refrigerant in the Mechanical Room, The BMS shall command on EF-2 and motorized damper for Outside Air louver shall open. An alarm shall occur through the central BMS. If the trouble contact closes, an alarm shall be activated through the central BMS. Provide alarm strobe at all entrances of mechanical room.

3.31 REFRIGERATOR/FREEZER

A. Mount a temperature sensor in both the freezer and refrigerator. Provide an alarm condition at the DDC user workstation when either reaches 10 degrees above the set point.

B. BMS shall receive and display information from Walk-In Freezer and Walk-in Cooler alarm panel per Foodservice equipment specification division 11, Model 200 or Modularm LC75 temperature and HACCP monitoring system at doors, provided with dry contacts for tie in to building monitoring system.

3.32 UTILITY MONITORING

A. BMS shall monitor the following and display on the energy dashboard system:

1. Natural Gas Total Therms.
   a. (~~2~~ ***8***) Meters shall be furnished by ATC
      1) ~~1~~ ***4*** meter for BMS monitoring
      2) ~~1~~ ***4*** meter for Artis Energy monitoring.
   b. (2) Meters installed by Division 22
   c. (~~2~~ ***4***) Meters and control wiring ***(serving BMS)*** provided by ATC.
      (4) Meters and control wiring (serving Artis Energy) provided

by Division 26. Provide Onicon F-5100 Series thermal mass meter. Provide BACnet interface, coordinate with meter manufacturer. Coordinate installation with Division 22.

d. Individual meter shall be provided for each of the following:
   1) Boiler gas service (one meter serving all boilers)
   2) Water heater gas service (one meter serving all water heaters)
   3) Main gas service
   4) Kitchen gas service

2. Natural Gas service pressure sensor after gas regulator shall be monitored and provided by ATC. Coordinate installation with Division 22. Coordinate requirements with New Haven Standards.
   a. Gas pressure service to be NOSHOK, Series 625 or equivalent, interconnected to BMS so gas pressure can be monitored at 654 Ferry Street

3. Domestic water GPM.
   a. (~~2~~ ***8***) Meters shall be furnished by ATC
      1) ~~1~~ ***4*** meter for BMS monitoring
      2) ~~1~~ ***4*** meter for Artis Energy monitoring.
   b. (2) Meters installed by Division 22
   c. (~~2~~ ***4***) Meters and control wiring ***(serving BMS)*** provided by ATC. ***(4) Meters and control wiring (serving Artis Energy) provided by Division 26.***
      1) 3/4" to 1" pipe provide Onicon F-1300 Series flow meter. Provide BACnet interface, coordinate with meter manufacturer. Coordinate installation with Division 22.
      2) 1-1/4" to 72" pipe provide Onicon F-1100 Series insertion flow meter. Provide BACnet interface, coordinate with meter manufacturer. Coordinate installation with Division 22.
   d. Individual meter shall be provided for each of the following:
      1) Cooling tower makeup water
      2) Boiler makeup water
      3) Main serving exterior hose bibs
      4) Overall domestic water service

4. Electric metering:
   a. Meters installed by Division 26
   b. Meters shall be furnished by Division 23, wiring required to monitor meter provided by Division 23. Totalizing and programming by the Division 23 Contractor.
      1) Meters shall be EMON 3200 class or engineer approved equal.
   c. BMS shall not connect with the NXEGEN (Artis Energy) control panel provided by division 26
   d. Control wiring provided by ATC and programming to display totalized metering within the BMS graphical display. Metering shall include the following. Please also note, for each category listed below there may be several meters that will need to be

totalized and displayed. Refer to Electrical Drawings (Power Riser Diagram) for total quantity of meters for each category.

e. BMS shall monitor KW Consumption at electrical panels serving each of the following:
   1) Meter Total Building Electrical Load kW metering.
   2) Meter lighting panelboards
   3) Meter receptacle panelboards
   4) Meter General purpose panelboards
   5) Meter HVAC panels
   6) Meter PV System
   7) Meter Chiller 1 kW
   8) Meter Chiller 2 kW
   9) Meter Elevator

5. Cooling tower:
   a. Conductivity controller monitoring.
   b. Cooling tower automatic purge valve monitoring

6. Air monitoring for contaminates:
   a. Wall mounted CO2 sensors shall be provided adjacent to all temperature sensors in regularly occupied spaced and as indicated on drawings.
   b. CO2 sensors shall monitor CO2 levels in each zone and report back to BMS ppm levels.
7. Boiler flue monitoring:
   a. Mechanical contractor shall provide flue temperature sensor and coordinate installation with ATC. ATC shall monitor flue temperature sensor to maintain boiler efficiency
8. CHWS/R BTU and HWS/R BTU
9. Coordinate any additional monitoring requirements with owner.

3.33 HEAT TRACE INTERFACE:

A. ***BMS shall interface with heat trace control panel signal***.

PART 4 POINTS LIST

4.1 CHILLED BEAM ZONE

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Zone Temp	×							×		×
Zone Setpoint Adjust	×							X		×
Heating Valve Supply		×						×		×
Cooling Valve Supply		×						×		×
Schedule							×			X
Heating Valve Return		×						×		×
Cooling Valve Return		×						×		×
Heating Setpoint								×		×
Cooling Setpoint								×		×
Condensate Sensor			×					×	×	×
Low Zone Temp								X	×	X
High Zone Temp								X	×	X

4.2 CABINET UNIT HEATER

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Schedd**	**Trend**	**Alarm**	**Show On Graphic**
Zone Temp	×							×		×
Zone Setpoint Adjust	×							X		×
Heating Valve		×						×		×
Fan Status			×							×
Fan Start/Stop				×				×		×
Schedule							×			
Heating Setpoint								×		×
Fan Failure									×	×
Low Zone Temp								X	×	X

4.3 UNIT HEATER

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Schedd**	**Trend**	**Alarm**	**Show On Graphic**
Zone Temp	×							×		×
Zone Setpoint Adjust	×									×
Heating Valve		×						×		×
Fan Status			×							×
Fan Start/Stop				×				×		×
Schedule							×			
Heating Setpoint								×		×
Fan Failure									×	×
Low Zone Temp								X	×	X

4.4 RADIATION FLOOR ZONE

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Zone Temp	×							×		×
Zone Setpoint Adjust	×									×
Heating Valve		×						×		×
Schedule							×			
Heating Setpoint								×		×
Low Zone Temp								x	×	x
Manifold Circulator Pump status			x					x	x	x
Return piping thermistor	X							X		X
Mixing valve position	x							x	x	x

4.5 FANS

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Fan Status			×					×		×
Fan Start/Stop				×				×		×
Schedule							×			
Fan Failure									×	×
Fan in Hand									×	x
Fan Damper Control				X				X		X

4.6 HYDRONIC RADIANT CEILING PANELS & FIN TUBE RADIATION

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Zone Temp	×							×		×
Zone Setpoint Adjust	×									×
Heating Valve		×						×		×
Schedule							×			
Heating Setpoint								×		×
Return piping thermistor	X							X		X
Low Zone Temp								x	×	x

4.7 MOTORIZED DAMPERS (MD)

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Damper		×						×		×
Schedule							×			
Damper Failure									×	×
Damper position										x

4.8 VARIABLE AIR VOLUME–TERMINAL UNIT

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Zone Temp	×							×		×
Zone Setpoint Adjust	×									×
Airflow	×							×		×
Zone Damper		×								×
Supply Air Velocity Pressure	×							×		×
HW Reheat Valve				×				×		×
Supply Air Temp	×							×		×
HW Radiation Valve				×				×		×
Airflow Setpoint					×			×		×
Heating Mode						×		×		X
Schedule							×			
Heating Setpoint								×		×
Cooling Setpoint								×		×
Low Zone Temp								X	×	X
Zone Differential Pressure(Shall be monitored in each VAV zone)	×							X		×

4.9 HOT WATER LOOP PUMPS (P-1AB)

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Hot Water Supply Pressure	×							×		×
Hot Water Return Pressure	×							×		×
Hot Water Pump 1A VFD Speed setpoint		×						×		×
Hot Water Pump 1B VFD Speed setpoint		×						×		×
Hot Water Pump 1A VFD Speed Feedback	X							X		X
Hot Water Pump 1B VFD Speed Feedback	X							X		X
Hot Water Pump 1A VFD Fault			×						×	×
Hot Water Pump 1B VFD Fault			×						×	×
Hot Water Pump 1A Status			×					×		×
Hot Water Pump 1B Status			×					×		×
Hot Water Pump 1A Start/Stop				×						×
Hot Water Pump 1B Start/Stop				×						×

4.10 CHILLED WATER LOOP PUMPS (P-2AB, P-3AB, P-4AB)

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Chilled Water Supply Pressure Pump 2A	×							×		×
Chilled Water Return Pressure Pump 2B	×							×		×
Chilled Water Supply Pressure Pump 3A	×							×		×
Chilled Water Return Pressure Pump 3B	×							×		×
Chilled Water Supply Pressure Pump 4A	×							×		×
Chilled Water Return Pressure Pump 4B	×							×		×
Chilled Water Supply Temperature Pump 2A	×							×		×
Chilled Water Return Temperature Pump 2B	×							×		×
Chilled Water Supply Temperature Pump 3A	×							×		×
Chilled Water Return Temperature Pump 3B	×							×		×
Chilled Water Supply Temperature Pump 4A	×							×		×
Chilled Water Return Temperature Pump 4B	×							×		×
Chilled Water Pump 2A VFD Speed setpoint		×						×		×
Chilled Water Pump 2B VFD Speed setpoint		×						×		×
Chilled Water Pump 3A VFD Speed setpoint		×						×		×
Chilled Water Pump 3B VFD Speed setpoint		×						×		×
Chilled Water Pump 4A VFD Speed setpoint		×						×		×
Chilled Water Pump 4B VFD Speed setpoint		×						×		×
Chilled Water Pump 2A VFD Speed Feedback	X							X		X
Chilled Water Pump 2B VFD Speed Feedback	X							X		X

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Chilled Water Pump 3A VFD Speed Feedback	X							X		X
Chilled Water Pump 3B VFD Speed Feedback	X							X		X
Chilled Water Pump 4A VFD Speed Feedback	X							X		X
Chilled Water Pump 4B VFD Speed Feedback	X							X		X
Chilled Water Pump 2A VFD Fault			×						×	×
Chilled Water Pump 2B VFD Fault			×						×	×
Chilled Water Pump 3A VFD Fault			×						×	×
Chilled Water Pump 3B VFD Fault			×						×	×
Chilled Water Pump 4A VFD Fault			×						×	×
Chilled Water Pump 4B VFD Fault			×						×	×
Chilled Water Pump 2A Status			×					×		×
Chilled Water Pump 2B Status			×					×		×
Chilled Water Pump 3A Status			×					×		×
Chilled Water Pump 3B Status			×					×		×
Chilled Water Pump 4A Status			×					×		×
Chilled Water Pump 4B Status			×					×		×
Chilled Water Pump 2A Start/Stop				×						×
Chilled Water Pump 2B Start/Stop				×						×
Chilled Water Pump 3A Start/Stop				×						×
Chilled Water Pump 3B Start/Stop				×						×
Chilled Water Pump 4A				×						×

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Start/Stop										
Chilled Water Pump 4B Start/Stop				×						×

4.11 CHILLED BEAM HEAT EXCHANGER

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
High chilled beam chilled water supply (CBCS) temperature: 65°F	X							X	X	X
Low chilled beam chilled water supply (CBCS) temperature: 54°F	X							X	X	X
Dual supply temperature sensor error: If two temperature sensors on CBCS before pumps read greater that 10% different	X							X	X	X
High chilled beam chilled water supply/return pressure difference: 25% greater than setpoint	X							X	X	X
Low chilled beam chilled water supply/return pressure difference: 25% lower than setpoint	X							X	X	X
Chilled Beam Loop Modulating control valve	***X***	***X***						***X***	***X***	***X***

4.12 DEDICATED OUTSIDE AIR HANDLING UNITS (DOA-1, 2)

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Floor Differential Pressure(Each Floor)	x				×					×
Supply Air Static Pressure	x				×			×	×	×
Supply Air Static Pressure setpoint	x				×			×		×
Supply Air Static Pressure 2/3 downstream in ductwork	x				×			×	×	×
Supply Air Static Pressure setpoint 2/3 downstream in ductwork	x				×			×		×
Supply Air High Static Pressure Shutdown	x	x			×			×	×	×
Outside Air Velocity Pressure (airflow station)	x				×			×	×	×
Outside Air CFM (airflow station)	x				×			×	×	×
Exhaust Air CFM (airflow station)	x				×			×	×	×
Exhaust Air Velocity Pressure (airflow station)	x				×			×	×	×
Heating Supply Air Setpoint temperature	x				×			×		×
Cooling Supply Air Setpoint temperature	x				×			×		×
Return Air Humidity	x				×			×		×
Return Air Temp	x				×			×		×
Supply Air Temp	x				×			×		×
Supply Air Humidity	X				×			×		×
Outdoor Air Temp	x				×			×		×
Outdoor Air Humidity	x				×			×		×
Economizer Enable						×		x		x
OA Air Dampers			x	x		×		×		×
Exhaust Air Dampers			x	x		×		×		×
Energy Recovery Core Bypass Damper Control	x	x				×		×		×
Pass Dehumidification Core Bypass Damper	x	x				×		×		×

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Control										
Chilled water control valve		x				×		x		X
Hot water control valve		x				×		x		X
Heat/Cool/ dehumidification Mode						×		×		×
Economizer Status						×		×		×
Dirty Filter (Pre-filter and final filter)			x			×		X	×	×
Dirty Filter (Return air filter)			x			×		X	×	×
Supply Fan Stop/Start				x				X		X
Supply Fan Status			x			×		X	×	×
Supply Fan VFD Speed Control		x						X		X
Supply Fan VFD Speed Feedback	x							X		X
Return Fan Stop/Start				x				X		X
Return Fan Status			x			×		X	×	×
Return Fan VFD Speed Control		x						X		X
Return Fan VFD Speed Feedback	x							X		X
Schedule							×	X		X
Supply Fan Failure								X	×	×
Supply Fan in Hand			X					X	×	X
Return Fan Failure								X	×	×
Return Fan in Hand			X					X	×	X
Case temp sensor chilled water coil	x							X	×	X
Cast temp sensor hot water coil	x							x	x	X
Discharge of chilled water coil dew point (sensible and dewpoint) sensor	x						X	x	x	X
Return air dew point (sensible and dewpoint) sensor	x						X	X	×	X
Discharge of energy core	X						X	X	×	X

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
at exhaust fan dew point (sensible and dewpoint) sensor										
Discharge air dew point (sensible and dewpoint) sensor	x						x	x	x	X
Low limit temperature sensor			x						x	X
Fire alarm status			x					x	x	x
Return Duct Smoke Detector	x								x	
Supply Duct Smoke Detector	X								X	

4.13 VARIABLE AIR VOLUME (AHU-2) – CHILLED/HOT WATER

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Outside Air Velocity Pressure (airflow station)	x				×			×	×	×
Outside Air CFM (airflow station)	x				×			×	×	×
Exhaust Air CFM (airflow station)	x				×			×	×	×
Exhaust Air Velocity Pressure (airflow station)	x				×			×	×	×
Zone Temp	×							×		×
Zone Setpoint Adjust	×									×
Supply Air Static Pressure	×							×	×	×
Supply Air Static Pressure setpoint	x				×			×		×
Supply Air Static Pressure 2/3 downstream in ductwork	x				×			×	×	×
Supply Air Static Pressure setpoint 2/3 downstream in ductwork	x				×			×		×
Supply Air Velocity	×							×	×	×

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Pressure										
Supply Air High Static Pressure Shutdown	X	X			×			×	×	×
Mixed Air Temp	×							×		×
Return Air Temp	×							×		×
Supply Air Temp	×							×		×
Heating Supply Air Setpoint temperature	X				×			×		×
Cooling Supply Air Setpoint temperature	X				×			×		×
Mixed Air Humidity	×							×		×
Return Air Humidity	×							×		×
Supply Air Humidity	×							×		×
Return Air CO2	×							×		×
CO2	×							×		×
Zone Differential Pressure	×									×
Outdoor Air Flow	×							×		×
Supply Fan VFD Speed		×						×		×
Exhaust Fan VFD Speed		×						×		×
Cooling Valve		×						×		×
Heating Valve		×						×		×
Return Air Dampers		×						×		×
OA Air Dampers		×						×		×
Exhaust Air Dampers		×						×		×
Dirty Filter			×						×	×
Freezestat			×					×	×	×
High Static Shutdown			×					×	×	×
Supply Air Smoke Detector			×					×	×	×
Return Air Smoke Detector			×					×	×	×
Supply Fan VFD Fault			×						×	×
Supply Fan Status			×					×		×
Exhaust Fan VFD Fault			×						×	
Exhaust Fan Status			×					×		×
OA Damper Status			×					×		×
Exhaust Damper Status			×					×		×
Schedule							×			

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Supply Fan Start/Stop				×				×		×
Exhaust Fan Start/Stop				×				×		×
Supply Air Static Pressure Setpoint					×					×
Supply Air Temp Setpoint					×			×		×
Economizer Mixed Air Enth Setpnt					×			×		×
High Supply Air Static Pressure									×	
Low Supply Air Static Pressure									×	
Supply Fan Failure									×	×
Supply Fan in Hand									×	
Exhaust Fan Failure									×	×
Exhaust Fan in Hand									×	
High Supply Air Temp									×	
Low Supply Air Temp									×	
High Mixed Air Temp									×	
Low Mixed Air Temp									×	
High Return Air Temp									×	
Low Return Air Temp									×	
Filter differential pressure	X						X	X	X	
Return Duct Smoke Detector	x								x	
Supply Duct Smoke Detector	X								X	

4.14 SINGLE ZONE AIR HANDLER (AHU-1) – CHILLED/HOT WATER

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Outside Air Velocity Pressure (airflow station)	x				×			×	×	×
Outside Air CFM (airflow station)	x				×			×	×	×
Exhaust Air CFM (airflow station)	x				×			×	×	×
Exhaust Air Velocity Pressure (airflow station)	x				×			×	×	×
Supply Air Static Pressure	×							×	×	×
Supply Air Static Pressure setpoint	x				×			×		×
Supply Air Static Pressure 2/3 downstream in ductwork	x				×			×	×	×
Supply Air Static Pressure setpoint 2/3 downstream in ductwork	x				×			×		×
Supply Air High Static Pressure Shutdown	x	x			×			×	×	×
Zone Temp	×							×		×
Zone Setpoint Adjust	×							x		×
Mixed Air Temp	×							×		×
Return Air Temp	×							×		×
Supply Air Temp	×							×		×
Heating Supply Air Setpoint temperature	x				×			×		×
Cooling Supply Air Setpoint temperature	x				×			×		×
Mixed Air Humidity	×							×		×
Return Air Humidity	×							×		×
Supply Air Humidity	×							×		×
Cooling Valve		×						×		×
Heating Valve		×						×		×
Mixed Air Dampers		×						×		×
Zone Override			×					×		×
Freezestat			×					×	×	×
Supply Fan Status			×					×		×
Supply Fan Start/Stop				×				×		×

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Economizer Zone Temp Setpoint					×			×		×
Schedule							×			
Heating Setpoint								×		×
Cooling Setpoint								×		×
High Zone Temp									×	
Low Zone Temp									×	
Supply Fan Failure									×	×
Supply Fan in Hand									×	
High Mixed Air Temp									×	
Low Mixed Air Temp									×	
High Return Air Temp									×	
Low Return Air Temp									×	
High Supply Air Temp									×	
Low Supply Air Temp									×	
Filter differential pressure	X						X	X	X	
Return Duct Smoke Detector	x								x	
Supply Duct Smoke Detector	X								X	

4.15 WATER COOLED CHILLERS SYSTEM

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Condenser Water Supply (BMS in) Temp	×							×		×
Chilled Water Return Temp	×							×		×
Chilled Water Supply Temp	×							×		×
Condenser Water Return Temp	×							×		×
Condenser Water Supply Temp	×							×		×
Chilled Water Supply Temp Setpoint Reset		×						×		×
Bypass Valve		×						×		×
Chiller Refrigerant Leak Shutdown			×					×	×	×

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Refrigerant Leak Exhaust Fan				x				x	x	x
Refrigerant Leak Exhaust Fan Status			x					x	x	x
Refrigerant Leak Exhaust Fan damper				x				x	x	x
Refrigerant Leak Exhaust Fan damper status			x					x	x	x
Refrigerant Leak Makeup air damper				x				x	x	x
Refrigerant Makeup air damper status			x					x	x	x
Chilled Water Isolation Valves Status			×					×		×
Chilled Water Isolation Valves				×						×
Chilled water flow meter 1	x							x		X
Chilled water flow meter 2	x							x		X
Chiller 1 Start/Stop				×						×
Chiller 2 Start/Stop				×						×
Chiller 1 Status			×					×		×
Chiller 2 Status			×					×		×
Chiller Bacnet interface								x	x	x
Condenser Water Isolation Valves Status	X		~~x~~					×		×
Condenser Water Isolation Valves		X		~~x~~						×
Cooling tower fan VFD Speed		×						×		×
Cooling tower fan VFD Feedback	x							x		x
Cooling tower fan VFD Fault			×						×	×
Cooling tower fan Status			×					×		×
Cooling tower fan Start/Stop				×						×
Cooling tower BMS in Valves Status	x							×		×
Cooling tower BMS in Isolation Valves		x								×
Cooling tower Valves Status	x							×		×
Cooling tower Isolation		x								×

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Valves										
Cooling tower Makeup water valve				x				x		x
Cooling tower Makeup water valve status			x					x		x
Cooling tower Water level	x							x		x
Cooling tower BMS in temp probe	X							X		x
Chiller 1 Enable				×				x		×
Chiller 2 Enable				×				x		×
Cooling tower Fan Start/Stop				×						×
Outside Air Temp					×					
Chilled Water Isolation Valve Failure									×	
Chilled Water Isolation Valve in Hand									×	
Chilled Water Pump 2 Failure									×	×
Chilled Water Pump 2 Failure									×	×
Chilled Water Pump 1 Running in Hand									×	
Chilled Water Pump 2 Running in Hand									×	
Condenser Water Pump 1 Failure									×	×
Condenser Water Pump 2 Failure									×	×
Condenser Water Pump 1 Running in Hand									×	
Condenser Water Pump 2 Running in Hand									×	
Chiller 1 Failure									×	×
Chiller 2 Failure									×	×
Chiller 1 Running in Hand									×	
Chiller 2 Running in Hand									×	
Low Condenser Water Supply (BMS in) Temp									×	
High Condenser Water									×	

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Supply (BMS in) Temp										
High Chilled Water Supply Temp									×	
Low Chilled Water Supply Temp									×	
High Condenser Water Return Temp									×	
Low Condenser Water Return Temp									×	
High Condenser Water Supply Temp									×	
Low Condenser Water Supply Temp									×	
Outside air temp										x
Chiller Schedule										x

4.16 COOLING TOWER

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Condenser Water Supply (BMS in) Temp	×							×		×
Condenser Water Return Temp	×							×		×
Condenser Water Supply Temp	×							×		×
Bypass Valve Output		×						×		×
Fan VFD Speed		×						×		×
Condenser Water Pump 1 Status			×					×		×
Condenser Water Pump 2 Status			×					×		×
Fan Status			×					×		×
Fan VFD Fault			×						×	×
Condenser Water Pump 1 Start/Stop				×						×
Fan Start/Stop				×						×
Condenser Water Pump 1 Failure									×	×
Condenser Water Pump 1 Running in Hand									×	
Low Condenser Water Supply (BMS in) Temp									×	
High Condenser Water Supply (BMS in) Temp									×	
Fan Failure									×	×
Fan in Hand									×	
BMS in Sump Heater CT-1									×	
High Condenser Water Return Temp									×	
Low Condenser Water Return Temp									×	
High Condenser Water Supply Temp									×	
Low Condenser Water Supply Temp									×	
Vibration cut off									X	X
Cooling tower schedule							X			X

4.17 BOILERS

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Operating Hours					×			x		×
Operating Pressure					×			×		×
Operating Hot Water Temp (by boiler controller)					×		x	×		×
Hot Water Supply Temp Setpoint					×		x	×		×
Hot Water Supply Temp	x				×			×		×
Hot Water Return Temp	x				×			×		×
Boiler B-1 Status (Bacnet interface)						×		×	x	×
Boiler B-2 Status (Bacnet interface)						×		×	x	×
Boiler B-3 Status (Bacnet interface)						×		×	x	×
Hot Water Flow Status			x			×		×		×
Flue gas temp sensor	x							x	x	X
OA CO2 sensor	x							X		x
OA temp sensor	x							x		x
OA dew point sensor	x							x		X
Boiler enable				x				x	x	x
Boiler Bacnet interface								x	x	x

4.18 SPLIT SYSTEM A/C UNIT

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Space Temperature @ room with AC-1	X							X	X	X
Space Temperature @ room with AC-2	X							X	X	X
Space Temperature @ room with AC-3	X							X	X	X
Space Temperature @ room with AC-4	X							X	X	X
A/C Unit Status AC-1			X					X	X	X
A/C Unit Status AC-2			X					X	X	X
A/C Unit Status AC-3			X					X	X	X
A/C Unit Status AC-4			X					X	X	X
CU Unit Status CU-1			X					X	X	X
CU Unit Status CU-2			X					X	X	X
CU Unit Status CU-3			X					X	X	X
CU Unit Status CU-4			X					X	X	X

4.19 MISCELLANEOUS SYSTEMS

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Water Meters			X					x	x	x
Gas Meters			X					x	X	X
CO2 meters			x					x	x	x
Boiler Flue			x					x	x	x
Building BTU meters			X					X	x	x
Domestic Hot Water Heater WH-1			X						X	X
Domestic Hot Water Heater WH-2			X						X	X
Domestic Hot Water Storage Tank			X						X	X
Hot Water Recirculation Pump			X						X	X
Glycol Pump – Hot water			x						X	x
Glycol Refractometer – Hot water			x						X	x
Glycol Pump – Chilled water			x						X	x
Glycol Refractometer – Chilled water			x						X	x
Glycol Pump – Chilled beam water			x						X	x
Glycol Refractometer – Chilled beam water			x						X	x
Centrifugal Separator			X						X	X
Chemical Treatment			X						X	x
Refrigerator and Freezer			X						X	X
Heat Tracing at Condenser water piping	X								x	x
Heat Tracing at Cold water makeup piping	***X***								***x***	***x***
Expansion tank control valve		***X***	***X***					***X***	***X***	***X***
PV monitoring			x					x	x	x
Building Fire Alarm Monitoring			x						x	X
Refrigeration Monitoring			X					X	X	X
Disturbance counter			x					x	x	x
Surge Protection			x					x	x	x

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**

4.20 LIGHTING CONTROLS INTERLOCK

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Corridor Light Override On/Off				X			X	X		X
Exterior Light On/Off				X			X	X		X
Corridor light failure			x						x	x
Exterior light failure			x						x	x

4.21 ELECTRIC PULSE SUB METERS

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Instantaneous Meter Usage Main Service	X							X		X
Instantaneous Meter Usage Lighting	X							X		X
Instantaneous Meter Usage Mechanical	X							X		X
Instantaneous Meter Usage Receptacles	X							X		X
Instantaneous Meter Usage Elevators	X							X		X
Instantaneous Meter Usage General Purpose	X							X		X
Instantaneous Meter Usage P.V. System	X							X		X
Instantaneous Meter Usage Chiller 1	X							X		X
Instantaneous Meter Usage Chiller 2	x							x		X
Elevator meter	x							x		X

4.22 DOMESTIC WATER HEATER

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Water Heater Setpoint	X							X		X
Water Heater Temperature	X							X		X
Current Modulation Level	X							X		X
OEM Fault code	X							X	X	X
DHW Set Point upper bound	X							X		X
DHW Set Point lower bound	X							X		X
Water heater Fault			X					X	X	X
Flame Status			X					X		X

4.24 WATER AND GAS SUB METERS

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Main Service	X							X		X
Cooling tower makeup water	X							X		X
Boiler makeup water	X							X		X
Exterior hose bibs	X							X		X
Boiler gas service	X							X		X
Water heater gas service	X							X		X
Kitchen gas service	X							X		X
Main gas service	X							X		X
Main gas pressure failure	x							x	x	X

END OF SECTION

NEW HAVEN PUBLIC SCHOOLS
SCHOOL CONSTRUCTION PROGRAM

SECTION 232113

HYDRONIC PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Heating water piping, buried.
2. Heating water piping, above ground.
3. Chilled water piping, buried.
4. Chilled water piping, above grade.
5. Condensate Drain Piping
6. Equipment drains and over flows.
7. Unions and flanges.
8. Combustion Air Piping

B. Related Sections:
1. Section 07 84 46 - Firestopping: Product requirements for firestopping for placement by this section.
2. Section 08 31 13 - Access Doors and Frames: Product requirements for access doors for placement by this section.
3. Section 09 91 23 - Painting and Coating: Product requirements Painting for placement by this section.
4. Section 23 04 00 – General Conditions for Mechanical Trades
5. Section 23 21 13 - Pipes and Tubes for HVAC Piping and Equipment: Product and installation requirements for piping materials applying to various system types.
6. Section 23 05 16 - Expansion Fittings and Loops for HVAC Piping: Product and execution requirements for expansion compensation devices use in heating and cooling piping systems.
7. Section 23 05 23 - General-Duty Valves for HVAC Piping: Product requirements for valves for placement by this section.
8. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for pipe hangers and supports, sleeves, and firestopping for placement by this section.
9. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment: Product requirements for Vibration Isolation for placement by this section.
10. Section 23 05 53 - Identification for HVAC Piping and Equipment: Product requirements for pipe identification for placement by this section.
11. Section 23 07 00 - HVAC Insulation: Product requirements for Piping Insulation for placement by this section.
12. Section 23 21 16 - Hydronic Piping Specialties: Product and execution requirements for piping specialties used in heating and cooling piping systems.
13. Section 23 21 23 - Hydronic Pumps: Product and execution requirements for pumps used in heating and cooling piping systems.

14. Section 23 25 00 - HVAC Water Treatment: Product and execution requirements for cleaning and chemical treatment of heating and cooling piping systems.

1.2 REFERENCES

A. American Society of Mechanical Engineers:
1. ASME B16.3 - Malleable Iron Threaded Fittings.
2. ASME B16.4 - Gray Iron Threaded Fittings.
3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
4. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
5. ASME B31.1 - Power Piping.
6. ASME B31.9 - Building Services Piping.
7. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

B. ASTM International:
1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
3. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
4. ASTM A536 - Standard Specification for Ductile Iron Castings.
5. ASTM B32 - Standard Specification for Solder Metal.
6. ASTM B75 – Standard Specification for Seamless Copper Tube.
7. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
8. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
9. ASTM D1785 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
10. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
11. ASTM D2241 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
12. ASTM D2310 - Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
13. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems.
14. ASTM F437 - Standard Specification for Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
15. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
16. ASTM F439 - Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
17. ASTM F441/F441M - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.

18. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
19. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
20. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

C. American Welding Society:
1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
2. AWS D1.1 - Structural Welding Code - Steel.

D. American Water Works Association:
1. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
2. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in, for Water and Other Liquids.
3. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
5. AWWA C606 - American National Standard for Grooved and Shouldered Joints.

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.

1.3 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.

B. Provide flanges, union, and couplings at locations requiring servicing. Use unions, flanges, and Grooved coupling couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

C. Provide pipe hangers and supports in accordance with ASME B31.1.

D. Use ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Use ball valves for throttling, bypass, or manual flow control services.

F. Use spring loaded check valves on discharge of hot water and chilled water pumps.

G. Use plug valves for throttling service. Use non-lubricated plug valves only when shut-off or isolating valves are also provided.

H. Use butterfly valves in heating water systems and in chilled systems interchangeably with gate and globe valves.

I. Use only butterfly valves in chilled water systems for throttling and isolation service.

J. Use grooved or lug end butterfly valves to isolate equipment.

K. Use 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

L. Flexible Connectors or Grooved coupling Flexible Couplings: Use at or near pumps where piping configuration does not absorb vibration.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate schematic layout of piping system, including equipment, critical dimensions, and sizes.

1. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and be specifically identified with the applicable Grooved coupling style or series number.

C. Product Data:
1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
3. Hangers and Supports: Submit manufacturers catalog information including load capacity.

D. Design Data: Indicate pipe size. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

E. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures and isolation.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

G. Welders' Certificate: Include welders' certification of compliance with ASME Section IX.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Procedures: Closeout procedures.

B. Project Record Documents: Record actual locations of valves, equipment and accessories.

C. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.1 code for installation of piping systems and ASME Section IX for welding materials and procedures.

B. Perform Work in accordance with applicable authority for welding hanger and support attachments to building structure.

C. To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied by the same manufacturer as the grooved components.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum (3) three years documented experience.

B. Fabricator or Installer: Company specializing in performing Work of this section with minimum (3) three years documented experience.

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 DELIVERY, STORAGE, AND HANDLING

A. Section 01 61 00 – Basic Product Requirements: Product storage and handling requirements.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Section 01 61 00 – Basic Product Requirements.

B. Do not install underground piping when bedding is wet or frozen.

1.11 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.12 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

1.13 WARRANTY

A. Section 01 77 00 - Closeout Procedures: Product warranties and product bonds.

B. Warranty shall include labor and materials for a minimum period of two (2) years unless otherwise specified. Warranty starts at date of Commissioning acceptance of a complete system and Owner approval

1.14 EXTRA MATERIALS

A. Section 01 77 00 - Closeout Procedures: Spare parts and maintenance products.

PART 2 PRODUCTS

2.1 HEATING WATER PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black.
   1. Fittings: ASME B16.3, malleable iron or ASTM A234/A234M, forged steel welding type.
   2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.

B. Steel Pipe: ASTM A53/A53M, Schedule 40, black, cut or rolled grooved ends.
   1. Fittings: ASTM A536 ductile iron, or ASTM A53 forged steel or fabricated from carbon steel pipe, grooved ends designed to accept Grooved coupling standard or AGS “W” series couplings.
   2. Joints: Grooved mechanical couplings meeting ASTM F1476.
      a. Housing Clamps: STM A536 ductile iron, enamel coated Tyco-Grinnell or Victaulic, compatible with steel piping sizes, rigid Tyco-Grinnell style 772 or Victaulic style 107 or flexible Grinnell style 707 or Victaulic 77 where expansion and contraction, or noise and vibration reduction are preferred.
         1) Rigid Type: 2 inch through 8 inch: “Installation ready” rigid coupling with angle pattern bolt pads designed for direct ‘stab’ installation onto grooved end pipe without prior disassembly of the coupling and Grade “EHP” EPDM gasket.

2) Flexible Type: 2 inch through 12 inch: Use in locations where vibration attenuation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors for vibration isolation at equipment connections. Three (3) couplings, for each connector, shall be placed in close proximity to the source of vibration.

b. Grade "EHP" EPDM Gasket: Elastomer composition for operating temperature range from -20 degrees F to 220 degrees F.

c. Accessories: Steel bolts, nuts, and washers.

C. Copper Tubing: ASTM B88, Type L drawn.

1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.
3. Alternate NO 12: 2" and Smaller piping only. Press Fittings: IAPMO PS 117, ANSI LC1002, NSF61-G, EPDM sealing element and leak detection feature.
   a. Contractor must provide certification letter from press fitting manufacture indicating installer(s) compliance with manufactures practices.
   b. Contractor shall log each fitting which shall reflect installer's initials. Each fitting shall provider permanent tag for each fitting installed. Tag shall indicate log number, installer initials, and date of install.

~~*2.2 CHILLED WATER PIPING, BURIED*~~

~~*A. Description: Factory fabricated piping with carrier pipe, insulations and casing.*~~

~~*B. Carrier Pipe: Steel pipe complying with ASTM A53/ A53M, Type E, Grade B with ends for welded joints.*~~

~~*C. Carrier Pipe Insulation:*~~

~~*1. Polyurethane Foam Pipe Insulation: ASTM C 591, preformed, rigid, cellular.*~~

~~*a. Thermal Conductivity (k-Value): 0.13 at 75 deg F.*~~
~~*b. Service Temperature: 0 to plus 200 deg F*~~
~~*c. Moisture Absorption: ASTM D 2842, maximum 0.054 percent by volume.*~~
~~*d. Minimum 90 percent closed cell.*~~
~~*e. Dry Density: 2 lb/cu. ft. maximum.*~~
~~*f. Compressive Strength: 35 psig minimum at 5 percent deformation.*~~
~~*g. Water-Vapor Transmission: 1.26 perm inches according to ASTM E 96.*~~

~~*D. Casing: High-density polyethylene or PVC.*~~

~~*E. Casing accessories include the following:*~~
~~*1. Joint Kit: Half-shell, pourable or split insulation, casing sleeve, and shrink wrap sleeve.*~~
~~*2. Expansion Blanket: Elastomeric foam, formed to fit over piping.*~~
~~*3. End Seals: Shrink wrap the casing material to seal watertight around casing and carrier pipe.*~~

~~*F. Source Quality Control: Factory test the carrier pipe to 150 percent of the operating pressure of system. Furnish test certificates.*~~

~~*G. Fittings:*~~
~~*1. Sizes 2" and under: Malleable iron, screwed, 150 lb. conforming to ASME B16.3 as manufactured by Grinnell or Stockham.*~~
~~*2. Sizes over 2": Standard weight butt weld carbon steel conforming to ASTM 234as manufactured by Tube Turns or Grinnell. Elbows shall be long radius type. Tees and fittings shall be prefabricated except Weldolet type fittings may be used where branch line is less than ½ the size of the main. Reducers shall be eccentric.*~~

2.3 CHILLED WATER ***& CONDENSER WATER*** PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black.
1. Fittings: ASME B16.3, malleable iron or ASTM A234/A234M, forged steel welding type.
2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.

B. Steel Pipe: ASTM A53/A53M Schedule 40, black, cut or rolled grooved ends.
1. Fittings: ASTM A536 ductile iron, or ASTM A53 forged steel or fabricated from carbon steel pipe, grooved ends designed to accept Grooved coupling standard or AGS "W" series couplings.
2. Joints: Grooved mechanical couplings meeting ASTM F1476.
a. Housing Clamps: STM A536 ductile iron, enamel coated Tyco-Grinnell or Victaulic, compatible with steel piping sizes, rigid Tyco-Grinnell style 772 or Victaulic style 107 or flexible Grinnell style 707 or Victaulic 77 where expansion and contraction, or noise and vibration reduction are preferred.
1) Rigid Type: 2 inch through 8 inch: "Installation ready" rigid coupling with angle pattern bolt pads designed for direct 'stab' installation onto grooved end pipe without prior disassembly of the coupling and Grade "EHP" EPDM gasket.
2) Flexible Type: 2 inch through 12 inch: Use in locations where vibration attenuation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors for vibration isolation at equipment connections. Three (3) couplings, for each connector, shall be placed in close proximity to the source of vibration.
b. Grade "EHP" EPDM Gasket: Elastomer composition for operating temperature range from -20 degrees F to 220 degrees F.
c. Accessories: Steel bolts, nuts, and washers.

C. Copper Tubing: ASTM B88, Type L drawn.
   1. Fittings:
      a. ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.
      b. Permanent push-to-connect fittings shall be ASME B16.22 wrought copper alloy or ASME B16.18 cast copper alloy with push-to-connect ends designed for direct insertion of copper tube. Push-to-connect ends shall be complete with EPDM engineered seal and 301 stainless steel internal components. EPDM engineered seal shall be suitable for water operating temperatures up to +180°F.
   2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.
   3. Alternate NO 12: 2" and Smaller piping only. Press Fittings: IAPMO PS 117, ANSI LC1002, NSF61-G, EPDM sealing element and leak detection feature
      a. Contractor must provide certification letter from press fitting manufacture indicating installer(s) compliance with manufactures practices.
      b. Contractor shall log each fitting which shall reflect installer's initials. Each fitting shall provider permanent tag for each fitting installed. Tag shall indicate log number, installer initials, and date of install.

2.4 CONDENSATE DRAIN PIPING

A. Copper Tubing: ASTM B88, Type L hard drawn.
   1. Fittings: ASME B16.18, cast bronze, or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, solder, Grade 95TA.

2.5 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized.
   1. Fittings: ASME B16.3, malleable iron or ASME B16.4, cast iron.
   2. Joints: Threaded for pipe 2 inch and smaller; flanged for pipe 2-1/2 inches and larger.

B. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized, cut or rolled grooved ends.
   1. Fittings: ASTM A536 ductile iron, or ASTM A53/A53M forged carbon steel or fabricated from carbons steel pipe grooved ends designed to accept Grooved coupling or AGS "W" series couplings.
   2. Joints: Grooved mechanical couplings meeting ASTM F1476 by Tyco Grinnell or Victaulic.
      a. Housing Clamps: ASTM A536 ductile iron, enamel coated compatible with steel piping sizes, rigid or flexible type.
         1) Rigid Type: 2 inch through 8 inch: "Installation ready" rigid coupling with angle pattern bolt pads designed for direct 'stab' installation onto grooved end pipe without prior

disassembly of the coupling and Grade "EHP" EPDM gasket.

2) Flexible Type: 2 inch through 12 inch: Use in locations where vibration attenuation and stress relief are required.

b. Grade "EHP" EPDM Gasket: Elastomer composition for operating temperature range from -20 degrees F to 220 degrees F.

c. Accessories: Steel bolts, nuts, and washers.

C. Copper Tubing: ASTM B88, Type L drawn.

1. Fittings:
   a. ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F. For 2" and larger, Victaulic CTS System may be used
3. Alternate NO 12: 2" and Smaller piping only. Press Fittings: IAPMO PS 117, ANSI LC1002, NSF61-G, EPDM sealing element and leak detection feature
   a. Contractor must provide certification letter from press fitting manufacture indicating installer(s) compliance with manufactures practices.
   b. Contractor shall log each fitting which shall reflect installer's initials. Each fitting shall provider permanent tag for each fitting installed. Tag shall indicate log number, installer initials, and date of install.

2.6 COMBUSTION AIR PIPING

A. CPVC Pipe: ASTM F441/F441M, Schedule ~~80~~ ***40***, chlorinated polyvinyl chloride (CPVC) material.

1. Fittings: ASTM F439, CPVC, Schedule ~~80~~ ***40***, socket type. ASTM F437, CPVC, Schedule 80, threaded.
2. Joints: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement. Prime joints with a contrasting color.

2.7 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:

1. Ferrous Piping: Class 150, malleable iron, threaded.
2. Copper Piping: Class 150, bronze unions with soldered.
3. Dielectric Connections:
   a. Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
   b. Waterway fitting with zinc electroplated steel or ductile iron body, male thread, grooved, or plain end, water impervious isolation barrier.
4. CPVC Piping: CPVC.

B. Flanges for Pipe 2-1/2 inches and Larger:

1. Ferrous Piping:
   a. Class 150, forged steel, slip-on flanges.

b. Grooved joint flange adapter, flat face, for direct connection to ANSI Class 125 and 150 flanges. For direct connection to ANSI Class 300 flanges

2. Copper Piping:
   a. Class 150, slip-on bronze flanges.
   b. Grooved joint flange adapter, flat face, for direct connection to ANSI Class 125 and 150 flanges.
3. CPVC Piping: CPVC flanges.
4. Gaskets: 1/16 inch thick preformed neoprene gaskets.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

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.

E. After completion, fill, clean, and treat systems. Refer to Section 23 25 00.

3.3 INSTALLATION - INSERTS

A. Provide inserts for placement in concrete forms.

B. Provide 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 flush with top of slab.

3.4 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Install in accordance with ASME B31.9.

B. Support horizontal piping as scheduled.

C. Install hangers to provide 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. Design hangers for pipe movement without disengagement of supported pipe.

F. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.

G. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.

H. Provide sheet lead packing between hanger or support and piping.

I. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

3.5 INSTALLATION - BURIED PIPING SYSTEMS

A. Install trace wire continuous over top of pipe.

B. Install Work in accordance with local codes and specification requirements.

3.6 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

A. Install Work in accordance with local codes and specification requirements.

B. Route piping 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. Refer to Section 23 05 29.

F. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.

G. Install pipe identification in accordance with Section 23 05 53.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

I. Provide access where valves and fittings are not exposed.

J. Slope hydronic piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe aligned.

K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

L. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting. Refer to Section 09 90 00.

M. Install valves with stems upright or horizontal, not inverted.

N. Insulate piping and equipment; refer to Section 23 07 00.

O. Grooved joint piping systems shall be installed in accordance with the manufacturer's guidelines and recommendations. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be supplied by the grooved coupling manufacturer. Grooved end shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove for proper gasket sealing. A factory trained field representative shall provide on-site training to contractor's field personnel in the installation of grooved piping products. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.
   1. Install the AGS piping system in accordance with the latest installation instructions. Use grooving tools with AGS roll sets to groove the pipe. Follow guidelines for tool selection and operation. Coupling installation shall be complete when visual metal-to-metal contact is reached. AGS products shall not be installed with standard grooved end pipe or components. Installing AGS products in combination with standard grooved end products could result in joint separation and/or leakage.

P. Vic Press 304™ Installation: Pipe shall be certified for use with the Vic Press 304™ system. Pipe shall be square cut, +/- 0.030", properly deburred and cleaned. Pipe ends shall be marked at the required location, using a manufacturer-supplied gauge, to ensure full insertion into the coupling or fitting during assembly. Use a Victaulic "PFT" series tool with the proper sized jaw for pressing.

3.7 FIELD QUALITY CONTROL

A. Section 01 77 00 - Closeout Procedures: Field inspecting, testing, adjusting, and balancing.

B. Test heating water piping system and chilled water piping system in accordance with ASME B31.9.

3.8 SCHEDULES Copper and Steel Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8
3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8
2-1/2 (Note 1)	9	11	1/2	1/2
3	10	12	1/2	1/2
4	12	14	1/2	5/8
5	13	16	1/2	5/8
6	14	17	5/8	3/4

A. Note 1: Refer to manufacturer's recommendations for grooved end piping systems.

END OF SECTION

NEW HAVEN PUBLIC SCHOOLS
SCHOOL CONSTRUCTION PROGRAM

SECTION 232116

HYDRONIC PIPING SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Positive displacement meters.
2. Heat consumption meters.
3. Liquid flow meters.
4. Pressure gages.
5. Pressure gage taps.
6. Thermometers.
7. Thermometer supports.
8. Test plugs.
9. Flexible connectors.
10. Diaphragm-type expansion tanks.
11. Air vents.
12. Air separators.
13. Strainers.
14. Pump suction fittings.
15. Combination pump discharge valves.
16. Flow controls.
17. Relief valves.
18. Glycol Make Up System
19. Glycol solution.
20. Plate and Frame Heat Exchanger

B. Related Sections:
1. Section 23 04 00 – General Conditions for Mechanical Trades
2. Section 23 21 13 - Hydronic Piping: Execution requirements for piping connections to products specified by this section.
3. Section 23 21 23 - Hydronic Pumps: Execution requirements for piping connections to products specified by this section.

1.2 REFERENCES

A. American Society of Mechanical Engineers:
1. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.
2. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.

B. ASTM International:
1. ASTM E1 - Standard Specification for ASTM Thermometers.
2. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

C. American Water Works Association:
   1. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
   2. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
   3. AWWA C702 - Cold-Water Meters - Compound Type.
   4. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
   5. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

D. Underwriters Laboratories Inc.:
   1. UL 393 - Indicating Pressure Gauges for Fire-Protection Service.
   2. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service.

1.3 PERFORMANCE REQUIREMENTS

A. Flexible Connectors: Provide at or near pumps or motorized equipment where piping configuration does not absorb vibration.

1.4 SUBMITTALS

A. Division 1 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit for manufactured products and assemblies used in this Project.
   1. Manufacturer’s data and list indicating use, operating range, total range, accuracy, and location for manufactured components.
   2. Submit product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.
   3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each piping specialty.
   4. Submit electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures, application, selection, and hookup configuration. Include pipe and accessory elevations.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Division 1 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of actual locations of components and instrumentation, flow controls and flow meters.

C. Operation and Maintenance Data: Submit instructions for calibrating instruments, installation instructions, assembly views, servicing requirements, lubrication instruction, and replacement parts list.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.

1.7 PRE-INSTALLATION MEETINGS

A. Division 1- Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Division 1- Product Requirements: Product storage and handling requirements.

B. Accept piping specialties on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

D. Protect systems from entry of foreign materials by temporary covers, caps and closures, completing sections of the work, and isolating parts of completed system until installation.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Division 1- Product Requirements.

B. Do not install instruments when areas are under construction, except rough in, taps, supports and test plugs.

1.10 FIELD MEASUREMENTS

A. Verify field measurements before fabrication.

1.11 WARRANTY

A. Division 1- Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish five year manufacturer warranty for piping specialties.

C. Warranty shall include labor and materials for a minimum period of two (2) years unless otherwise specified. Warranty starts at date of Commissioning acceptance of a complete system and Owner approval

1.12 MAINTENANCE SERVICE

A. Division 1- Execution and Closeout Requirements: Maintenance service.

B. Furnish service and maintenance of glycol fluid and glycol charging components for two years from Date of Substantial Completion.

C. Furnish monthly visit for one year starting from Date of Substantial Completion to make glycol fluid concentration analysis on site with refractive index measurement instrument. Detail findings with maintenance personnel in writing of corrective actions needed including analysis and amounts of glycol or water added.

1.13 MAINTENANCE MATERIALS

A. Division 1- Execution and Closeout Requirements: Spare parts and maintenance materials.

B. Furnish two bottles of red gage oil for static pressure gages.

1.14 EXTRA MATERIALS

A. Division 1- Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish four pressure gages with pulsation damper and dial thermometers.

C. Furnish one extra 50 gallon drum of propylene glycol.

PART 2 PRODUCTS

2.1 PRESSURE GAGES

A. Manufacturers:
   1. Trerice
   2. Ernst
   3. Davis
   4. Substitutions: Division 1- Product Requirements.

B. Gage: ASME B40.1, with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
   1. Case: Cast aluminum
   2. Bourdon Tube: Brass.
   3. Dial Size: 3-1/2 inch diameter.
   4. Mid-Scale Accuracy: One percent.
   5. Scale: As shown on drawings.

2.2 PRESSURE GAGE TAPS

A. Manufacturers:
1. Trerice
2. Ernst
3. Davis

B. Ball Valve: Brass 1/4 inch NPT for 250 psi.

2.3 STEM TYPE THERMOMETERS

A. Manufacturers:
1. Trerice
2. Ernst
3. Davis

B. Thermometer: ASTM E1, red appearing mercury, lens front tube, cast aluminum case with enamel finish.
1. Size: 9 inch scale.
2. Window: Clear glass.
3. Stem: Brass, 3/4 inch NPT, 3-1/2 inch long.
4. Accuracy: ASTM E77 2 percent.
5. Calibration: Degrees F.

2.4 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions, and with cap and chain.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.5 TEST PLUGS

A. Manufacturers:
1. Omega
2. Imac
3. Peterson

B. 1/4 inch NPT or 1/2 inch NPT brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with:
1. Neoprene core for temperatures up to 200 degrees F.
2. Nordel core for temperatures up to 350 degrees F.
3. Viton core for temperatures up to 400 degrees F.

2.6 FLEXIBLE CONNECTORS

A. Manufacturers:
1. Mason
2. Vibration Eliminator

3. Metra Flex Model
4. Substitutions: Division 1- Product Requirements.

B. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 300 psig.

2.7 DIAPHRAGM-TYPE EXPANSION TANKS

A. Manufacturers:
1. Armstrong
2. Taco
3. B+G
4. Amtrol

B. Construction: Welded steel, tested and stamped in accordance with ASME Section VIII; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible butyl diaphragm sealed into tank, and steel support stand.

C. Accessories: Pressure gage and air-charging fitting, tank drain; pre-charge to 12 psig.

D. Automatic Cold Water Fill Assembly: Pressure reducing valve, double check back flow prevention device, test cocks, strainer, vacuum breaker, and by-pass valves.

2.8 AIR VENTS

A. Manufacturers:
1. Armstrong
2. B+G
3. Amtrol
4. Taco
5. Substitutions: Division 1 - Product Requirements

B. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

C. Float Type:
1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

D. Washer Type:
1. Brass with hydroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

2.9 AIR SEPARATORS

A. Manufacturers:
   1. Armstrong
   2. Spirotherm
   3. B+G.
   4. Taco .

B. Dip Tube Fitting: For 125 psig operating pressure; to prevent free air collected in boiler from rising into system.

C. In-line Air Separators: Cast iron for sizes 1-1/2 inch and smaller, or steel for sizes 2 inch and larger; tested and stamped in accordance with ASME Section VIII; for 125 psig operating pressure.

D. Combination Air Separators/Strainers: Steel, tested and stamped in accordance with ASME Section VIII; for 125 psig operating pressure, with integral galvanized steel strainer, tangential inlet and outlet connections, and internal stainless steel air collector tube.

2.10 STRAINERS

A. Manufacturers:
   1. Sarco
   2. Armstrong
   3. Yarway
   4. Substitutions: Division 1- Product Requirements.

B. Size 2 inch and Smaller:
   1. Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

C. Size 2-1/2 inch to 4 inch:
   1. Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

D. Size 5 inch and Larger:
   1. Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

2.11 PUMP SUCTION FITTINGS

A. Manufacturers:
   1. B+G
   2. Taco
   3. Armstrong
   4. Substitutions: Division 1 - Product Requirements.

B. Fitting: Angle pattern, cast-iron body. Threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger. Rated for 175 psig working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable fine mesh strainer to fit over cylinder strainer, and permanent magnet located in flow stream and removable for cleaning.

C. Accessories: Adjustable foot support, blow-down tapping in bottom, gage tapping in side.

2.12 COMBINATION PUMP DISCHARGE VALVES

A. Manufacturers:
1. B+G
2. Taco
3. Armstrong
4. Substitutions: Division 1- Product Requirements.

B. Valves: Straight or angle pattern, flanged cast-iron valve body with bolt-on bonnet for 175 psig operating pressure, non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation.

2.13 AUTOMATIC FLOW CONTROLS (MANUAL BALANCING VALVES ARE NOT ACCEPTABLE)

A. Manufacturers:
1. Nexus
2. Griswold
3. Flow Design
4. Macon
5. FDI

B. Construction: Brass or bronze body with union on inlet, and outlet, temperature and pressure test plug on inlet and outlet combination blow-down and back-flush drain.

C. Calibration: Control within 5 percent of design flow over entire operating pressure.

D. Control Mechanism: Stainless steel or nickel plated brass piston or regulator cup, operating against stainless steel helical or wave formed spring.

E. Accessories: In-line strainer on inlet and ball valve on outlet.

2.14 RELIEF VALVES

A. Manufacturers:
1. Watts
2. Tyco
3. Parker Hannifin

4. B+G
5. Substitutions: Division 1- Product Requirements.

B. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.

2.15 GLYCOL MAKE UP SYSTEM

A. Wessels Model GMP-13100 (GMP-1) & Wessels GMPD-23100 (GMP-2).

B. Other acceptable manufacturers offering equivalent products:
1. Bell and Gossett.
2. Armstrong.
3. John Wood.

C. The make-up systems shall be Wessels or approved equal. See plans.

D. The pumping assembly shall be mounted in a sturdy steel frame with legs to keep it off the floor. It shall include a 1.8 GPM at 50 psig pump, a 1/3 HP motor, a magnetic starter, a pressure tank with a pressure control, a priming valve, a PRV, a shut-off valve and a pressure gauge. Pump shall be 120 volt, single phase. Note that GMP-1 has one pump and GMP-2 has two pumps.

E. It shall feature a cut-off and alarm arrangement which will stop the pump in case of excessive pressure, or a low solution level, and activate an audible (which can be silenced) and a visual alarm. A 110 V signal shall also be available for a remote alarm.

F. A translucent 50 gallon polyethylene solution container, complete with a lid, shall be mounted on the pumping assembly and shall include a strainer and a shut off valve.

2.16 GLYCOL SOLUTION

A. Manufacturers:
1. Dow
2. Dupont
3. Exxon

B. Inhibited propylene glycol and water solution mixed 30 percent glycol - 70 percent water, suitable for operating temperatures from -50 degrees F to 325 degrees F.

2.17 PLATE AND FRAME HEAT EXCHANGER

A. Manufacturers:
1. Armstrong
2. Wessels
3. Sondex
4. Taco

B. The unit shall be provided with an aluminum or stainless steel OSHA splash shield.

C. The units shall be built in accordance with ASME code and when necessary be ASME Code stamped board registered.

D. Frame:

1. ***The frame plate and pressure plate should be carbon steel SA 516 grade 70.***
2. ***The frame and pressure plate shall be of sufficient thickness to meet the ASME design pressure. Stiffeners or support brackets are not allowed.***
3. ***Carbon steel frame components shall be painted with Armstrong "Harvester Red" epoxy paint.***
4. ***Units with four-inch or greater connections shall be unlined or alloy lined studded ports to mate with raised face or flat faced ANSI flanges. Rubber liners are not allowed.***
5. ***Units with two-inch or smaller connections shall have carbon steel female tapped NPT or male NPT connections if an alloy material is required.***
6. ***Units with two and half or three-inch connections shall be either studded ports or NPT as describe above.***
7. ***The frame design shall allow the thermal plates to be supported by the carry bar, top bar. The guide bar, bottom bar, shall only help properly align the plates.***
8. ***A roller assembly from the carry bar shall support the pressure plate for units taller than 60" and wider than 21".***
9. ***Tightening bolts shall be zinc plated carbon steel SA193 B7.***

E. Plates:

1. ***Plates shall be constructed of 316 L Stainless Steel.***
2. ***Plates shall be pressed in a one-step stamping process.***
3. ***Plates shall use an integral rolled edge hanging system to provide a rigid hanger device between the plate and carry bar and guide bar. Welded on hanging brackets or stiffeners are not acceptable.***
4. ***Plates shall be permanently marked to indicate plate material and thickness.***

F. Gaskets:

1. ***The gaskets shall be a one-piece construction with a double gasket barrier at the port region. The area isolated by the double gasket shall be vented to the atmosphere, so that a gasket failure is detected by leakage to the exterior prior to any possible cross contamination.***
2. ***Gaskets are to be "mechanically fixed". Glued gaskets are not acceptable.***
3. ***The gaskets are to be made of NBR.***

G. Selection, Certification and Testing:

1. ***The manufacturer shall hydro-test the unit to 1.3 times the design pressure as directed by ASME Code.***

PART 3 EXECUTION

3.1 INSTALLATION - METERS

A. Install positive displacement meters in accordance with AWWA M6, with isolating valves on inlet and outlet.

3.2 INSTALLATION - THERMOMETERS AND GAGES

A. Install one pressure gage for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gage.

B. Install gage taps in piping

C. Install pressure gages with pulsation dampers. Provide ball valve to isolate each gage. Extend nipples to allow clearance from insulation.

D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.

E. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets as required.

F. Coil and conceal excess capillary on remote element instruments.

G. Provide instruments with scale ranges selected according to service with largest appropriate scale.

H. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

I. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.3 INSTALLATION - HYDRONIC PIPING SPECIALTIES

A. Locate test plugs adjacent to pressure gages and pressure gage taps as indicated on Drawings.

B. Where large air quantities accumulate, provide enlarged air collection standpipes.

C. Install manual air vents at system high points.

D. For automatic air vents in ceiling spaces or other concealed locations, install vent tubing to nearest drain.

E. Provide air separator on suction side of system circulation pump and connect to expansion tank.

F. Provide drain and hose connection with valve on strainer blow down connection.

G. Provide pump suction fitting on suction side of base mounted centrifugal pumps. Remove temporary strainers after cleaning systems.

H. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps.

I. Support pump fittings with floor mounted pipe and flange supports.

J. Provide radiator valves on water inlet for the following terminal heating unit types: radiation, unit heaters, and fan coil units.

K. Provide radiator-balancing valves on water outlet for the following terminal heating unit types: radiation, unit heaters, and fan coil units.

L. Provide relief valves on pressure tanks, low-pressure side of reducing valves, heat exchangers, and expansion tanks.

M. Select system relief valve capacity greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

N. Pipe relief valve outlet to nearest floor drain.

O. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

P. Feed glycol solution to system through make-up line with pressure regulator, venting system high points. Set to fill at 12 psig.

3.4 FIELD QUALITY CONTROL

A. Division 1 - Quality Requirements, Division 1- Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Test for strength of glycol and water solution and submit written test results.

3.5 CLEANING

A. Division 1- Execution and Closeout Requirements: Requirements for cleaning.

B. Clean and flush glycol system before adding glycol solution.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Division 1 - Execution and Closeout Requirements: Requirements for protecting installed construction.

B. Do not install hydronic pressure gauges until after systems are pressure tested.

3.7 SCHEDULES

A. Pressure Gages.

1. Pumps.
   a. Location: Suction & discharge of all pumps, circulators.
   b. Scale range:0-75 PSIG
2. Expansion tanks.
   a. Location: On tank.
   b. Scale range: 0-75 PSIG
3. Pressure reducing valves.
   a. Location: Inlet & discharge.
   b. Scale range: 0-75 PSIG

B. Pressure Gage Tapping Location:
   1. Major coils - inlets and outlets.
   2. Chiller - inlets and outlets.
   3. Boiler - inlets and outlets.

C. Stem Type Thermometers:
   1. Boilers - inlets and outlets.
      a. Location: inlets and outlets.
      b. Scale range: 50-250 Degrees F.
   2. Chiller - inlets and outlets.
      a. Location: inlets and outlets.
      b. Scale range: 50-250 Degrees F.
   3. After major coils.
      a. Location: inlets and outlets.
      b. Scale range: 50-250 Degrees F.

END OF SECTION

NEW HAVEN PUBLIC SCHOOLS
SCHOOL CONSTRUCTION PROGRAM

SECTION 235100

BREECHINGS, CHIMNEYS, AND STACKS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Double wall metal stacks.

B. Related Sections:
   1. Division 3 - Concrete Forming and Accessories: Execution requirements for inserts specified by this section.
   2. Division 3 - Cast-In-Place Concrete: Concrete for stack foundations.
   3. Section 23 04 00 – General Conditions for Mechanical Trades
   4. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for hangers and supports for placement by this section.
   5. Section 23 07 00 - HVAC Insulation: Execution requirements for insulation specified by this section.
   6. Section 23 08 00-Commissioning of HVAC Systems
   7. Section 23 52 34 – Hot Water Condensing: Boilers using breeching, chimneys, and stacks.
   8. Division 26 - Equipment Wiring Connections: Execution requirements for electrical connections specified by this section.

1.2 REFERENCES

A. American National Standards Institute:
   1. ANSI Z21.66 - Automatic Vent Damper Devices for Use with Gas-Fired Appliances.
   2. ANSI Z21.67 - Mechanically Actuated Automatic Vent Damper Device.
   3. ANSI Z21.68 - Thermatically Actuated Automatic Vent Damper Devices.
   4. ANSI Z95.1 - Oil Burning Equipment, Installation.

B. 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 A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   4. A1011/A1011M-07 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
   5. ASTM C401 - Standard Classification of Alumina and Alumina-Silicate Castable Refractories.

C. National Fire Protection Association:
   1. NFPA 31 - Standard for the Installation of Oil-Burning Equipment.
   2. NFPA 54 - National Fuel Gas Code.
   3. NFPA 82 - Standard on Incinerators and Waste and Linen Handling Systems and Equipment.
   4. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances.

D. Sheet Metal and Air Conditioning Contractors:
   1. SMACNA - Guide for Steel Stack Construction.
   2. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

E. Underwriters Laboratories Inc.:
   1. UL 103 - Factory-Built Chimneys for Residential Type and Building Heating Appliances.
   2. UL 127 - Factory-Built Fireplaces.
   3. UL 378 - Draft Equipment.
   4. UL 441 - Gas Vents.
   5. UL 641 - Type L Low-Temperature Venting Systems.
   6. UL 959 - Medium Heat Appliance Factory Built Chimneys.

1.3 DEFINITIONS

A. Breeching: Vent Connector.

B. Chimney: Primarily vertical shaft enclosing at least one vent for conducting flue gases outdoors.

C. Smoke Pipe: Round, single wall vent connector.

D. Vent: Portion of a venting system designed to convey flue gases directly outdoors from a vent connector or from an appliance when a vent connector is not used.

E. Vent Connector: Part of a venting system that conducts the flue gases from the flue collar of an appliance to a chimney or vent, and may include a draft control device.

1.4 DESIGN REQUIREMENTS

A. Design metal stacks for wind loading of 110 mph and seismic loads for Zone 2A.

1.5 SUBMITTALS

A. Division 1 - Submittal Procedures: Submittals procedures.

B. Shop Drawings: Indicate general construction, dimensions, weights, support and layout of breeching. Submit layout drawings indicating plan view and elevations.

C. Product Data: Submit data indicating factory built chimneys, including dimensional details of components and flue caps, dimensions and weights, electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions: Submit assembly, support details, and connection requirements.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with State of Connecticut standard.

B. Maintain one copy of each document on site.

C. Provide factory built vents and chimneys used for venting natural draft appliances complying with NFPA 211 and UL listed and labeled.

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.

C. Design stacks over 10 feet above roof under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.

1.8 PRE-INSTALLATION MEETINGS

A. Division 1 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Division 1 - Product Requirements.

B. Maintain water integrity of roof during and after installation of chimney or vent.

1.10 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.11 WARRANTY

A. Division 1- Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish two year manufacturer warranty for manufactured units.

C. Warranty shall include labor and materials for a minimum period of two (2) years unless otherwise specified. Warranty starts at date of Commissioning acceptance of a complete system and Owner approval

PART 2 PRODUCTS

2.1 DOUBLE WALL METAL STACKS (FOR BOILERS AND WATER HEATERS)

A. Manufacturers:
1. Metal Fab Model Corrugard
2. Metalbestos Model CI Vent
3. Vent Fab
4. Van Packer
5. Heat Fab Model CI Vent

B. Furnish double wall metal stacks, tested to UL 1738 and UL listed, for use with building heating equipment, in compliance with NFPA 211.

C. Fabricate with 1 inch minimum air space between walls. Construct inner jacket of 20 gage ASTM A666 AL 29-4C stainless steel. Construct outer jacket of Type 409 stainless steel 24 gage for sizes 8 inches to 24 inches and 20 gage for sizes 28 inches to 48 inches.

D. AL29-4C stainless is required for inner jacket, substitutions are not acceptable regardless of listings.

E. Accessories, UL labeled:
1. Sidewall Rain Cap: Consists of conical rain shield with inverted cone for partial rain protection with low flow resistance.

PART 3 EXECUTION

3.1 PREPARATION

A. Install concrete inserts for support of breeching, chimneys, and stacks in coordination with formwork.

3.2 INSTALLATION

A. Install in accordance with NFPA SMACNA Guide for Steel Stack Construction.

B. Install breeching with minimum of joints. Align accurately at connections, with internal surfaces smooth.

C. Support breeching from building structure, rigidly with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling. Support vertical breeching, chimneys, and stacks at 12 foot spacing, to adjacent structural surfaces, or at floor penetrations. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for equivalent duct support configuration and size.

D. Install stacks on concrete foundations. Refer to Division 3.

E. Pitch breeching with positive slope up from fuel-fired equipment to chimney or stack.

F. Coordinate installation of dampers.

G. Insulate breeching in accordance with Section 23 07 00.

H. Install vent dampers, locating close to draft hood collar, and secured to breeching.

I. Assemble and install stack sections in accordance with NFPA 82, industry practices, and in compliance with UL listing. Join sections with acid-resistant joint cement. Connect base section to foundation using anchor lugs.

J. Level and plumb chimney and stacks.

K. Clean breeching, chimneys, and stacks during installation, removing dust and debris.

L. Install slip joints allowing removal of appliances without removal or dismantling of breeching, breeching insulation, chimneys, or stacks.

M. Provide minimum length of breeching to connect appliance to chimney.

N. Extend vent above roof in accordance with applicable code.

O. Maximum Vent Horizontal Distance: 75 percent of vent vertical distance.

P. Where appliance requires draft hood or barometric control device, install manufacturer furnished listed devices in accordance with manufacturer's instructions and applicable code.

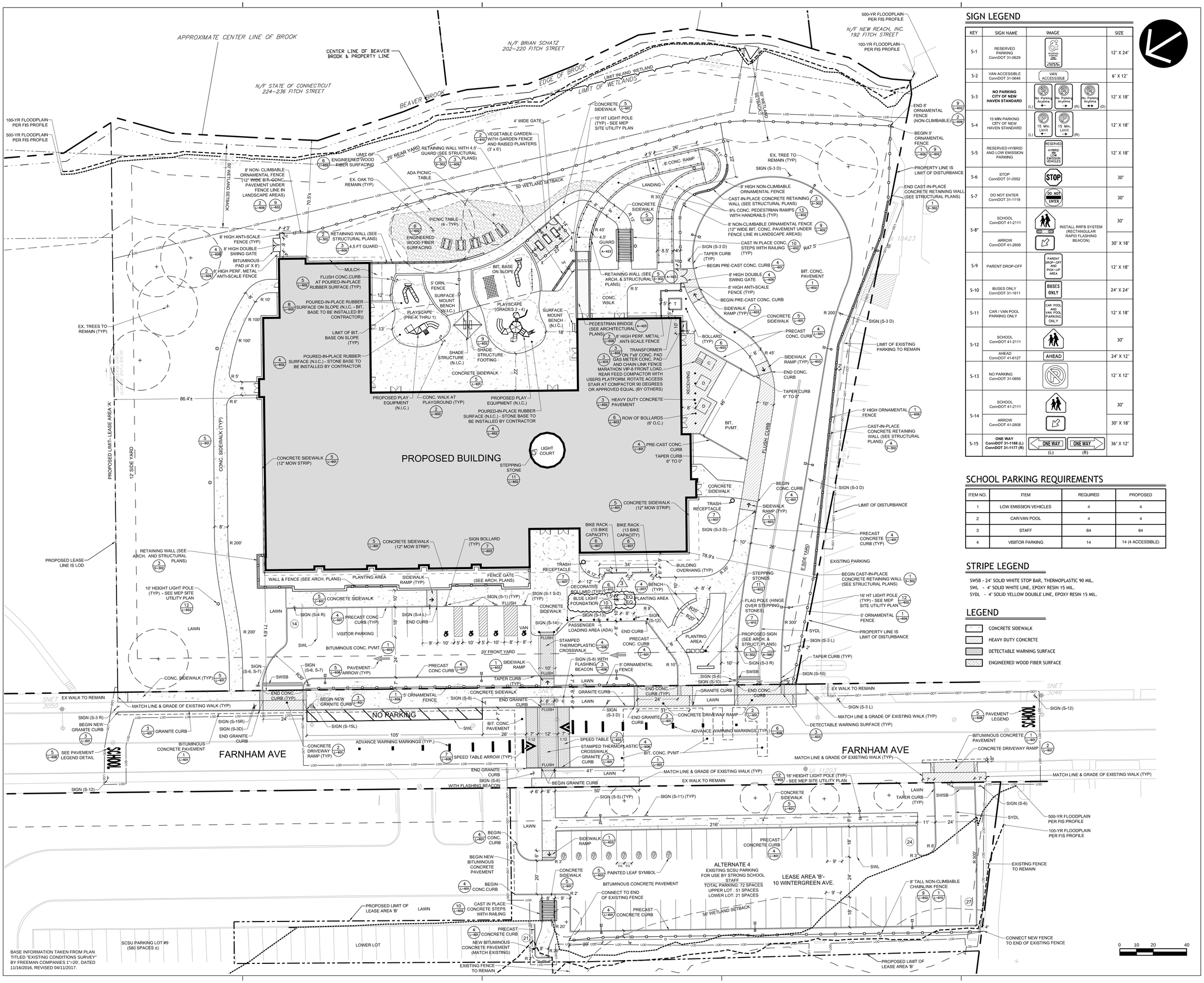
Q. Provide drain connection at bottom of stacks and pipe to nearest floor drain.

3.3 COMMISSIONING

A. Verify that equipment is installed and commissioned as per requirements of Section 230800 and manufacturer's written instructions.

B. Complete installation and functional tests according to Section 230800 and manufacturer's written instructions.

END OF SECTION



BASE INFORMATION TAKEN FROM PLAN TITLED "EXISTING CONDITIONS SURVEY" BY FREEMAN COMPANIES 1"=20', DATED 11/16/2016, REVISED 04/11/2017.

SIGN LEGEND

KEY	SIGN NAME	IMAGE	SIZE
S-1	RESERVED PARKING ConnDOT 31-0629	RESERVED PARKING VAN ACCESSIBLE	12" X 24"
S-2	VAN ACCESSIBLE ConnDOT 31-0648	VAN ACCESSIBLE	6" X 12"
S-3	**NO PARKING CITY OF NEW HAVEN STANDARD**	No Parking Anytime (L) / No Parking Anytime (R) / No Parking Anytime (D)	12" X 18"
S-4	15 MIN PARKING CITY OF NEW HAVEN STANDARD	15 Min. Limit (L) / 15 Min. Limit (R)	12" X 18"
S-5	RESERVED HYBRID AND LOW EMISSION PARKING	RESERVED HYBRID LOW EMISSION VEHICLES	12" X 18"
S-6	STOP ConnDOT 31-0552	STOP	30"
S-7	DO NOT ENTER ConnDOT 31-1119	DO NOT ENTER	30"
S-8*	SCHOOL ConnDOT 41-2111	INSTALL RRFB SYSTEM (RECTANGULAR RAPID FLASHING BEACON)	30"
	ARROW ConnDOT 41-2608		30" X 18"
S-9	PARENT DROP-OFF	PARENT DROP-OFF AND PICK-UP AREA	12" X 18"
S-10	BUSES ONLY ConnDOT 31-1611	BUSES ONLY	24" X 24"
S-11	CAR / VAN POOL PARKING ONLY	CAR POOL AND VAN POOL PARKING ONLY	12" X 18"
S-12	SCHOOL ConnDOT 41-2111		30"
	AHEAD ConnDOT 41-6127	AHEAD	24" X 12"
S-13	NO PARKING ConnDOT 31-0695		12" X 12"
S-14	SCHOOL ConnDOT 41-2111		30"
	ARROW ConnDOT 41-2608		30" X 18"
S-15	**ONE WAY ConnDOT 31-1188 (L) ConnDOT 31-1177 (R)**	ONE WAY (L) / ONE WAY (R)	36" X 12"

SCHOOL PARKING REQUIREMENTS

ITEM NO.	ITEM	REQUIRED	PROPOSED
1	LOW EMISSION VEHICLES	4	4
2	CAR/VAN POOL	4	4
3	STAFF	64	64
4	VISITOR PARKING	14	14 (4 ACCESSIBLE)

STRIPE LEGEND

SWSB - 24" SOLID WHITE STOP BAR, THERMOPLASTIC 90 MIL.
SWL - 4" SOLID WHITE LINE, EPOXY RESIN 15 MIL.
SYDL - 4" SOLID YELLOW DOUBLE LINE, EPOXY RESIN 15 MIL.

LEGEND

- CONCRETE SIDEWALK
- HEAVY DUTY CONCRETE
- DETECTABLE WARNING SURFACE
- ENGINEERED WOOD FIBER SURFACE

NEW HAVEN PUBLIC SCHOOLS

STRONG 21st CENTURY COMMUNICATIONS LAB SCHOOL

SOUTHERN CONNECTICUT STATE UNIVERSITY
FARNHAM AVENUE
NEW HAVEN, CT 06515

STATE PROJECT# : 093-0368N

JCJ ARCHITECTURE
120 HUYSHOPE AVENUE
SUITE 400
HARTFORD, CT 06106
860.247.9226

PICKARD CHILTON
980 CHAPEL STREET
NEW HAVEN, CT 06510
203.786.8600

CONSULTANTS:

SITE/CIVIL ENGINEER
FREEMAN COMPANIES
36 JOHN STREET
HARTFORD, CT 06106
860.251.9550

STRUCTURAL ENGINEER
MICHAEL HORTON ASSOCIATES
151 MEADOW STREET
BRANDORD, CT 06405
203.481.8600

MEP ENGINEER / FIRE PROTECTION
CONSULTING ENGINEERING SERVICES
811 MIDDLE STREET
MIDDLETOWN, CT 06457
860.632.1682

ACOUSTIC / AUDIO VISUAL
JAFFE HOLDEN ACOUSTICS
114A WASHINGTON STREET
NORWALK, CT 06854
203.838.4167

FOOD SERVICE
McFARLAND KISTLER & ASSOCIATES
1130 PERRY HIGHWAY - SUITE 115
PITTSBURGH, PA 15237
412.367.1905

HARDWARE CONSULTANT
P.H. HAWLEY ASSOCIATES
36 SCENIC DRIVE
BERLIN, CT 06037
860.438.7636

ISSUED FOR BID
03-05-2018

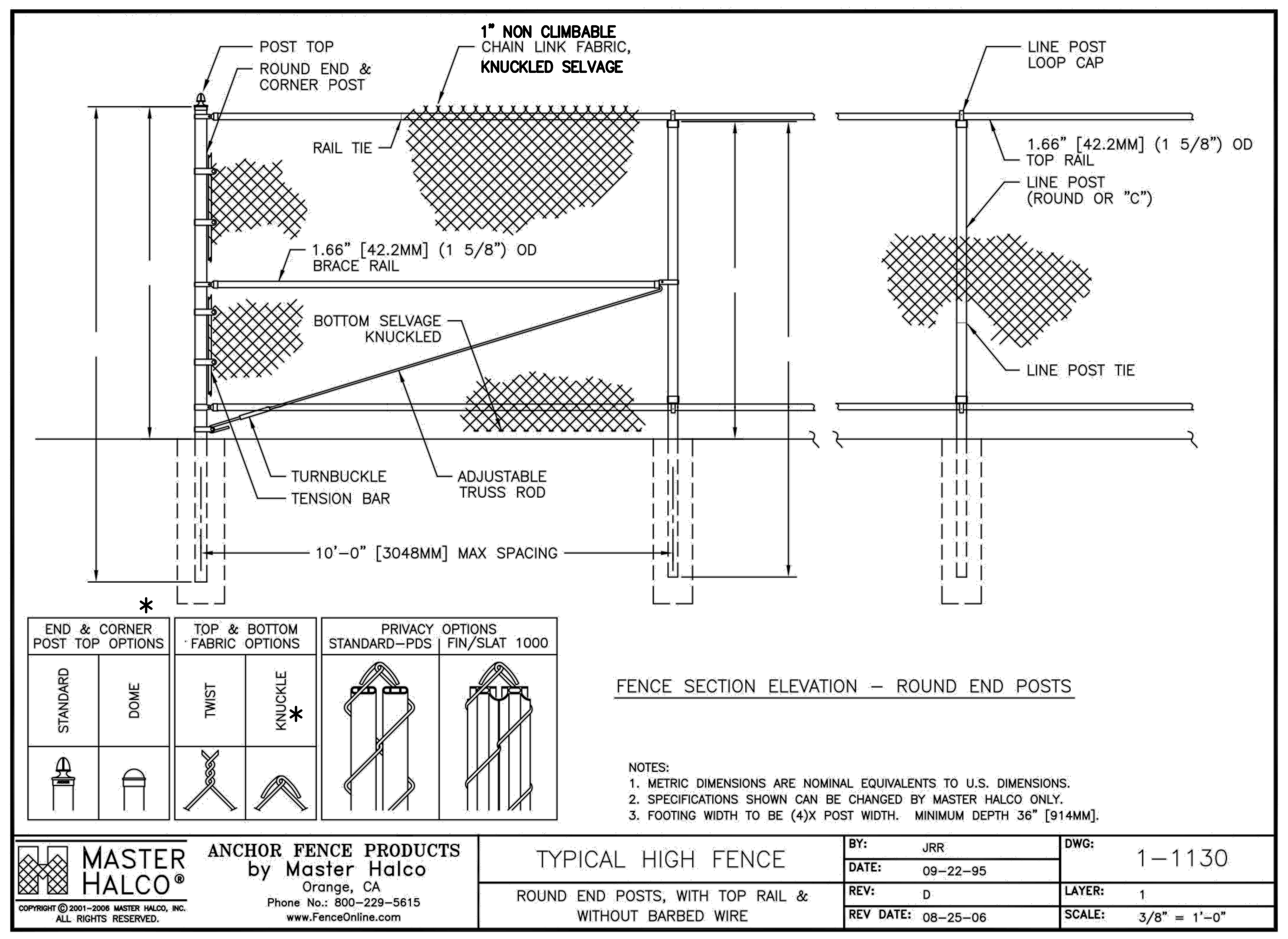
P.I.C. L.D.
P.M. P.A.

ISSUE 2017-09-08
JOB H16040.00
DRAWN B.Y.
SCALE 1"=20'

REVISIONS:
3 03/27/2018 ADDENDUM 03

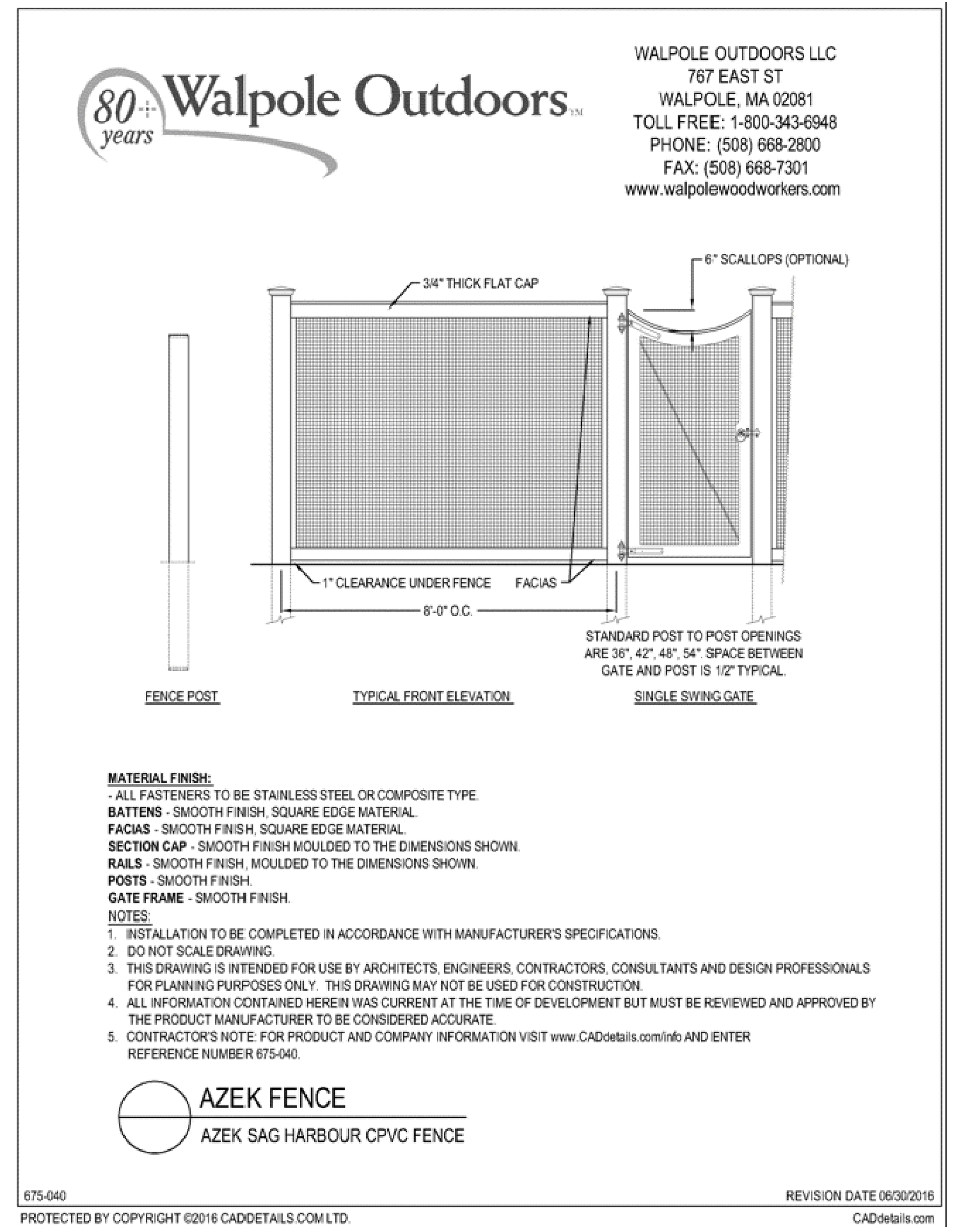
SITE LAYOUT PLAN

L-102

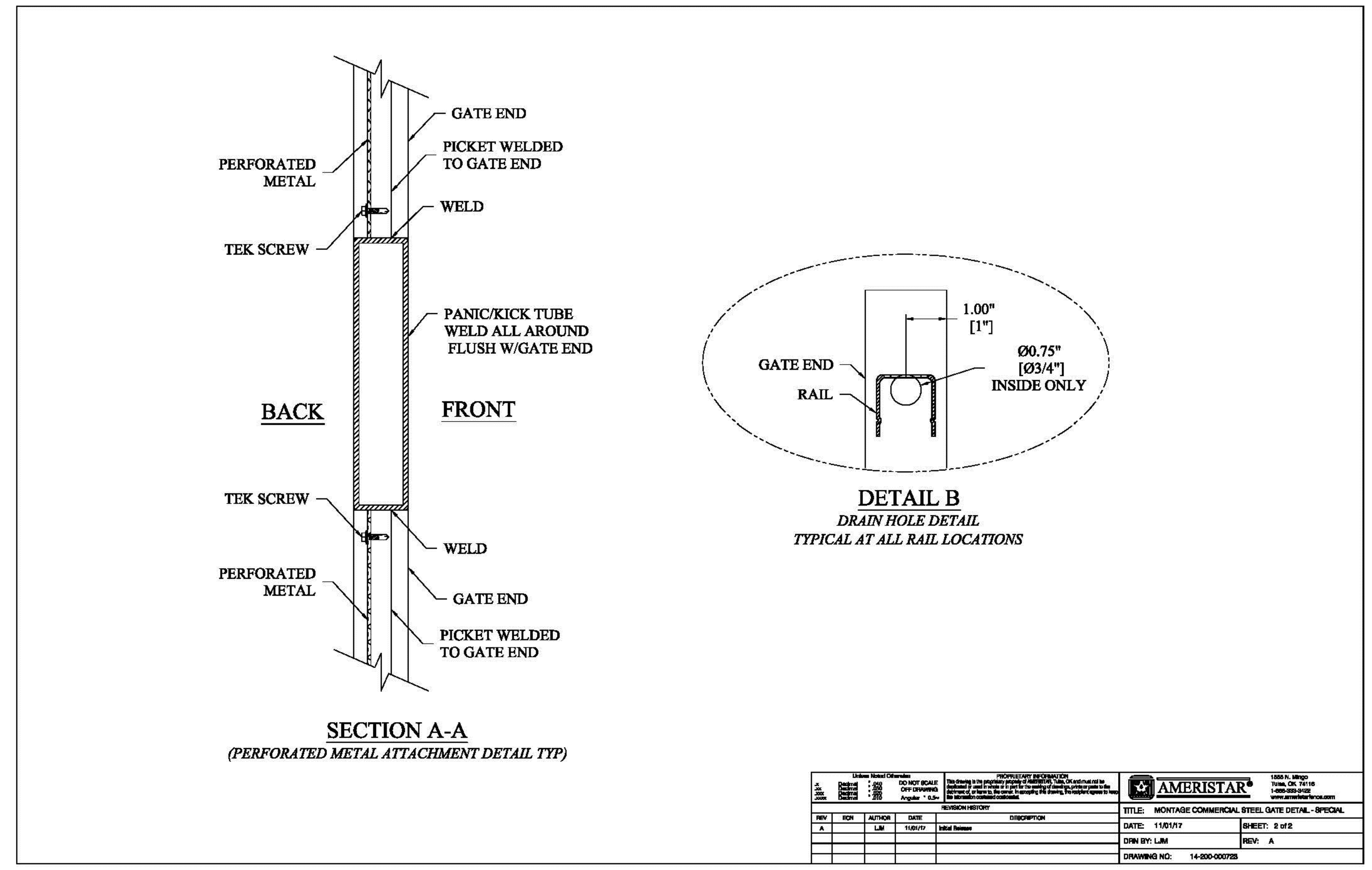


NOTE:
1. PRODUCT TO BE AS SHOWN OR APPROVED EQUAL

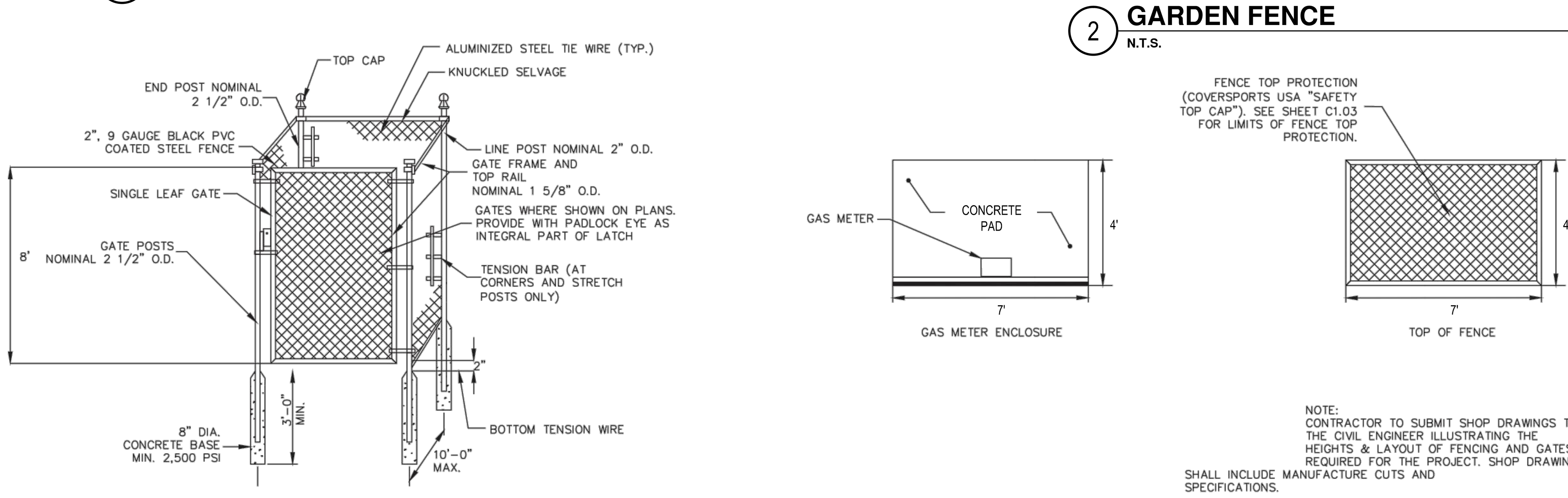
1 8' NON-CLIMBABLE CHAIN LINK FENCES
N.T.S.



2 GARDEN FENCE
N.T.S.



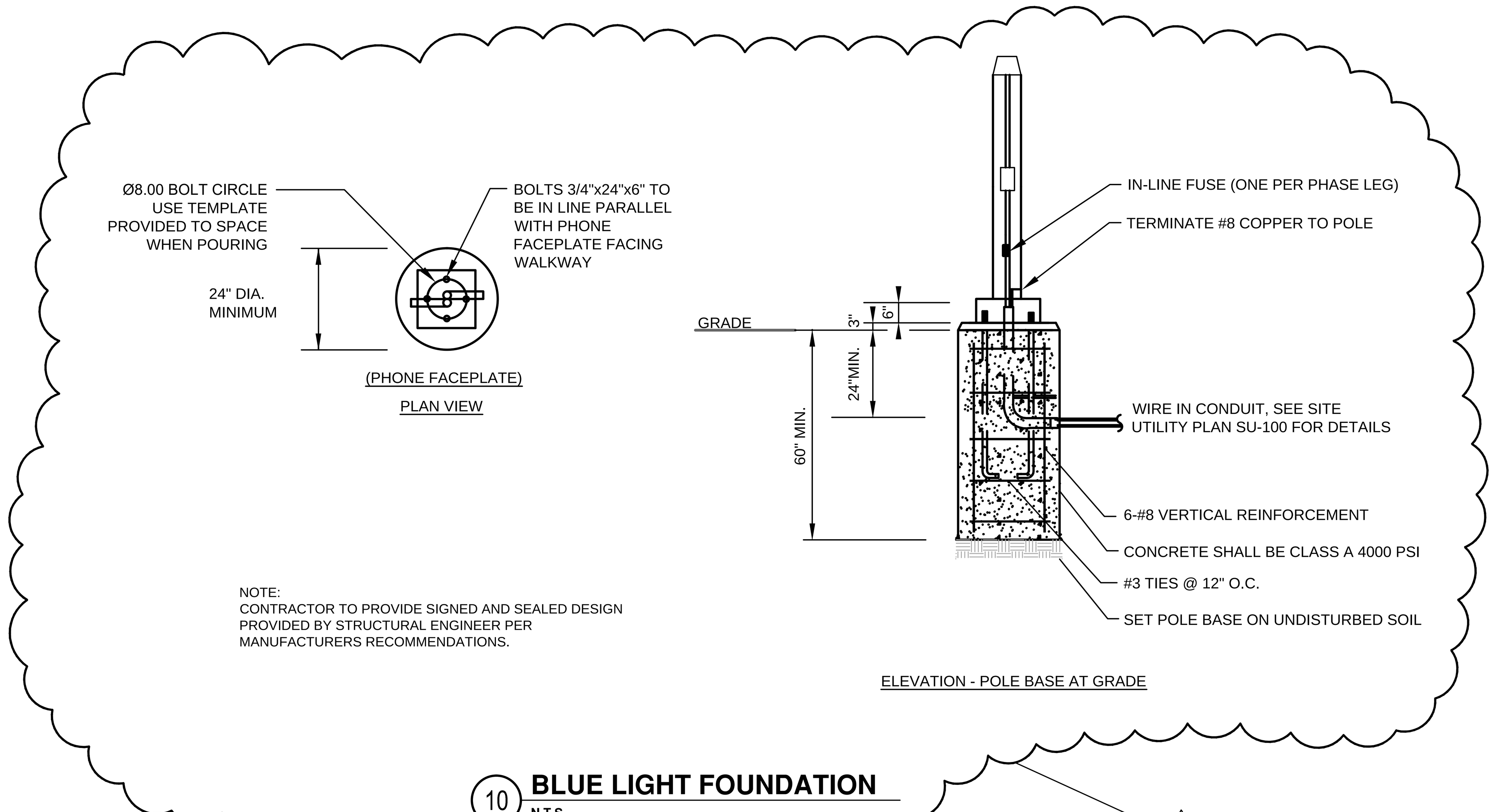
8 8' GATE PANIC/KICK TUBE - SECTION
N.T.S.



NOTE:
CONTRACTOR TO SUBMIT SHOP DRAWINGS TO THE CIVIL ENGINEER ILLUSTRATING THE HEIGHTS & LAYOUT OF FENCING AND GATES REQUIRED FOR THE PROJECT. SHOP DRAWINGS SHALL INCLUDE MANUFACTURE CUTS AND SPECIFICATIONS.

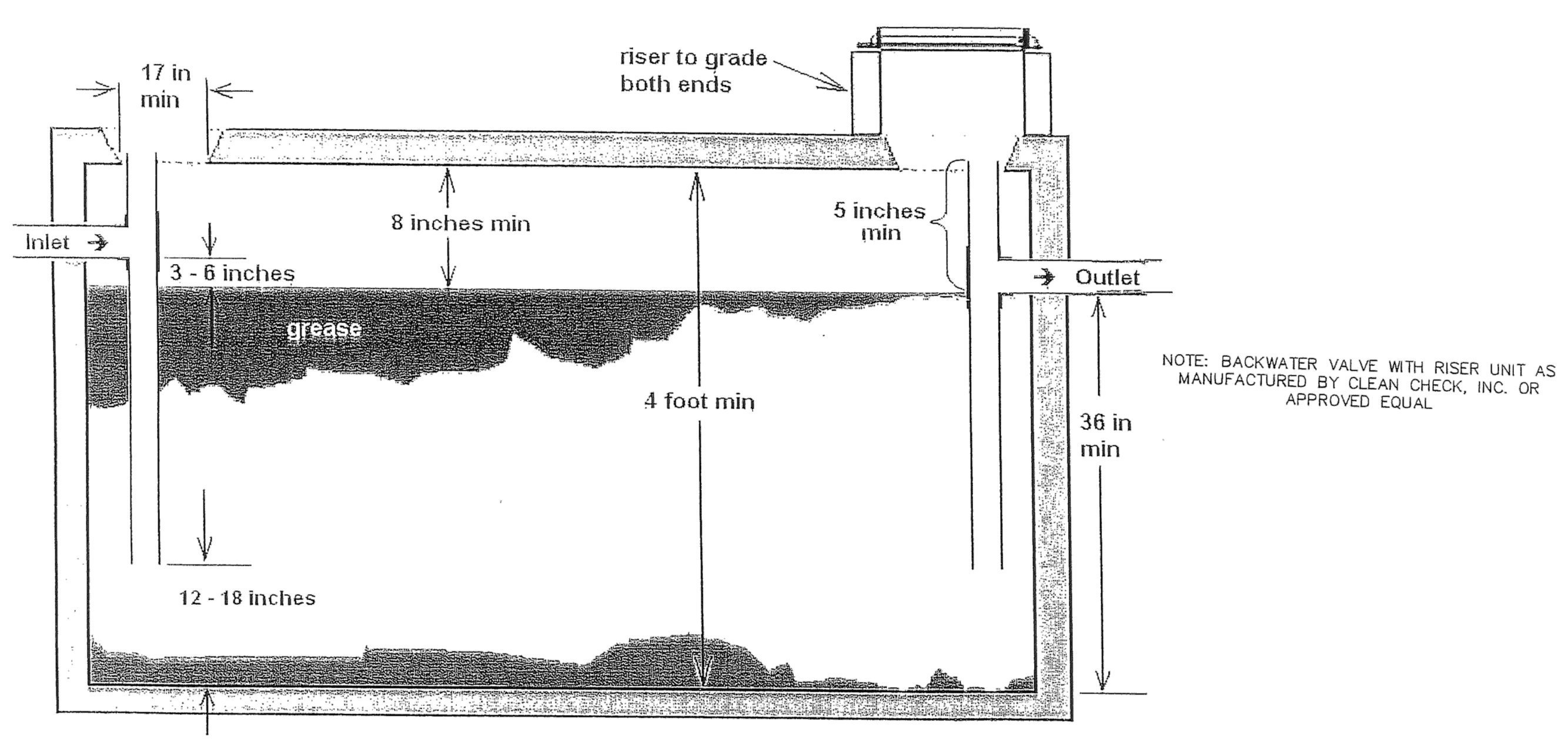
PROVIDE PVC PRIVACY SLATS. DESIGN SHALL BE APPROVED BY SCGC

3 CHAIN LINK FENCE FOR GAS METER ENCLOSURE
N.T.S.



10 BLUE LIGHT FOUNDATION
N.T.S.

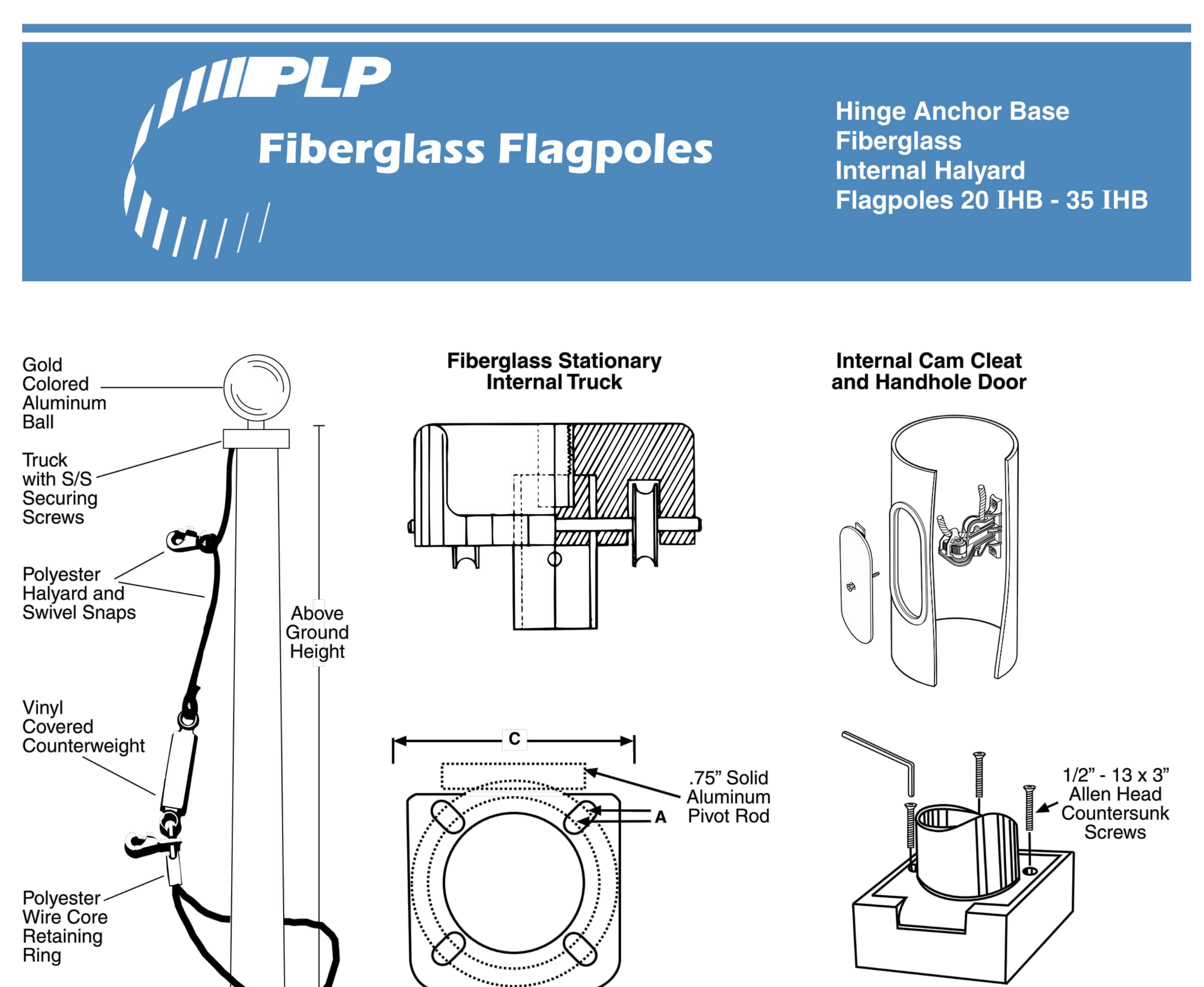
Outside In-Ground Grease Trap/Interceptor

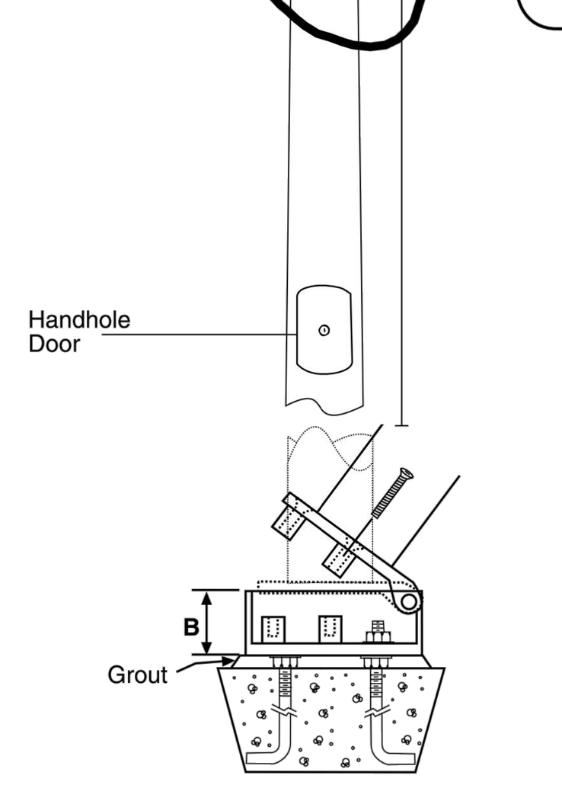


NOTE: BACKWATER VALVE WITH RISER UNIT AS MANUFACTURED BY CLEAN CHECK, INC. OR APPROVED EQUAL

On eight inches of 3/4 inch stone

5 2,500 GALLON GREASE TRAP
N.T.S.



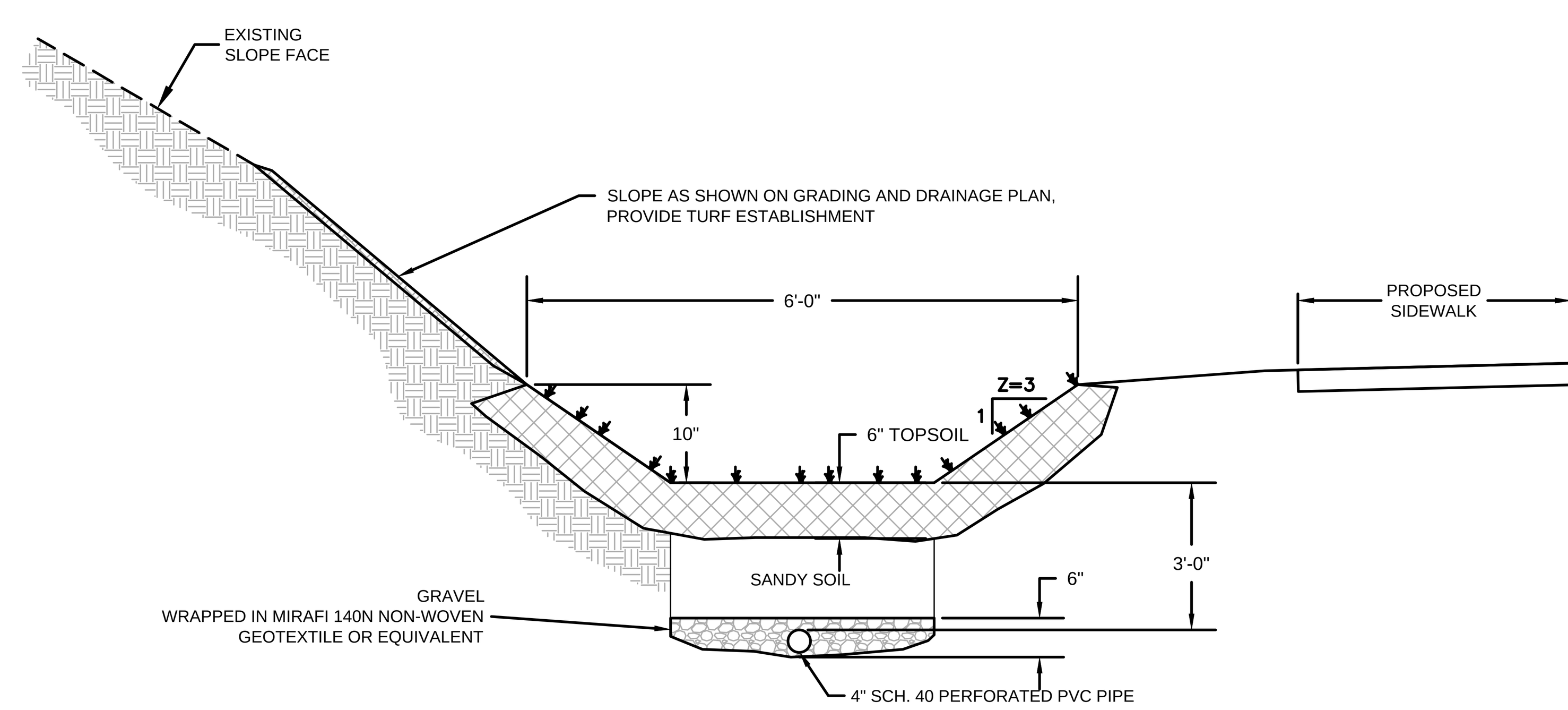


Model Number	PLP 20IHB	PLP 25IHB	PLP 30IHB	PLP 35IHB
Above Ground Height	20'	25'	30'	35'
Butt Diameter	5.75"	6.5"	6.5"	7"
Top Diameter	3"	3"	3"	3"
Pole Weight With Base (lbs.)	52	72	89	108
Shipping Weight With Base (lbs.)*	92	118	141	167
Ball Diameter	5"	5"	6"	6"
Halyard	#10	#10	#10	#10
Truck	F/G	F/G	F/G	F/G
Snaps	Brass Swivel	Brass Swivel	Brass Swivel	Brass Swivel
Standard Flag Size	4x6	4x6	5x8	5x8
Anchor Bolt Length	25"	25"	25"	25"
Bolt Diameter	3/4"	3/4"	3/4"	3/4"
Exposed Thread	3"	3"	3"	3"
Bolt Circle (A)	7.5"-9"	8.5"-9"	8.5"-9"	8.5"-9"
Base Dimensions (B&C)	3.5" h x 10.5"w			

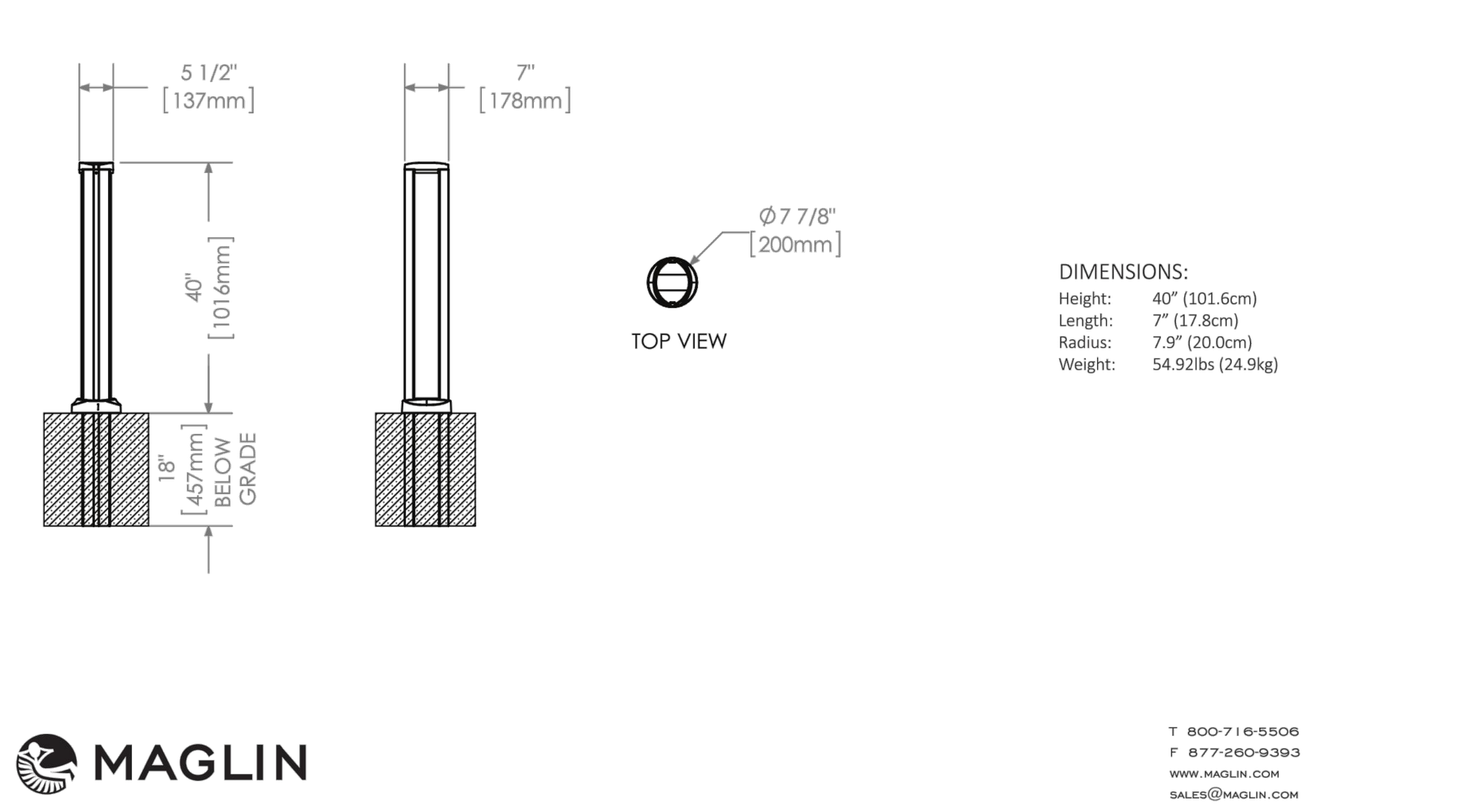
* Shipping weight includes weight of packaging, fittings, and anchor bolts.

NOTE:
25 FOOT TALL HINGED BASE FLAGPOLE WITH REVOLVING TRUCK, INTERNAL HALYARD AND HARDWARE TO FLY TWO FLAGS CONCURRENTLY (U.S. AND STATE OF CONNECTICUT)

7 FLAG POLE
N.T.S.



9 INFILTRATION SWALE
N.T.S.



6 DECORATIVE BOLLARD
N.T.S.

NEW HAVEN PUBLIC SCHOOLS

STRONG 21st CENTURY COMMUNICATIONS LAB SCHOOL

SOUTHERN CONNECTICUT STATE UNIVERSITY
FARNHAM AVENUE
NEW HAVEN, CT 06515

STATE PROJECT#: 093-0368N

JCJARCHITECTURE
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SUITE 400
HARTFORD, CT 06106
860.247.9226

PICKARD CHILTON
980 CHAPEL STREET
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203.786.8600

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MICHAEL HORTON ASSOCIATES
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203.838.4167
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P.H. HAWLEY ASSOCIATES
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860.438.7636

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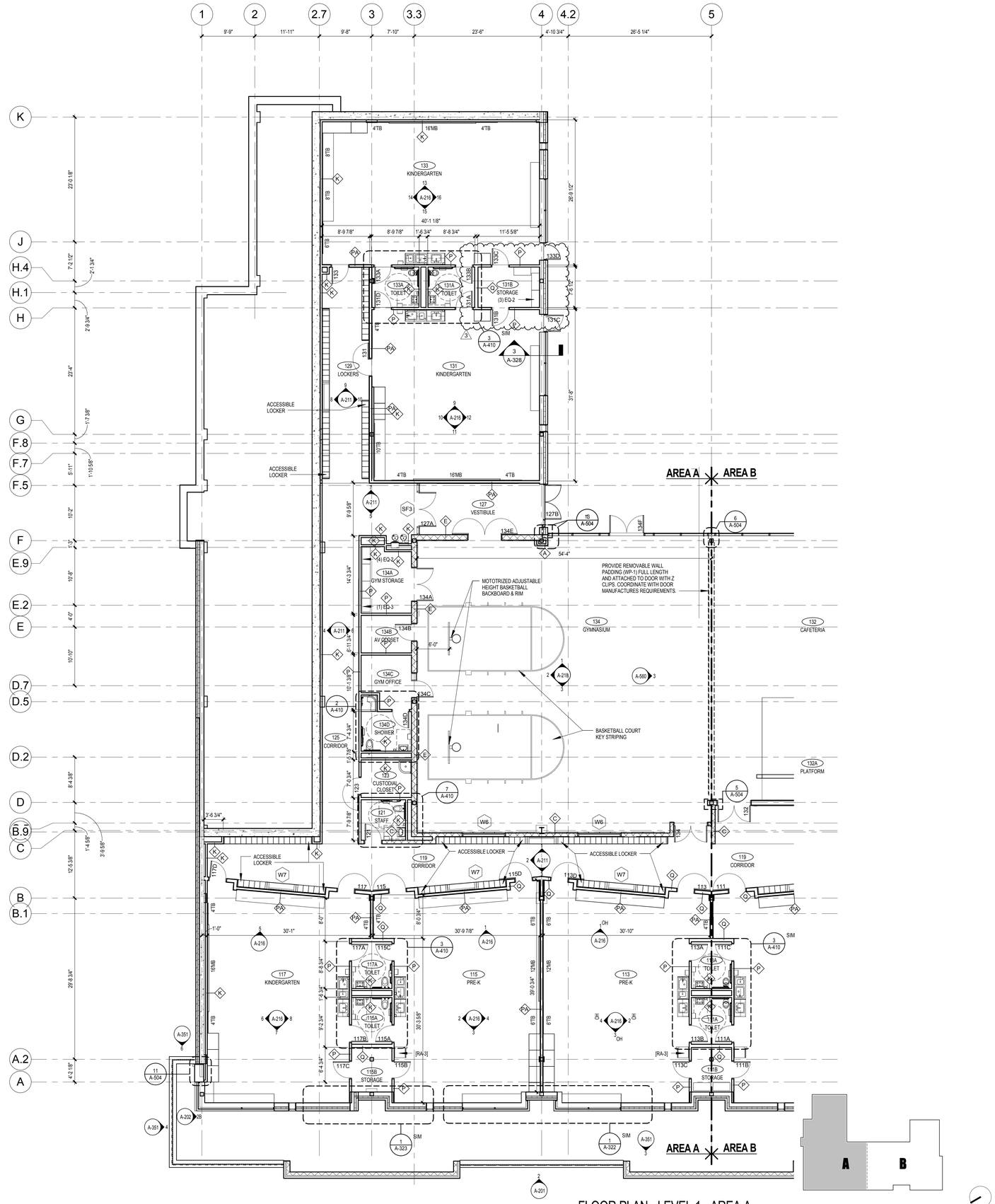
SCALE

REVISIONS:
3 03/27/2018 ADDENDUM 03

SITE DETAILS

L-610



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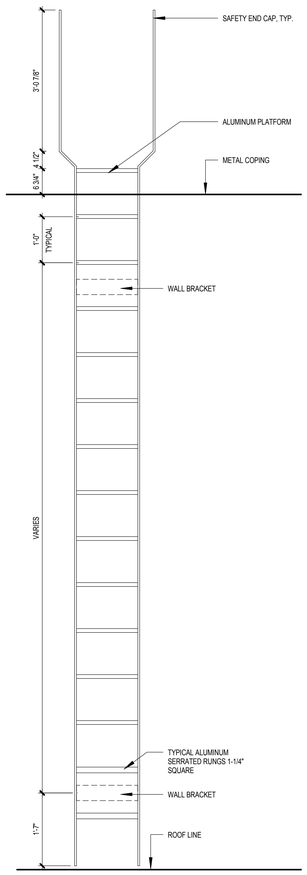
DRAWN Author
SCALE 1/8" = 1'-0"

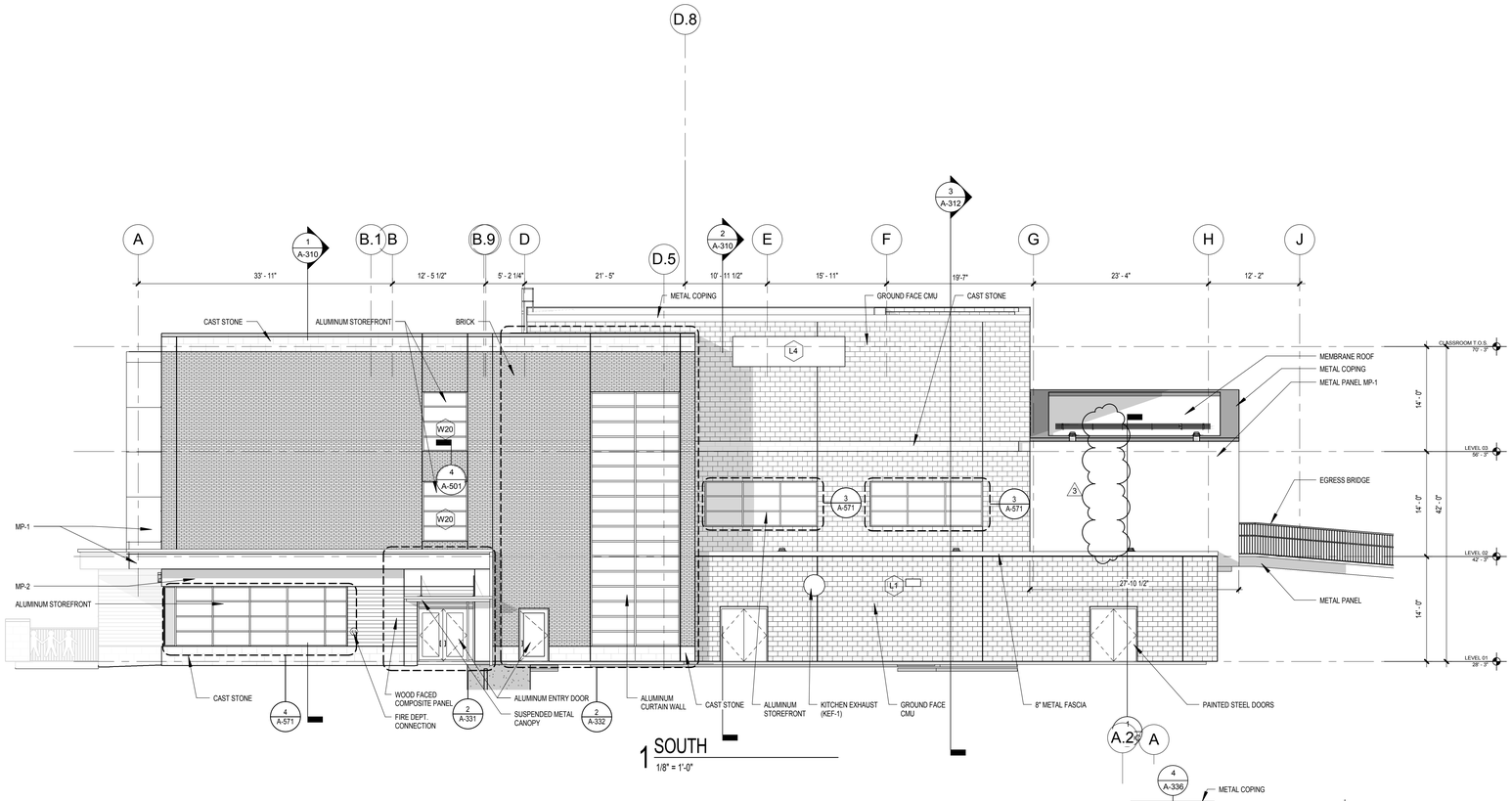
REVISIONS:
3 03/27/2018 ADDENDUM 03

FLOOR PLAN - LEVEL 1 - AREA A

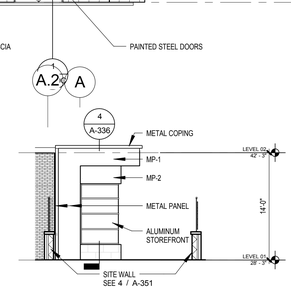
A-111



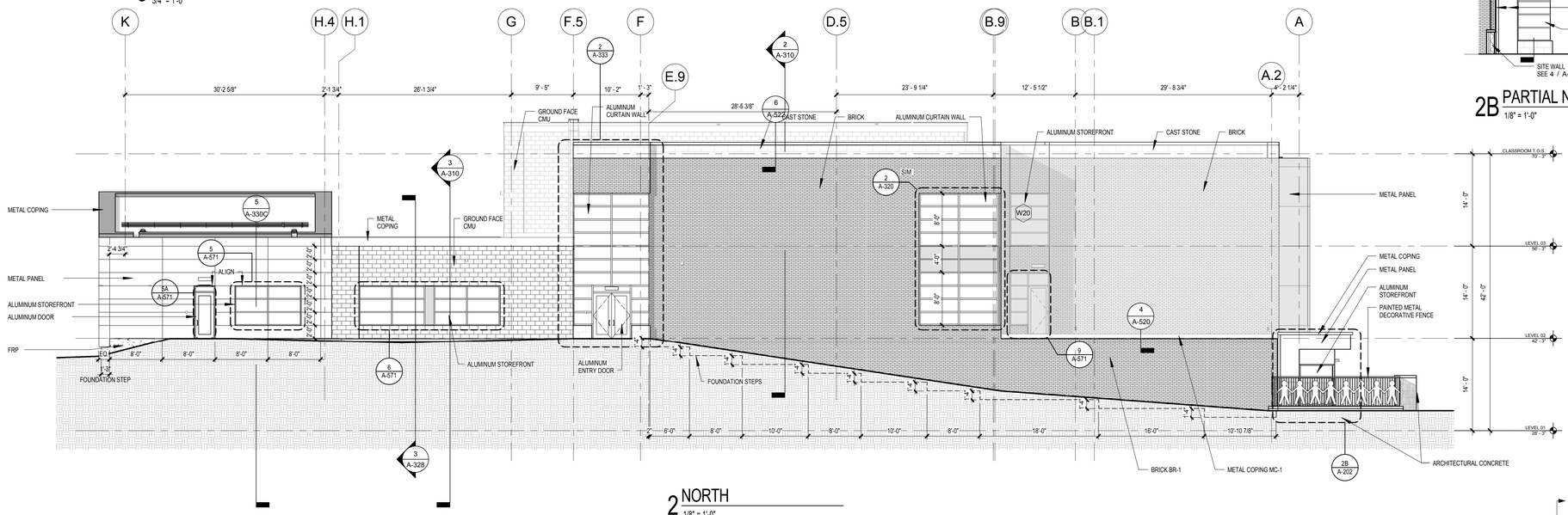
3 Roof Ladder Detail
3/4" = 1'-0"



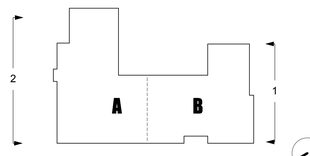
1 SOUTH
1/8" = 1'-0"



2B PARTIAL NORTH
1/8" = 1'-0"



2 NORTH
1/8" = 1'-0"



NORTH

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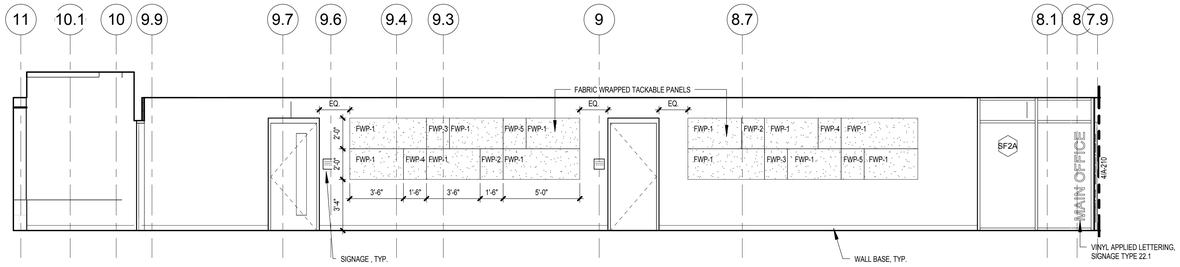
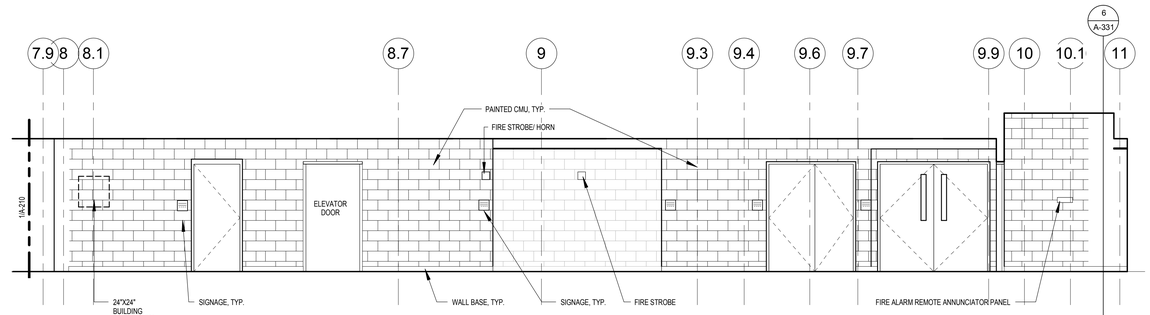
3 03/27/2018 ADDENDUM 03

EXTERIOR ELEVATIONS - NORTH & SOUTH & SERVICE COURT

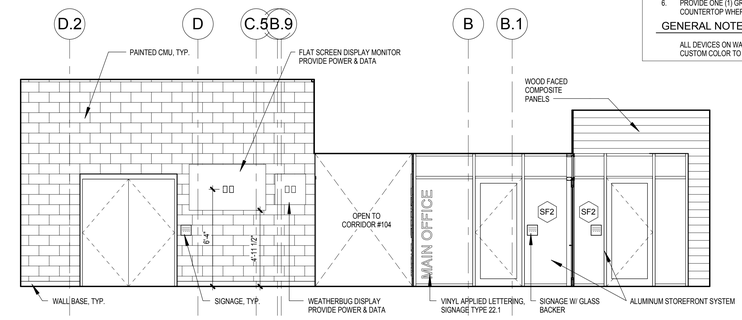
A-202



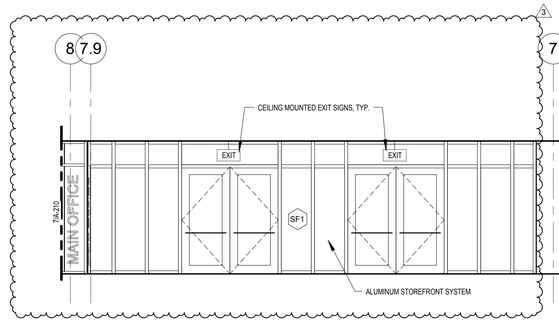
7 104 CORRIDOR/ 106 VESTIBULE - EAST
1/4" = 1'-0"

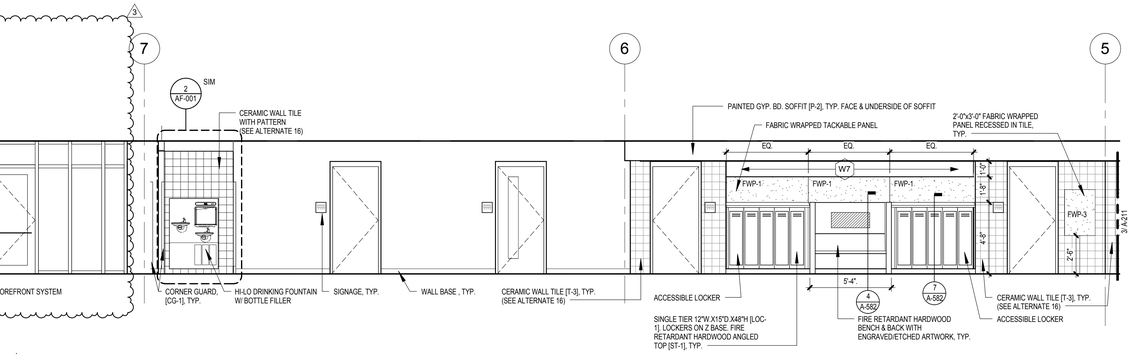


6 104 CORRIDOR/ 106 VESTIBULE - WEST
1/4" = 1'-0"

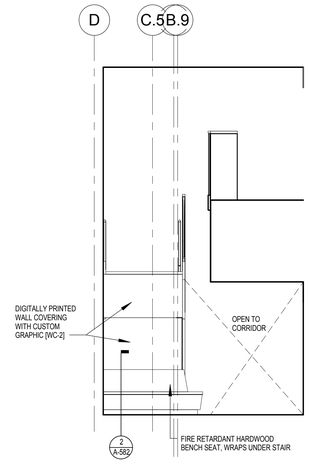


5 102 MAIN LOBBY/ 106 VESTIBULE - SOUTH
1/4" = 1'-0"

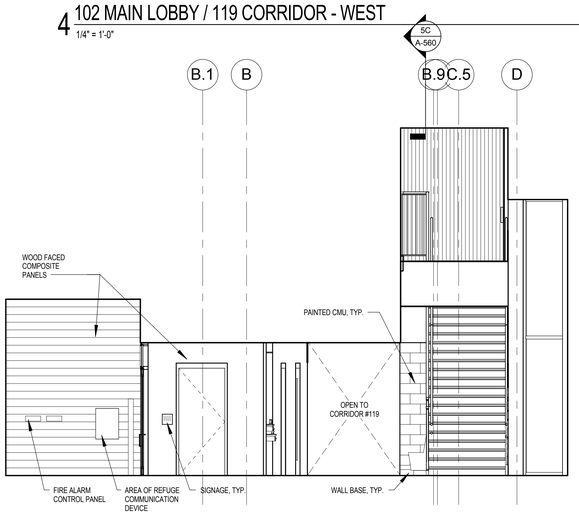




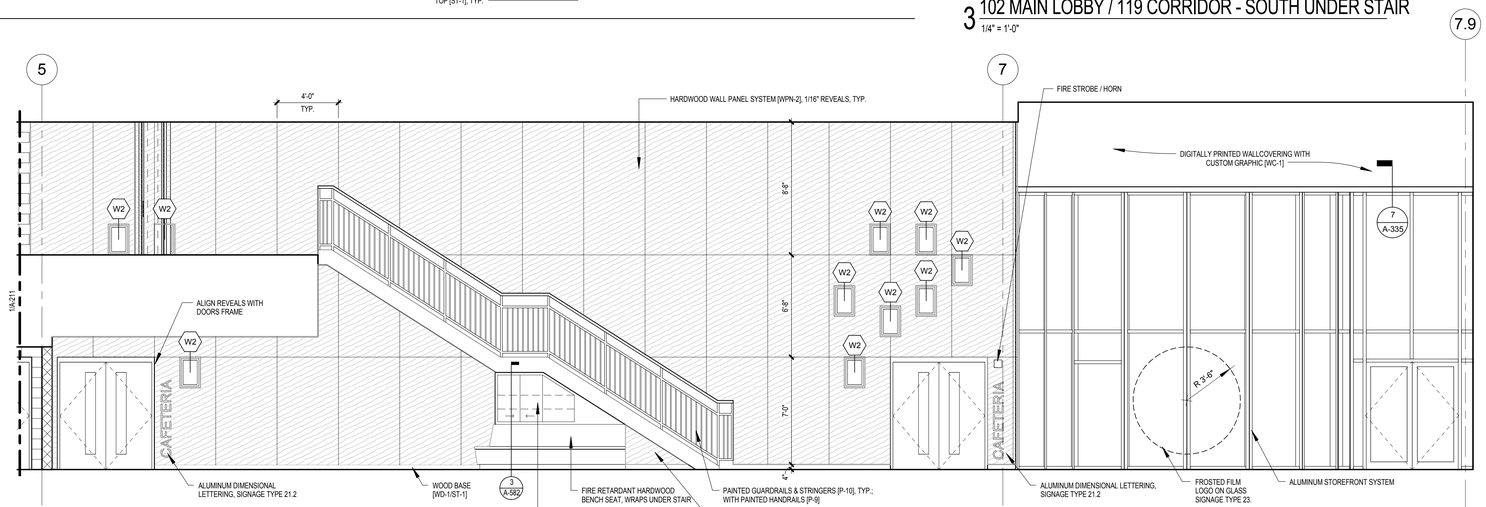
4 102 MAIN LOBBY / 119 CORRIDOR - WEST
1/4" = 1'-0"



3 102 MAIN LOBBY / 119 CORRIDOR - SOUTH UNDER STAIR
1/4" = 1'-0"



2 102 MAIN LOBBY/ 100 VESTIBULE - NORTH
1/4" = 1'-0"



1 102 MAIN LOBBY / CORRIDOR - EAST
1/4" = 1'-0"

LEGEND:

BC	BASE CABINET
BCD	BASE CABINET W/ DRAWERS
OBC	OPEN BASE CABINET
DB	DRAWER BASE
TC	TALL CABINET
OTC	OPEN TALL CABINET
SC	SPECIALTY CABINET
WC	WALL CABINET
OWC	OPEN WALL CABINET
TW	TEACHER'S WARDROBE
ADA	HANDICAPPED ACCESSIBLE
SB	SINK BASE

36.30BC — WIDTH, HEIGHT, TYPE

MILLWORK NOTES:

1. PROVIDE BACK SPLASH AT BACK AND SIDES OF ALL BASE CABINETS WHERE A WALL IS PRESENT.
2. PROVIDE WOOD BLOCKING AS REQ'D. IN WALL FOR ALL MILLWORK ITEMS & MARKER BOARDS AND TACK BOARDS - REFER TO SPECIFICATIONS.
3. REFER TO SPECIFICATIONS FOR ALL MILLWORK HARDWARE AND FINISHES.
4. PROVIDE MINIMUM 1-1/2" FILLER PANELS AT CABINETS THAT EXTEND TO WALLS. PROVIDE MINIMUM 2" FILLER PANELS AT CABINETS THAT BUTT INTO PERPENDICULAR CABINETS, TYP.
5. ALL DOORS AND DRAWERS SHALL BE LOCKING UNLESS OTHERWISE NOTED. ROOMS TO BE KEYED ALIKE.
6. PROVIDE ONE (1) GROMMET HOLE AND COVER AT COUNTERTOP WHERE EACH OPEN KNEE SPACE OCCURS.

GENERAL NOTE:

ALL DEVICES ON WALLS THAT ARE NOT WHITE ARE TO BE CUSTOM COLOR TO MATCH ADJOINING/ADJACENT SURFACES.

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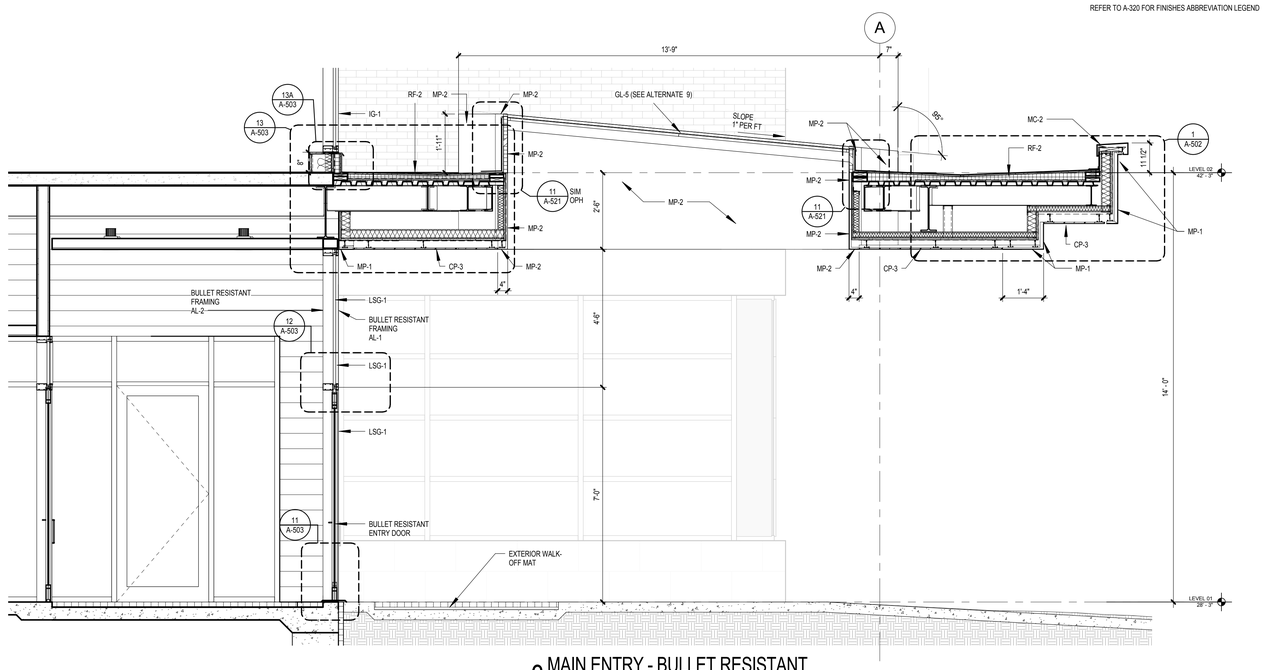
REVISIONS:

3	03/27/2018	ADDENDUM 03

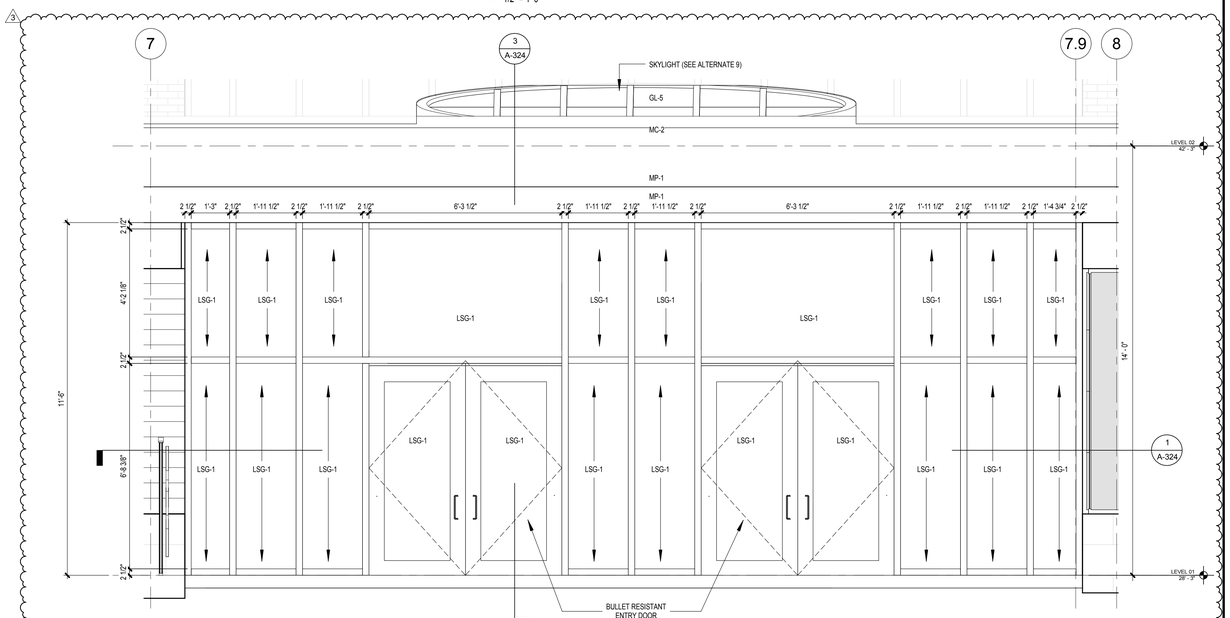
INTERIOR ELEVATIONS

A-210

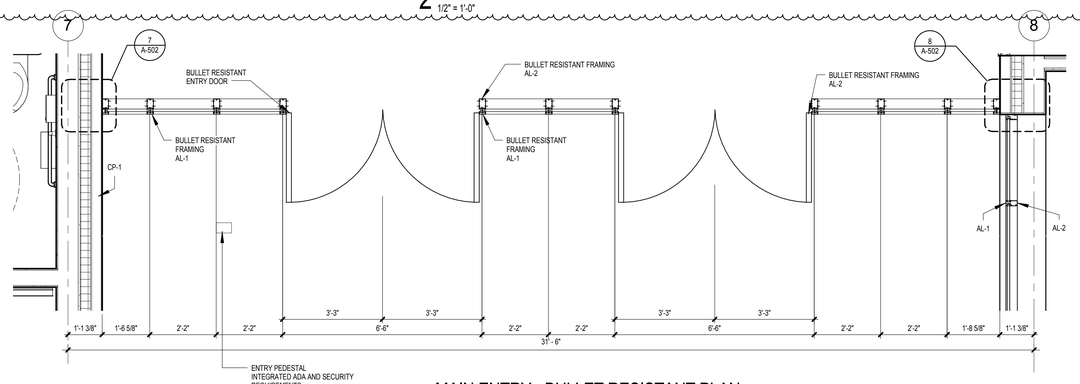
REFER TO A-320 FOR FINISHES ABBREVIATION LEGEND



3 MAIN ENTRY - BULLET RESISTANT
1/2" = 1'-0"



2 MAIN ENTRY - BULLET RESISTANT
1/2" = 1'-0"



1 MAIN ENTRY - BULLET RESISTANT PLAN
1/2" = 1'-0"

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SCALE 1/2" = 1'-0"

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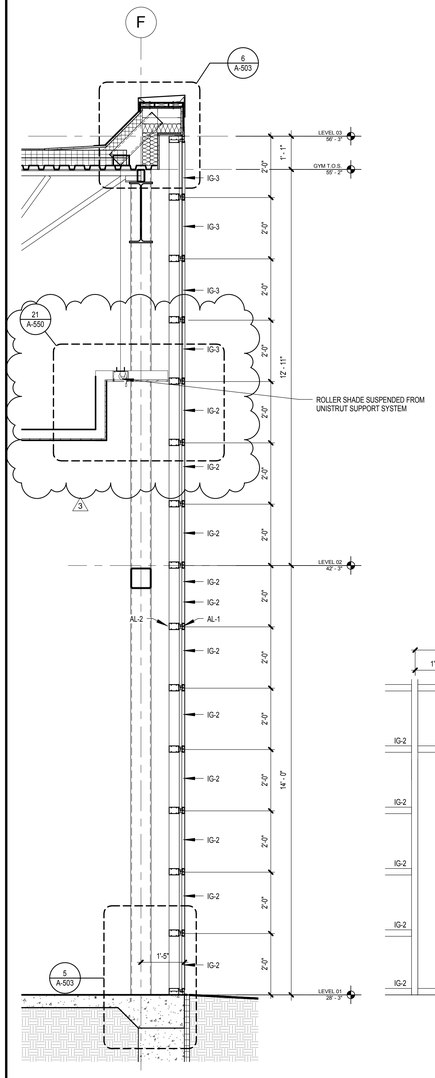
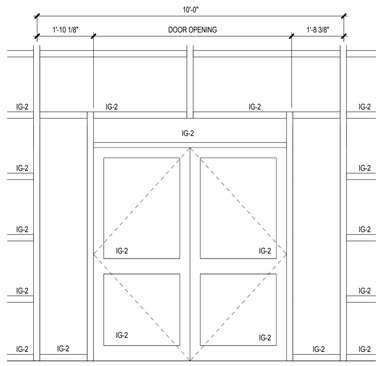
3 03/27/2018 ADDENDUM 03

ENCLOSURE SECTION, ENLARGED PLAN AND ELEVATION - MAIN ENTRY

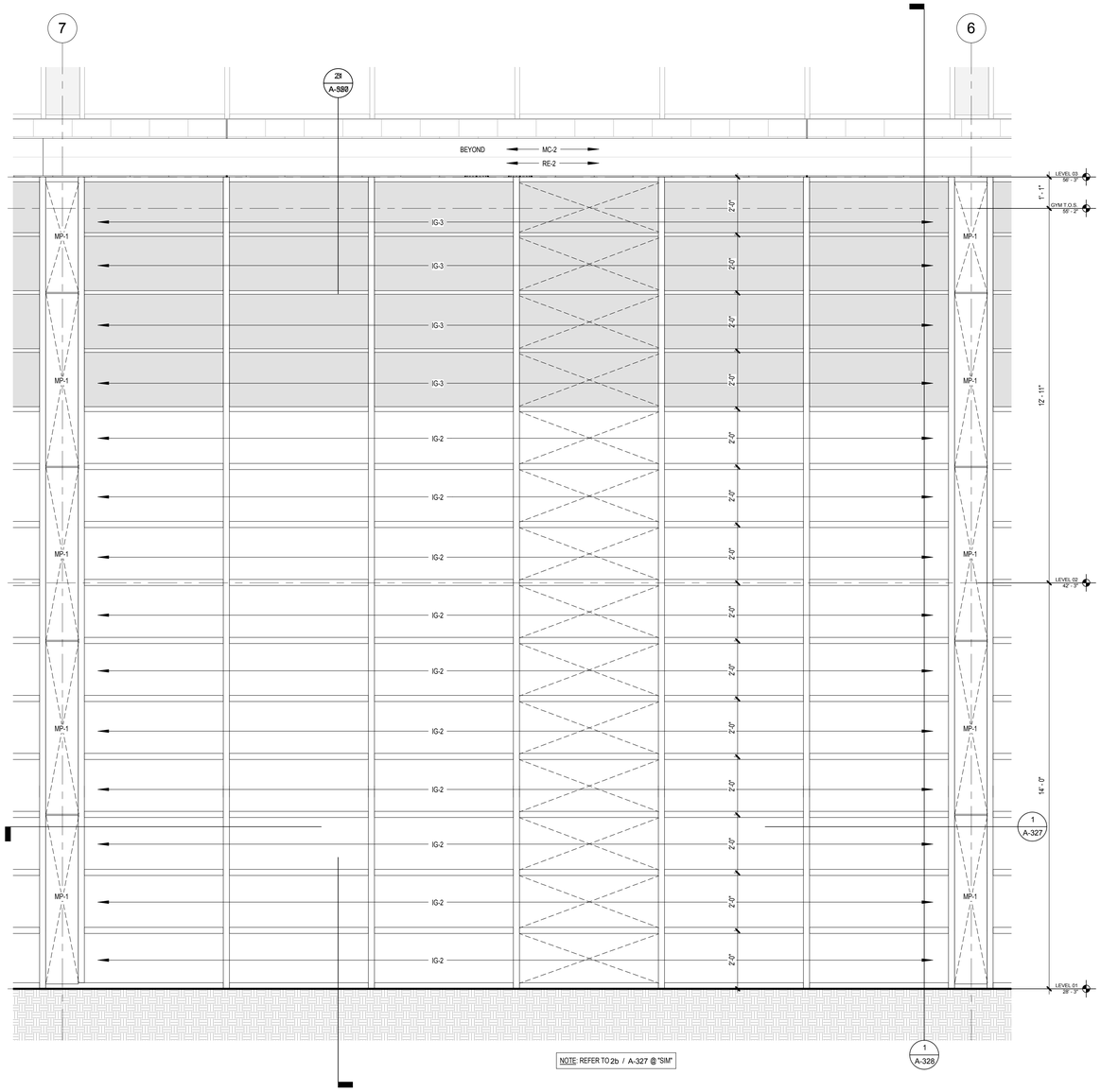
A-324



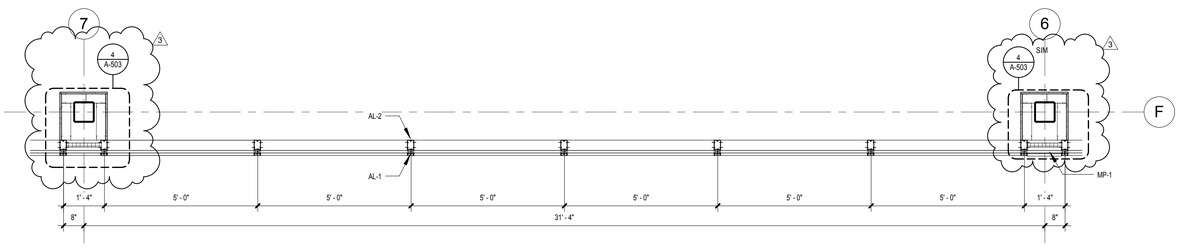
3 EAST GYM/CAF TYPICAL ENCLOSURE
1/2" = 1'-0"



2b ALUMINUM DOOR ELEVATION
1/2" = 1'-0"



2 EAST GYM/CAF TYPICAL ENCLOSURE
1/2" = 1'-0"



1 EAST GYM/CAF TYPICAL ENCLOSURE - PLAN
1/2" = 1'-0"

FINISHES ABBREVIATION LEGEND:

AC	ACOUSTICAL CEILING (METAL)
ACP	ACOUSTICAL CEILING PANEL
AL	ALUMINUM (COATING)
AWP	ACOUSTICAL WALL PANEL
BR	BRICK
CMU	CONCRETE MASONRY UNIT
CM	CONCRETE MASONRY UNIT
CONC	SEALED CONCRETE
CP	COMPOSITE PANEL RAINSCREEN
CPT	CARPET TILE
CS	CAST STONE/CULTURED STONE MASONRY
CW	CURTAIN WALL SYSTEM
EP	EPOXY PAINT
FT	FLOOR TILE (LINOLEUM TILE)
FWP	FABRIC WRAPPED PANELS
GB	GYPSUM BOARD
GL	GLAZING
GRT	GROUT
JS	JOINT SEALANT
IG	INSULATED GLAZING
LOC	LOCKER TYPE/COLOR
LSIG	LAMINATED SAFETY GLAZING
LV	LOUVER
M	MIRROR
MB	MARKERBOARD
MC	METAL COPING
MCP	MINERAL COMPOSITE PANELS
MP	METAL PANEL
MR	METAL ROOF
OP	OPERABLE PANEL PARTITION
P	PAINT
PC	PRIVACY CURTAIN
PL	PLASTIC LAMINATE
RAF	RESILIENT ATHLETIC FLOORING
RE	ROOF EDGE FASCIA
RF	RESINOUS FLOORING
RT	RESILIENT TILE (RUBBER TILE)
RTR	RESILIENT TREAD/RISER
SFT	STOREFRONT
SG	SECURITY GLAZING
SS	SOLID SURFACE
ST	STAIN
SVT	SOLID VINYL TILE
T	TILE
TB	TACKBOARD
TP	TOILET PARTITIONS
TS	TRANSITION STRIP
WB	WALL BASE
WC	WALL COVERING
WD	WOOD
WF	WOOD FLOORING
WM	WALK-OFF MAT
WPN	WALL PANELING (INTERIOR)
WT	WINDOW TREATMENT

INTERIOR FINISHES NOTES:

1. REFER TO NORTH DIRECTIONAL ARROWS ON PLANS.
2. HOLLOW METAL DOORS FRAMES & INTERIOR WINDOW FRAMES SHALL BE PAINTED P-6, UNLESS OTHERWISE NOTED.
3. ALL FINISHES IN EXITS SHALL BE CLASS A RATED. ALL FINISHES IN CORRIDORS SHALL BE CLASS A OR CLASS B RATED.
4. THE FOLLOWING SHALL BE PAINTED UNLESS OTHERWISE STATED:
   A. EXPOSED SPRINKLER PIPING, ELECTRICAL CONDUIT, AND WIRE MOLDING IN FINISHED AREAS.
   B. EXPOSED DUCTWORK IN FINISHED AREAS.
   C. EXPOSED BEAMS, JOISTS, DECK, AND COLUMNS IN FINISHED AREAS.
   D. INTERIOR LINTELS
   E. INTERIOR HANDRAILS & GUARDRAILS
   F. INTERIOR STEEL LADDERS, EP-2, TYP.
5. EXPOSED CEILINGS SHALL BE PAINTED P-7, UNLESS OTHERWISE NOTED. EXPOSED CEILINGS IN THE NORTH AND SOUTH PENTHOUSE, ELECTRICAL, DATA AND MECHANICAL ROOMS SHALL NOT BE PAINTED.
6. REFER TO FLOOR FINISH DRAWINGS (AF) FOR FLOOR FINISH PATTERNS AND DETAILS.
7. REFER TO INTERIOR ELEVATIONS FOR ADDITIONAL WALL FINISH INFORMATION.
8. CEILING, FLOORS, AND WALLS IN FOOD PREPARATION AND SERVING AREAS SHALL BE WASHABLE.
9. REFER TO REFLECTED CEILING PLANS FOR PAINT DESIGNATIONS AT SOFFITS.

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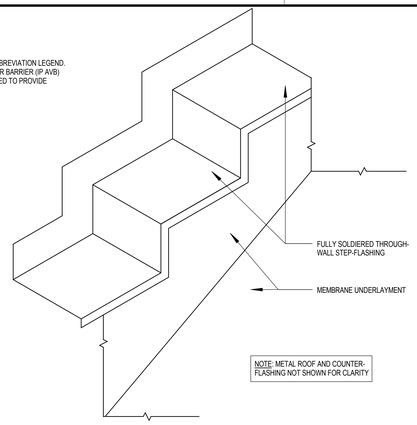
REVISIONS:
3 03/27/2018 ADDENDUM 03

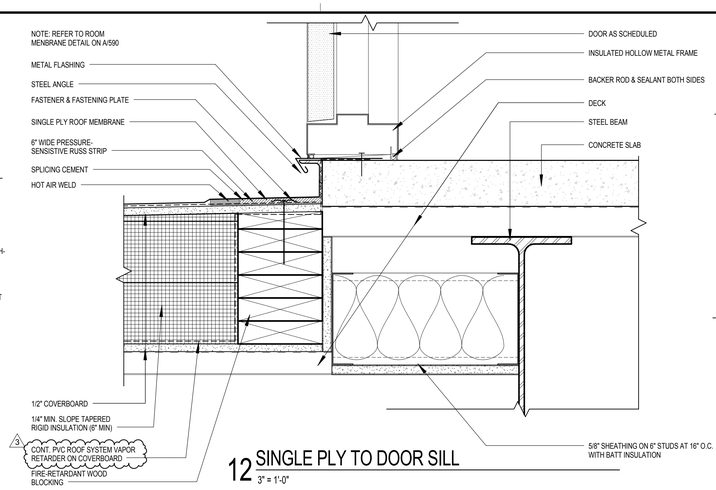
ENCLOSURE SECTION, ENLARGED PLAN AND ELEVATION - EAST GYM AND CAFETERIA

A-327

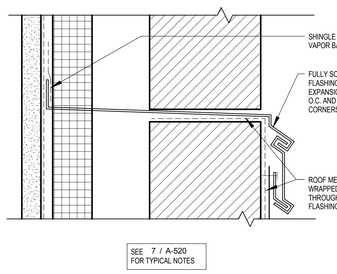
GENERAL NOTES:
1. REFER TO A-320 FOR FINISHES ABBREVIATION LEGEND.
2. PROVIDE IMPERMEABLE AIR/VAPOR BARRIER (IP AVB) THROUGHOUT UNLESS OTHER NOTED TO PROVIDE VAPOR PERMEABLE (VP AVB)



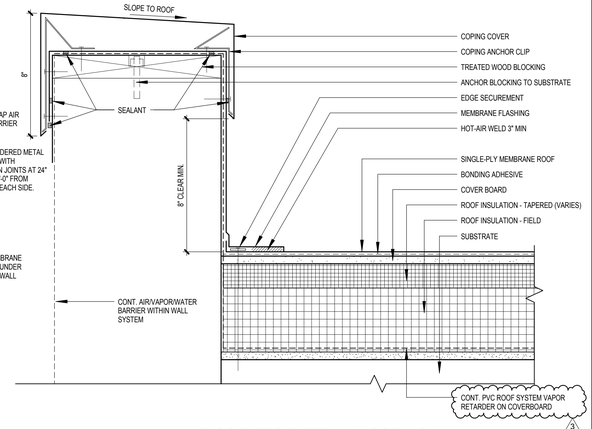
15 STEP FLASHING
1 1/2" = 1'-0"



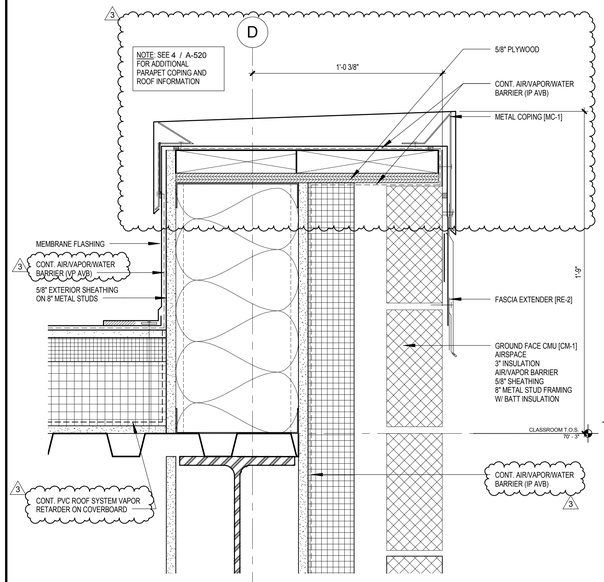
12 SINGLE PLY TO DOOR SILL
3" = 1'-0"



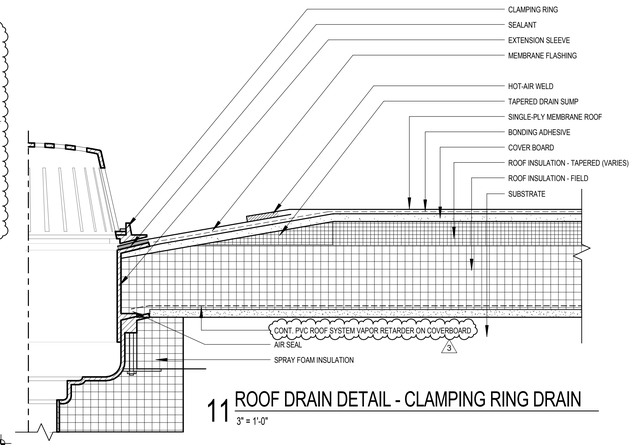
8 THROUGH-WALL FLASHING DETAIL
6" = 1'-0"



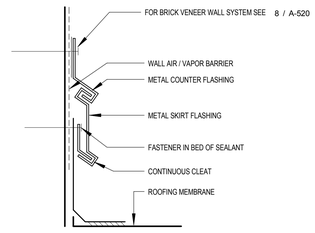
4 ROOF EDGE DETAIL - COPING
3" = 1'-0"



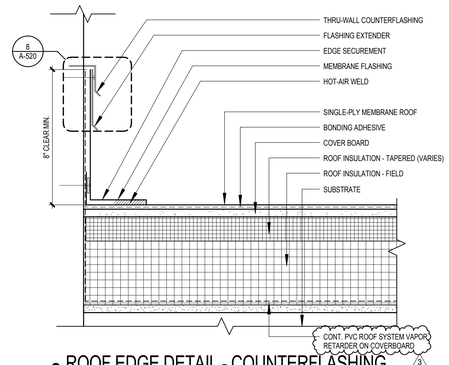
14 PARAPET DETAIL
3" = 1'-0"



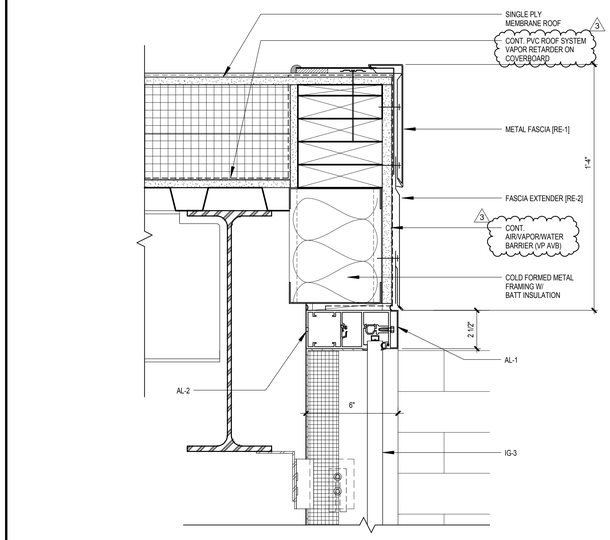
11 ROOF DRAIN DETAIL - CLAMPING RING DRAIN
3" = 1'-0"



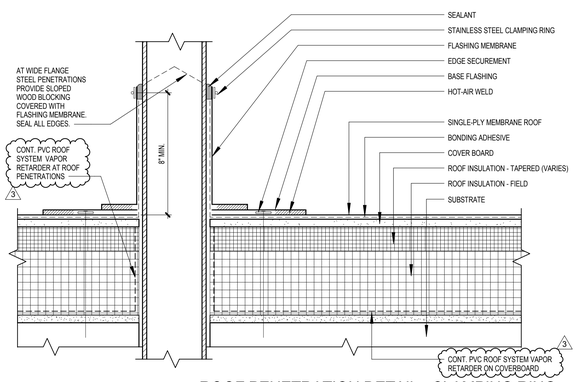
7 TYP. ROOF/WALL COUNTER-FLASHING
6" = 1'-0"



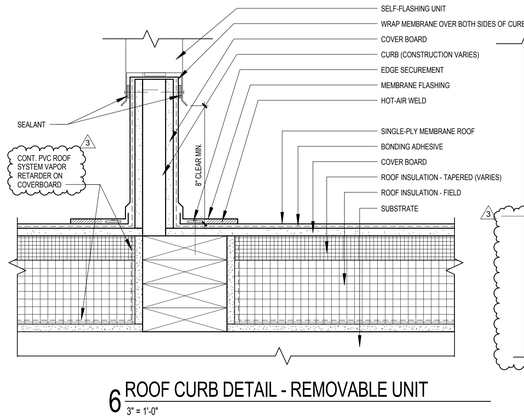
3 ROOF EDGE DETAIL - COUNTERFLASHING
3" = 1'-0"



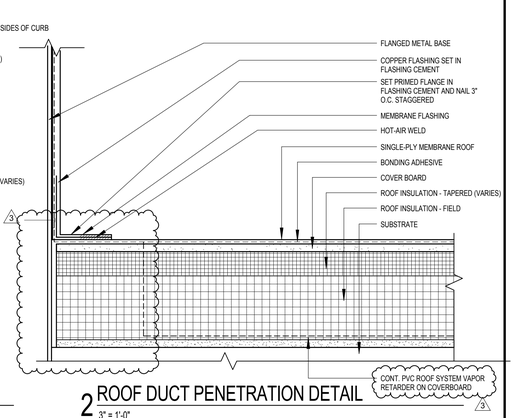
13 CURTAIN WALL HEAD AT ENTRY ZONE
3" = 1'-0"



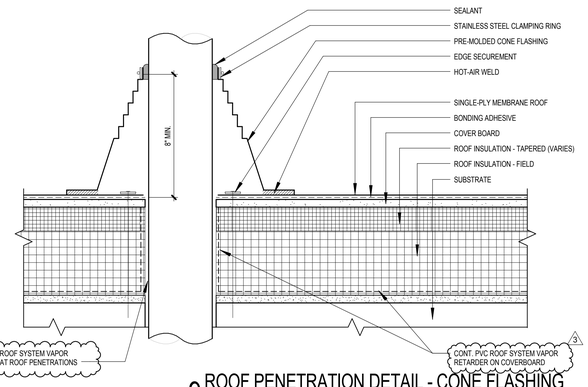
10 ROOF PENETRATION DETAIL - CLAMPING RING
3" = 1'-0"



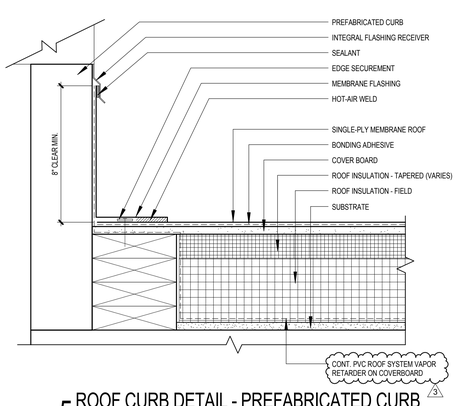
6 ROOF CURB DETAIL - REMOVABLE UNIT
3" = 1'-0"



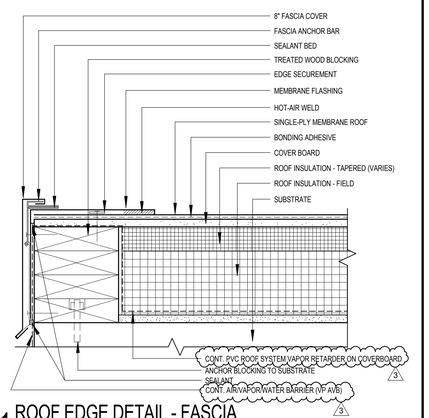
2 ROOF DUCT PENETRATION DETAIL
3" = 1'-0"



9 ROOF PENETRATION DETAIL - CONE FLASHING
3" = 1'-0"



5 ROOF CURB DETAIL - PREFABRICATED CURB
3" = 1'-0"



1 ROOF EDGE DETAIL - FASCIA
3" = 1'-0"

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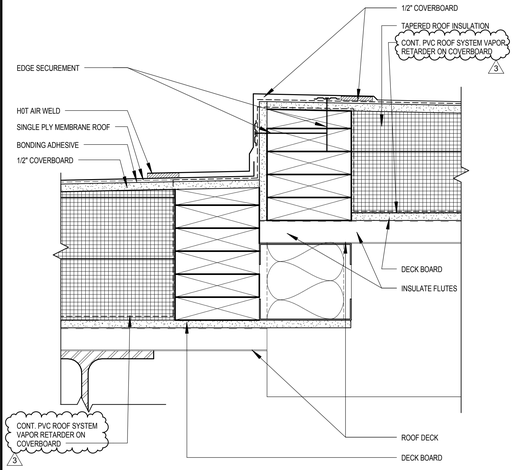
REVISIONS:
3 03/27/2018 ADDENDUM 03

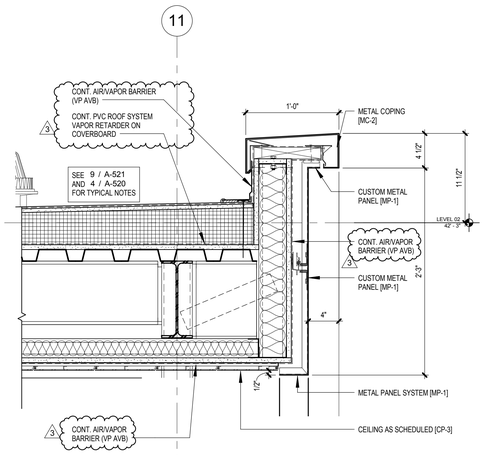
ROOF DETAILS

A-520

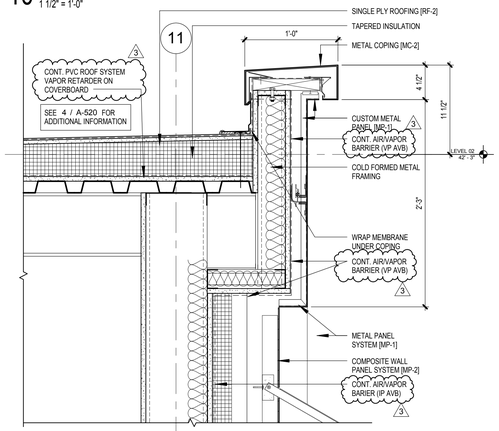
GENERAL NOTES:
1. REFER TO A-320 FOR FINISHES ABBREVIATION LEGEND.
2. PROVIDE IMPERMEABLE AIR/VAPOR BARRIER (IP AVB) THROUGHOUT UNLESS OTHER NOTED TO PROVIDE VAPOR PERMEABLE (VP AVB)



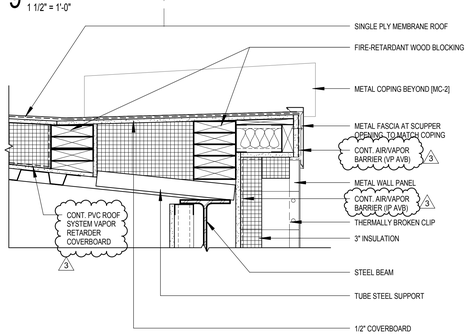
13 ROOF HEIGHT TRANSITION
3" = 1'-0"



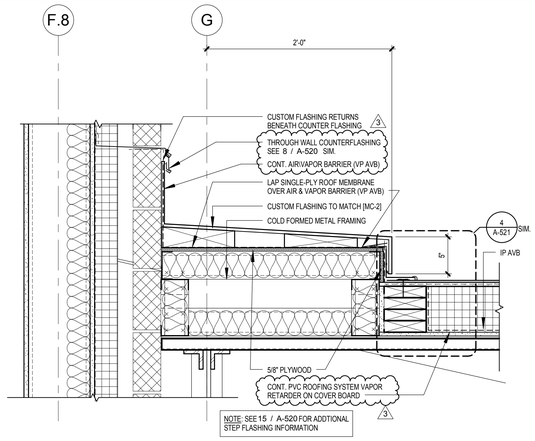
10 BUS ENTRY OVERHANG
1 1/2" = 1'-0"



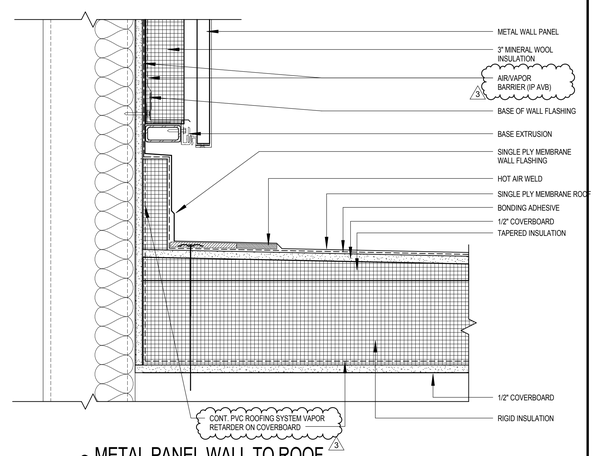
9 BUS ENTRY ROOF AND PARAPET
1 1/2" = 1'-0"



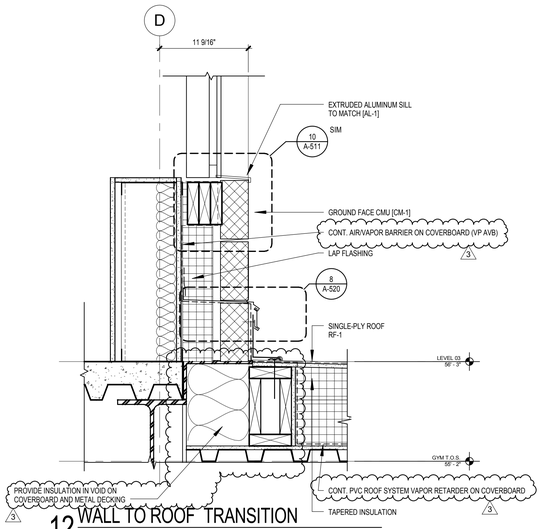
8 SLOPED ROOF - OVERFLOW SCUPPER
1 1/2" = 1'-0"



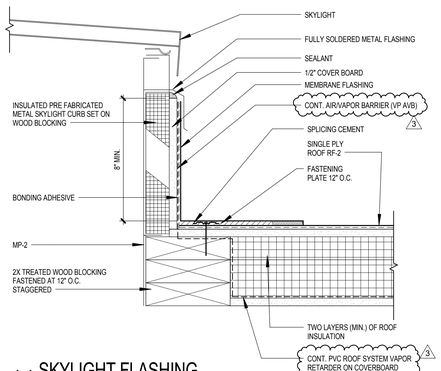
6 DISCOVERY ROOF TO WALL TRANSITION
1 1/2" = 1'-0"



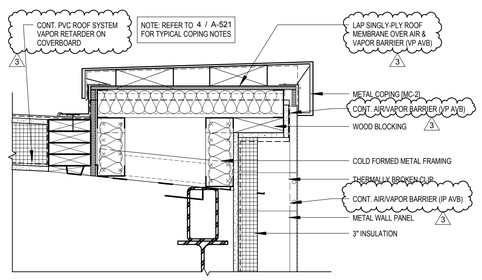
3 METAL PANEL WALL TO ROOF
3" = 1'-0"



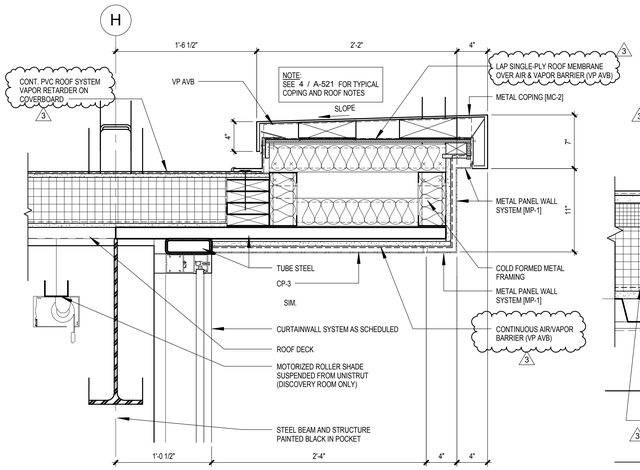
12 WALL TO ROOF TRANSITION
1 1/2" = 1'-0" NOTE: NO WINDOW @ "SIM"



11 SKYLIGHT FLASHING
3" = 1'-0"

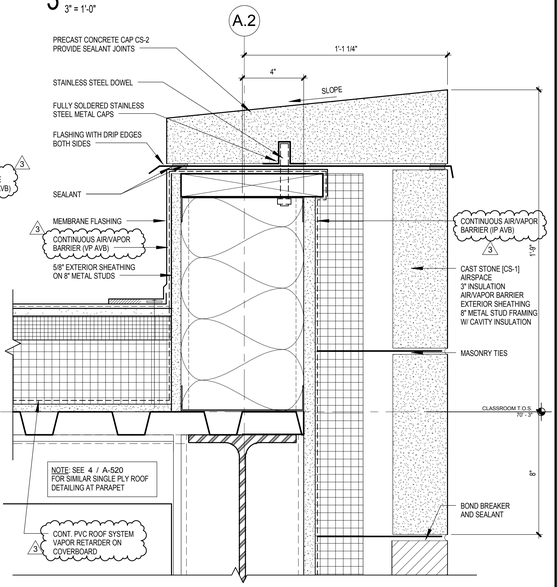


7 SLOPED ROOF COPING - LOW
1 1/2" = 1'-0"

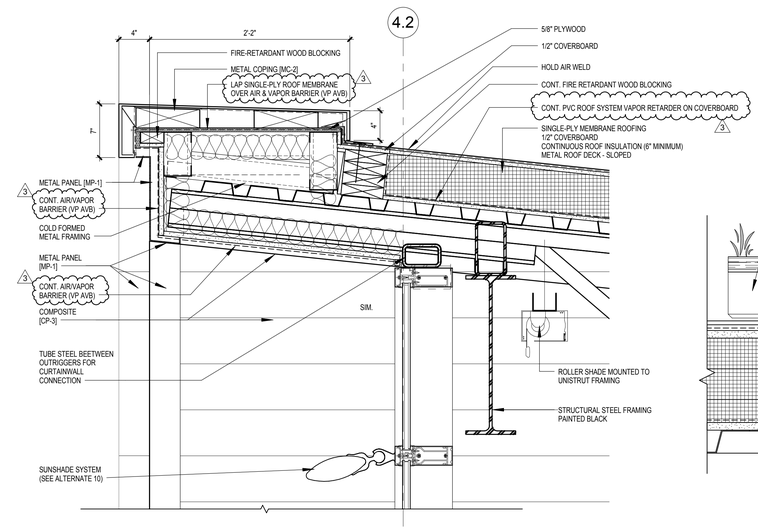


NOTE: NO CURTAINWALL @ "SIM"; METAL PANEL EXTENDS

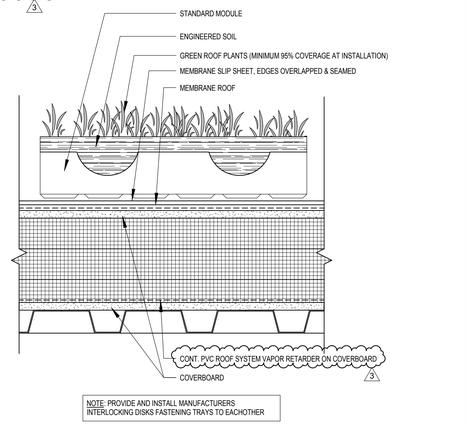
5 SLOPED ROOF COPING - SIDE
1 1/2" = 1'-0"



2 MASONRY CAP PARAPET
3" = 1'-0"



4 SLOPED ROOF COPING - HIGH
1 1/2" = 1'-0"



NOTE: PROVIDE AND INSTALL MANUFACTURERS INTERLOCKING DISKS FASTENING TRAYS TO EACHOTHER

1 VEGETATIVE ROOF ASSEMBLY
3" = 1'-0"

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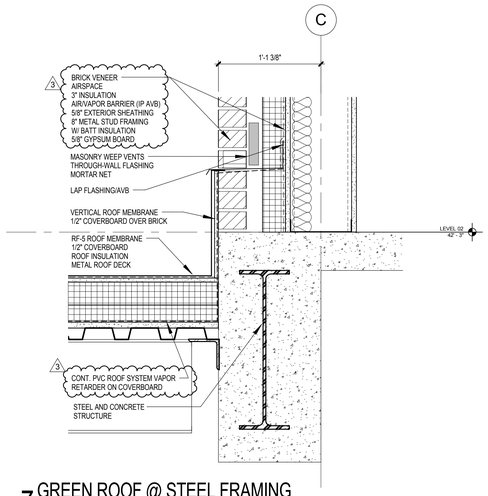
ROOF DETAILS

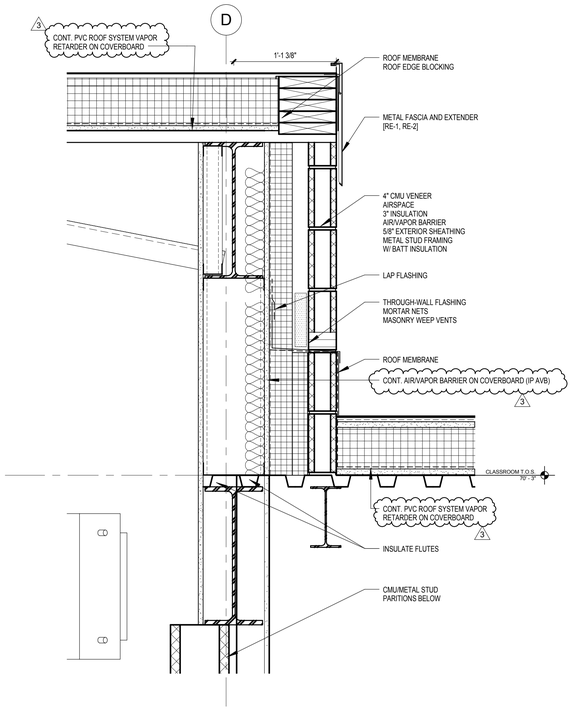
A-521

3/23/2018 10:27:31 AM

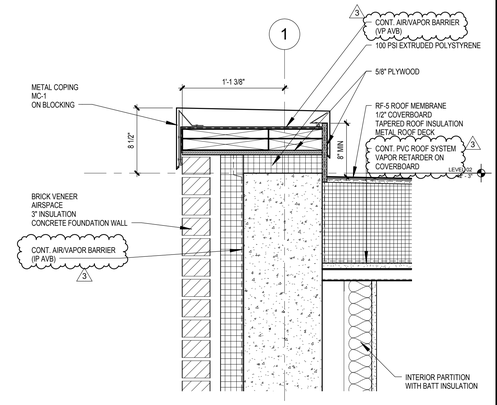
GENERAL NOTES:
1. REFER TO A-320 FOR FINISHES ABBREVIATION LEGEND.
2. PROVIDE IMPERMEABLE AIR/VAPOR BARRIER (IP AVB) THROUGHOUT UNLESS OTHER NOTED TO PROVIDE VAPOR PERMEABLE (VP AVB)



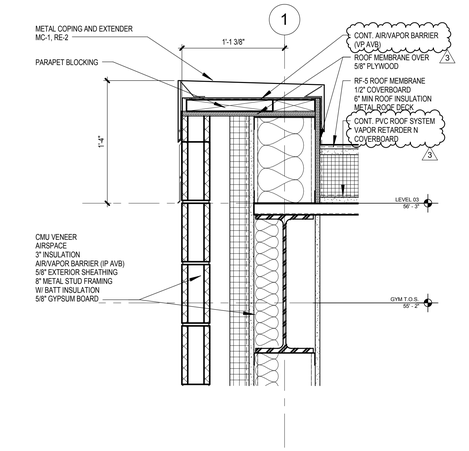
7 GREEN ROOF @ STEEL FRAMING
1 1/2" = 1'-0"



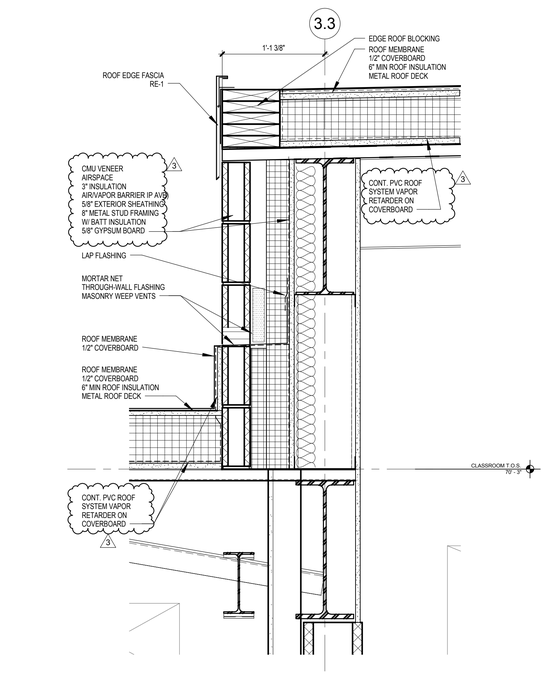
5 NORTH PENTHOUSE @ D LINE
1 1/2" = 1'-0"



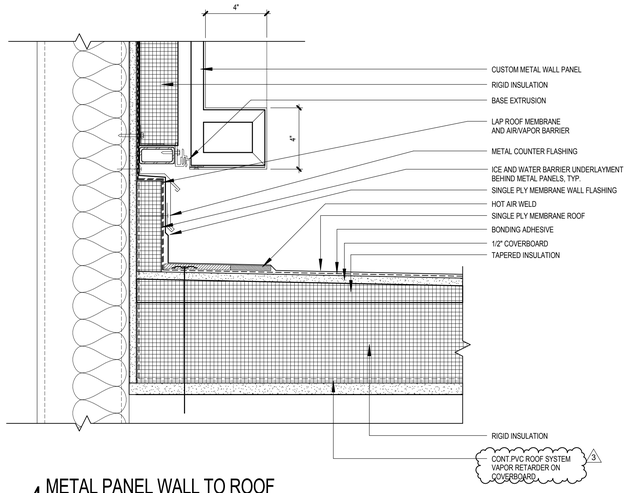
3 COPING @ GREEN ROOF
1 1/2" = 1'-0"



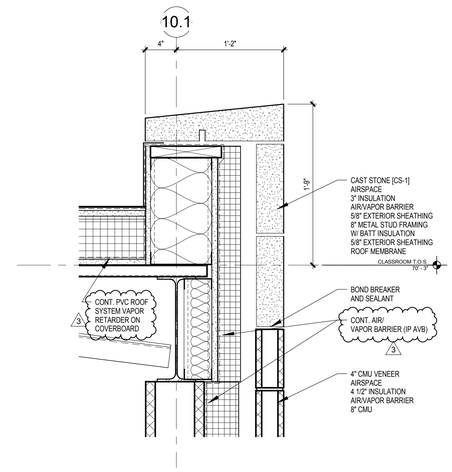
2 COPING @ CMU VENEER PARAPET
1 1/2" = 1'-0"



6 MECH PENTHOUSE ROOF EDGE
1 1/2" = 1'-0"



4 METAL PANEL WALL TO ROOF
3" = 1'-0"



1 CAST STONE CAP @ CMU
1 1/2" = 1'-0"

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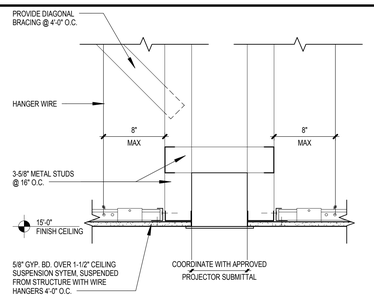
SCALE As indicated

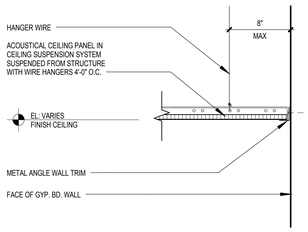
REVISIONS:
3 03/27/2018 ADDENDUM 03

ROOF DETAILS

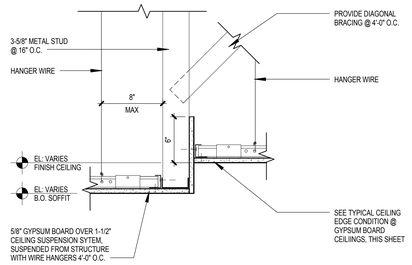
A-522



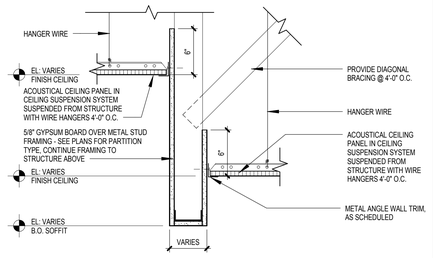
20 RECESSED PROJECTOR SCREEN DETAIL
1 1/2" = 1'-0"



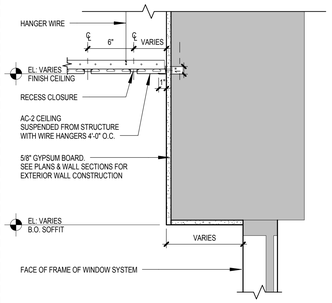
15 TYPICAL ACOUSTICAL CEILING EDGE CONDITION @ ACOUSTICAL CEILING PANELS
1 1/2" = 1'-0"



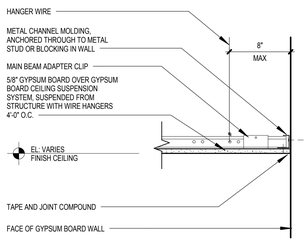
10 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



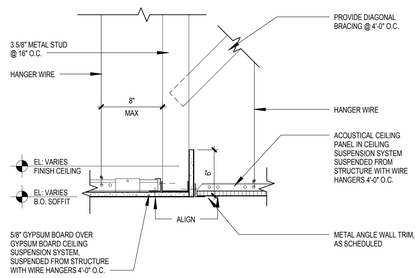
5 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



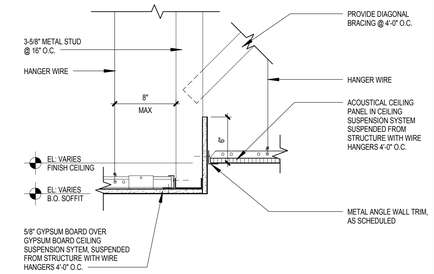
19 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



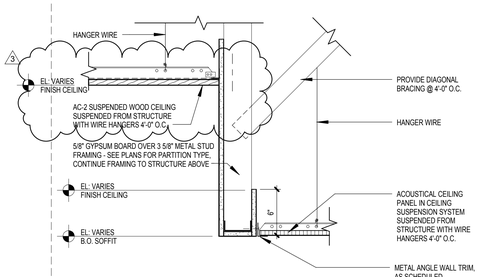
14 TYPICAL CEILING EDGE CONDITION @ GYPSUM BOARD CEILINGS
1 1/2" = 1'-0"



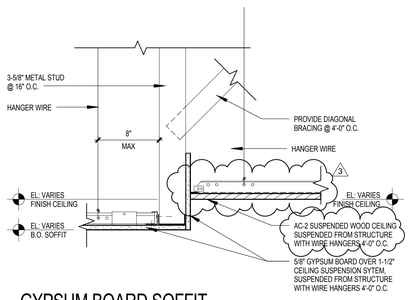
9 CEILING DETAIL
1 1/2" = 1'-0"



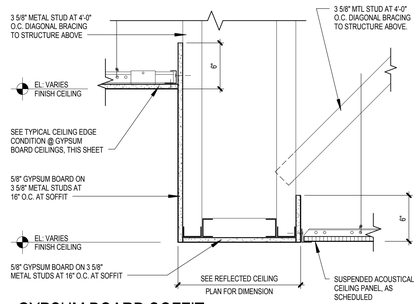
4 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



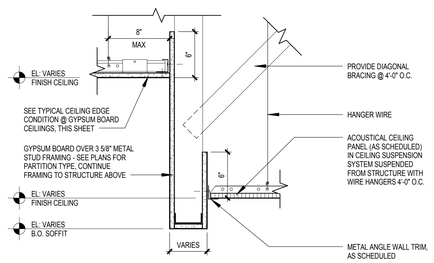
18 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



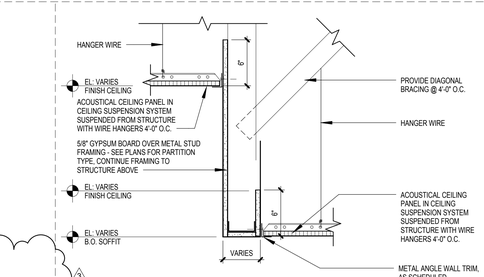
13 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



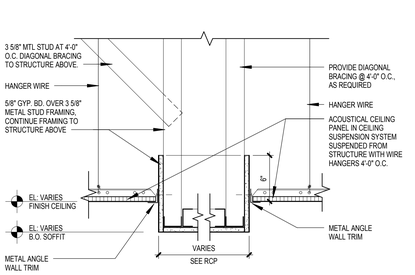
8 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



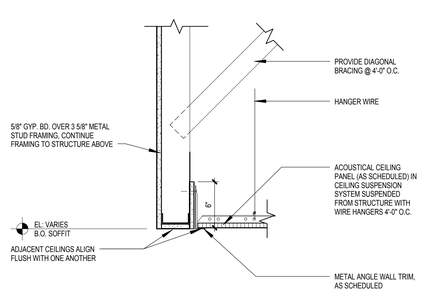
3 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



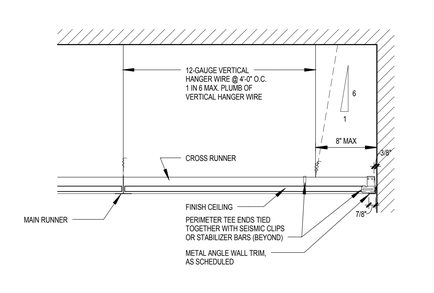
17 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



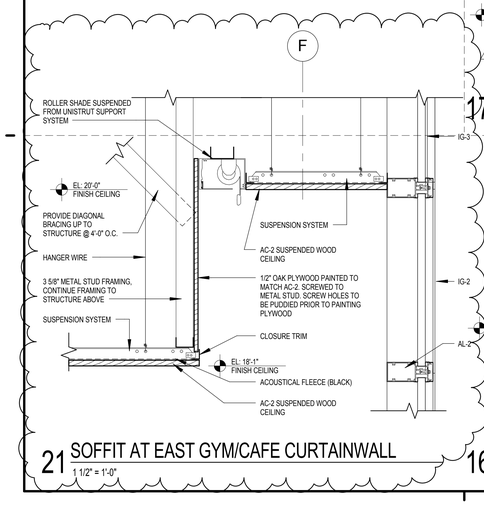
12 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



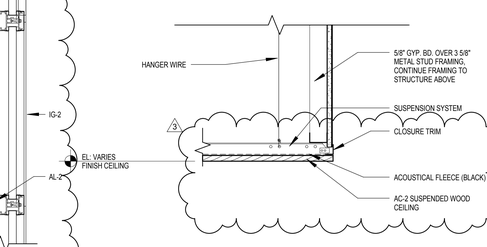
7 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



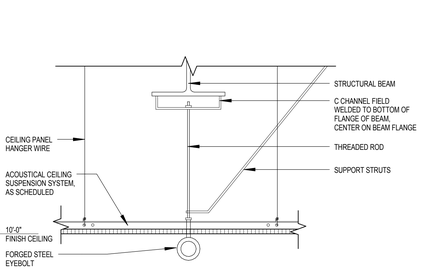
2 SEISMIC DETAIL AT ACOUSTICAL CEILING PANELS
1 1/2" = 1'-0"



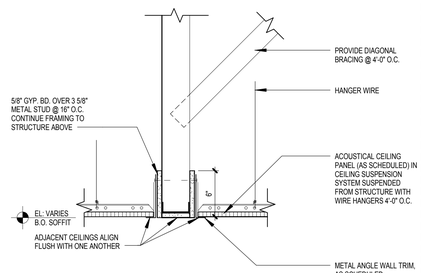
21 SOFFIT AT EAST GYM/CAFE CURTAINWALL
1 1/2" = 1'-0"



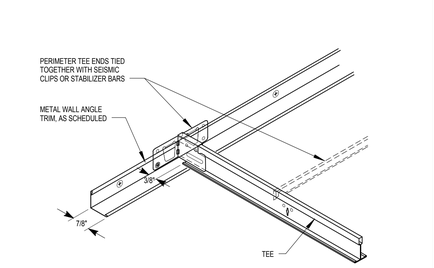
16 PERIMETER SOFFIT @ WOOD CEILING
1 1/2" = 1'-0"



11 THERAPY SWING DETAIL
1 1/2" = 1'-0"



6 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



1 SEISMIC PERIMETER TREATMENT ISOMETRIC1
1 1/2" = 1'-0"

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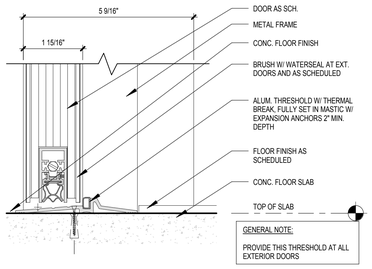
SCALE 1 1/2" = 1'-0"

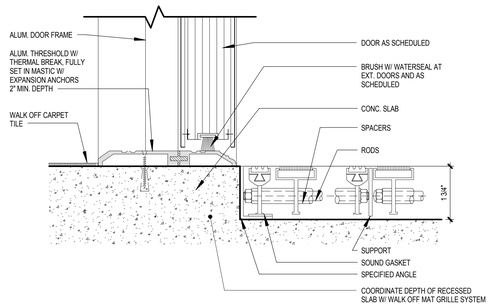
REVISIONS:
3 03/27/2018 ADDENDUM 03

CEILING DETAILS

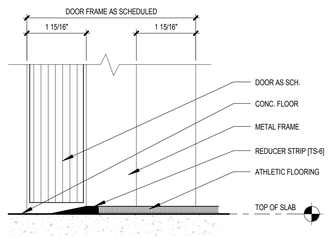
A-550



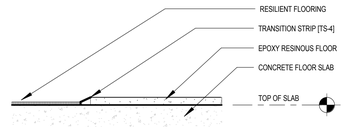
14 THRESHOLD - ACOUSTICAL DOORS
6" = 1'-0"



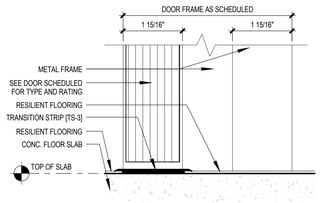
13 THRESHOLD - RECESSED GRILLE TO CARPET/ RESILIENT
6" = 1'-0"



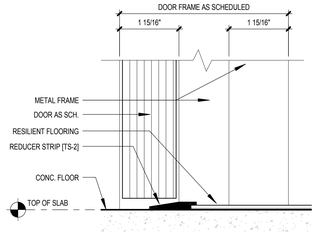
12 THRESHOLD - ATHLETIC FLOOR TO CONCRETE
6" = 1'-0"



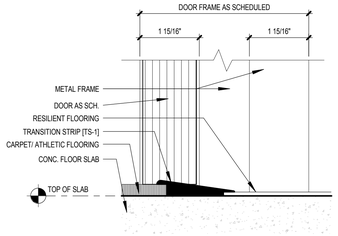
11 TRANSITION DETAIL - RESINOUS FLOORING TO RESILIENT
6" = 1'-0"



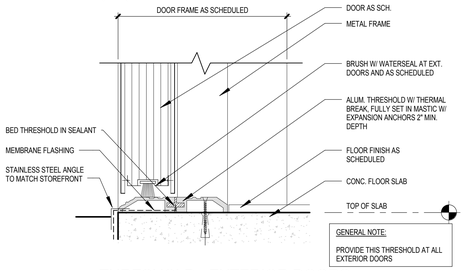
10 THRESHOLD - RESILIENT TO RESILIENT
6" = 1'-0"



9 THRESHOLD - RESILIENT TO CONCRETE
6" = 1'-0"



8 THRESHOLD - RESILIENT TO CARPET
6" = 1'-0"



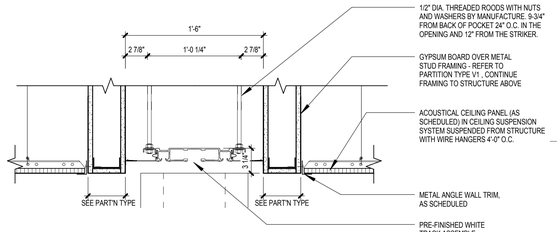
7 THRESHOLD - EXTERIOR DOORS
6" = 1'-0"

NOTES:

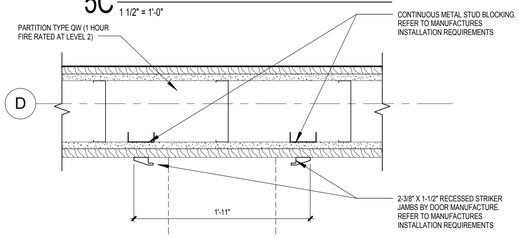
1) REFER TO SECURITY DRAWINGS FOR ADDITIONAL INFORMATION ON DEVICE PUNCH-OUTS IN FRAMES TO ACCOMODATE CONCEALED WIRING.

LEGEND:

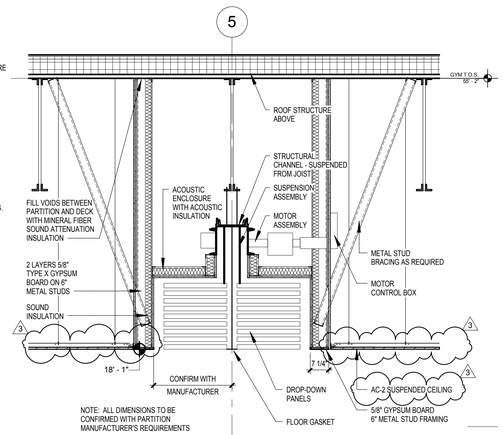
SG	SINGLE PANE GLASS
IG	INSULATING GLASS
MO	MASONRY OPENING
WD	SOLID CORE WOOD DOOR
HMF	HOLLOW METAL FRAME
GALV	GALVANIZED
RO	ROUGH OPENING
SO	STEEL INSULATING OVERHEAD DOOR
SC	STEEL COILING DOOR
SG-1	UNCOATED CLEAR FLOAT-GLASS
SG-2	UNCOATED CLEAR FLOAT-GLASS FULLY TEMPERED
SG-3	FROSTED FLOAT-GLASS
SG-4	FIRE RATED SAFETY GLASS
SG-5	MIRROPANE ONE WAY GLASS
SG-6A	COLORED INTERLAYER LAMINATED GLAZING (COLOR 1)
SG-6B	COLORER INTERLAYER LAMINATED GLAZING (COLOR 2)
SG-6C	COLORED INTERLAYER LAMINATED GLAZING (COLOR 3)
SG-6D	COLORED INTERLAYER LAMINATED GLAZING (COLOR 4)
IG-1	(NEW EXTERIOR WINDOWS STOREFRONT, ALMUNINUM CURTAINWALL)
IG-2	INSULATING GLASS-GLASS FULLY TEMPERED (ALUMINUM STOREFRONT AND CURTAIN WALL WHERE SAFETY GLAZING IS REQUIRED)
IG-3	COATED SPANDREL INSULATING GLASS
IG-4A	INSULATING GLASS-GLASS FULLY TEMPERED (COLOR 1)
IG-4B	INSULATING GLASS-GLASS FULLY TEMPERED (COLOR 2)
IG-4C	INSULATING GLASS-GLASS FULLY TEMPERED (COLOR 3)
IG-4D	INSULATING GLASS-GLASS FULLY TEMPERED (COLOR 4)
IG-4E	INSULATING GLASS-GLASS FULLY TEMPERED (FROSTED)
LSG-1	LAMINATED SECURITY GLAZING (BULLET RESISTANT)
LSG-2	LAMINATED SECURITY GLAZING (SCHOOL GUARD)
LSIG-1	LAMINATED SECURITY INSULATING GLAZING (SCHOOL GUARD) (CLEAR)
LSIG-2A	LAMINATED SECURITY INSULATING GLAZING (SCHOOL GUARD) (COLOR 1)
LSIG-2B	LAMINATED SECURITY INSULATING GLAZING (SCHOOL GUARD) (COLOR 2)
LSIG-2C	LAMINATED SECURITY INSULATING GLAZING (SCHOOL GUARD) (COLOR 3)
LSIG-2D	LAMINATED SECURITY INSULATING GLAZING (SCHOOL GUARD) (COLOR 4)
LSIG-2E	LAMINATED SECURITY INSULATING GLAZING (SCHOOL GUARD) (FROSTED)



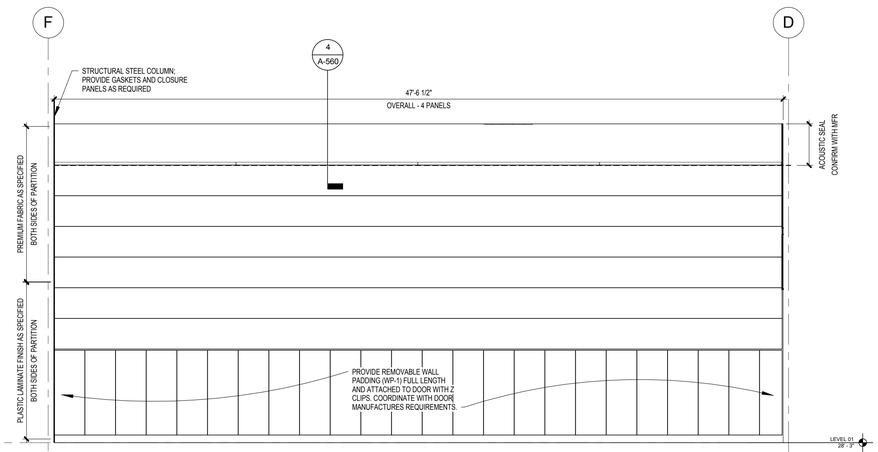
5C HORIZONTAL DOOR HEAD & SOFFIT
1 1/2" = 1'-0"



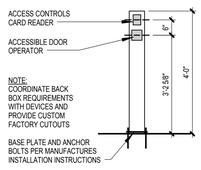
5B HOZONTAL DOOR AT WALL
1 1/2" = 1'-0"



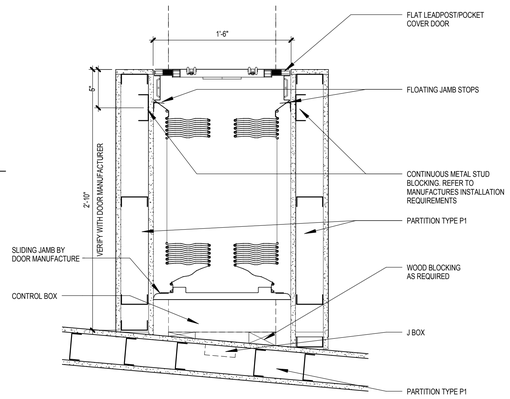
4 DROP DOWN PARTITION HEAD
1/2" = 1'-0"



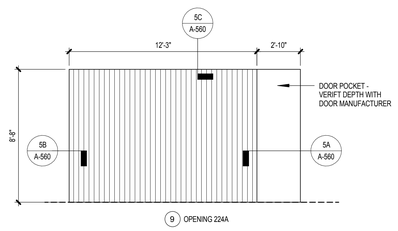
3 OVERHEAD DROP DOWN PARTITION
1/4" = 1'-0"

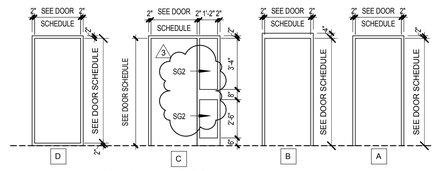


DOOR OPERATOR
6B INTERIOR PEDESTAL DETAIL
1/2" = 1'-0"

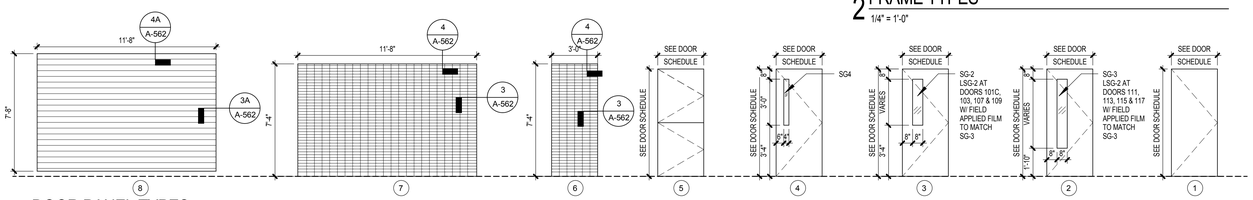


5A HORZONTAL DOOR POCKET
1 1/2" = 1'-0"

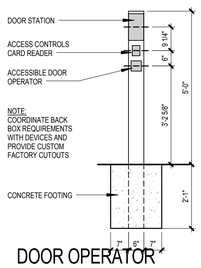




2 FRAME TYPES
1/4" = 1'-0"



1 DOOR PANEL TYPES
1/4" = 1'-0"



DOOR OPERATOR
6A EXTERIOR PEDESTAL DETAIL
1/2" = 1'-0"

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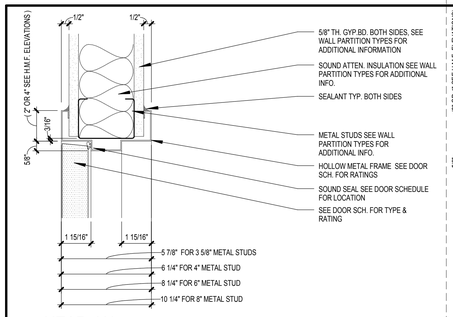
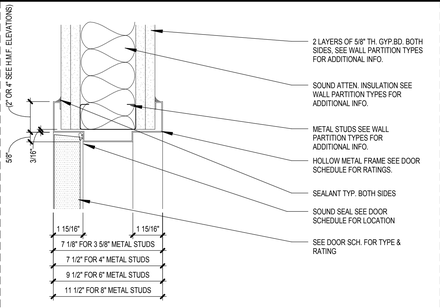
3 03/27/2018 ADDENDUM 03

DOORS, FRAMES, & WINDOWS - PLANS, ELEVATIONS, SECTIONS

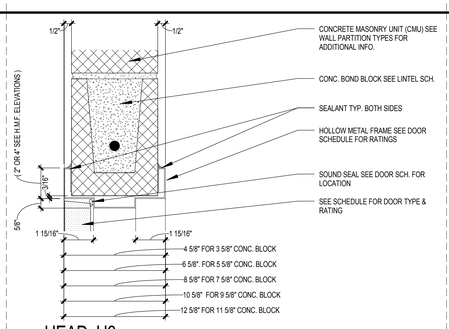
A-560



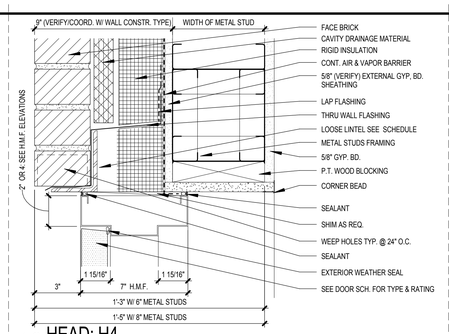
25 HEAD: H1
3" = 1'-0"



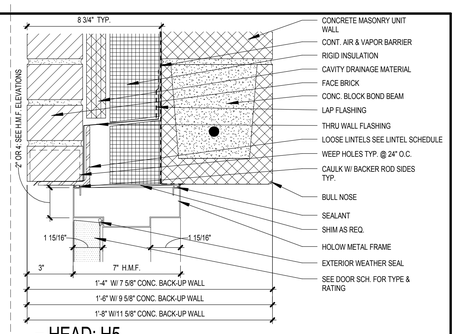
20 HEAD: H2
3" = 1'-0"



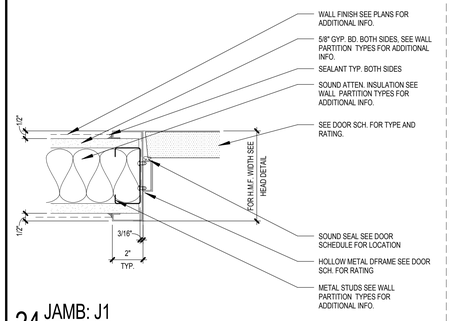
15 HEAD: H3
3" = 1'-0"



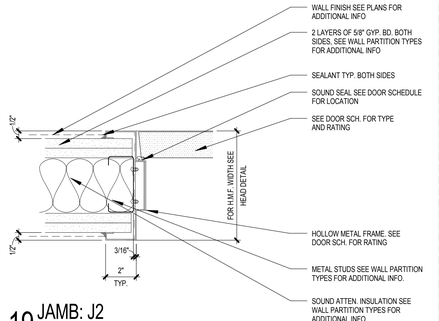
10 HEAD: H4
3" = 1'-0"



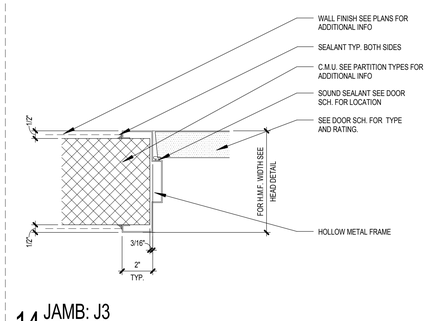
5 HEAD: H5
3" = 1'-0"



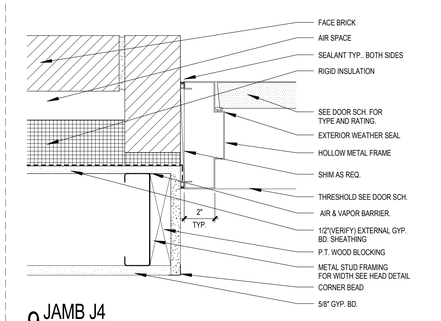
24 JAMB: J1
3" = 1'-0"



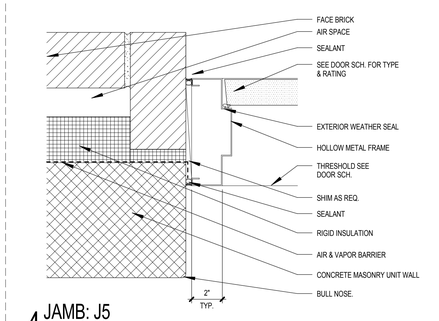
19 JAMB: J2
3" = 1'-0"



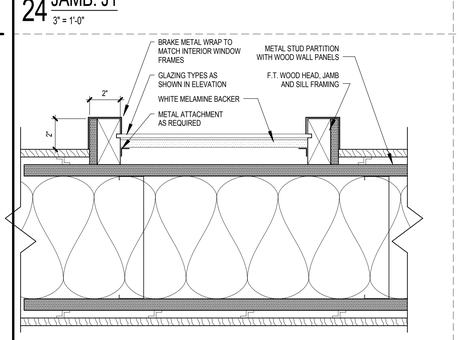
14 JAMB: J3
3" = 1'-0"



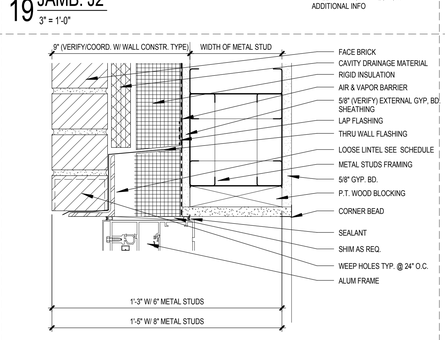
9 JAMB J4
3" = 1'-0"



4 JAMB: J5
3" = 1'-0"



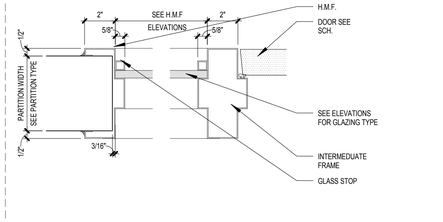
23 INTERIOR CAFETERIA WINDOW JAMB
3" = 1'-0"



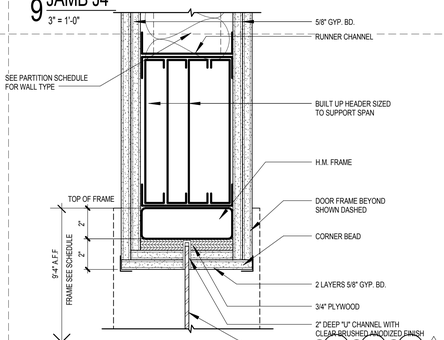
18 HEAD: H4
3" = 1'-0"

GENERAL NOTE:

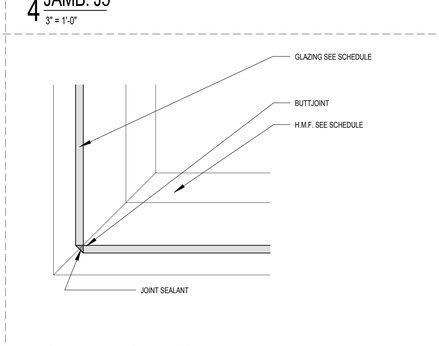
TYP. JAMB DETAILS FOR HOLLOW METAL FRAME. W/ LITE SEE DRAWINGS FOR ADDITIONAL INFO. AND PARTITION TYPES.



13 TYP INTERMEDIATE JAMB DETAIL W/SIDE LITE
3" = 1'-0"



8 HEAD AT CLERESTORY
3" = 1'-0"



3 DETAIL AT BUTT JOINT
3" = 1'-0"

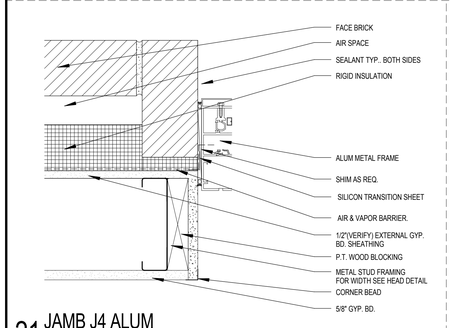
22 TYPICAL CURTAIN WALL SILL
3" = 1'-0"

17 HEAD: H5
3" = 1'-0"

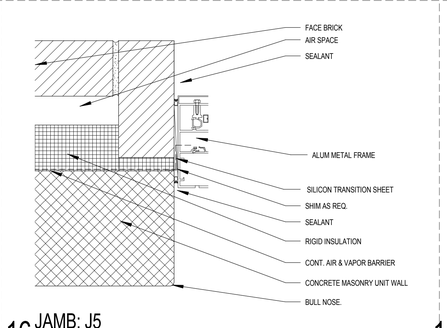
12 TYP SILL DETAIL HOLLOW METAL WINDOWS
3" = 1'-0"

7 JAMB AT CLERESTORY
3" = 1'-0"

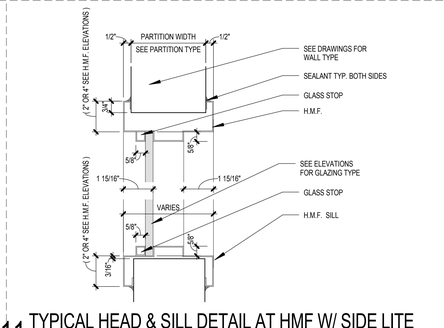
2 TYP HEAD DETAIL AT HOLLOW METAL WINDOWS
3" = 1'-0"



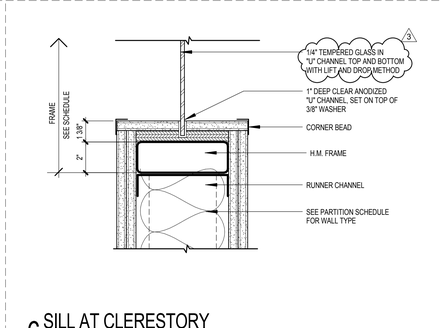
21 JAMB J4 ALUM
3" = 1'-0"



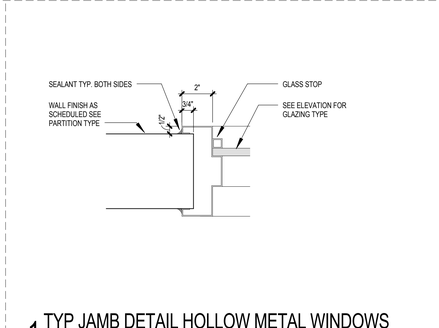
16 JAMB: J5
3" = 1'-0"



11 TYPICAL HEAD & SILL DETAIL AT HMF W/ SIDE LITE
3" = 1'-0"



6 SILL AT CLERESTORY
3" = 1'-0"



1 TYP JAMB DETAIL HOLLOW METAL WINDOWS
3" = 1'-0"

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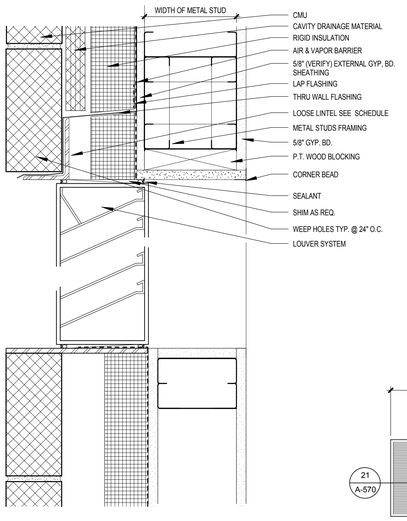
SCALE	3" = 1'-0"

REVISIONS:

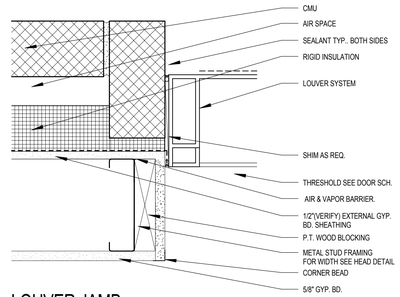
3 03/27/2018 ADDENDUM 03

HOLLOW METAL FRAME DETAILS SHEET I

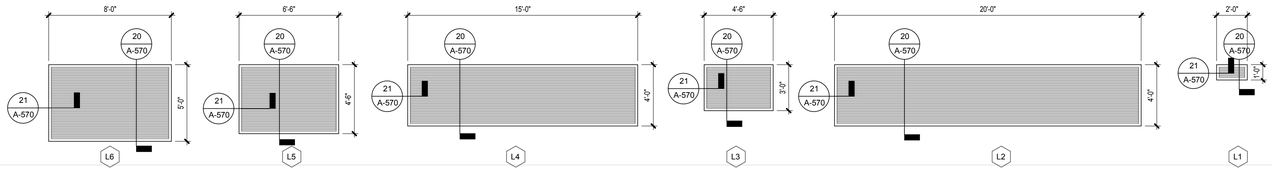
A-561



20 LOUVER HEAD AND SILL
3" = 1'-0"



21 LOUVER JAMB
3" = 1'-0"

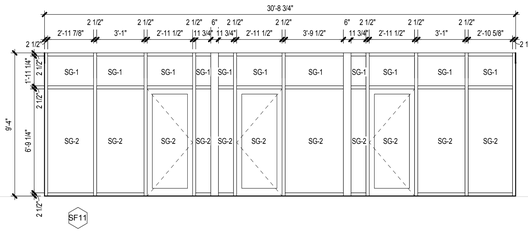


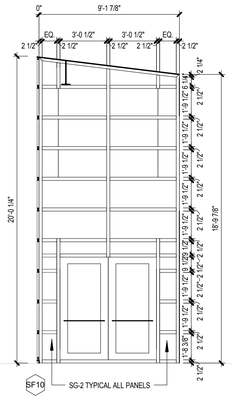
NOTES:

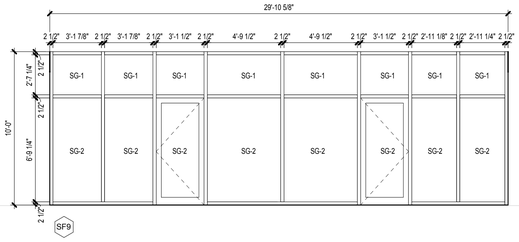
1) REFER TO SECURITY DRAWINGS FOR ADDITIONAL INFORMATION ON DEVICE PUNCH-OUTS IN FRAMES TO ACCOMODATE CONCEALED WIRING.

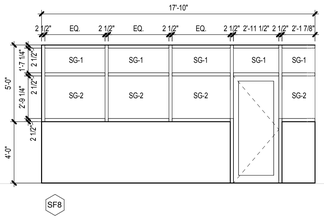
LEGEND:

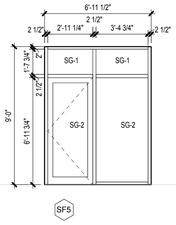
SG	SINGLE PANE GLASS
IG	INSULATING GLASS
MO	MASONRY OPENING
WD	SOLID CORE WOOD DOOR
HMF	HOLLOW METAL FRAME
GALV	GALVANIZED
RO	ROUGH OPENING
SO	STEEL INSULATING OVERHEAD DOOR
SC	STEEL COILING DOOR
SG-1	UNCOATED CLEAR FLOAT-GLASS
SG-2	UNCOATED CLEAR FLOAT-GLASS FULLY TEMPERED
SG-3	FROSTED FLOAT-GLASS
SG-4	FIRE RATED SAFETY GLASS
SG-5	MIRROPANE ONE WAY GLASS
SG-6A	COLORED INTERLAYER LAMINATED GLAZING (COLOR 1)
SG-6B	COLORER INTERLAYER LAMINATED GLAZING (COLOR 2)
SG-6C	COLORED INTERLAYER LAMINATED GLAZING (COLOR 3)
SG-6D	COLORED INTERLAYER LAMINATED GLAZING (COLOR 4)
IG-1	(NEW EXTERIOR WINDOWS STOREFRONT, ALMUNINUM CURTAINWALL)
IG-2	INSULATING GLASS-GLASS FULLY TEMPERED (ALUMINUM STOREFRONT AND CURTAIN WALL WHERE SAFETY GLAZING IS REQUIRED)
IG-3	COATED SPANDREL INSULATING GLASS
IG-4A	INSULATING GLASS-GLASS FULLY TEMPERED (COLOR 1)
IG-4B	INSULATING GLASS-GLASS FULLY TEMPERED (COLOR 2)
IG-4C	INSULATING GLASS-GLASS FULLY TEMPERED (COLOR 3)
IG-4D	INSULATING GLASS-GLASS FULLY TEMPERED (COLOR 4)
IG-4E	INSULATING GLASS-GLASS FULLY TEMPERED (FROSTED)
LSG-1	LAMINATED SECURITY GLAZING (BULLET RESISTANT)
LSG-2	LAMINATED SECURITY GLAZING (SCHOOL GUARD)
LSIG-1	LAMINATED SECURITY INSULATING GLAZING (SCHOOL GUARD) (CLEAR)
LSIG-2A	LAMINATED SECURITY INSULATING GLAZING (SCHOOL GUARD) (COLOR 1)
LSIG-2B	LAMINATED SECURITY INSULATING GLAZING (SCHOOL GUARD) (COLOR 2)
LSIG-2C	LAMINATED SECURITY INSULATING GLAZING (SCHOOL GUARD) (COLOR 3)
LSIG-2D	LAMINATED SECURITY INSULATING GLAZING (SCHOOL GUARD) (COLOR 4)
LSIG-2E	LAMINATED SECURITY INSULATING GLAZING (SCHOOL GUARD) (FROSTED)

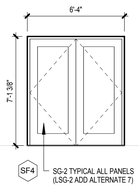


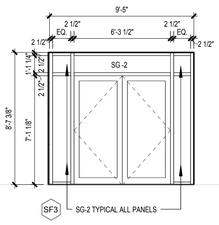


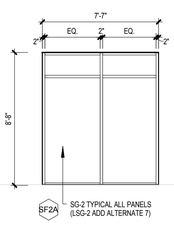


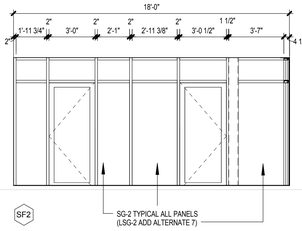


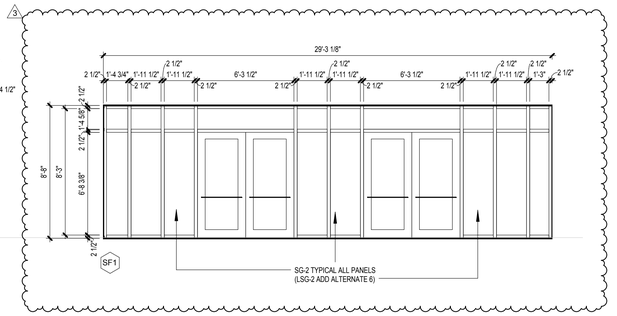


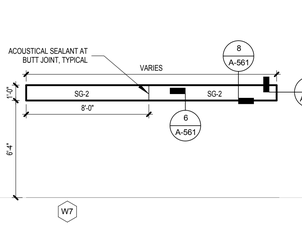


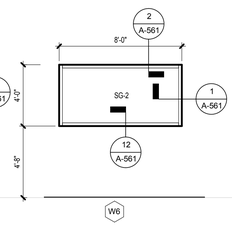


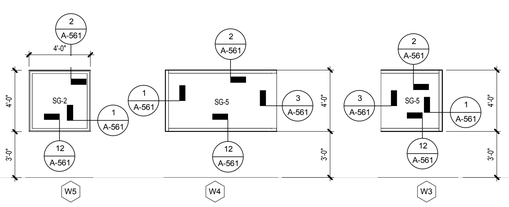


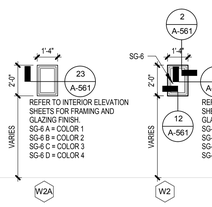


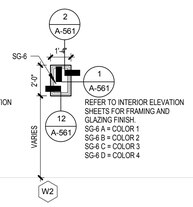


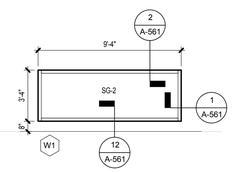












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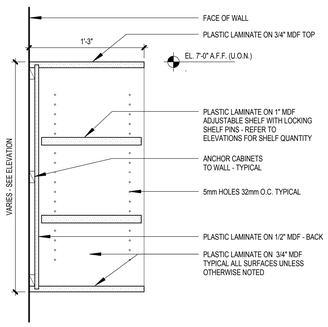
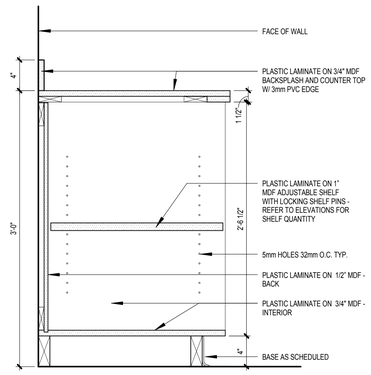
INTERIOR STOREFRONT, INTERIOR WINDOW ELEVATIONS & LOUVERS

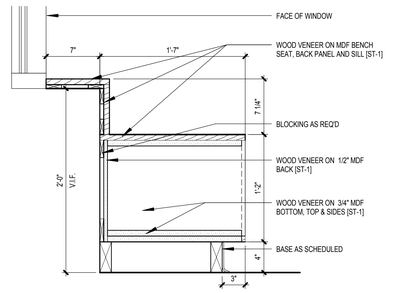
A-570



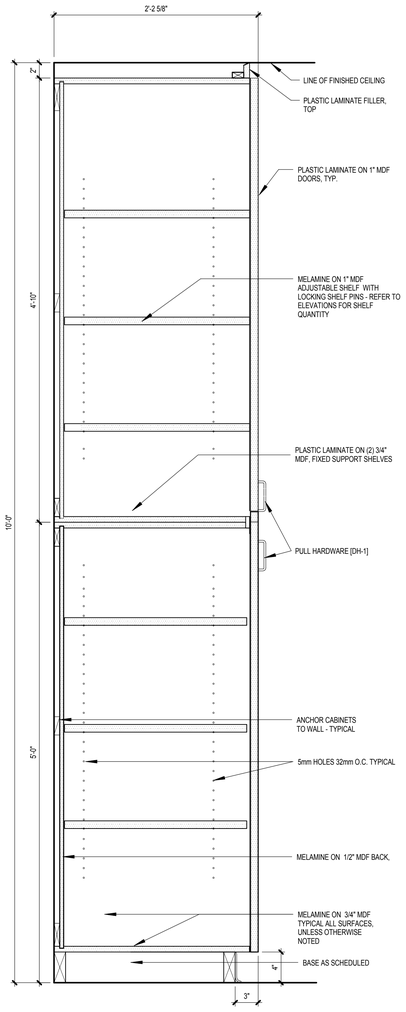
10 SECTION AT OPEN WALL CABINET
1 1/2" = 1'-0"



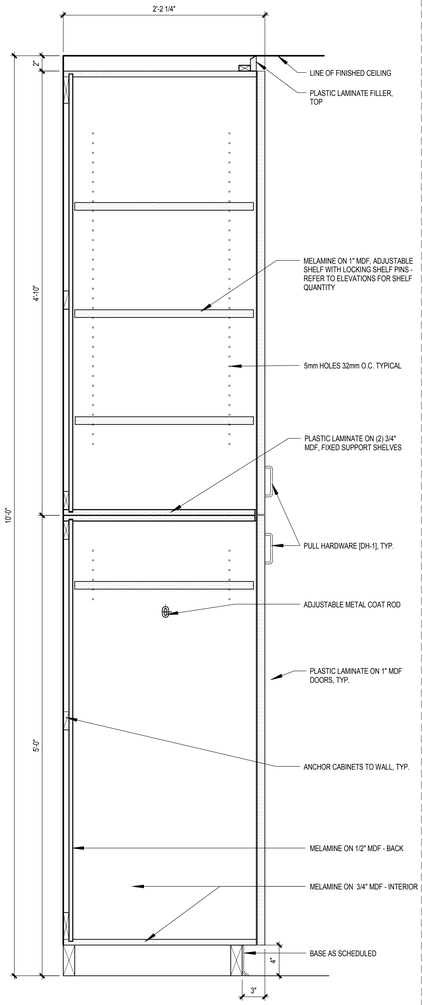
8 SECTION AT OPEN BASE CABINET
1 1/2" = 1'-0"



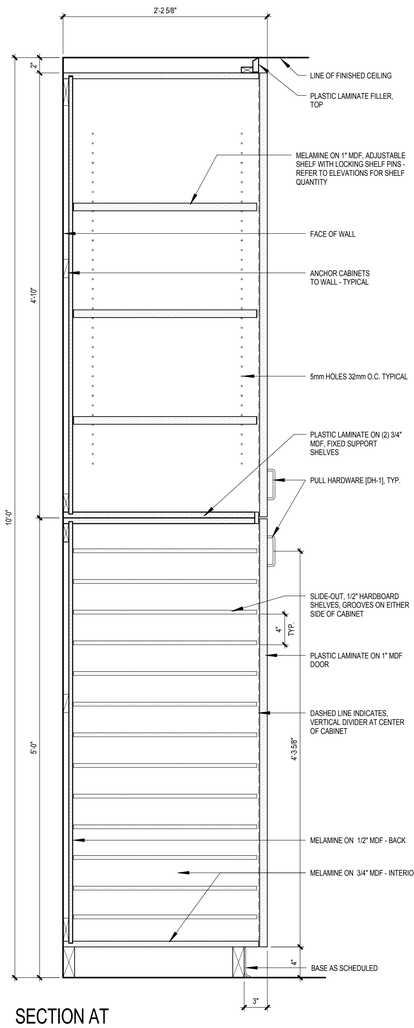
6 SECTION AT BENCH W/ OPEN BOOKCASE
1 1/2" = 1'-0"



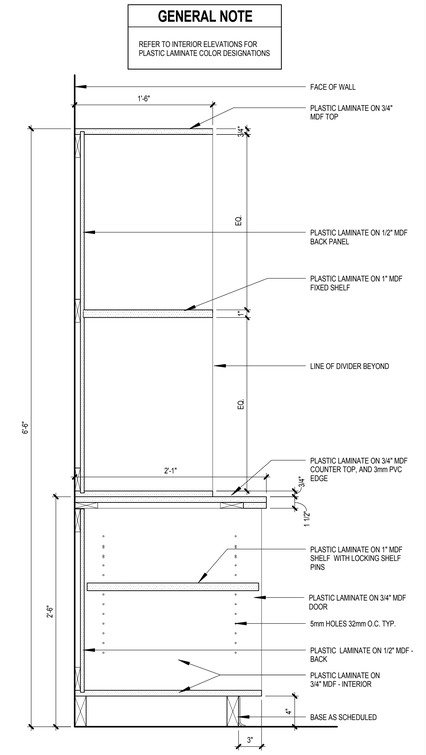
9 SECTION AT TALL DOUBLE STORAGE CABINET
1 1/2" = 1'-0"



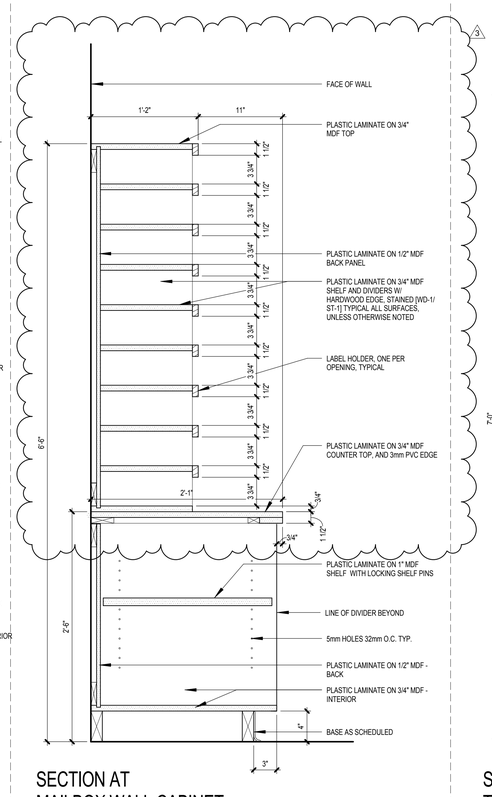
7 SECTION AT WARDROBE/ STORAGE CABINET
1 1/2" = 1'-0"



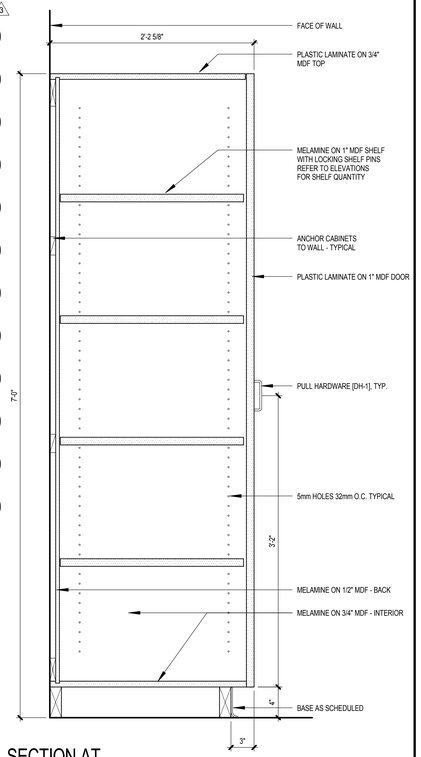
5 SECTION AT TALL CABINET FOR PAPER STORAGE
1 1/2" = 1'-0"



2 SECTION AT STORAGE WALL CABINET
1 1/2" = 1'-0"



3 SECTION AT MAILBOX WALL CABINET
1 1/2" = 1'-0"



1 SECTION AT TALL CABINET WITH DOOR/SHELVES
1 1/2" = 1'-0"

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MILLWORK DETAILS

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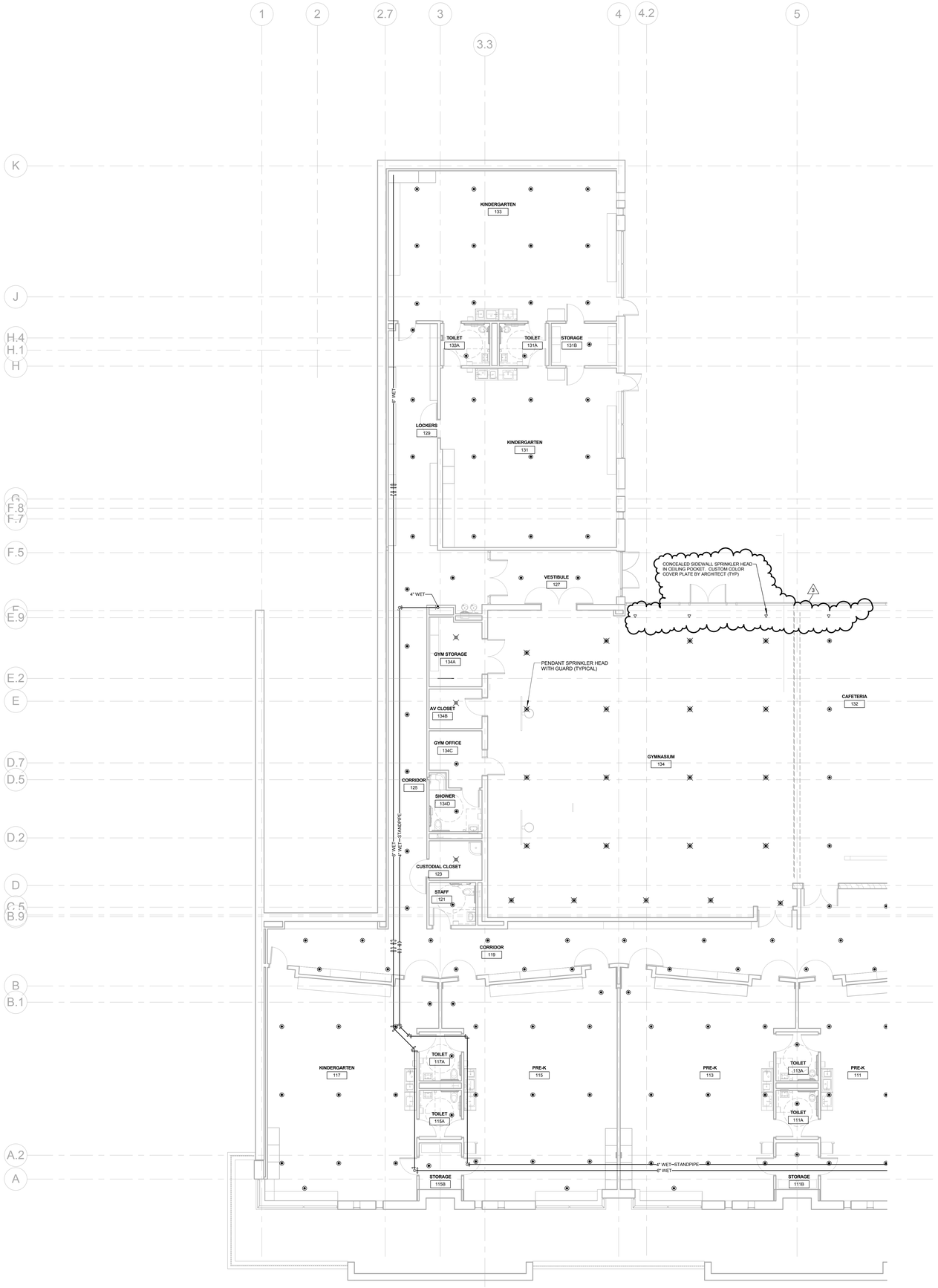
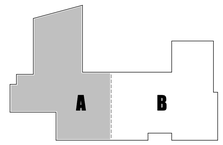


1 FIRE PROTECTION FLOOR PLAN - LEVEL 1 - AREA A
1/8" = 1'-0"

GENERAL NOTES - FIRE PROTECTION

1. CONTRACTOR SHALL PREPARE DETAILED COORDINATION DRAWINGS WHICH INCLUDE ALL MEP, STRUCTURAL AND ARCHITECTURAL COORDINATION. BIM CLASH DETECTION SHALL BE USED TO VERIFY COORDINATION DRAWINGS.
2. PROVIDE FULL SPRINKLER COVERAGE WITHIN BUILDING PER NFPA 13, NFPA 14 AND LOCAL CODE REQUIREMENTS.
3. PROVIDE CONCEALED SPRINKLERS IN STAIRS PER NFPA REQUIREMENTS. WHERE POSSIBLE SPRINKLER PIPING IN STAIR SHALL BE CONCEALED.
4. PROVIDE CONCEALED SPRINKLERS IN SKYLIGHTS PER NFPA REQUIREMENTS. WHERE POSSIBLE SPRINKLER PIPING IN SKYLIGHT SHALL BE CONCEALED.
5. PROVIDE INTERMEDIATE TEMPERATURE CLASSIFICATION SPRINKLERS IN KITCHEN AND SKYLIGHTS PER NFPA 13 REQUIREMENTS.
6. PROVIDE SPRINKLERS ABOVE AND BELOW OBSTRUCTIONS PER NFPA 13 REQUIREMENTS IN AREAS WHERE NO CEILINGS ARE PROVIDED AND EXPOSED DUCTWORK, PIPING AND OTHER UTILITIES ARE LOCATED.
7. PROVIDE SPRINKLERS ABOVE AND BELOW CLOUD CEILINGS PER NFPA 13 REQUIREMENTS.
8. ALL EQUIPMENT, PIPING, AND CONDUIT SHALL BE PLENUM RATED WHERE CEILINGS ARE NOT CONTINUOUS.
9. PROVIDE FIRE PROTECTION TEST AND DRAINS TO THE EXTERIOR OF THE BUILDING AS REQUIRED BY NFPA. COORDINATE DRAIN TO EXTERIOR OF BUILDING WITH ARCHITECT. DRAIN SHALL TERMINATE WITH SPLASH BLOCK. REFER TO DETAIL FOR FLOOR CONTROL ZONE ASSEMBLY AND WET PIPE SYSTEM TEST CONNECTION DETAIL.
10. PROVIDE STANDPIPES IN STAIRWELLS AND MECHANICAL PENTHOUSES PER NFPA 14 REQUIREMENTS.
11. THE CONTRACTOR SHALL PROVIDE PIPE EXPANSION JOINTS ON PIPING PASSING THRU ALL BUILDING EXPANSION JOINT LOCATIONS AS REQUIRED PER BUILDING CODES WHETHER OR NOT SHOWN ON DRAWINGS REVIEW ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR EXACT BUILDING EXPANSION JOINT LOCATIONS AND EXPANSION DIMENSIONS.
12. COORDINATE ALL ELECTRICAL REQUIREMENTS WITH DIVISION 26.
13. FIRE SPRINKLER DRAWINGS TO BE SUBMITTED TO AND APPROVED BY LOCAL FIRE MARSHAL PRIOR TO START OF INSTALLATION.
14. ALL DEVICES ARE TO BE A CUSTUM COLOR TO MATCH ADJOINING/ADJACENT SURFACES OR BE PAINTABLE. SEE FINISH SCHEDULE FOR COLOR.



KEY PLAN

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FIRE PROTECTION FLOOR PLAN - LEVEL1 - AREA A

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GENERAL NOTES - FIRE PROTECTION

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8. ALL EQUIPMENT, PIPING, AND CONDUIT SHALL BE PLENUM RATED WHERE CEILINGS ARE NOT CONTINUOUS.
9. PROVIDE FIRE PROTECTION TEST AND DRAINS TO THE EXTERIOR OF THE BUILDING AS REQUIRED BY NFPA. COORDINATE DRAIN TO EXTERIOR OF BUILDING WITH ARCHITECT. DRAIN SHALL TERMINATE WITH SPLASH BLOCK. REFER TO DETAIL FOR FLOOR CONTROL ZONE ASSEMBLY AND WET PIPE SYSTEM TEST CONNECTION DETAIL.
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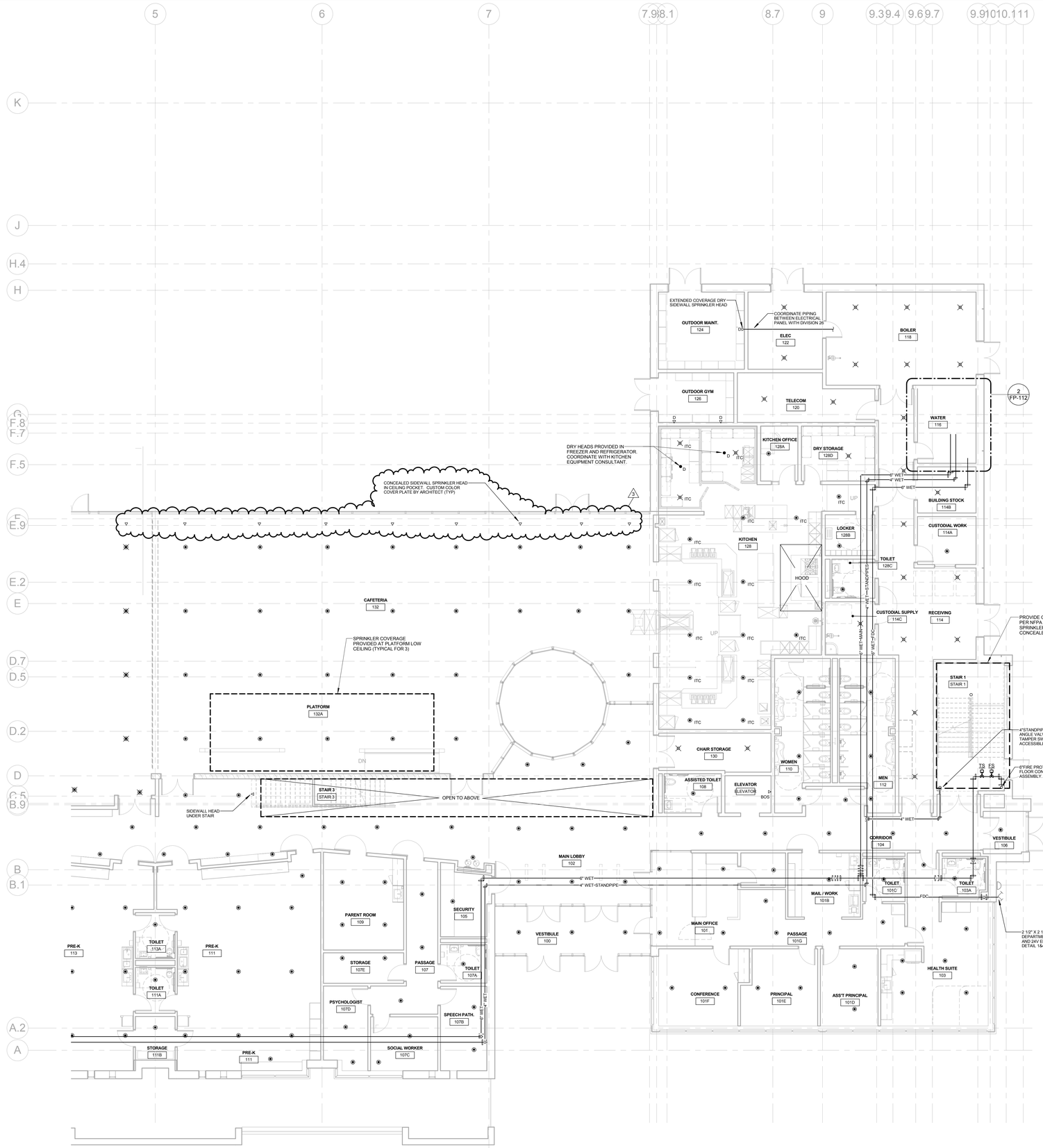
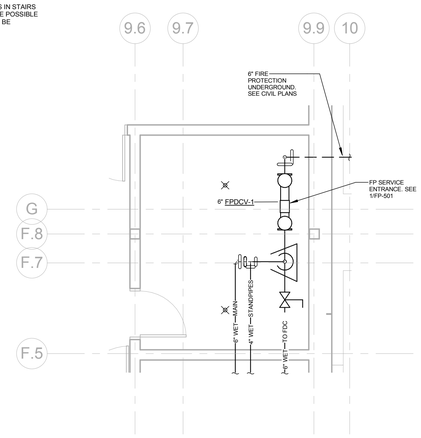
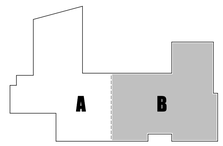
12. COORDINATE ALL ELECTRICAL REQUIREMENTS WITH DIVISION 26.
13. FIRE SPRINKLER DRAWINGS TO BE SUBMITTED TO AND APPROVED BY LOCAL FIRE MARSHAL PRIOR TO START OF INSTALLATION.
14. ALL DEVICES ARE TO BE A CUSTUM COLOR TO MATCH ADJOINING/ADJACENT SURFACES OR BE PAINTABLE. SEE FINISH SCHEDULE FOR COLOR.



1 FIRE PROTECTION FLOOR PLAN - LEVEL 1 - AREA B
1/8" = 1'-0"



2 FIRE SERVICE ROOM PART PLAN
1/4" = 1'-0"



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FIRE PROTECTION FLOOR PLAN - LEVEL 1 - AREA B

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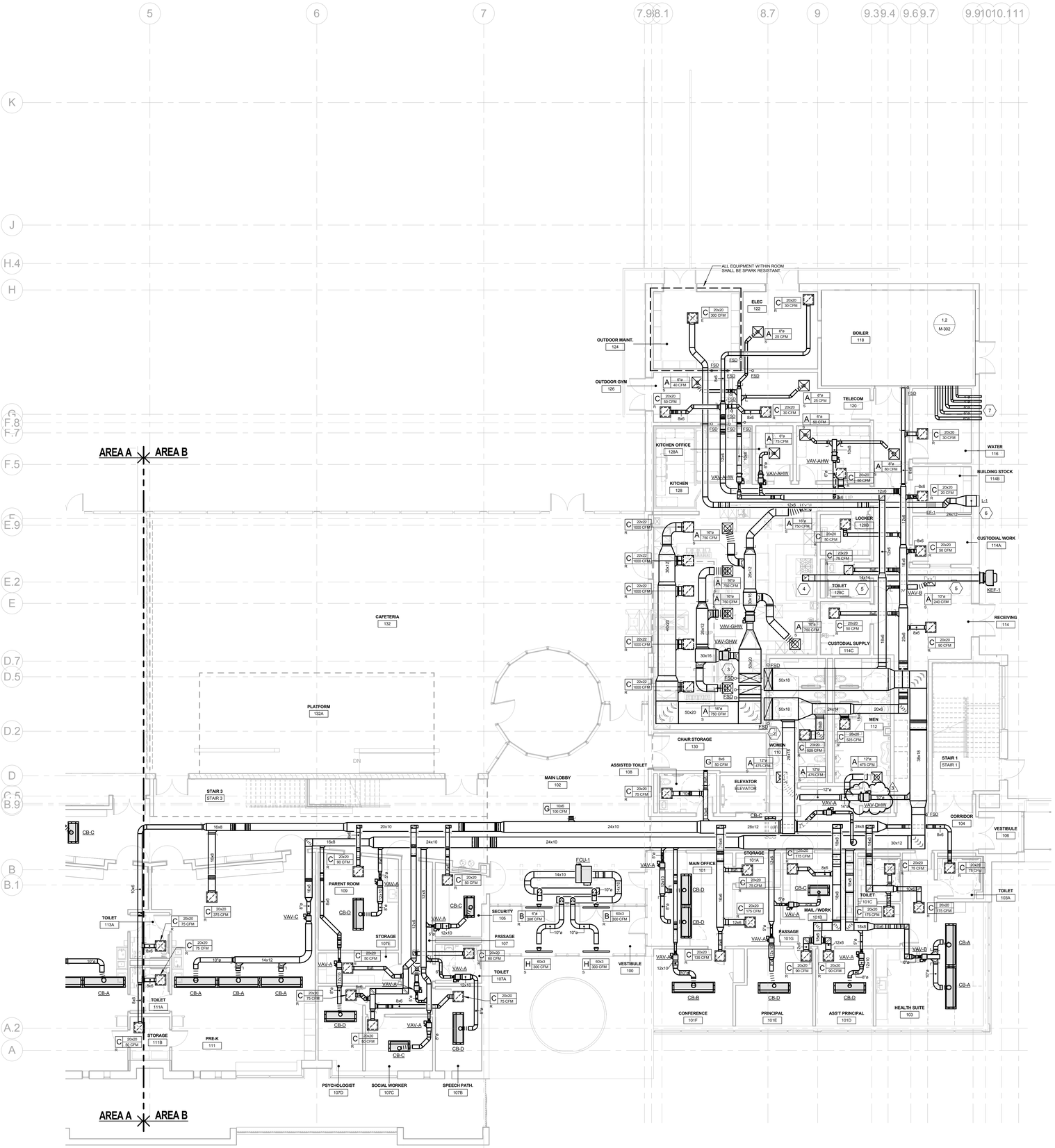


1 MECHANICAL FLOOR PLAN - LEVEL 1 - AREA B
1/8" = 1'-0"

MECHANICAL GENERAL NOTES

1. SEE MP SERIES FOR MECHANICAL PIPING DRAWINGS.
2. CONTRACTOR SHALL PREPARE DETAILED COORDINATION DRAWINGS WHICH INCLUDE ALL MEP, STRUCTURAL AND ARCHITECTURAL COORDINATION. BIM CLASH DETECTION SHALL BE USED TO VERIFY COORDINATION DRAWINGS.
3. AUTOMATIC TEMPERATURE CONTROLS (ATC) SHALL PROVIDE AND INSTALL SPACE MOUNTED DEW POINT SENSOR. ONE FOR EVER ROOM A CHILLED BEAM IS INSTALLED.
4. PROVIDE FIRE DAMPERS, FIRE STOPPING AND SMOKE BARRIER SEALING OF ALL PENETRATIONS THROUGH FIRE WALLS AND FLOORS AS REQUIRED. REFER TO ARCHITECTURAL FLOOR PLANS AND CODE SHEETS FOR ADDITIONAL INFORMATION.
5. NO PIPING, ETC, SHALL BE INSTALLED IN STAIRWELLS UNLESS THAT PIPING OR EQUIPMENT SERVES THE STAIRS.
6. DUCTS AND PIPES PENETRATING BEAMS SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS.
7. ALL EQUIPMENT, PIPING, INSULATION, DUCTWORK, CONDUIT SHALL BE PLENUM RATED AND HAVE CLEAN SEAMS AND CONNECTIONS WHERE CEILINGS ARE NOT CONTINUOUS.
8. PROVIDE VOLUME DAMPERS ON ALL DUCTWORK SERVING DIFFUSERS, GRILLS, CHILLED BEAMS, ETC.
9. CHILLED BEAMS SHALL BE EXPOSED TYPE WHEN NOT LOCATED IN HARD OR DROPPED CEILINGS. COORDINATE EXACT LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS.
10. ACOUSTICAL DUCT LINER IS REQUIRED FOR THE FIRST 6 FEET DOWNSTREAM OF ALL VAV BOXES, NOT ALL THE WAY TO RGD'S.
11. ACOUSTICAL DUCT LINER SHALL BE PROVIDED FOR FIRST 10 FEET OF DUCTWORK FROM DOA AND AHU UNITS. THIS SHALL BE FOR DUCT BETWEEN UNIT AND SPACES SERVED NOT ON INTAKE OR EXHAUSTS TO LOUVERS.
12. THE CONTRACTOR SHALL PROVIDE PIPE EXPANSION JOINTS ON PIPING PASSING THRU ALL BUILDING EXPANSION JOINT LOCATIONS AS REQUIRED PER BUILDING CODES WHETHER OR NOT SHOWN ON DRAWINGS. REVIEW ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR EXACT BUILDING EXPANSION JOINT LOCATIONS AND EXPANSION DIMENSIONS.
13. CHILLED BEAM SUPPLY DUCT: PROVIDE 10"ROUND DUCT SUPPLY TO 8'-0". 8"ROUND DUCT SUPPLY TO 6'0" CHILLED BEAM. PROVIDE 6"ROUND DUCT SUPPLY TO 4'-0"CHILLED BEAM.
14. VAV BOXES: PROVIDED ACOUSTICAL LINING 1" THICK FOR 10'-0" AFTER VAV BOX PER ACOUSTICAL ENGINEER REQUIREMENTS. DUCTWORK VAV INLET AND OUTLET MINIMUM INDICATED ON VAV SCHEDULE SHALL BE PROVIDED REGARDLESS OF DUCTWORK SIZE INDICATED ON DRAWINGS IF SMALLER THAN SCHEDULE INDICATED.
15. HOUSEKEEPING PADS: REINFORCED CONCRETE WITH APPROXIMATELY 1" CHAMFERED EDGES, MINIMUM CLEARANCE OF 6" FROM EQUIPMENT BASE TO EDGE OF PAD. PAD SHALL BE MINIMUM 4" THICK, BUT THICKER WHERE REQUIRED FOR PROPER INSTALLATION OF EQUIPMENT, INCLUDING BUT NOT LIMITED TO CONDENSING BOILERS WITHOUT OR WITHOUT CONDENSATE PUMPS, AS REQUIRED FOR THE PROPER INSTALLATION OF NEUTRALIZATION EQUIPMENT AND GRAVITY DRAINAGE TO FLOOR DRAIN, CONDENSATE PUMP, OR SIMILAR.
16. RADON PIPING SHALL BE PVC. DIVISION 22 SHALL PROVIDE PIPING THROUGH ROOF. DIVISION 23 SHALL PROVIDE ROOF CURB, FAN AND ACCESSORIES COORDINATE CONNECTION OF RADON PIPE WITH DIVISION 22 AND 31. DIVISION 23 SHALL COORDINATE RADON FAN WITH DIVISION 26 AND 31.
17. COORDINATE ALL ELECTRICAL REQUIREMENTS WITH DIVISION 26.
18. COORDINATE ALL AIR INTAKES WITH EXHAUST. EXHAUSTS SHALL BE MINIMUM 25'-0" AWAY FROM ANY INTAKES OR OPENINGS.
19. KITCHEN: COORDINATE REQUIREMENTS WITH KITCHEN CONSULTANT AND REFER TO FSE SERIES DRAWINGS FOR ADDITIONAL INFORMATION. PROVIDE DUCTWORK AND ACCESSORIES FOR DISHWASHER HOOD, GREASE HOOD, AND CLOTHES DRYER EXHAUST. GREASE EXHAUST AND DISHWASHER EXHAUST DUCTWORK SHALL BE PITCHED BACK TO HOOD.
20. TEMPERATURE SENSORS SHALL BE LOCATED ON WALL ADJACENT TO LIGHT SENSOR. COORDINATE LOCATION WITH OWNER, ARCHITECT AND ATC. TEMPERATURE SENSORS SHALL BE PROVIDED WITH VANDAL PROOF ENCLOSURES AND COORDINATED WITH OWNER AND ARCHITECT.
21. TEMPERATURE SENSORS SHALL BE PROVIDED WITH DEWPOINT SENSING CAPABILITY. WALL MOUNTED CO2 SENSORS SHALL BE PROVIDED ADJACENT TO ALL TEMPERATURE SENSORS. COORDINATE WITH ATC.
22. MOTORS: ALL MOTORS ARE TO BE PREMIUM EFFICIENCY TYPE MEETING OR EXCEEDING UTILITY REQUIREMENTS FOR REBATE PROGRAM.
23. MECHANICAL CONTRACTOR SHALL PROVIDE FINAL PIPING CONNECTIONS TO ALL HYDRONIC MECHANICAL EQUIPMENT INCLUDING CHILLED BEAMS WITH 12" OR 18" LONG FLEXIBLE HOSE COIL CONNECTORS CONSTRUCTED OF EPDM HOSE WITH STAINLESS STEEL BRAIDING RATED FOR MAXIMUM OPERATING PRESSURE OF NOT LESS THAN 125PSI WITH SWEAT OR NPT THREADED OR PUSH FIT CONNECTIONS AT ALL LOCATIONS ON DRAWINGS.
24. THE MECHANICAL CONTRACTOR IS RESPONSIBLE TO PROVIDE AND INSTALL ALL PIPING UP THRU SLAB OF THE CAO BUILDING. COORDINATE CONNECTIONS WITH MAIN BUILDING TO THE CAO BUILDING WITH DIVISION 23 CAO BUILDING CONTRACTOR
25. STAND ALONE CO DETECTION SYSTEM SHALL BE PROVIDED AND INSTALLED AT KITCHEN AND BOILER ROOM BY DIVISION 26. SYSTEM SHOWN DRAWINGS FOR REFERENCE.
26. ALL MECHANICAL DEVICES LOCATED IN CEILINGS, INCLUDING BUT NOT LIMITED TO DIFFUSERS, ACCESS PANELS, CABINET UNIT HEATERS, RADIANT CEILING PANELS, ETC, ARE TO BE A CUSTOM COLOR TO MATCH ADJOINING ADJACENT SURFACES. REFER TO ARCHITECTURAL FINISH SCHEDULE FOR REQUIRED COLOR OF DEVICES.
27. REFER TO ARCHITECTURAL INTERIOR ELEVATIONS FOR LOCATIONS/ MOUNTING HEIGHTS OF THERMOSTATS, TEMPERATURE SENSORS AND CO2 SENSORS.
28. MECHANICAL PIPING SUPPLY AND RETURN ISOLATION VALVES:

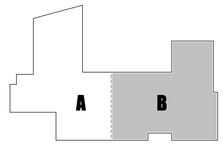
A. PROVIDE ISOLATION VALVES AT BASE OF EACH RISER LOCATION.
B. PROVIDE ISOLATION VALVES AT EACH BRACH SERVING EACH FLOOR.
C. PROVIDE ISOLATION VALVES AT EACH BRACH SERVING EACH AREA/WING.
D. PROVIDE ISOLATION VALVES AT EACH CLASSROOM, OFFICE, OR ZONE.
E. PROVIDE ISOLATION VALVES AT EACH PIECE OF EQUIPMENT.

MECHANICAL ALTERNATE

ALTERNATE NO. 12. PROPPRESS: THE USE OF PRESS TYPE FITTINGS SHALL BE PROVIDED AS AN ALTERNATE FOR COPPER PIPING SIZES 2" AND LESS ONLY. PROVIDE CREDIT TO OWNER FOR REVIEW BEFORE USE OF PRESS TYPE FITTINGS. SEE SPECIFICATION 232113, SECTION 2.1.2,3.2.4 FOR ADDITIONAL INFORMATION.

KEY NOTES - MECHANICAL HVAC

1. 46" x 14" SUPPLY AND RETURN DUCTS UP TO SECOND FLOOR. FIRE/SMOKE DAMPERS SHALL BE INSTALLED IN VERTICAL DUCT BEFORE TRANSITION IS MADE TO SERVE FIRST FLOOR.
2. 50" x 18" SUPPLY AND RETURN DUCTS UP TO SECOND FLOOR. FIRE/SMOKE DAMPERS SHALL BE INSTALLED IN VERTICAL DUCT BEFORE TRANSITION IS MADE TO SERVE FIRST FLOOR.
3. 50" x 20" SUPPLY AND RETURN DUCTS UP TO SECOND FLOOR. FIRE/SMOKE DAMPERS SHALL BE INSTALLED IN VERTICAL DUCT BEFORE TRANSITION IS MADE TO SERVE FIRST FLOOR.
4. 14" x 14" GREASE EXHAUST DUCT DOWN TO KITCHEN HOOD. GREASE DUCT SHALL BE PITCHED BACK TO HOOD.
5. PROVIDE 12" x 12" GREASE DUCT CLEANOUT. CLEANOUT SHALL BE CENTERED IN DUCT TO ALLOW FOR MINIMUM 1" CLEARANCE FROM EDGE OF DUCT.
6. 24" x 12" PLENUM BOX DUCTED TO LOUVER L-1. FURNISH WITH BIRD SCREEN AND MOTORIZED DAMPER. MOTORIZED DAMPER SHALL BE INTERLOCKED WITH EXHAUST FAN EF-1.
7. BOILER AND WATER HEATER VENT.
8. 46" x 14" SUPPLY AND RETURN DUCTS DOWN TO FIRST FLOOR. 54" x 22" SUPPLY AND RETURN DUCTS UP TO THIRD FLOOR.
9. CEILINGS IN THIS AREA ARE SLOPPED. CONTRACTOR TO COORDINATE CHILLED BEAMS AND DUCTWORK TO ENSURE ALL COMPONENTS ARE LOCATED ABOVE CEILING, AND DUCTWORK SHALL NOT BE VISIBLE IN SPACE.
10. 50" x 26" SUPPLY AND RETURN DUCTS UP TO PENTHOUSE.
11. 70" x 36" SUPPLY AND RETURN DUCTS UP. SOUND ATTENUATORS TO BE INSTALLED IN VERTICAL SECTION OF DUCT.
12. 50" x 18" SUPPLY AND RETURN DUCTS DOWN. 60" x 26" SUPPLY AND RETURN DUCTS UP.
13. 50" x 20" SUPPLY AND RETURN DUCTS UP AND DOWN. FIRE/SMOKE DAMPERS SHALL BE INSTALLED IN VERTICAL DUCT IN SOUTH PENTHOUSE.



KEY PLAN

NORTH

NEW HAVEN PUBLIC SCHOOLS

STRONG 21st CENTURY COMMUNICATIONS LAB SCHOOL

SOUTHERN CONNECTICUT STATE UNIVERSITY
FARNHAM AVENUE
NEW HAVEN, CT 06515

STATE PROJECT# : 093-0368N

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SUITE 400
HARTFORD, CT 06106
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412.367.1905

HARDWARE CONSULTANT
P.H. HAWLEY ASSOCIATES
36 SCENIC DRIVE
BERLIN, CT 06037
860.438.7636

ISSUED FOR BID
03-05-2018

P.I.C. _____ L.D. _____
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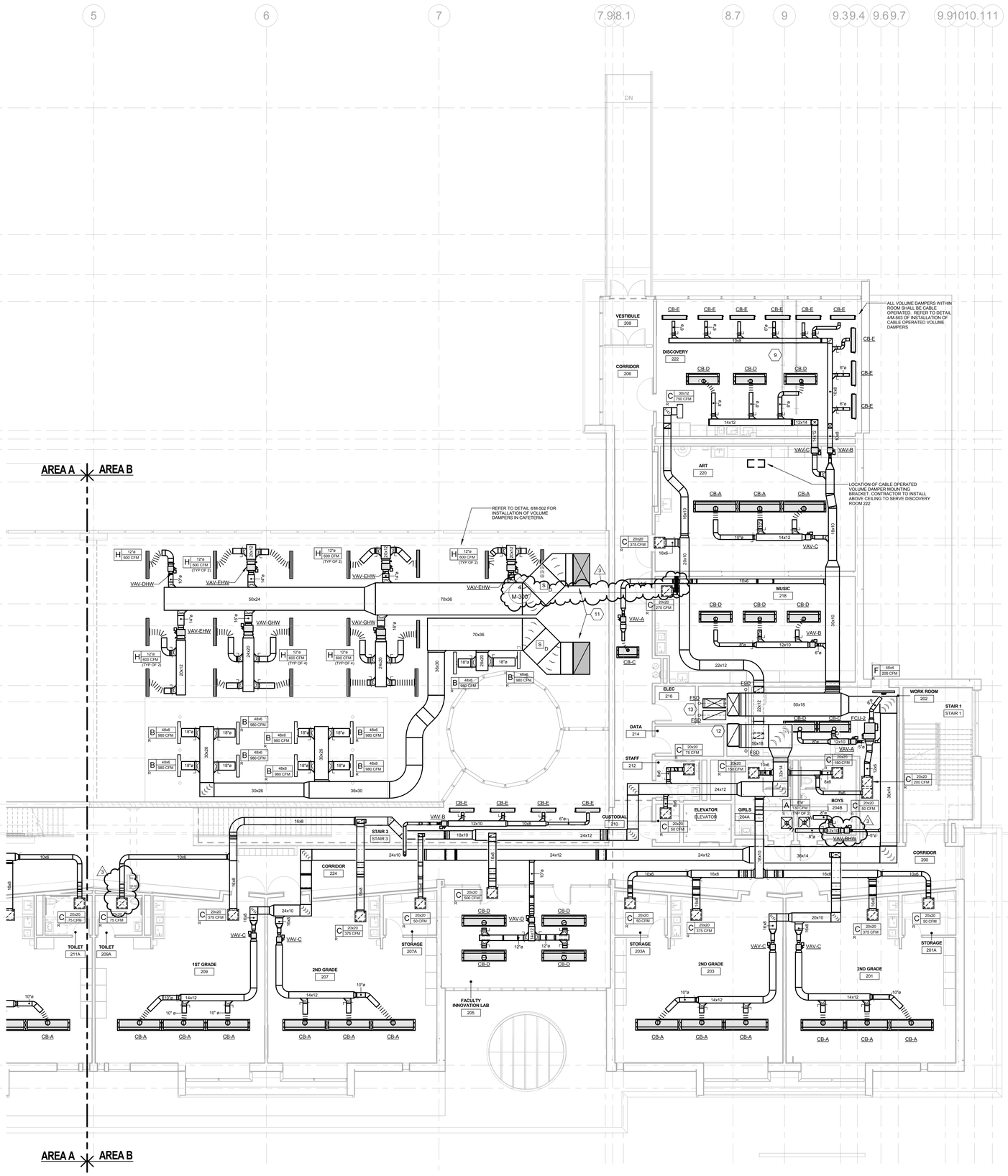
ISSUE	2017-09-08
JOB	H16040.00
DRAWN	BCH
SCALE	As indicated

REVISIONS:

3	03/27/2018	ADDENDUM 03

MECHANICAL FLOOR PLAN - LEVEL 1 - AREA B

M-112



1 MECHANICAL FLOOR PLAN - LEVEL 2 - AREA B
1/8" = 1'-0"

MECHANICAL GENERAL NOTES

1. SEE MP SERIES FOR MECHANICAL PIPING DRAWINGS
2. CONTRACTOR SHALL PREPARE DETAILED COORDINATION DRAWINGS WHICH INCLUDE ALL MEP, STRUCTURAL AND ARCHITECTURAL COORDINATION. BIM CLASH DETECTION SHALL BE USED TO VERIFY COORDINATION DRAWINGS.
3. AUTOMATIC TEMPERATURE CONTROLS (ATC) SHALL PROVIDE AND INSTALL SPACE MOUNTED DEW POINT SENSOR. ONE FOR EVER ROOM A CHILLED BEAM IS INSTALLED.
4. PROVIDE FIRE DAMPERS, FIRE STOPPING AND SMOKE BARRIER SEALING OF ALL PENETRATIONS THROUGH FIRE WALLS AND FLOORS AS REQUIRED. REFER TO ARCHITECTURAL FLOOR PLANS AND CODE SHEETS FOR ADDITIONAL INFORMATION.
5. NO PIPING, ETC, SHALL BE INSTALLED IN STAIRWELLS UNLESS THAT PIPING OR EQUIPMENT SERVES THE STAIRS.
6. DUCTS AND PIPES PENETRATING BEAMS SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS.
7. ALL EQUIPMENT, PIPING, INSULATION, DUCTWORK, CONDUIT SHALL BE PLENUM RATED AND HAVE CLEAN SEAMS AND CONNECTIONS WHERE CEILINGS ARE NOT CONTINUOUS.
8. PROVIDE VOLUME DAMPERS ON ALL DUCTWORK SERVING DIFFUSERS, GRILLS, CHILLED BEAMS, ETC.
9. CHILLED BEAMS SHALL BE EXPOSED TYPE WHEN NOT LOCATED IN HARD OR DROPPED CEILINGS. COORDINATE EXACT LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS.
10. ACOUSTICAL DUCT LINER IS REQUIRED FOR THE FIRST 6 FEET DOWNSTREAM OF ALL VAV BOXES, NOT ALL THE WAY TO RGD'S.
11. ACOUSTICAL DUCT LINER SHALL BE PROVIDED FOR FIRST 10 FEET OF DUCTWORK FROM DOA AND AHU UNITS, THIS SHALL BE FOR DUCT BETWEEN UNIT AND SPACES SERVED NOT ON INTAKE OR EXHAUSTS TO LOUVERS.
12. THE CONTRACTOR SHALL PROVIDE PIPE EXPANSION JOINTS ON PIPING PASSING THRU ALL BUILDING EXPANSION JOINT LOCATIONS AS REQUIRED PER BUILDING CODES WHETHER OR NOT SHOWN ON DRAWINGS. REVIEW ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR EXACT BUILDING EXPANSION JOINT LOCATIONS AND EXPANSION DIMENSIONS.
13. CHILLED BEAM SUPPLY DUCT: PROVIDE 10"ROUND DUCT SUPPLY TO 8'-0". 8"ROUND DUCT SUPPLY TO 6'0" CHILLED BEAM. PROVIDE 6"ROUND DUCT SUPPLY TO 4'-0"CHILLED BEAM.
14. VAV BOXES: PROVIDED ACOUSTICAL LINING 1" THICK FOR 10'-0" AFTER VAV BOX PER ACOUSTICAL ENGINEER REQUIREMENTS. DUCTWORK VAV INLET AND OUTLET MINIMUM INDICATED ON VAV SCHEDULE SHALL BE PROVIDED REGARDLESS OF DUCTWORK SIZE INDICATED ON DRAWINGS IF SMALLER THAN SCHEDULE INDICATED.
15. HOUSEKEEPING PADS: REINFORCED CONCRETE WITH APPROXIMATELY 1" CHAMFERED EDGES. MINIMUM CLEARANCE OF 6" FROM EQUIPMENT BASE TO EDGE OF PAD. PAD SHALL BE MINIMUM 6" THICK, BUT THICKER WHERE REQUIRED FOR PROPER INSTALLATION OF EQUIPMENT, INCLUDING BUT NOT LIMITED TO CONDENSING BOILERS WITHOUT OR WITHOUT CONDENSATE PUMPS, AS REQUIRED FOR THE PROPER INSTALLATION OF NEUTRALIZATION EQUIPMENT AND GRAVITY DRAINAGE TO FLOOR DRAIN. CONDENSATE PUMP, OR SIMILAR.
16. RADON PIPING SHALL BE PVC. DIVISION 22 SHALL PROVIDE PIPING THROUGH ROOF. DIVISION 23 SHALL PROVIDE ROOF CURB, FAN AND ACCESSORIES COORDINATE CONNECTION OF RADON PIPE WITH DIVISION 22 AND 31. DIVISION 23 SHALL COORDINATE RADON FAN WITH DIVISION 26 AND 31.
17. COORDINATE ALL ELECTRICAL REQUIREMENTS WITH DIVISION 26.
18. COORDINATE ALL AIR INTAKES WITH EXHAUST. EXHAUSTS SHALL BE MINIMUM 25'-0" AWAY FROM ANY INTAKES OR OPENINGS.
19. KITCHEN: COORDINATE REQUIREMENTS WITH KITCHEN CONSULTANT AND REFER TO FSE SERIES DRAWINGS FOR ADDITIONAL INFORMATION. PROVIDE DUCTWORK AND ACCESSORIES FOR DISHWASHER HOOD, GREASE HOOD, AND CLOTHES DRYER EXHAUST. GREASE EXHAUST AND DISHWASHER EXHAUST DUCTWORK SHALL BE PITCHED BACK TO HOOD.
20. TEMPERATURE SENSORS SHALL BE LOCATED ON WALL ADJACENT TO LIGHT SENSOR. COORDINATE LOCATION WITH OWNER, ARCHITECT AND ATC. TEMPERATURE SENSORS SHALL BE PROVIDED WITH VANDAL PROOF ENCLOSURES AND COORDINATED WITH OWNER AND ARCHITECT.
21. TEMPERATURE SENSORS SHALL BE PROVIDED WITH DEWPOINT SENSING CAPABILITY. WALL MOUNTED CO2 SENSORS SHALL BE PROVIDED ADJACENT TO ALL TEMPERATURE SENSORS. COORDINATE WITH ATC.
22. MOTORS: ALL MOTORS ARE TO BE PREMIUM EFFICIENCY TYPE MEETING OR EXCEEDING UTILITY REQUIREMENTS FOR REBATE PROGRAM.
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24. THE MECHANICAL CONTRACTOR IS RESPONSIBLE TO PROVIDE AND INSTALL ALL PIPING UP THRU SLAB OF THE CAO BUILDING. COORDINATE CONNECTIONS WITH MAIN BUILDING TO THE CAO BUILDING WITH DIVISION 23 CAO BUILDING CONTRACTOR.
25. STAND ALONE CO DETECTION SYSTEM SHALL BE PROVIDED AND INSTALLED AT KITCHEN AND BOILER ROOM BY DIVISION 26. SYSTEM SHOWN DRAWINGS FOR REFERENCE.
26. ALL MECHANICAL DEVICES LOCATED IN CEILINGS, INCLUDING BUT NOT LIMITED TO DIFFUSERS, ACCESS PANELS, CABINET UNIT HEATERS, RADIANT CEILING PANELS, ETC, ARE TO BE A CUSTOM COLOR TO MATCH ADJOINING/ ADJACENT SURFACES. REFER TO ARCHITECTURAL FINISH SCHEDULE FOR REQUIRED COLOR OF DEVICES.
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4. 14" x 14" GREASE EXHAUST DUCT DOWN TO KITCHEN HOOD. GREASE DUCT SHALL BE PITCHED BACK TO HOOD.
5. PROVIDE 12" x 12" GREASE DUCT CLEANOUT. CLEANOUT SHALL BE CENTERED IN DUCT TO ALLOW FOR MINIMUM 1" CLEARANCE FROM EDGE OF DUCT.
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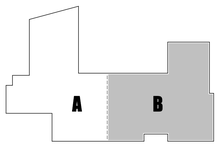
10. 50" x 26" SUPPLY AND RETURN DUCTS UP TO PENTHOUSE.
11. 70" x 36" SUPPLY AND RETURN DUCTS UP. SOUND ATTENUATORS TO BE INSTALLED IN VERTICAL SECTION OF DUCT.
12. 50" x 18" SUPPLY AND RETURN DUCTS DOWN. 60" x 26" SUPPLY AND RETURN DUCTS UP.
13. 50" x 20" SUPPLY AND RETURN DUCTS UP AND DOWN. FIRE/SMOKE DAMPERS SHALL BE INSTALLED IN VERTICAL DUCT IN SOUTH PENTHOUSE.

KEY PLAN



NORTH

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STATE PROJECT# : 093-0368N

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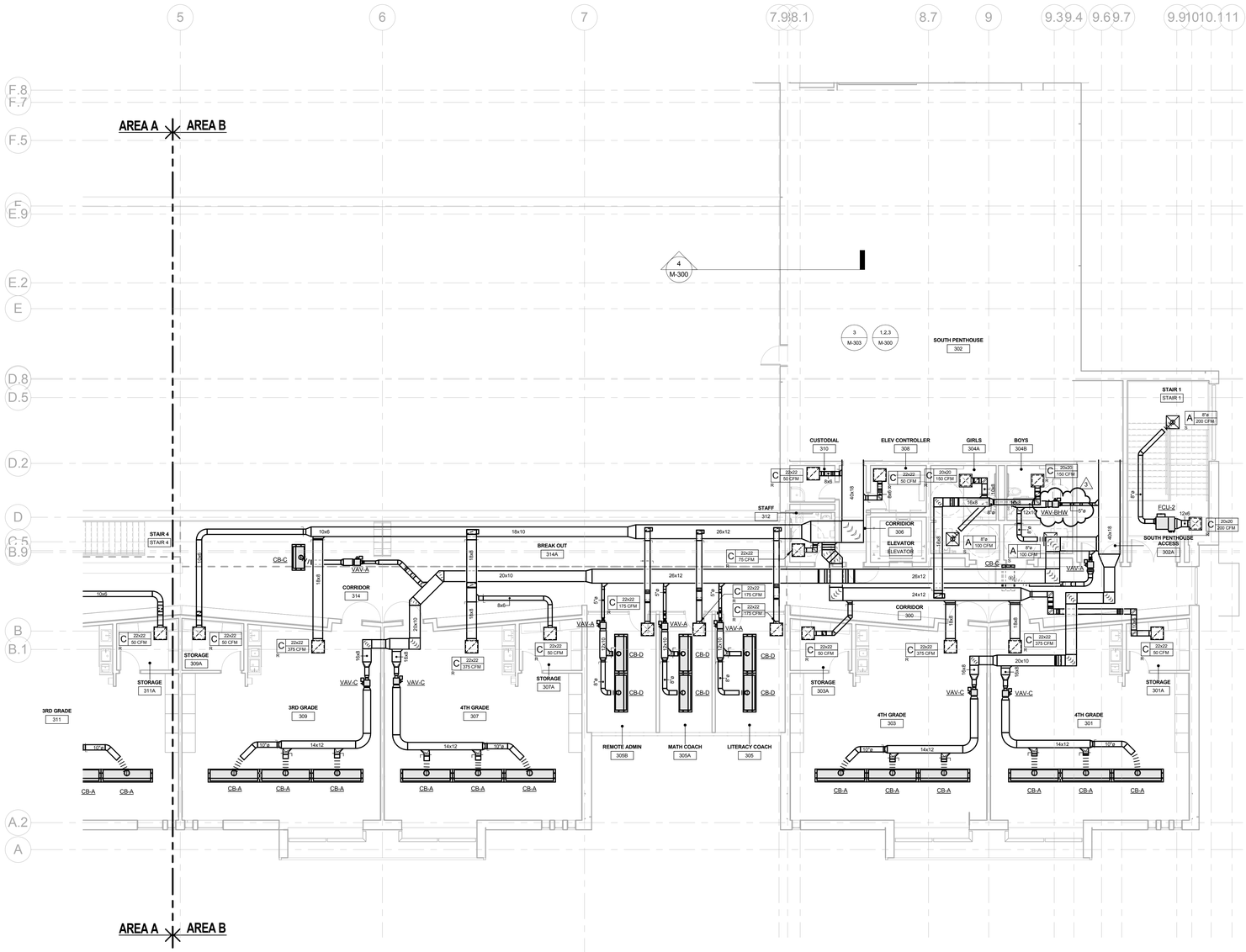
SCALE As indicated

REVISIONS:
3 03/27/2018 ADDENDUM 03

MECHANICAL FLOOR PLAN - LEVEL 2 - AREA B

M-122



1 MECHANICAL FLOOR PLAN - LEVEL 3 - AREA B
1/8" = 1'-0"

MECHANICAL GENERAL NOTES

1. SEE MP SERIES FOR MECHANICAL PIPING DRAWINGS
2. CONTRACTOR SHALL PREPARE DETAILED COORDINATION DRAWINGS WHICH INCLUDE ALL MEP, STRUCTURAL AND ARCHITECTURAL COORDINATION. BIM CLASH DETECTION SHALL BE USED TO VERIFY COORDINATION DRAWINGS.
3. AUTOMATIC TEMPERATURE CONTROLS (ATC) SHALL PROVIDE AND INSTALL SPACE MOUNTED DEW POINT SENSOR. ONE FOR EVER ROOM A CHILLED BEAM IS INSTALLED.
4. PROVIDE FIRE DAMPERS, FIRE STOPPING AND SMOKE BARRIER SEALING OF ALL PENETRATIONS THROUGH FIRE WALLS AND FLOORS AS REQUIRED. REFER TO ARCHITECTURAL FLOOR PLANS AND CODE SHEETS FOR ADDITIONAL INFORMATION.
5. NO PIPING, ETC, SHALL BE INSTALLED IN STAIRWELLS UNLESS THAT PIPING OR EQUIPMENT SERVES THE STAIRS.
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9. CHILLED BEAMS SHALL BE EXPOSED TYPE WHEN NOT LOCATED IN HARD OR DROPPED CEILINGS. COORDINATE EXACT LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS.
10. ACOUSTICAL DUCT LINER IS REQUIRED FOR THE FIRST 6 FEET DOWNSTREAM OF ALL VAV BOXES, NOT ALL THE WAY TO RGD'S.
11. ACOUSTICAL DUCT LINER SHALL BE PROVIDED FOR FIRST 10 FEET OF DUCTWORK FROM DOA AND AHU UNITS. THIS SHALL BE FOR DUCT BETWEEN UNIT AND SPACES SERVED NOT ON INTAKE OR EXHAUSTS TO LOUVERS.
12. THE CONTRACTOR SHALL PROVIDE PIPE EXPANSION JOINTS ON PIPING PASSING THRU ALL BUILDING EXPANSION JOINT LOCATIONS AS REQUIRED PER BUILDING CODES WHETHER OR NOT SHOWN ON DRAWINGS. REVIEW ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR EXACT BUILDING EXPANSION JOINT LOCATIONS AND EXPANSION DIMENSIONS.
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15. HOUSEKEEPING PADS: REINFORCED CONCRETE WITH APPROXIMATELY 1" CHAMFERED EDGES, MINIMUM CLEARANCE OF 6" FROM EQUIPMENT BASE TO EDGE OF PAD. PAD SHALL BE MINIMUM 4" THICK, BUT THICKER WHERE REQUIRED FOR PROPER INSTALLATION OF EQUIPMENT, INCLUDING BUT NOT LIMITED TO CONDENSING BOILERS WITHOUT OR WITHOUT CONDENSATE PUMPS, AS REQUIRED FOR THE PROPER INSTALLATION OF NEUTRALIZATION EQUIPMENT AND GRAVITY DRAINAGE TO FLOOR DRAIN, CONDENSATE PUMP, OR SIMILAR.
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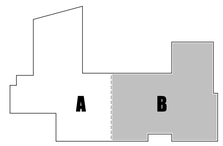
4. 14" x 14" GREASE EXHAUST DUCT DOWN TO KITCHEN HOOD. GREASE DUCT SHALL BE PITCHED BACK TO HOOD.
5. PROVIDE 12" x 12" GREASE DUCT CLEANOUT. CLEANOUT SHALL BE CENTERED IN DUCT TO ALLOW FOR MINIMUM 1" CLEARANCE FROM EDGE OF DUCT.
6. 24" x 12" PLENUM BOX DUCTED TO LOUVER L-1. FURNISH WITH BIRD SCREEN AND MOTORIZED DAMPER. MOTORIZED DAMPER SHALL BE INTERLOCKED WITH EXHAUST FAN EF-1.
7. BOILER AND WATER HEATER VENT.
8. 46" x 14" SUPPLY AND RETURN DUCTS DOWN TO FIRST FLOOR. 54" x 22" SUPPLY AND RETURN DUCTS UP TO THIRD FLOOR.
9. CEILINGS IN THIS AREA ARE SLOPPED. CONTRACTOR TO COORDINATE CHILLED BEAMS AND DUCTWORK TO ENSURE ALL COMPONENTS ARE LOCATED ABOVE CEILING, AND DUCTWORK SHALL NOT BE VISIBLE IN SPACE.
10. 50" x 26" SUPPLY AND RETURN DUCTS UP TO PENTHOUSE.
11. 70" x 36" SUPPLY AND RETURN DUCTS UP. SOUND ATTENUATORS TO BE INSTALLED IN VERTICAL SECTION OF DUCT.
12. 50" x 18" SUPPLY AND RETURN DUCTS DOWN. 60" x 26" SUPPLY AND RETURN DUCTS UP.
13. 50" x 20" SUPPLY AND RETURN DUCTS UP AND DOWN. FIRE/SMOKE DAMPERS SHALL BE INSTALLED IN VERTICAL DUCT IN SOUTH PENTHOUSE.



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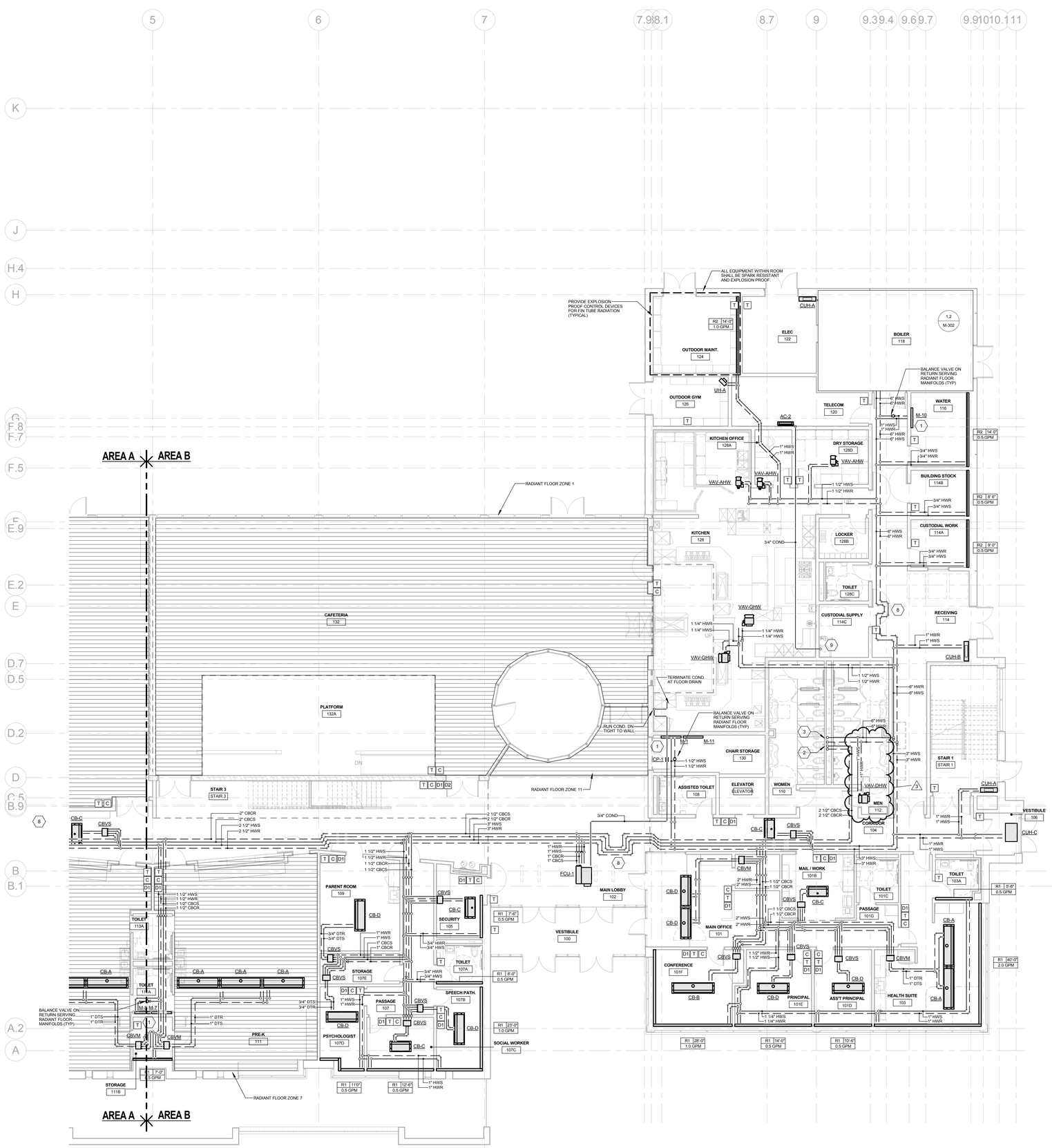
3 03/27/2018 ADDENDUM 03

MECHANICAL FLOOR PLAN - LEVEL 3 - AREA B

M-132



1 MECHANICAL PIPING FLOOR PLAN - LEVEL 1 - AREA B
1/8" = 1'-0"

MECHANICAL GENERAL NOTES

1. SEE MP SERIES FOR MECHANICAL PIPING DRAWINGS.
2. CONTRACTOR SHALL PREPARE DETAILED COORDINATION DRAWINGS WHICH INCLUDE ALL MEP, STRUCTURAL AND ARCHITECTURAL COORDINATION. BIM CLASH DETECTION SHALL BE USED TO VERIFY COORDINATION DRAWINGS.
3. AUTOMATIC TEMPERATURE CONTROLS (ATC) SHALL PROVIDE AND INSTALL SPACE MOUNTED DEW POINT SENSOR. ONE FOR EVER ROOM A CHILLED BEAM IS INSTALLED.
4. PROVIDE FIRE DAMPERS, FIRE STOPPING AND SMOKE BARRIER SEALING OF ALL PENETRATIONS THROUGH FIRE WALLS AND FLOORS AS REQUIRED. REFER TO ARCHITECTURAL FLOOR PLANS AND CODE SHEETS FOR ADDITIONAL INFORMATION.
5. NO PIPING, ETC, SHALL BE INSTALLED IN STAIRWELLS UNLESS THAT PIPING OR EQUIPMENT SERVES THE STAIRS.
6. DUCTS AND PIPES PENETRATING BEAMS SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS.
7. ALL EQUIPMENT, PIPING, INSULATION, DUCTWORK, CONDUIT SHALL BE PLENUM RATED AND HAVE CLEAN SEAMS AND CONNECTIONS WHERE CEILINGS ARE NOT CONTINUOUS.
8. PROVIDE VOLUME DAMPERS ON ALL DUCTWORK SERVING DIFFUSERS, GRILLS, CHILLED BEAMS, ETC.
9. CHILLED BEAMS SHALL BE EXPOSED TYPE WHEN NOT LOCATED IN HARD OR DROPPED CEILINGS. COORDINATE EXACT LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS.
10. ACOUSTICAL DUCT LINER IS REQUIRED FOR THE FIRST 6 FEET DOWNSTREAM OF ALL VAV BOXES, NOT ALL THE WAY TO RGD'S.
11. ACOUSTICAL DUCT LINER SHALL BE PROVIDED FOR FIRST 10 FEET OF DUCTWORK FROM DOA AND AHU UNITS. THIS SHALL BE FOR DUCT BETWEEN UNIT AND SPACES SERVED NOT ON INTAKE OR EXHAUSTS TO LOUVERS.
12. THE CONTRACTOR SHALL PROVIDE PIPE EXPANSION JOINTS ON PIPING PASSING THRU ALL BUILDING EXPANSION JOINT LOCATIONS AS REQUIRED PER BUILDING CODES WHETHER OR NOT SHOWN ON DRAWINGS. REVIEW ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR EXACT BUILDING EXPANSION JOINT LOCATIONS AND EXPANSION DIMENSIONS.
13. CHILLED BEAM SUPPLY DUCT: PROVIDE 10"ROUND DUCT SUPPLY TO 8'-0". 8"ROUND DUCT SUPPLY TO 6'0" CHILLED BEAM. PROVIDE 6"ROUND DUCT SUPPLY TO 4'-0"CHILLED BEAM.
14. VAV BOXES: PROVIDED ACOUSTICAL LINING 1" THICK FOR 10'-0" AFTER VAV BOX PER ACOUSTICAL ENGINEER REQUIREMENTS. DUCTWORK VAV INLET AND OUTLET MINIMUM INDICATED ON VAV SCHEDULE SHALL BE PROVIDED REGARDLESS OF DUCTWORK SIZE INDICATED ON DRAWINGS IF SMALLER THAN SCHEDULE INDICATED.
15. HOUSEKEEPING PADS: REINFORCED CONCRETE WITH APPROXIMATELY 1" CHAMFERED EDGES, MINIMUM CLEARANCE OF 6" FROM EQUIPMENT BASE TO EDGE OF PAD. PAD SHALL BE MINIMUM 4" THICK, BUT THICKER WHERE REQUIRED FOR PROPER INSTALLATION OF EQUIPMENT, INCLUDING BUT NOT LIMITED TO CONDENSING BOILERS WITHOUT OR WITHOUT CONDENSATE PUMPS, AS REQUIRED FOR THE PROPER INSTALLATION OF NEUTRALIZATION EQUIPMENT AND GRAVITY DRAINAGE TO FLOOR DRAIN, CONDENSATE PUMP, OR SIMILAR.
16. RADON PIPING SHALL BE PVC. DIVISION 22 SHALL PROVIDE PIPING THROUGH ROOF. DIVISION 23 SHALL PROVIDE ROOF CURB, FAN AND ACCESSORIES COORDINATE CONNECTION OF RADON PIPE WITH DIVISION 22 AND 31. DIVISION 23 SHALL COORDINATE RADON FAN WITH DIVISION 26 AND 31.
17. COORDINATE ALL ELECTRICAL REQUIREMENTS WITH DIVISION 26.
18. COORDINATE ALL AIR INTAKES WITH EXHAUST. EXHAUSTS SHALL BE MINIMUM 25'-0" AWAY FROM ANY INTAKES OR OPENINGS.
19. KITCHEN: COORDINATE REQUIREMENTS WITH KITCHEN CONSULTANT AND REFER TO FSE SERIES DRAWINGS FOR ADDITIONAL INFORMATION. PROVIDE DUCTWORK AND ACCESSORIES FOR DISHWASHER HOOD, GREASE HOOD, AND CLOTHES DRYER EXHAUST. GREASE EXHAUST AND DISHWASHER EXHAUST DUCTWORK SHALL BE PITCHED BACK TO HOOD.
20. TEMPERATURE SENSORS SHALL BE LOCATED ON WALL ADJACENT TO LIGHT SENSOR. COORDINATE LOCATION WITH OWNER, ARCHITECT AND ATC. TEMPERATURE SENSORS SHALL BE PROVIDED WITH VANDAL PROOF ENCLOSURES AND COORDINATED WITH OWNER AND ARCHITECT.
21. TEMPERATURE SENSORS SHALL BE PROVIDED WITH DEWPOINT SENSING CAPABILITY. WALL MOUNTED CO2 SENSORS SHALL BE PROVIDED ADJACENT TO ALL TEMPERATURE SENSORS. COORDINATE WITH ATC.
22. MOTORS: ALL MOTORS ARE TO BE PREMIUM EFFICIENCY TYPE MEETING OR EXCEEDING UTILITY REQUIREMENTS FOR REBATE PROGRAM.
23. MECHANICAL CONTRACTOR SHALL PROVIDE FINAL PIPING CONNECTIONS TO ALL HYDRONIC MECHANICAL EQUIPMENT INCLUDING CHILLED BEAMS WITH 12" OR 18" LONG FLEXIBLE HOSE COIL CONNECTORS CONSTRUCTED OF EPDM HOSE WITH STAINLESS STEEL BRAIDING RATED FOR MAXIMUM OPERATING PRESSURE OF NOT LESS THAN 125PSI WITH SWEAT OR NPT THREADED OR PUSH FIT CONNECTIONS AT ALL LOCATIONS ON DRAWINGS.
24. THE MECHANICAL CONTRACTOR IS RESPONSIBLE TO PROVIDE AND INSTALL ALL PIPING UP THRU SLAB OF THE CAO BUILDING. COORDINATE CONNECTIONS WITH MAIN BUILDING TO THE CAO BUILDING WITH DIVISION 23 CAO BUILDING CONTRACTOR
25. STAND ALONE CO DETECTION SYSTEM SHALL BE PROVIDED AND INSTALLED AT KITCHEN AND BOILER ROOM BY DIVISION 26. SYSTEM SHOWN DRAWINGS FOR REFERENCE.
26. ALL MECHANICAL DEVICES LOCATED IN CEILINGS, INCLUDING BUT NOT LIMITED TO DIFFUSERS, ACCESS PANELS, CABINET UNIT HEATERS, RADIANT CEILING PANELS, ETC, ARE TO BE A CUSTOM COLOR TO MATCH ADJOINING/ ADJACENT SURFACES. REFER TO ARCHITECTURAL FINISH SCHEDULE FOR REQUIRED COLOR OF DEVICES.
27. REFER TO ARCHITECTURAL INTERIOR ELEVATIONS FOR LOCATIONS/ MOUNTING HEIGHTS OF THERMOSTATS, TEMPERATURE SENSORS AND CO2 SENSORS.
28. MECHANICAL PIPING SUPPLY AND RETURN ISOLATION VALVES:

A. PROVIDE ISOLATION VALVES AT BASE OF EACH RISER LOCATION.
B. PROVIDE ISOLATION VALVES AT EACH BRACH SERVING EACH FLOOR.
C. PROVIDE ISOLATION VALVES AT EACH BRACH SERVING EACH AREA/WING.
D. PROVIDE ISOLATION VALVES AT EACH CLASSROOM, OFFICE, OR ZONE.
E. PROVIDE ISOLATION VALVES AT EACH PIECE OF EQUIPMENT.

MECHANICAL ALTERNATE

ALTERNATE NO. 12. PROPRESS: THE USE OF PRESS TYPE FITTINGS SHALL BE PROVIDED AS AN ALTERNATE FOR COPPER PIPING SIZES 2" AND LESS ONLY. PROVIDE CREDIT TO OWNER FOR REVIEW BEFORE USE OF PRESS TYPE FITTINGS. SEE SPECIFICATION 232113, SECTION 2.1.2.3.2.4 FOR ADDITIONAL INFORMATION.

KEY NOTES - MECHANICAL PIPING

1. RADIANT FLOOR MANIFOLD AND PUMP: 1-1/4" SUPPLY AND RETURN WATER MANIFOLDS MOUNTED ON WALL IN PIPE CABINET AT 4'-0" ABOVE FINISHED FLOOR. ALL VALVES SHALL BE ACCESSIBLE. NOTE APPLIES TO EACH MANIFOLD
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3. 6" HOT WATER SUPPLY AND RETURN PIPING UP.
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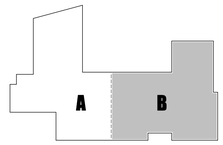
6. 4" CHILLED WATER SUPPLY AND RETURN PIPING DOWN.
7. 4" HOT WATER SUPPLY AND RETURN PIPING DOWN.
8. PROVIDE EXPANSION LOOP. EXPANSION LOOPS SHALL BE A MINIMUM OF 4'-0" LONG AND 3'-0" WIDE.
9. CONDENSATE DOWN TO JANITORS SINK. TERMINATE 1'-0" ABOVE SINK.
10. EMERGENCY REFRIGERANT ALARM/ HORN STROBE. MOUNT 5'-0" ABOVE FINISHED FLOOR.



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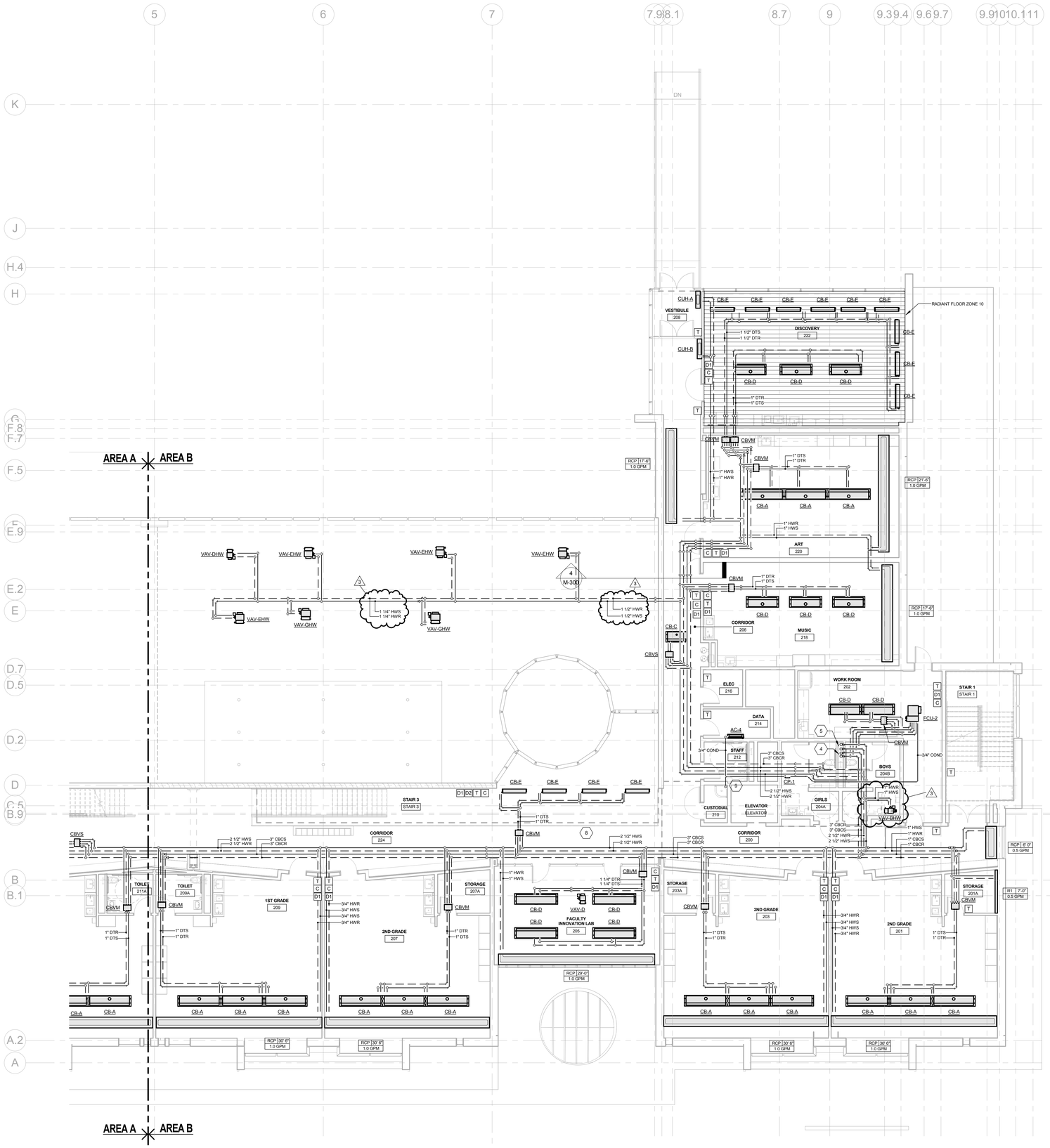
3	03/27/2018	ADDENDUM 03

MECHANICAL PIPING FLOOR PLAN - LEVEL 1 - AREA B

MP-112



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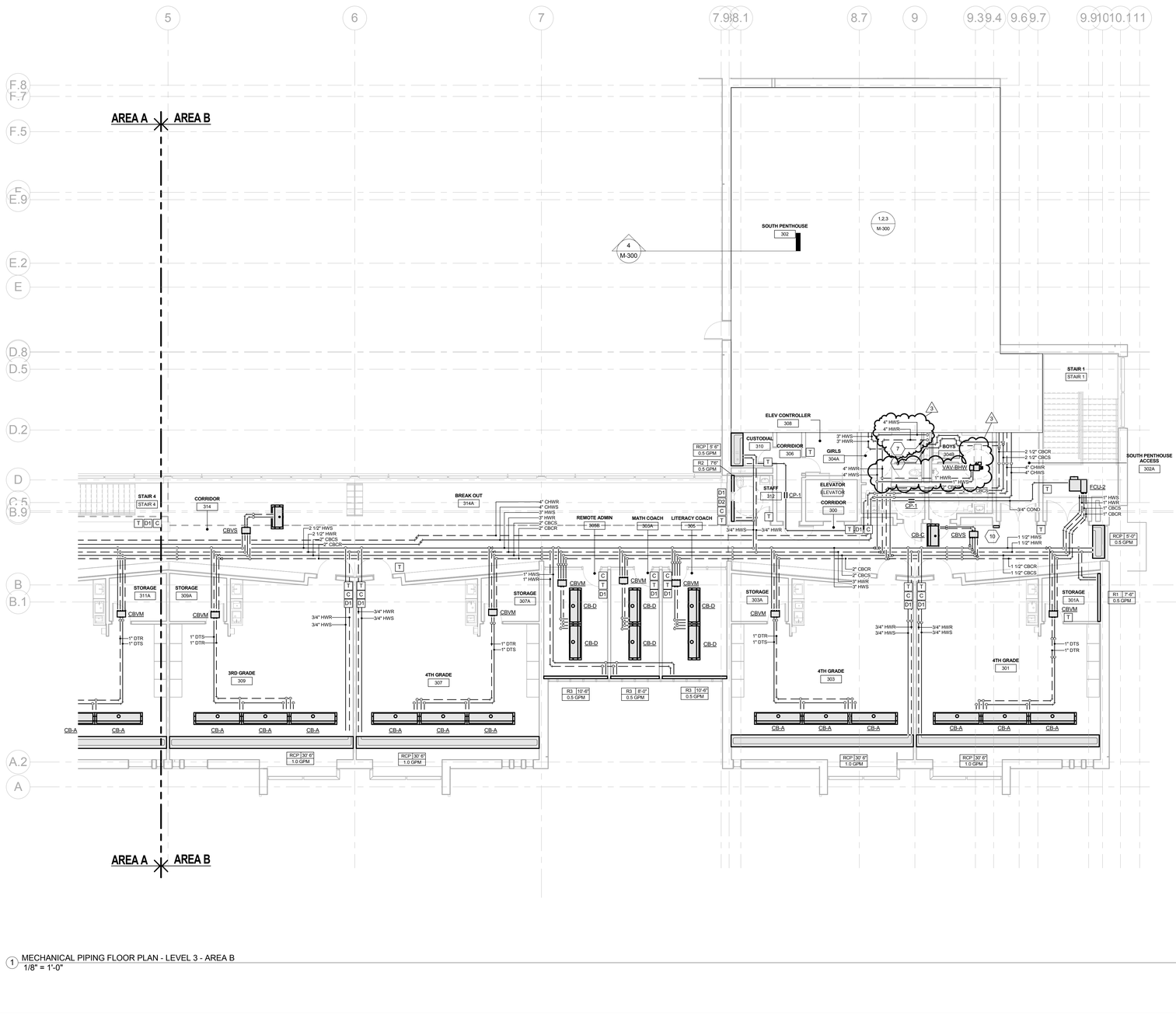
MECHANICAL PIPING FLOOR PLAN - LEVEL 2 - AREA B

MP-122



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5. NO PIPING, ETC, SHALL BE INSTALLED IN STAIRWELLS UNLESS THAT PIPING OR EQUIPMENT SERVES THE STAIRS.
6. DUCTS AND PIPES PENETRATING BEAMS SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS.
7. ALL EQUIPMENT, PIPING, INSULATION, DUCTWORK, CONDUIT SHALL BE PLENUM RATED AND HAVE CLEAN SEAMS AND CONNECTIONS WHERE CEILINGS ARE NOT CONTINUOUS.
8. PROVIDE VOLUME DAMPERS ON ALL DUCTWORK SERVING DIFFUSERS, GRILLS, CHILLED BEAMS, ETC.
9. CHILLED BEAMS SHALL BE EXPOSED TYPE WHEN NOT LOCATED IN HARD OR DROPPED CEILINGS. COORDINATE EXACT LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS.
10. ACOUSTICAL DUCT LINER IS REQUIRED FOR THE FIRST 6 FEET DOWNSTREAM OF ALL VAV BOXES, NOT ALL THE WAY TO RGD'S.
11. ACOUSTICAL DUCT LINER SHALL BE PROVIDED FOR FIRST 10 FEET OF DUCTWORK FROM DOA AND AHU UNITS. THIS SHALL BE FOR DUCT BETWEEN UNIT AND SPACES SERVED NOT ON INTAKE OR EXHAUSTS TO LOUVERS.
12. THE CONTRACTOR SHALL PROVIDE PIPE EXPANSION JOINTS ON PIPING PASSING THRU ALL BUILDING EXPANSION JOINT LOCATIONS AS REQUIRED PER BUILDING CODES WHETHER OR NOT SHOWN ON DRAWINGS. REVIEW ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR EXACT BUILDING EXPANSION JOINT LOCATIONS AND EXPANSION DIMENSIONS.
13. CHILLED BEAM SUPPLY DUCT: PROVIDE 10"ROUND DUCT SUPPLY TO 8'-0". 8"ROUND DUCT SUPPLY TO 6'0" CHILLED BEAM. PROVIDE 6"ROUND DUCT SUPPLY TO 4'-0"CHILLED BEAM.
14. VAV BOXES: PROVIDED ACOUSTICAL LINING 1" THICK FOR 10'-0" AFTER VAV BOX PER ACOUSTICAL ENGINEER REQUIREMENTS. DUCTWORK VAV INLET AND OUTLET MINIMUM INDICATED ON VAV SCHEDULE SHALL BE PROVIDED REGARDLESS OF DUCTWORK SIZE INDICATED ON DRAWINGS IF SMALLER THAN SCHEDULE INDICATED.
15. HOUSEKEEPING PADS: REINFORCED CONCRETE WITH APPROXIMATELY 1" CHAMFERED EDGES, MINIMUM CLEARANCE OF 6" FROM EQUIPMENT BASE TO EDGE OF PAD. PAD SHALL BE MINIMUM 4" THICK, BUT THICKER WHERE REQUIRED FOR PROPER INSTALLATION OF EQUIPMENT, INCLUDING BUT NOT LIMITED TO CONDENSING BOILERS WITHOUT OR WITHOUT CONDENSATE PUMPS, AS REQUIRED FOR THE PROPER INSTALLATION OF NEUTRALIZATION EQUIPMENT AND GRAVITY DRAINAGE TO FLOOR DRAIN, CONDENSATE PUMP, OR SIMILAR.
16. RADON PIPING SHALL BE PVC. DIVISION 22 SHALL PROVIDE PIPING THROUGH ROOF. DIVISION 23 SHALL PROVIDE ROOF CURB, FAN AND ACCESSORIES COORDINATE CONNECTION OF RADON PIPE WITH DIVISION 22 AND 31. DIVISION 23 SHALL COORDINATE RADON FAN WITH DIVISION 26 AND 31.
17. COORDINATE ALL ELECTRICAL REQUIREMENTS WITH DIVISION 26.
18. COORDINATE ALL AIR INTAKES WITH EXHAUST. EXHAUSTS SHALL BE MINIMUM 25'-0" AWAY FROM ANY INTAKES OR OPENINGS.
19. KITCHEN: COORDINATE REQUIREMENTS WITH KITCHEN CONSULTANT AND REFER TO FSE SERIES DRAWINGS FOR ADDITIONAL INFORMATION. PROVIDE DUCTWORK AND ACCESSORIES FOR DISHWASHER HOOD, GREASE HOOD, AND CLOTHES DRYER EXHAUST. GREASE EXHAUST AND DISHWASHER EXHAUST DUCTWORK SHALL BE PITCHED BACK TO HOOD.
20. TEMPERATURE SENSORS SHALL BE LOCATED ON WALL ADJACENT TO LIGHT SENSOR. COORDINATE LOCATION WITH OWNER, ARCHITECT AND ATC. TEMPERATURE SENSORS SHALL BE PROVIDED WITH VANDAL PROOF ENCLOSURES AND COORDINATED WITH OWNER AND ARCHITECT.
21. TEMPERATURE SENSORS SHALL BE PROVIDED WITH DEWPOINT SENSING CAPABILITY. WALL MOUNTED CO2 SENSORS SHALL BE PROVIDED ADJACENT TO ALL TEMPERATURE SENSORS. COORDINATE WITH ATC.
22. MOTORS: ALL MOTORS ARE TO BE PREMIUM EFFICIENCY TYPE MEETING OR EXCEEDING UTILITY REQUIREMENTS FOR REBATE PROGRAM.
23. MECHANICAL CONTRACTOR SHALL PROVIDE FINAL PIPING CONNECTIONS TO ALL HYDRONIC MECHANICAL EQUIPMENT INCLUDING CHILLED BEAMS WITH 12" OR 18" LONG FLEXIBLE HOSE COIL CONNECTORS CONSTRUCTED OF EPDM HOSE WITH STAINLESS STEEL BRAIDING RATED FOR MAXIMUM OPERATING PRESSURE OF NOT LESS THAN 125PSI WITH SWEAT OR NPT THREADED OR PUSH FIT CONNECTIONS AT ALL LOCATIONS ON DRAWINGS.
24. THE MECHANICAL CONTRACTOR IS RESPONSIBLE TO PROVIDE AND INSTALL ALL PIPING UP THRU SLAB OF THE CAO BUILDING. COORDINATE CONNECTIONS WITH MAIN BUILDING TO THE CAO BUILDING WITH DIVISION 23 CAO BUILDING CONTRACTOR
25. STAND ALONE CO DETECTION SYSTEM SHALL BE PROVIDED AND INSTALLED AT KITCHEN AND BOILER ROOM BY DIVISION 26. SYSTEM SHOWN DRAWINGS FOR REFERENCE.
26. ALL MECHANICAL DEVICES LOCATED IN CEILINGS, INCLUDING BUT NOT LIMITED TO DIFFUSERS, ACCESS PANELS, CABINET UNIT HEATERS, RADIANT CEILING PANELS, ETC, ARE TO BE A CUSTOM COLOR TO MATCH ADJOINING ADJACENT SURFACES. REFER TO ARCHITECTURAL FINISH SCHEDULE FOR REQUIRED COLOR OF DEVICES.
27. REFER TO ARCHITECTURAL INTERIOR ELEVATIONS FOR LOCATIONS/ MOUNTING HEIGHTS OF THERMOSTATS, TEMPERATURE SENSORS AND CO2 SENSORS.
28. MECHANICAL PIPING SUPPLY AND RETURN ISOLATION VALVES:

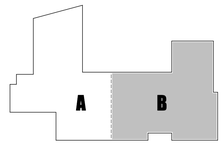
A. PROVIDE ISOLATION VALVES AT BASE OF EACH RISER LOCATION.
B. PROVIDE ISOLATION VALVES AT EACH BRACH SERVING EACH FLOOR.
C. PROVIDE ISOLATION VALVES AT EACH BRACH SERVING EACH AREA/WING.
D. PROVIDE ISOLATION VALVES AT EACH CLASSROOM, OFFICE, OR ZONE.
E. PROVIDE ISOLATION VALVES AT EACH PIECE OF EQUIPMENT.

MECHANICAL ALTERNATE

ALTERNATE NO. 12. PROPRESS: THE USE OF PRESS TYPE FITTINGS SHALL BE PROVIDED AS AN ALTERNATE FOR COPPER PIPING SIZES 2" AND LESS ONLY. PROVIDE CREDIT TO OWNER FOR REVIEW BEFORE USE OF PRESS TYPE FITTINGS. SEE SPECIFICATION 232113, SECTION 2.1.2.3.2.4 FOR ADDITIONAL INFORMATION.

KEY NOTES - MECHANICAL PIPING

1. RADIANT FLOOR MANIFOLD AND PUMP: 1-1/4" SUPPLY AND RETURN WATER MANIFOLDS MOUNTED ON WALL IN PIPE CABINET AT 4'-0" ABOVE FINISHED FLOOR. ALL VALVES SHALL BE ACCESSIBLE. NOTE APPLIES TO EACH MANIFOLD
2. 2-1/2" CHILLED WATER SUPPLY AND RETURN PIPING UP.
3. 6" HOT WATER SUPPLY AND RETURN PIPING UP.
4. 2-1/2" CHILLED WATER SUPPLY AND RETURN PIPING DOWN . 4" CHILLED WATER SUPPLY AND RETURN PIPING UP.
5. 6" HOT WATER SUPPLY AND RETURN PIPING DOWN. 4" HOT WATER SUPPLY AND RETURN PIPING UP.
6. 4" CHILLED WATER SUPPLY AND RETURN PIPING DOWN.
7. 4" HOT WATER SUPPLY AND RETURN PIPING DOWN.
8. PROVIDE EXPANSION LOOP. EXPANSION LOOPS SHALL BE A MINIMUM OF 4'-0" LONG AND 3'-0" WIDE.
9. CONDENSATE DOWN TO JANITORS SINK. TERMINATE 1'-0" ABOVE SINK.
10. EMERGENCY REFRIGERANT ALARM/ HORN STROBE. MOUNT 5'-0" ABOVE FINISHED FLOOR.



KEY PLAN

NORTH

NEW HAVEN PUBLIC SCHOOLS

STRONG 21st CENTURY COMMUNICATIONS LAB SCHOOL

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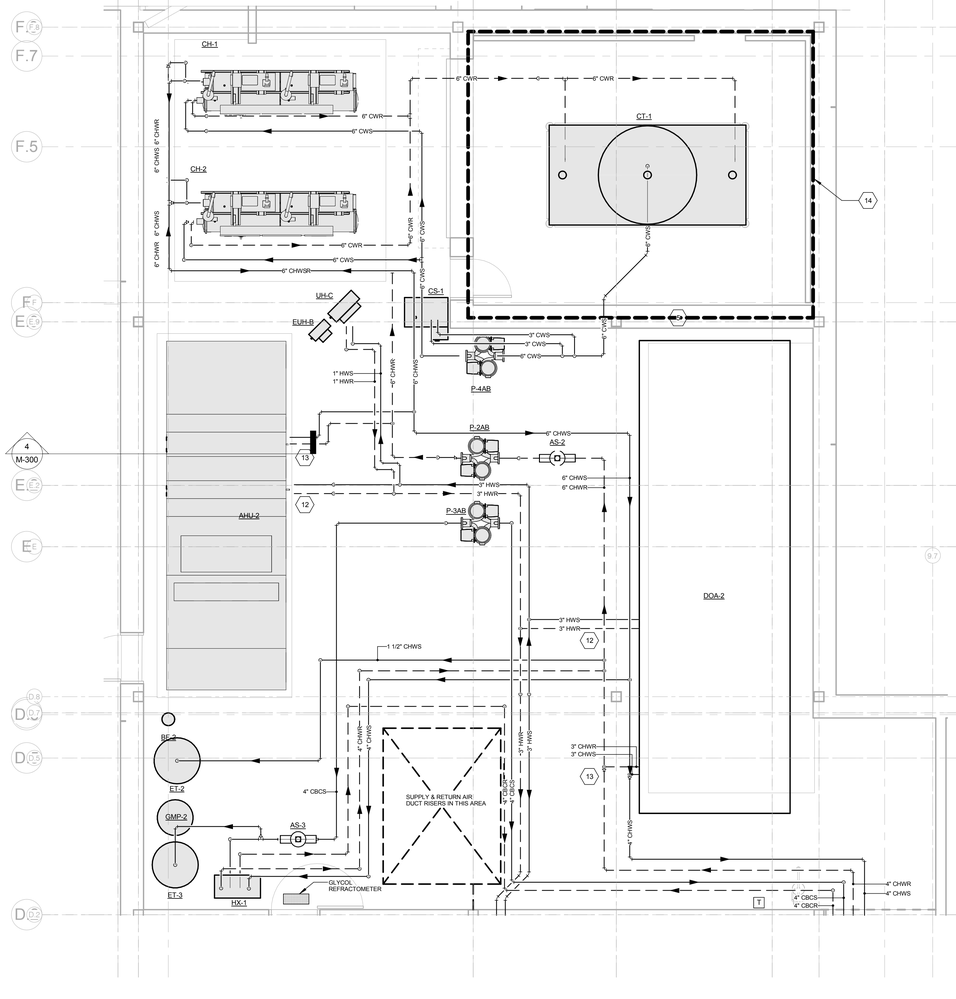
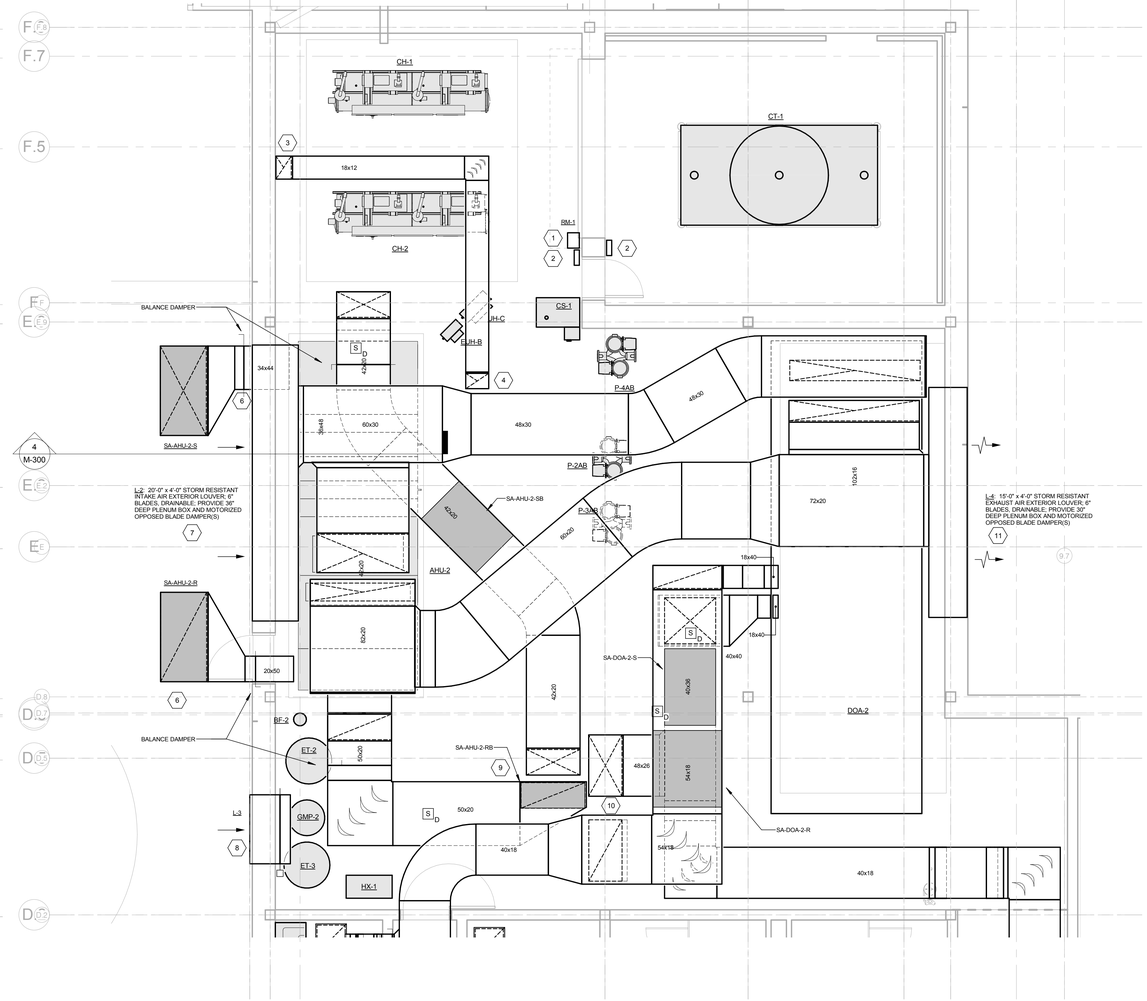
MECHANICAL PIPING FLOOR PLAN - LEVEL 3 - AREA B

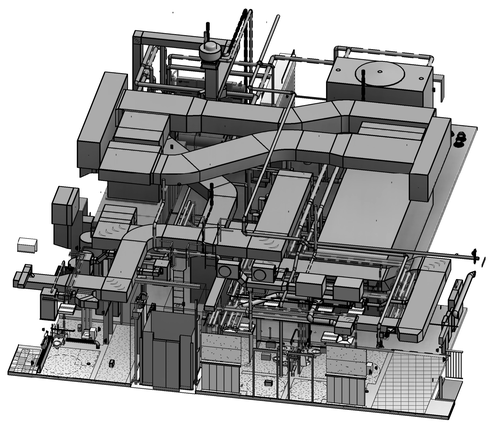
MP-132



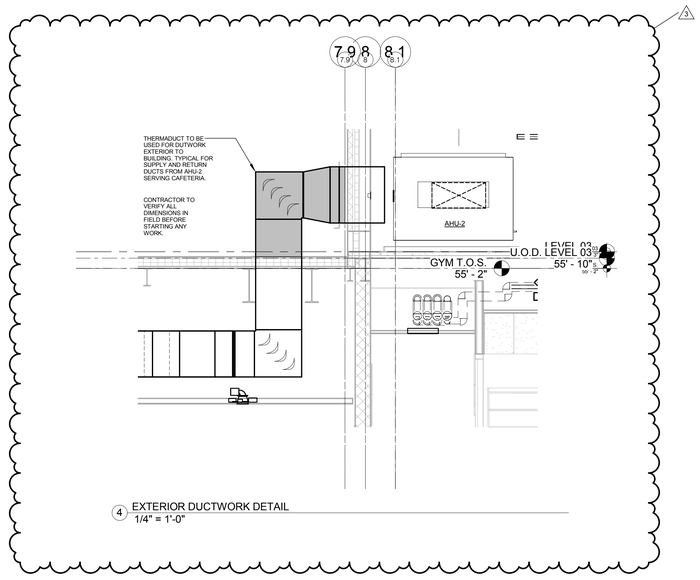
3 MECHANICAL FLOOR PLAN - LEVEL 3 - SOUTH PENTHOUSE PIPING
1/4" = 1'-0"



1 MECHANICAL FLOOR PLAN - LEVEL 3 - SOUTH PENTHOUSE HVAC
1/4" = 1'-0"



2 3D -Mech Penthouse - South



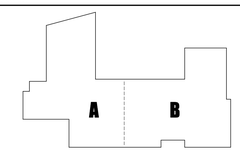
4 EXTERIOR DUCTWORK DETAIL
1/4" = 1'-0"

GENERAL NOTES- LOCATION OF DEVICES

1. CONTRACTOR SHALL INSTALL ALL VALVES, FREEZESTATS, VFD'S, CONTROL DEVICES, ETC. IN ACCESSIBLE LOCATIONS. ALL DEVICES SHALL BE LOCATED IN AREAS WHERE THE OWNER CAN ACCESS THE DEVICES WITHOUT USING A LADDER. DEVICES THAT CAN NOT BE ACCESSIBLE FROM FLOOR SHALL BE COORDINATED AND APPROVED BY OWNER BEFORE INSTALLATION.

SOUTH PENTHOUSE - KEY NOTES

1. REFRIGERANT SENSOR AND ALARM. MOUNT 5'-0" ABOVE FINISHED FLOOR.
2. EMERGENCY REFRIGERANT ALARM/HORN STROBE. MOUNT 5'-0" ABOVE FINISHED FLOOR.
3. EXHAUST DUCT DOWN. TERMINATE DUCT OPEN ENDED 1'-0" ABOVE FINISHED FLOOR. INSTALL 1/2" WIRE MESH ON OPEN END OF DUCT.
4. 18" x 12" EXHAUST DUCT UP TO EXHAUST FAN EF-2.
5. ALL PIPING IN UN-CONDITIONED AREA SHALL BE HEAT TRACED.
6. 70" x 36" SUPPLY AND RETURN DUCT DOWN TO CAFETERIA. DUCTWORK TO PENETRATE THROUGH PENTHOUSE WALL.
7. 36" DEEP PLENUM BOX TO BE DUCTED TO L-2 INTAKE LOUVER. FURNISH WITH MOTORIZED DAMPER(S) AND BIRD SCREEN.
8. 54" x 36" PLENUM BOX TO BE DUCTED TO L-3. DUCT SHALL BE OPEN ENDED WITH 1/2" WIRE MESH INSTALLED. FURNISH WITH MOTORIZED DAMPER AND BIRD SCREEN. DAMPER SHALL BE INTERLOCKED WITH EF-2.
9. 42" x 20" SUPPLY AND RETURN DUCTS DOWN TO SECOND FLOOR.
10. 48" x 26" SUPPLY AND RETURN DUCTS DOWN TO SECOND FLOOR.
11. 30" DEEP PLENUM BOX TO BE DUCTED TO L-4 INTAKE LOUVER. FURNISH WITH MOTORIZED DAMPER AND BIRD SCREEN.
12. HOT WATER SUPPLY AND RETURN DOWN TO HOT WATER COIL LOCATED IN MECHANICAL UNIT. REFER TO DETAILS FOR VALVES AND ACCESSORIES.
13. CHILLED WATER SUPPLY AND RETURN DOWN TO CHILLED WATER COIL LOCATED IN MECHANICAL UNIT. REFER TO DETAILS FOR VALVES AND ACCESSORIES.
14. ALL PIPING EXPOSED IN THE COOLING TOWER OUTDOOR AREA SHALL BE PROVIDED WITH HEAT TRACE. CONTRACTOR SHALL VERIFY EXACT LENGTH OF HEAT TRACE NEEDED. REFER TO HEAT TRACE SCHEDULE ON SHEET M-604 FOR MORE INFORMATION. COORDINATE ELECTRICAL CONNECTION AND POWER WITH DIVISION 26.



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MECHANICAL ENLARGED DRAWING- SOUTH PENTHOUSE PLAN

M-300

VARIABLE AIR VOLUME TERMINAL UNIT SCHEDULE

SYMBOL	MANUFACTURER	MODEL	GENERAL: COOLING AIR DAMPER	PHYSICAL: COOLING AIR DAMPER MIN. CFM	PHYSICAL: COOLING AIR DAMPER MAX. CFM	REMARKS: TYPE	REMARKS: RATINGS	REMARKS: FEATURES	REMARKS: INSTALL	DUCTWORK: VAV OUTLET MIN.	DUCTWORK: VAV INLET MIN.
VAV-A	TRANE	VCCF	4"	50	225	1	1,2	1	ALL	12"X10"	5"
VAV-B	TRANE	VCCF	5"	100	350	1	1,2	1	ALL	12"X10"	6"
VAV-C	TRANE	VCCF	6"	100	500	1	1,2	1	ALL	14"X12"	8"
VAV-D	TRANE	VCCF	8"	200	900	1	1,2	1	ALL	14"X12"	10"
VAV-E	TRANE	VCCF	10"	500	1400	1	1,2	1	ALL	12"X14"	10"
VAV-F	TRANE	VCCF	12"	800	2000	1	1,2	1	ALL	14"X17"	12"
VAV-G	TRANE	VCCF	14"	1500	3000	1	1,2	1	ALL	18"X19"	14"
VAV-H	TRANE	VCCF	16"	2000	4000	1	1,2	1	ALL	18"X23"	16"

REMARKS - TYPE:
1. SINGLE DUCT, AIR ONLY
2. SINGLE DUCT, 2-ROW HW COIL

REMARKS - RATINGS:
1. PERFORMANCE CERTIFIED IN ACCORDANCE TO ARI 880
2. SEE THE VAV TERMINAL UNIT SOUND POWER LEVEL SCHEDULE BELOW FOR ACOUSTICAL DATA

REMARKS - FEATURES:
1. 1" FOIL FACED INSULATION, PRESSURE INDEPENDENT, LOW VOLTAGE

REMARKS - INSTALL:
1. UNLESS NOTED OTHERWISE, UNSIZED DUCTWORK DOWNSTREAM OF VAV UNIT SHALL BE THE SAME SIZE (INSIDE CLEAR) AS THE UNIT/COIL DISCHARGE DUCT CONNECTION.
2. PROVIDE LINE VOLTAGE (120V) WIRING FROM SPACE CIRCUIT IN NEAREST 120 VOLT ELECTRIC PANEL TO VAV TERMINAL UNIT. ELECTRICAL WORK SHALL BE IN COORDINATED WITH DIVISION 26.
3. PROVIDED ACOUSTICAL LINING 1" THICK FOR 10'-0" AFTER VAV BOX PER ACOUSTICAL ENGINEER REQUIREMENTS.
4. MINIMUM DUCTWORK INLET AND OUTLET SIZE SHALL BE PROVIDED REGARDLESS OF DUCTWORK SIZE INDICATED ON DRAWINGS IF INDICATED SMALLER THAN VAV CONNECTIONS SCHEDULED.

VAV TERMINAL UNIT SOUND POWER LEVEL SCHEDULE

INLET (IN.)	CFM	DISCHARGE SOUND POWER - OCTAVE BAND (HERTZ) 125	250	500	1000	2000	4000	RADIATED SOUND POWER - OCTAVE BAND (HERTZ) 125	250	500	1000	2000	4000
4	150	67	70	60	58	55	53	52	52	50	43	39	33
5	250	63	66	60	57	55	54	52	50	49	42	37	31
6	400	65	67	62	59	56	55	58	54	51	43	37	32
8	700	64	68	62	59	58	60	57	54	53	45	42	36
10	1,100	69	68	66	66	61	57	63	59	54	47	39	32
12	1,600	68	69	66	61	62	60	66	62	54	46	40	36
14	2,100	68	68	66	61	59	58	61	61	51	43	37	32
16	2,800	69	68	67	62	61	60	60	60	53	46	41	36

TERMINAL UNITS SHALL PRODUCE THE NOMINAL SOUND POWER LEVELS (dB re: 10E-12 WATTS) INDICATED ABOVE, MEASURED IN ACCORDANCE TO ARI STANDARD 880, AT 1.5 IN WG INLET PRESSURE

VAV TERMINAL UNIT HEATING COIL SCHEDULE

SYMBOL	MANUFACTURER	MODEL	INLET (IN.)	GPM	MAX. WPD (FT WG)	EAT (°F)	EWT (°F)	LWT (°F)	COIL	HEATING CFM: CFM	HEATING CFM: LAT (°F)	REMARKS: TYPE	REMARKS: RATINGS	REMARKS: FEATURES	REMARKS: INSTALL
VAV-AHW	TRANE	VCWF	4"	0.5	1.15	55	130	90	2.8 MBH 2-ROW COIL	100	90	2	1,2	1	ALL
VAV-BHW	TRANE	VCWF	5"	1.0	3.84	55	130	90	10.3 MBH 2-ROW COIL	250	90	2	1,2	1	ALL
VAV-CHW	TRANE	VCWF	8"	2.0	0.35	55	130	90	19.1 MBH 2-ROW COIL	600	90	2	1,2	1	ALL
VAV-DHW	TRANE	VCWF	8"	2.0	0.35	55	130	90	27 MBH 2-ROW COIL	600	90	2	1,2	1	ALL
VAV-EHW	TRANE	VCWF	10"	2.0	0.72	55	130	90	27 MBH 2-ROW COIL	1100	90	2	1,2	1	ALL
VAV-GHW	TRANE	VCWF	14"	5.0	1.09	55	130	90	55 MBH 2-ROW COIL	2300	90	2	1,2	1	ALL

1. VAV TERMINAL UNITS SHALL HAVE HOT WATER HEATING COILS. HEATING COILS SHALL HAVE A NOMINAL CAPACITY IN ACCORDANCE WITH THE ABOVE. ALL HEATING COILS LISTED ABOVE HAVE MINIMUM 1" HW COIL CONNECTION.

ACTIVE CHILLED BEAM SCHEDULE

SYMBOL	MANUFACTURER MODEL NUMBER	DIMENSIONS (L x W)	AIR INLET (IN)	CFM	SOUND LEVEL (dB)	PRIMARY AIR: SENSIBLE COOLING CAP. (BTU/H)	PRIMARY AIR: STATIC PRESSURE (IN WG)	CHILLED WATER COIL: FLOW RATE (GPM)	CHILLED WATER COIL: PRESSURE DROP (PSI)	CHILLED WATER COIL: COIL SENSIBLE COOLING CAP. (BTU/H)	CHILLED WATER COIL: BEAM COOLING CAP. WITH SUPPLY AIR ON (BTU/H)	HOT WATER COIL: FLOW RATE (GPM)	HOT WATER COIL: PRESSURE DROP (PSI)	HOT WATER COIL: BEAM HEATING CAP. WITH SUPPLY AIR ON (BTU/H)
CB-A	DADANCO MODEL # ACB40	2' x 8'	10	140	20	2,904	0.5	1.4	2.7	5,325	8,230	0.5	0.4	4,319
CB-B	DADANCO MODEL # ACB40	2' x 8'	10	150	19	3,112	0.5	1.4	2.7	4,907	8,018	0.5	0.4	3,879
CB-C	DADANCO MODEL # ACB40	2' x 4'	6	60	19	1,245	0.5	1.3	6.7	3,182	4,427	0.5	1.1	4,500
CB-D	DADANCO MODEL # ACB40	2' x 6'	8	100	20	2,075	0.5	1.0	6.4	4,557	6,632	0.5	1.7	5,711
CB-E	DADANCO MODEL # ACB30	2' x 4'	6	60	19	1,245	0.62	1.3	6.3	2,875	4,120	0.5	1.0	4,200

NOTES:
A. EACH CHILLED BEAM SHALL BE TWO (2) PIPE CONFIGURATION FOR A SINGLE COIL RECEIVING CHILLED WATER OR HOT WATER; COIL PERFORMANCE FOR COOLING AND HEATING SHOWN.
B. DISCHARGE AIR PATTERN SHALL BE 2-WAY CONFIGURATION
C. COOLING CAPACITY BASED ON PRIMARY AIR CONDITIONS OF 55.9°F DB / 50.8°F WB AND AN INDOOR DESIGN TEMPERATURE OF 75°F DB / 50%RH
D. COOLING CAPACITY BASED ON A CHILLED WATER TEMPERATURE OF 57°F AND 30% PROPYLENE GLYCOL.
E. HEATING CAPACITY BASED ON A PRIMARY AIR TEMPERATURE OF 80°F DB AND AND INDOOR DESIGN TEMPERATURE OF 72°F DB / 50% RH.
F. HEATING CAPACITY BASED ON A HOT WATER TEMPERATURE OF 110°F AND 30% PROPYLENE GLYCOL.
G. COORDINATE BEAM MOUNTING WITH CEILING BEING INSTALLED PROVIDE ALL NECESSARY TRIM PIECES FOR FLUSH MOUNTING IN SUSPENDED CEILING.

REMARKS:
1. 8'-0" BEAM PROVIDE TOP 10"DUCT CONNECTION
2. PROVIDE NPT CONNECTION TO CHILLED BEAM
3. PROVIDE WITH BEAM PLENUM DUCT PRESSURE TAPS AND CFM PERFORMANCE CHART FOR BALANCING LOCATE ON BEAM HOUSING.
4. COORDINATE BEAM FRAME WITH CEILING TYPE TO ENSURE THERE IS NO CAPS AROUND BEAM WHEN SET IN CEILING GRID
5. CHILLED BEAMS SHALL BE EXPOSED TYPE WHEN NOT LOCATED IN HARD OR DROPPED CEILINGS. COORDINATE EXACT LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS.
6. PROVIDE SPACE MOUNTED DEW POINT SENSOR. ONE FOR EVERY ROOM A CHILLED BEAM IS INSTALLED. PROVIDED AND INSTALLED BY AUTOMATIC TEMPERATURE CONTROLS (ATC) CONTRACTOR.
7. COLOR OF CHILLED BEAMS SHALL BE COORDINATED WITH ARCHITECT.
8. MODEL ACB30 CHILLED BEAMS SHALL BE PROVIDED WITH KRUEGER DFL DIFFUSER. DIFFUSER SHALL HAVE (1) 2" SLOT. COORDINATE SIZE WITH CHILLED BEAM.

PUMP SCHEDULE

SYMBOL	MANUFACTURER/ MODEL NUMBER	TYPE	LOCATION	SYSTEM SERVING	MEDIA	FLOW RATE (GPM)	TDH (FT)	FLUID TEMP (°F)	PUMP MOTOR ENCLOSURE	MOTOR DATA: HP	RPM	VOLTS	PHASE	REMARKS
P-1AB	ARMSTRONG/ 4302-0406-015.0	DA-IL	MECH ROOM	HOT WATER	PPG	375	75	130-90	ODP	15	3288	208	3	ALL
P-2AB	ARMSTRONG/ 4302-0406-010.0	DA-IL	MECH ROOM	CHILLED WATER	PPG	350	75	40	ODP	10	3160	208	3	ALL
P-3AB	ARMSTRONG/ 4302-0410-010.0	DA-IL	MECH ROOM	CHILLED BEAM	PPG	275	90	55	ODP	10	2398	208	3	ALL
P-4AB	ARMSTRONG/ 4302-0606-015.0	DA-IL	MECH ROOM	CONDENSER WATER	W	500	60	60	ODP	15	2591	208	3	ALL

TYPE:
IL = VERTICAL IN-LINE, CLOSE COUPLED
DA-IL = SPLIT COUPLED VERTICAL IN-LINE DUAL ARM

MEDIA:
W = WATER
PPG = 30% PROPYLENE GLYCOL WATER SOLUTION

REMARKS:
1. PUMP SHALL BE OPERATED FROM INELEGENT VARIABLE FREQUENCY DRIVE AND SENSELESS TECHNOLOGY. MANUFACTURER SUPPLIES PUMP MOUNTED VFD AND DISCONNECT SWTICH.
2. PUMP SHALL BE PROVIDED WITH HIGH EFFICIENCY MOTOR.
3. PROVIDE WITH END SUCTION DIFFUSER AND TRIPLE DUTY VALVE.
4. PROVIDE WITH BACKNET ADAPTER COORDINATE WITH ATC.

FAN SCHEDULE

SYMBOL	MANUFACTURER	MODEL	LOCATION	SERVICE	PHYS.: WEIGHT (LBS)	PERFORMANCE: CFM	SP (IN WG)	BHP	SOUND	PLUME HEIGHT (FT)	MOTOR RPM	ELECTRICAL: HP	VOLTS	PHASE	REMARKS: TYPE	RATINGS	FEATURES	INSTALL
KEF-1	COOK	ACWD-XP-VF 210WX17D-VF2	WALL MOUNTED	KITCHEN EX	235	1800	2.0	1.07	68 dBA	N/A	1725	1.5	208	1	4	1,2	1	1
EF-1	COOK	70TCNHB	OUTDOOR STORAGE	EXHAUST	100	300	2.5	0.613	80 dBA	N/A	3450	1	208	3	2	1,2	2,3	2
EF-2	COOK	180RH17D (VF2)	REFRIGERANT EXHAUST	EXHAUST	172	3000	1.0	0.945	69 dBA	N/A	1725	1.5	208	1	1	1,2	1	3
REF-1	FANTECH	Rn4-4	RADON EXHAUST- ROOF	EXHAUST	8.25	200	2.0	172 Watts	N/A	N/A	4169	N/A	120	1	5	2	1	5,6
REF-2	FANTECH	Rn4-4	RADON EXHAUST- ROOF	EXHAUST	8.25	200	2.0	172 Watts	N/A	N/A	4169	N/A	120	1	5	2	1	5,6
REF-3	FANTECH	Rn4-4	RADON EXHAUST- ROOF	EXHAUST	8.25	200	2.0	172 Watts	N/A	N/A	4169	N/A	120	1	5	2	1	5,6
CF-1	WEAVER AIR	AIR ROW L-660-10L	MEDIA TECHNOLOGY	MEDIA TECH.	18	N/A	N/A	N/A	N/A	N/A	N/A	N/A	120	1	3	2	N/A	-
CF-2	WEAVER AIR	AIR ROW L-660-10L	DISCOVERY	DISCOVERY	18	N/A	N/A	N/A	N/A	N/A	N/A	N/A	120	1	3	2	N/A	-
CF-3	WEAVER AIR	AIR ROW L-660-18L	GYM/ CAFE	GYM/ CAFE	18	N/A	N/A	N/A	N/A	N/A	N/A	N/A	120	1	3	2	N/A	4

REMARKS - TYPE:
1. ROOF MOUNTED DIRECT DRIVE, UPBLAST FAN
2. INLINE, HUNG FROM STRUCTURE
3. CEILING FAN, VARIABLE SPEED.
4. OUTDOOR, WALL MOUNTED, DIRECT DRIVE, ECM
5. OUTDOOR, ROOF MOUNTED, RADON EXHAUST FAN

REMARKS - RATINGS:
1. AMCA AIR & SOUND CERTIFIED
2. UL LISTED

REMARKS - FEATURES:
1. PROVIDE ECM MOTOR
2. EXPLOSION PROOF. AMCA 'A' SPARK RESISTANT CONSTRUCTION
3. BELT GUARD

REMARKS - INSTALL:
1. FAN SHALL BE INSTALLED WALL MOUNTED. FURNISH WITH FAN MOUNTED SPEED CONTROLLER, PRE-WIRED NEMA 3 DISCONNECT AND SIDEWALL BRACKET HINGED KIT. FAN SHALL BE MONITORED BY BMS VIA BACNET MSTP.
2. FURNISH WITH BELT GUARD AND TENSIONER. FAN SHALL BE FURNISHED WITH EXPLOSION PROOF DISCONNECT, AND SHALL BE AMCA 'A' SPARK RESISTANT. FAN SHALL BE MONITORED BY BMS VIA BACNET MSTP.
3. PROVIDE DISCONNECT, STARTER, ROOF CURB, ECM MOTOR, BACKDRAFT DAMPER. FAN SHALL BE INTERLOCKED WITH REFRIGERANT MONITORING SYSTEM AND MOTORIZED DAMPER.
4. PROVIDE PROTECTIVE WIRE CAGE AROUND FANS LOCATED IN GYM.
5. UNIT SHALL RUN CONTINUOUSLY 24/7 OPERATION.
6. PRESSURE SWITCH/ALARM, WITH WARNING SIGNAL RELAY, MOUNTED IN EACH MAIN RADON EXHAUST RISER TO ROOF. PROVIDE FIRE-RATED ACCESS DOOR TO SERVICE PRESSURE SWITCH/ ALARM DEVICE, IF DEVICE IS LOCATED IN CHASE OR INACCESSIBLE CEILING. COORDINATE WITH ATC

LOUVER SCHEDULE

SYMBOL	MANUFACTURER/ MODEL NUMBER	LOCATION	AIRFLOW (CFM)	VELOCITY (FPM)	SERVICE (INTAKE / EXHAUST)	FREE AREA (SQ FT)	SIZE (WxH)	BLADE WIDTH	PRESSURE DROP (IN WG)	REMARKS
L-1	RUSKIN ELF-6375DX	BUILDING STOCK 114B	300	441	EXHAUST	0.68	24"x12"	6"	0.02	ALL
L-2	RUSKIN ELF-6375DX	SOUTH PENTHOUSE	28,000	600	INTAKE	46.5	240"x48"	6"	0.06	ALL
L-3	RUSKIN ELF-6375DX	SOUTH PENTHOUSE	3,000	391	INTAKE	7.6	54"x36"	6"	0.02	ALL
L-4	RUSKIN ELF-6375DX	SOUTH PENTHOUSE	28,000	806	EXHAUST	58.0	180"x48"	6"	0.08	ALL
L-5	RUSKIN ELF-6375DX	NORTH PENTHOUSE	8,000	468	INTAKE	17.1	78"x54"	6"	0.03	ALL
L-6	RUSKIN ELF-6375DX	NORTH PENTHOUSE	11,000	460	INTAKE	23.7	96"x60"	6"	0.03	ALL

REMARKS:
1. PROVIDE WITH MOTORIZED DAMPER. INTERLOCK WITH UNIT SERVED. COORDINATE WITH ATC.
2. PROVIDE BIRDSCREENS AT AIR INTAKES & EXHAUST
3. PLENUM BOXES SHALL BE INSULATED.

GRAVITY VENTILLATOR SCHEDULE

SYMBOL	MANUFACTURER / MODEL NUMBER	LOCATION	AIRFLOW (CFM)	VELOCITY (FPM)	SERVICE (INTAKE/ EXHAUST)	FREE AREA (SQ FT)	THROAT SIZE	NO. OF TIERS	PRESSURE DROP (IN WG)	REMARKS
GV-1	LOREN COOK/ TRE	NORTH PENTHOUSE	11,000	800	EXHAUST	---	36"x60"	6	0.25	ALL
GV-2	LOREN COOK/ TRE	NORTH PENTHOUSE	8,000	800	EXHAUST	---	30"x54"	5	0.25	ALL

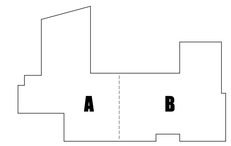
REMARKS:
1. PROVIDE WITH MOTORIZED DAMPER. INTERLOCK WITH UNIT SERVED. COORDINATE WITH ATC.
2. VOLTAGE SHALL BE CONFIRMED WITH ATC AND DIVISION 26.
3. FURNISH WITH BIRDSCREENS.
4. FURNISH WITH INSULATED ROOF CURB.

BOILER SCHEDULE

SYMBOL	MANUFACTURER/ MODEL NUMBER	MEDIA	GROSS OUTPUT (MBH)	GROSS INPUT (MBH)	EWT/LWT (°F)	FUEL DATA: TYPE	FUEL DATA: RATE (MBH)	WATER CONTENT (GALS)	OPERATING WEIGHT (LBS)	BURNER DATA: AMPS	BURNER DATA: VOLTS	BURNER DATA: PHASE	FLOW (GPM)	PRESSURE DROP (PSI)	REMARKS
B-1	AERCO BMK 750	PPG	720	750	90/130	NG	750	16.25	802	13	120	1	66 OPERATING 175 MAX - 25 MIN	3.0 @ 100 GPM	ALL
B-2	AERCO BMK 750	PPG	720	750	90/130	NG	750	16.25	802	13	120	1	66 OPERATING 175 MAX - 25 MIN	3.0 @ 100 GPM	ALL
B-3	AERCO BMK 750	PPG	720	750	90/130	NG	750	16.25	802	13	120	1	66 OPERATING 175 MAX - 25 MIN	3.0 @ 100 GPM	ALL

REMARKS:
1. PROVIDE CONDENSATE NEUTRALIZATION KIT.
2. BOILERS TO BE PROVIDED WITH A BACNET BOILER SEQUENCING TECHNOLOGY PANEL (BTS) SHALL COMMUNICATE WITH BMS. COORDINATE WITH ATC.
3. PROTOCOL CONVERTERS. BACNET GATEWAY. BOILERS TO BE SUPPLIED WITH ON-BOARD CONTROLS WITH OUTDOOR RESET AND AERCO CONTROL SYSTEM. PROVIDE BOILER VALVE CONTROLLER AND ASSOCIATED VALVE. COORDINATE WITH ATC. ATC SHALL PROVIDE MONITORING OA SENSOR.
4. PROVIDE WITH MANUFACTURER SUPPLY WATER TEMP SENSOR
5. PROVIDE GAS REGULATOR AND PIPE RELIEF TO OUTSIDE. PROVIDE 4" WC MINIMUM GAS PRESSURE, COORDINATE WITH MANUFACTURE REQUIREMENTS. BOILER MANUFACTURER TO PROVIDE GAS SERVICE REGULATORS.
6. BOILER SHALL HAVE CAPABILITY TO MONITOR O2 LEVELS TO MAINTAIN BOILER EFFICIENCY. MECHANICAL CONTRACTOR SHALL PROVIDE FLUE TEMPERATURE SENSOR AND COORDINATE INSTALLATION WITH ATC. ATC SHALL MONITOR FLUE TEMPERATURE SENSOR TO MAINTAIN BOILER EFFICIENCY.
7. UNOCCUPIED HEATING HOT WATER SUPPLY TEMPERATURE SHALL BE 150°F AT 0°F (AND BELOW) AND SHALL RESET TO 100°F AT 60°F (ADJUSTABLE).
8. BOILERS SHALL BE PROVIDED WITH ELECTRONIC IGNITION.
9. BOILER FLUE SHALL BE AL 29-4C

MEDIA:
HW = HOT WATER
PPG = 30% PROPYLENE GLYCOL/WATER SOLUTION.



KEY PLAN

NORTH

NEW HAVEN PUBLIC SCHOOLS

STRONG 21st CENTURY COMMUNICATIONS LAB SCHOOL

SOUTHERN CONNECTICUT STATE UNIVERSITY
FARNHAM AVENUE
NEW HAVEN, CT 06515

STATE PROJECT# : 093-0368N

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HARDWARE CONSULTANT
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860.438.7636

ISSUED FOR BID
03-05-2018

P.I.C. _____ **L.D.** _____
P.M. _____ **P.A.** _____

ISSUE 2017-09-08
JOB H16040.00
DRAWN BCH
SCALE 1/8" = 1'-0"

REVISIONS:
3 03/27/2018 ADDENDUM 03

MECHANICAL SCHEDULES

M-601

COOLING TOWER SCHEDULE

SYMBOL	MANUFACTURER / MODEL NUMBER	MEDIA	WET BULB (°F)	TOTAL HEAT REJECTION (BTU)	# OF CELLS	AIRFLOW PER CELL (CFM)	CONDENSER WATER FLOW (GPM)	CONDENSER WATER EWT (°F)	CONDENSER WATER LWT (°F)	FAN ELECTRICAL DATA HP	FAN ELECTRICAL DATA VOLTS	FAN ELECTRICAL DATA PHASE	BASIN HEATER AMBIENT TEMP (°F)	BASIN HEATER KW	BASIN HEATER VOLTS	BASIN HEATER PHASE	WEIGHT (LBS)	REMARKS
CT-1	MARLEY NC8402KLN1	W	78	2,491,200	1	57,030	500	95	85	1FAN @ 5	208	3	1.85	9.0	208	3	10,930	ALL

MEDIA:
W = WATER

COOLING TOWER REMARKS:
1. PROVIDE WITH LOW SOUND FAN. REFER TO SCHEDULE FOR MAXIMUM SOUND PRESSURE.
2. PROVIDE A VARIABLE FREQUENCY DRIVE FOR EACH MOTOR (CELL). VFD ENCLOSURE SHALL BE NEMA 3R FOR OUTDOOR USE.
3. FACTORY MOUNTED VFD W/ SINGLE POINT POWER CONNECTION.
4. PROVIDE UNIT MOUNTED DISCONNECT SWITCH NEMA 3R FOR OUTDOOR USE.
5. PROVIDE VIBRATION CUT-OUT SWITCH (FACTORY WIRED).
6. PROVIDE FROM FACTORY LADDER AND EXTERNAL SERVICE PLATFORM. LADDER AND SERVICE PLATFORM SHALL BE FIELD INSTALLED.
7. INDUCED DRAFT, CROSS-FLOW, DOUBLE-FLOW
8. GEAR DRIVE.
9. PROVIDE SAND FILTER.
10. BASIN HEATER SHALL PREVENT FREEZING DOWN TO -5°F
11. CONDENSER WATER RETURN PIPE CONNECTION SHALL BE AT BOTTOM OF TOWER. PROVIDE INTERNAL PIPING TO TOP HEADERS.
12. PROVIDE FREE COOLING ECONOMIZER OPTION
13. COOLING TOWER SHALL BE DRAINED, WINTERIZED BETWEEN OCT. 15 - APRIL 15.
14. CONTRACTOR SHALL SUPPLY SUPPORT FRAME ELEVATED 3'-0" HIGH. COORDINATE COOLING TOWER ELEVATION WITH MANUFACTURER.
15. PROVIDE HEAT TRACE ON SUPPLY AND RETURN MAINS FROM MECHANICAL ROOM TO COOLING TOWER. COORDINATE WITH DIVISION 26.
16. BARRIER SHALL BE AT MINIMUM 3 FEET ABOVE COOLING TOWER.
17. THE NOISE ORDINANCE FOR NEW HAVEN STATES THAT NOISE LEVELS AT THE PROPERTY LINE CANNOT EXCEED 45 DBA FOR NIGHT TIME HOURS AND 55 DBA FOR DAYTIME HOURS

CENTRIFUGAL SEPARATOR (CS-1) PUROFLUX PF-64-025	
FLOW RATE	160 GPM
VOLUME	8 GAL
PURGE SIZE	1"
INLET SIZE	3"
OUTLET SIZE	2.5"
PUMP MOTOR	5 HP
WEIGHT	600 LBS

CENTRIFUGAL SEPARATOR REMARKS:
1. 45 MICRON NOMINAL PARTICULATE REMOVAL
2. 150PSI WORKING PRESSURE
3. FULLY ASSEMBLED SKID PACKAGE.
4. CONTROLS: PROGRAMMABLE LOGIC CONTROLLER (PLC) AUTOMATIC PURGE CYCLE.
5. PROVIDE WITH INTEGRATED PUMP CSP-1
6. PROVIDE PRESSURE GAUGE / AUTO & MANUAL AIR VENT VALVES.
7. ELECTRICAL INFORMATION: 208V 3 PHASE, 15 FLA
8. REFER TO MANUFACTURE INFORMATION FOR PIPING AND OTHER REQUIREMENTS.
9. PROVIDE WITH STARTER AND DISCONNECT SWITCH.

CONDUCTIVITY COOLING TOWER CONTROLLER REMARKS:
PROVIDE PULSAFEEDER MICRO VISION OR APPROVED EQUAL CONDUCTIVITY COOLING TOWER CONTROLLER MODEL MVS-1-P-A
- 115 VOLT COORDINATE WITH DIVISION 26
- PREWIRED WITH POWER CORD AND PIGTAILS FOR 115V
- STANDARD PANEL AND FLOW ASSEMBLY.
- COORDINATE WITH DIVISION 26
- COORDINATE WITH ATC

AUTOMATIC PURGE VALVE REMARKS:
PROVIDE LAKOS ELECTRIC FAIL SAFE VALVE MODEL EFS AUTO/TIMER PURGE TO DRAIN
- 115 VOLT COORDINATE WITH DIVISION 26
- INSTALL PER MNAUFACTURES INSTALLATION PROCEDURE
- COORDINATE WITH ATC. THE EQUIPMENT SHALL BE PROVIDED WITH BMS FOR TRENDING PURPOSES.

LOCATION	DISTANCE	RPM %	MAXIMUM SOUND PRESSURE (dB) OCTAVE BAND (HZ) 63	125	250	500	1K	2K	4K	8K	OVERALL DBA
AIR INLET (SPL)	5'0"	100	65	70	67	64	63	58	55	49	68
CASED FACE (SPL)	5'0"	100	63	65	62	56	55	47	43	35	60
FAN DISCHARGE (SPL)	5'0"	100	68	71	70	66	67	61	58	52	71
TOTAL (PWL)	-	100	90	92	86	82	82	77	74	68	86

SOUND NOTES:
- SOUND PRESSURE LEVEL (SPL) EXPRESSED IN dB (RE:20X10-6Pa)
- SOUND POWER LEVEL (PWL) EXPRESSED IN dB (RE: 1X10-12 WATTS)
- SOUND DATA IS IN ACCORDANCE WITH ATC-128
- SOUND PRESSURE LEVELS SHALL NOT EXCEED LISTED VALUES. DATA IS AT A DISTANCE OF 5 FEET OF THE COOLING TOWER.

WATER COOLED CHILLER SCHEDULE

SYMBOL	MANUFACTURER/ MODEL NUMBER	MEDIA	REFRIGERANT	FULL LOAD EER	IPLV	SOUND	NOM/ACT CAPACITY (TONS)	EVAPORATOR FLOW (GPM)	EVAPORATOR MIN. FLOW	EVAPORATOR EWT (°F)	EVAPORATOR LWT (°F)	EVAPORATOR PD (FT HD)	CONDENSER FLOW (GPM)	CONDENSER MIN. FLOW	CONDENSER EWT (°F)	CONDENSER LWT (°F)	CONDENSER PD (FT HD)	ELECTRICAL DATA MCA	MOCP	VOLTS	PHASE	OPERATING WEIGHT (LBS)	REMARKS
CH-1	TRANE RTWD-90-HE	COND-WATER EVAP-PPG	R-134A	14.6	0.505 kW/ton	74 dBA	90 / 87	136	74 GPM	57	41	6.5	250	124 GPM	85	95	6.5	245	350	208	3	5,800	ALL
CH-2	TRANE RTWD-90-HE	COND-WATER EVAP-PPG	R-134A	14.6	0.505 kW/ton	74 dBA	90 / 87	136	74 GPM	57	41	6.5	250	124 GPM	85	95	6.5	245	350	208	3	5,800	ALL

REMARKS:
1. COMMUNICATION INTERFACE TO BMS VIA BACNET.
2. PROVIDE WITH SINGLE POINT POWER AND WITH NON-FUSED DISCONNECTS.
3. PROVIDE WITH FACTORY AUTHORIZED START-UP.
4. PROVIDE WITH WYE-DELTA STARTERS AND DISCONNECTS.
5. PROVIDE SOUND BLANKETS
6. PROVIDE CIRCUIT BREAKER OPTION FOR DISCONNECT AT THE CHILLER.

MEDIA:
PPG = 30% PROPYLENE GLYCOL/WATER SOLUTION

REFRIGERANT MONITOR SCHEDULE

SYMBOL	MANUFACTURER / MODEL NUMBER	DESCRIPTION
RM-1	TOXALERT TOX-REFRIG	PROVIDE 15 PPM SENSITIVITY, BACNET COMMUNICATION. 120V

NOTES:
1. PROVIDED BY MECHANICAL CONTRACTOR, INSTALLED BY TEMPERATURE CONTROLS CONTRACTOR. COORDINATE WITH ATC AND DIVISION 26.
2. PROVIDE TOX-REFRIG/ANA SENSORS
3. PROVIDE RRAP-24 REFRIGERANT REMOTE ALARM PANEL.
4. PROVIDE COMBO HORN/STROBE INSIDE ROOM AND OUTSIDE ROOM AT EACH DOOR LOCATION.
5. PROVIDE NEMA4 ENCLOSURES AS NECESSARY FOR OUTDOOR APPLICATION
6. PROVIDE ALL NECESSARY PARTS AND ACCESSORIES FOR A COMPLETE OPERATING SYSTEM.

SPLIT SYSTEM AC UNIT - INDOOR AIR HANDLER SCHEDULE

SYMBOL	MANUFACTURER	MODEL	TYPE	LOCATION	NOM. TONS	FAN CFM (LOW-HIGH)	CAPACITIES COOLING (BTUH)	CAPACITIES HEATING (BTUH)	REFRIGERANT PIPING FROM CONTROLLER TO AIR HANDLER LIQUID	REFRIGERANT PIPING FROM CONTROLLER TO AIR HANDLER GAS	ELECTRICAL MCA	ELECTRICAL VOLTS	ELECTRICAL PHASE	SOUND PRESSURE (dBA)	REMARKS
AC-1	MITSUBISHI	PKA-A18HA7	WALL	AV CLOSET 134B	1.5	290-380	18,000	-	1/2"	1/4"	1	208	1	36-43	ALL
AC-2	MITSUBISHI	PKA-A18HA7	WALL	TELECOM 120	1.5	290-380	18,000	-	1/2"	1/4"	1	208	1	36-43	ALL
AC-3	MITSUBISHI	PKA-A12HA7	WALL	DATA 228	1.0	290-380	12,000	-	1/2"	1/4"	1	208	1	36-43	ALL
AC-4	MITSUBISHI	PKA-A12HA7	WALL	DATA 214	1.0	290-380	12,000	-	1/2"	1/4"	1	208	1	36-43	ALL

REMARKS:
1. PROVIDE DRAIN PAN CONDENSATE SENSOR DPLS-1. UNIT SHALL SHUT DOWN BEFORE OVERFLOW CAN OCCUR.
2. PROVIDE CONDENSATE PUMP. COORDINATE ELECTRICAL REQUIREMENTS WITH DIVISION 26.

SPLIT SYSTEM OUTDOOR UNIT SCHEDULE

SYMBOL	MANUFACTURER	MODEL	LOCATION	NOMINAL TONS	CAPACITIES COOLING (BTUH)	CAPACITIES HEATING (BTUH)	ELECTRICAL MCA	ELECTRICAL VOLTS	ELECTRICAL PHASE	SOUND PRESSURE (dBA)	WEIGHT (LBS)	REMARKS	UNITS SERVED
CU-1	MITSUBISHI	PUY-A18NKA7	ROOF	1.5	18,000	-	11	208	1	44	100	1-6	AC-1
CU-2	MITSUBISHI	PUY-A18NKA7	ROOF	1.5	18,000	-	11	208	1	44	100	1-6	AC-2
CU-3	MITSUBISHI	PUY-A12NKA7	ROOF	1.0	12,000	-	11	208	1	44	100	1-6	AC-3
CU-4	MITSUBISHI	PUY-A12NKA7	ROOF	1.0	12,000	-	11	208	1	44	100	1-6	AC-4

REMARKS:
1. R410A REFRIGERANT. CAPACITY RATINGS AT ARI CONDITIONS. COOLING - 80°F EDB, 67°F EWB, 95°F ODB. HEATING - 70°F EDB, 47°F ODB, 43°F OWB.
2. R410A REFRIGERANT. DESIGN HEATING CAPACITY RATINGS BASED ON, R410A REFRIGERANT. HEATING CAPACITY - 70°F EDB, 0°F ODB, -0.4°F OWB
3. PROVIDE LOW AMBIENT KIT
4. ROUTE REFRIGERANT PIPING FROM CONDENSING UNIT TO ASSOCIATED EVAPORATOR UNIT. COORDINATE EXACT ROUTING IN FIELD. REFERIGERANT PIPE SIZE BY EQUIPMENT MANUFACTURER
5. PROVIDE BACKNET ADAPTER.
6. PROVIDE WITH CONTROL NETWORK INTERFACE FOR EACH CONDENSING UNIT.

SPLIT SYSTEM COOLING UNIT GENERAL NOTES

1. UNLESS OTHERWISE INDICATED, CONDENSATE PIPING IS 3/4". PROVIDE A MINIMUM 2" WATER SEAL TRAP AT THE CONNECTION TO THE AIR HANDLING UNIT
2. SEE THE HEAT PUMP REFRIGERANT PIPE TABLES THIS SHEET FOR REFRIGERANT PIPE SIZES. PROVIDE FULL PORT BALL VALVES AND SHRAEDER CONNECTION ON ALL PORTS INCLUDING SPARE PORTS PER MANUFACTURERS RECOMMENDED INSTALLATION.
3. CONDENSATE PIPING SHALL BE COPPER AND SHALL BE INSULATED WITH 1" THICK INSULATION.
4. MOUNT EACH MODULE ROOF REFRIGERANT UNIT ON TWO ROOF RAILS, SIMILAR TO GREENHECK MODEL GESR, GALVANIZED STEEL, 14" HIGH. ATTACH RAILS TO THE DECK STRUCTURE.
5. PROVIDE SPLIT SYSTEM REFRIGERANT PIPING AND CONTROL WIRING BETWEEN THE INDOOR UNIT AND THE OUTDOOR UNIT
6. UNITS SHALL BE PROVIDED WITH R410A REFRIGERANT.
7. PROVIDE MITSUBISHI M-NET CONTROL ADAPTER (ONE PER CONDENSING UNIT) AND SINGLE BACNET INTERFACE FOR UP-TO 50 M-NET CONTROL ADAPTORS.

HEAT EXCHANGER SCHEDULE

SYMBOL	MANUFACTURER/ MODEL NUMBER	TYPE	LOCATION	COLD SIDE FLOW (GPM)	COLD SIDE TEMP IN/OUT DEG. F	WATER PD PSI	HOT SIDE FLOW (GPM)	HOT SIDE TEMP IN/OUT DEG. F	WATER PD PSI	CAPACITY (MBH)	REMARKS
HX-1	ARMSTRONG S-36-1000-57	PF	MECH ROOM	137.8	41/57	1.52	275	63/55	4.86	1,042	1

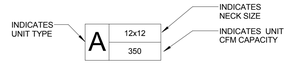
PF=PLATE AND FRAME ST=SHELL AND TUBE REMARKS: 1) CAPACITY BASED ON 30% PROPYLENE GLYCOL SOLUTION

DIFFUSER AND REGISTER SCHEDULE

SYMBOL	MANUFACTURER/ MODEL NUMBER	DUTY	TYPE	BORDER TYPE	CONSTRUCTION OBD	CONSTRUCTION FRAME	CONSTRUCTION BLADES	REMARKS
A	KRUEGER SH SERIES	SUPPLY	DD	LAY IN	NONE	STEEL	STEEL	1
B	KRUEGER DFL SERIES	RETURN	LS	SURFACE	NONE	ALUMINUM	ALUMINUM	7
C	KRUEGER S85 SERIES	RETURN	LF	LAY IN	NONE	STEEL	STEEL	1
D	NOT USED							
E	NOT USED							
F	KRUEGER DFL-10	SUPPLY	LB	SCREWED FLANGE	NONE	ALUMINUM	ALUMINUM	4
G	KRUEGER 1800 SERIES	RETURN	LB	SCREWED FLANGE	NONE	ALUMINUM	ALUMINUM	5
H	KRUEGER DFL SERIES	SUPPLY	LB	LAY IN	NONE	STEEL	STEEL	8

TYPES:

DD - DIRECTIONAL DIFFUSER
LB - LINEAR BAR
LF - LOUVERED FACE
LS - LINEAR SLOT
SW - SIDEWALL REGISTER
RD - ROUND DIFFUSER



REMARKS:

1. ALL LAY-IN TYPE BORDERS SHALL FIT RECESSED INTO T-BAR HUNG CEILING GRID.
2. MECHANICAL CONTRACTOR SHALL FIELD INSTALL DRUM REGISTER ON FACE OF BRANCH DUCT. PROVIDE VOLUME DAMPER IN BRANCH DUCT
3. PROVIDE "DFP" FACTORY INSULATED SUPPLY PLENUM WITH TWO (2) 2" SLOTS; 1-WAY THROW 8"Ø INLET; REFER TO FLOOR PLAN. PROVIDE BLANKOFF STRIPS FOR INACTIVE SECTIONS. PROVIDE CUSTOM CURVING AS NECESSARY, COORDINATE WITH ARCHITECT.
4. PROVIDE "DFP" FACTORY INSULATED SUPPLY PLENUM WITH TWO (2) 3" SLOTS; 1-WAY THROW 10"Ø INLET; REFER TO FLOOR PLAN. PROVIDE BLANKOFF STRIPS FOR INACTIVE SECTIONS. PROVIDE CUSTOM CURVING AS NECESSARY, COORDINATE WITH ARCHITECT.
5. PROVIDE WITH 15 DEGREE BALDE DEFLECTION. PROVIDE FIELD FABRICATED INSULATED SUPPLY PLENUM BOX. PROVIDE BLANKOFF STRIPS FOR INACTIVE SECTIONS. COORDINATE WITH ARCHITECT.
6. HEAVY DUTY FIXED BLADE 1/2" SPACING
7. PROVIDE FACTORY INSULATED RETURN PLENUM. LINEAR SLOT SHALL HAVE (1) 3" WIDE SLOT WITH MINIMUM 12" INLET.
8. PROVIDE FACTORY INSULATED SUPPLY PLENUM. LINEAR SLOT SHALL HAVE (1) 2.5" WIDE SLOT WITH MINIMUM 12" INLET.

HYDRONIC RADIANT CEILING PANEL SCHEDULE

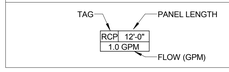
TAG	MANUFACTURER	MODEL	PHYSICAL WIDTH (IN)	PHYSICAL TUBES	PERF. EWT/LWT (°F)	PERF. BTUH PER LINEAL FOOT	REMARKS TYPE	REMARKS RATINGS	REMARKS FEATURES	REMARKS INSTALL
RCP	AIRTITE	AR-X	24	4	130/90	155	1	1	1	1-3

REMARKS-TYPE:
1. 1/2" I.D. COPPER TUBING MECHANICALLY ATTACHED TO EXTRUDED ALUMINUM LINEAR PANEL(S), COLOR SELECTED BY ARCHITECT.

REMARKS-RATINGS:
1. WIDTH, NUMBER OF TUBES, AND BTUH PER LINEAL FOOT DATA IN THIS SCHEDULE ARE FOR NOMINAL RATING PURPOSES ONLY. SEE PLANS FOR SIZING INFORMATION, AS INDICATED BY THE SYMBOL AT THE BOTTOM OF THIS SCHEDULE.

REMARKS-FEATURES:
1. PROVIDE MOUNTING ACCESSORIES INCLUDING OVERLAPPING FINISH TRIM AT ENDS (AND SIDES IF NECESSARY) THAT ALLOWS FOR EXPANSION AND CONTRACTION OF THE CEILING PANEL WITHOUT ADVERSE AFFECT ON THE ADJACENT ARCHITECTURAL FINISHES OR ON ADJACENT PANELS, AND THAT DOES NOT SHOW ANY GAPS IN THE CEILING WHEN THE PANELS ARE INSTALLED

REMARKS-INSTALL:
1. SEE PIPING DETAILS
2. PROVIDE WALL TO WALL INSTALLATION. COORDINATE AROUND COLUMNS AND ARCHITECTURAL LAYOUT.
3. MINIMUM FLOW FOR RADIANT CEILING PANEL SHALL BE NO LOWER THEN 0.5GPM



FLOWRATE (gpm)= (TOTAL BTU/H) / (500 x ΔT)

HOT WATER HYDRONIC SYSTEM EQUIPMENT AND ACCESSORIES

GENERAL MODEL	GENERAL MANUFACTURER	GENERAL MODEL	DESCRIPTION	REMARKS
AS-1	ARMSTONG	DAS-6	AIR SEPARATOR, INTEGRAL AIR VENT, 6", 125 PSIG ASME, 270°F, 380 GPM	1
BF-1	ELBI	DB5-300	BYPASS FEEDER, 5 GALLON, DOME BOTTOM, LEGS, 200 PSIG AT 200°F	-
ET-1	ARMSTONG	A1000-L	EXPANSION TANK, REPLACEABLE BUTYL BLADDER TYPE, ASME CONSTRUCTION, 264 GALLON TOTAL, 264 GALLON ACCEPTANCE	-
PRV-1	WATTS	U5B-LP	PRESSURE REDUCING VALVE, INTEGRAL THERMAL EXPANSION BYPASS, LOW PRESSURE RANGE (10 PSIG - 35 PSIG), 1-1/4"	-
RPZ-1	WATTS	909M1-QT	REDUCED PRESSURE ZONE BACKFLOW PREVENTER ASSEMBLY, QUARTER TURN SHUT-OFF VALVES, 1-1/4"	-
SG-1	JOHN ERNST	138P	SIGHT GLASS, 2", BRONZE BODY, PADDLEWHEEL INDICATOR, 125 PSIG @ 200°F	-

REMARKS:
1. ROUTE RELIEF/VENT OUTLET TO GLYCOL MAKEUP PUMP TANK

CHILLER HYDRONIC SYSTEM EQUIPMENT AND ACCESSORIES

GENERAL MODEL	GENERAL MANUFACTURER	GENERAL MODEL	DESCRIPTION	REMARKS
AS-2	ARMSTONG	DAS-6	AIR SEPARATOR, INTEGRAL AIR VENT, 6", 125 PSIG ASME, 270°F, 380 GPM	1
BF-2	ELBI	DB5-300	BYPASS FEEDER, 5 GALLON, DOME BOTTOM, LEGS, 200 PSIG AT 200°F	-
ET-2	ARMSTONG	A800-L	EXPANSION TANK, REPLACEABLE BUTYL BLADDER TYPE, ASME CONSTRUCTION, 211 GALLON TOTAL, 211 GALLON ACCEPTANCE	-
ET-3	ARMSTONG	A1000-L	EXPANSION TANK, REPLACEABLE BUTYL BLADDER TYPE, ASME CONSTRUCTION, 264 GALLON TOTAL, 264 GALLON ACCEPTANCE	-
PRV-2	WATTS	U5B	PRESSURE REDUCING VALVE, INTEGRAL THERMAL EXPANSION BYPASS, 1-1/4"	:
RPZ-2	WATTS	909M1-QT	REDUCED PRESSURE ZONE BACKFLOW PREVENTER ASSEMBLY, QUARTER TURN SHUT-OFF VALVES, 1-1/4"	-
SG-2	JOHN ERNST	138P	SIGHT GLASS, 2", BRONZE BODY, PADDLEWHEEL INDICATOR, 125 PSIG @ 200°F	-
FM-2	PRESO	PCVJ	VENTURI FLOWMETER, FLANGED, P/T PLUGS, 150 PSIG, LINE SIZE	-
AS-3	ARMSTONG	DAS-5	AIR SEPARATOR, INTEGRAL AIR VENT, 5", 125 PSIG ASME, 270°F, 275 GPM	1

REMARKS:
1. ROUTE RELIEF/VENT OUTLET TO GLYCOL MAKEUP PUMP TANK

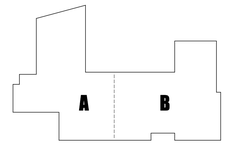
COOLING TOWER HYDRONIC SYSTEM EQUIPMENT AND ACCESSORIES

GENERAL MODEL	GENERAL MANUFACTURER	GENERAL MODEL	DESCRIPTION	REMARKS
PRV-3	WATTS	U5B	PRESSURE REDUCING VALVE, INTEGRAL THERMAL EXPANSION BYPASS, 1-1/4"	-
RPZ-3	WATTS	909M1-QT	REDUCED PRESSURE ZONE BACKFLOW PREVENTER ASSEMBLY, QUARTER TURN SHUT-OFF VALVES, 2"	-
FM-3	PRESO	PCVJ	VENTURI FLOWMETER, FLANGED, P/T PLUGS, 150 PSIG, LINE SIZE	-

GLYCOL MAKE-UP UNIT SCHEDULE

SYMBOL	MANUFACTURER/ MODEL NUMBER	TANK VOLUME (GAL)	PUMP CAPACITY FLOW (GPM)	PUMP CAPACITY PRESSURE (PSIG)	MOTOR DATA HP	MOTOR DATA VOLTS	MOTOR DATA PHASE	REMARKS
GMP-1	WESSELS GMP-13100	100	1.8	32	1/3	120	1	1
GMP-2	WESSELS GMPD-23100	100	1.8	32	1/3	120	1	1,2

REMARKS:
1. PROVIDE WITH MOTOR STARTER, DISCONNECT SWITCH, REMOTE PRESSURE SENSOR AND CONTROLS. CONNECT DDC SYSTEM TO GLYCOL FEED PUMP TANK DRY ALARM CONTACT.
2. DUPLEX UNIT SHALL BE CONNECTED TO BOTH CHILLED WATER AND CHILLED BEAM CHILLED WATER SYSTEMS.



KEY PLAN

NORTH

NEW HAVEN PUBLIC SCHOOLS

STRONG 21st CENTURY COMMUNICATIONS LAB SCHOOL

SOUTHERN CONNECTICUT STATE UNIVERSITY
FARNHAM AVENUE
NEW HAVEN, CT 06515

STATE PROJECT# : 093-0368N

JCJARCHITECTURE
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SUITE 400
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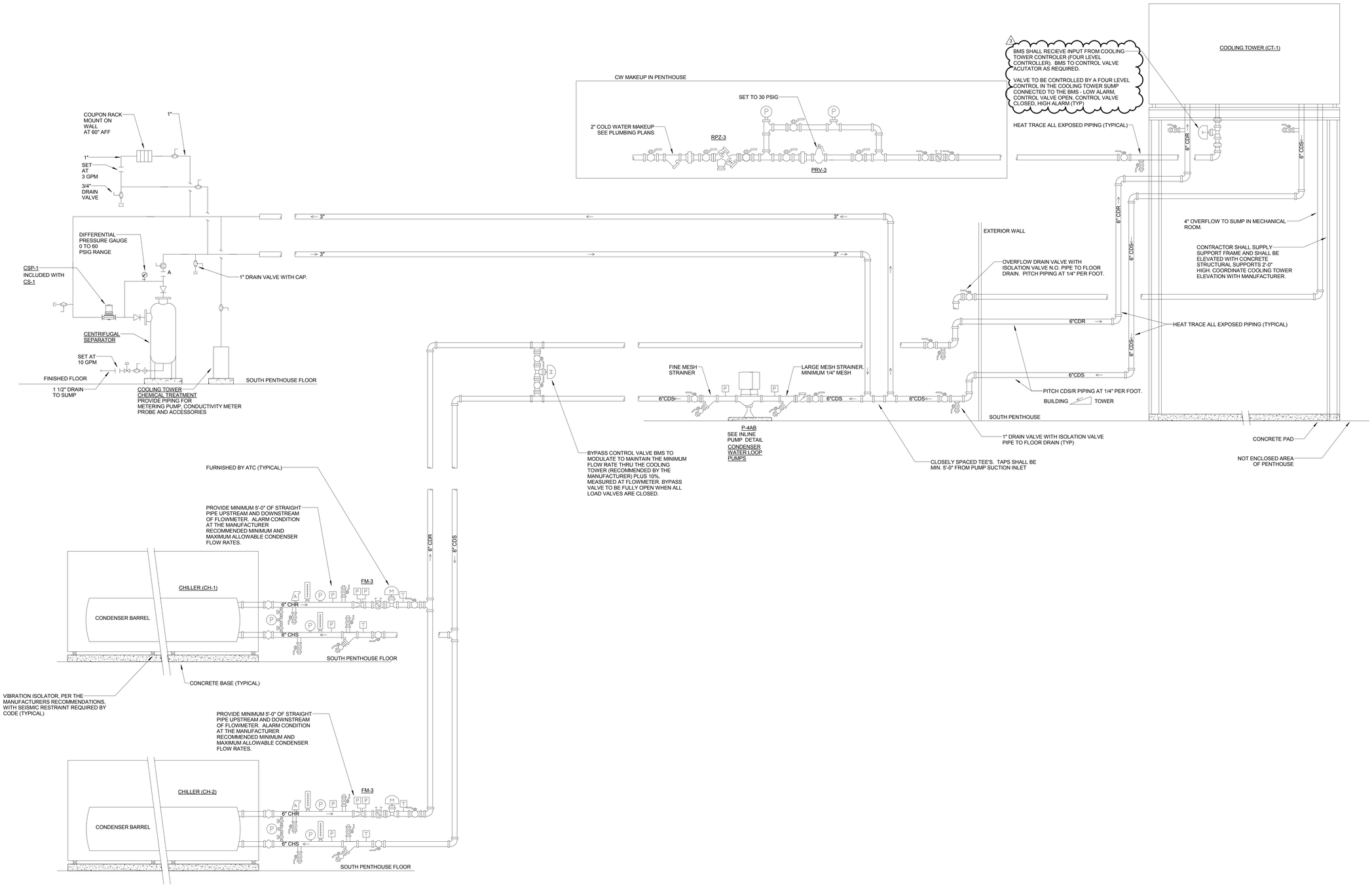
MECHANICAL SCHEDULES

M-603



1 CW PIPING DIAGRAM 2
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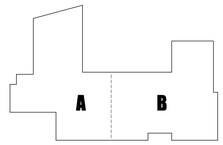

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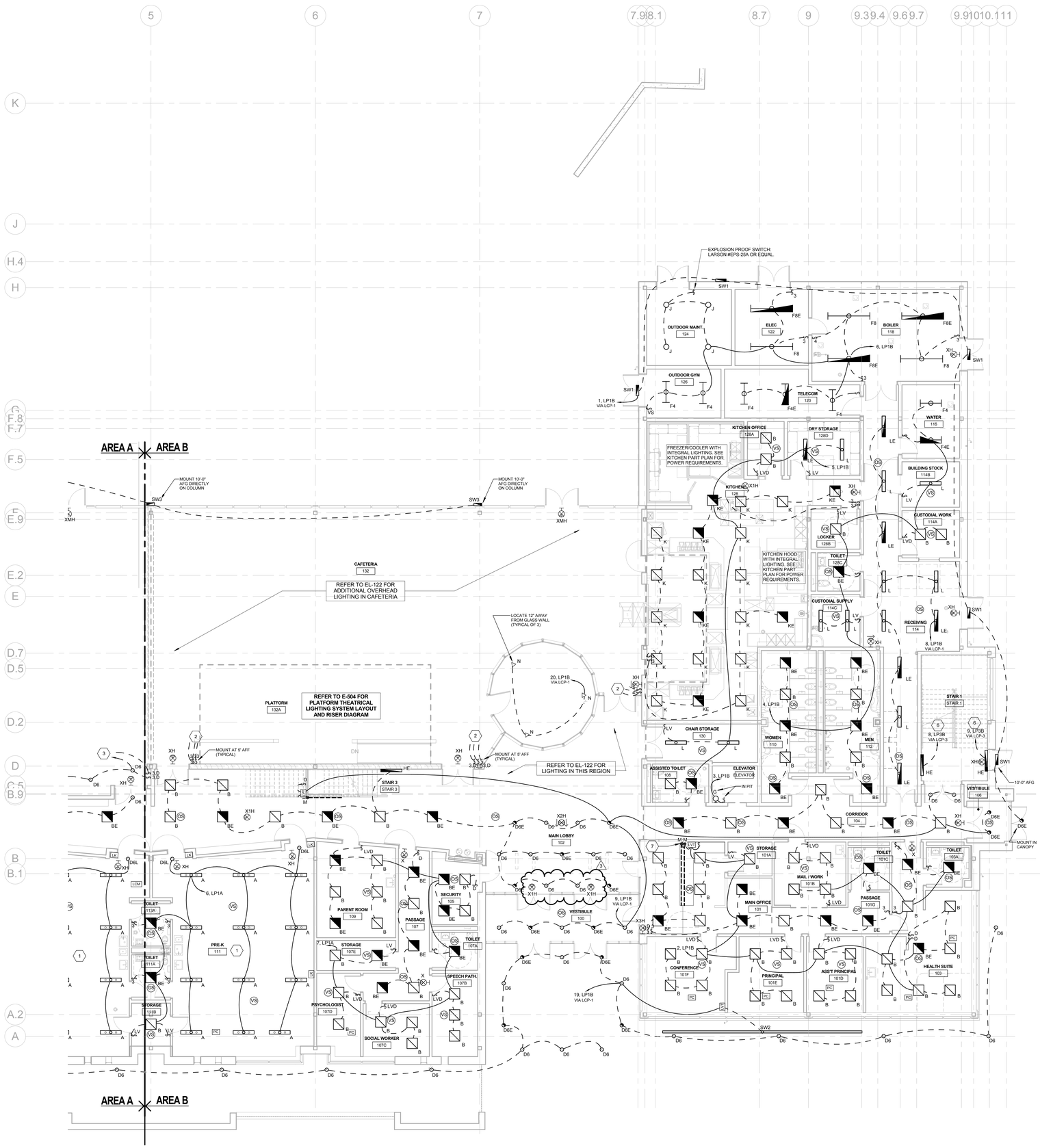
MECHANICAL PIPING DIAGRAMS

M-702



1 ELECTRICAL LIGHTING FLOOR PLAN - LEVEL 1 - AREA B
1/8" = 1'-0"

GENERAL NOTES - LIGHTING

1) ALL CIRCUITS SHALL BE 2#12,#12G.,3/4"C., TO NEW 20A-1P CIRCUIT BREAKER IN PANEL INDICATED UNLESS NOTED OTHERWISE.
2) ALL BRANCH CIRCUITS EXCEEDING 150' IN LENGTH SHALL BE 2#10,#10G., 3/4"C. UNLESS NOTED OTHERWISE.
3) ALL DEVICES SHALL BE LABELED WITH SOURCE PANEL AND CIRCUIT NUMBER(S).
4) REFER TO ARCHITECTS REFLECTED CEILING PLAN FOR EXACT LOCATION OF CEILING MOUNTED ELECTRICAL DEVICES.
5) REFER TO DRAWING E-000 FOR ELECTRICAL SYMBOLS, LEGENDS, AND ABBREVIATIONS.
6) REFER TO DRAWING E-600 FOR LIGHTING FIXTURE SCHEDULE.
7) BRANCH CIRCUIT WIRING AND SWITCHED WIRING IS INDICATED DIAGRAMMATICALLY FOR CLARITY. CONTRACTOR SHALL INSTALL AND EXTEND BRANCH CIRCUITS AS REQUIRED BETWEEN SPACES AND SHALL TAKE SWITCH CIRCUIT FROM LIGHT FIXTURE WHERE POINT OF CONNECTION OF BRANCH CIRCUIT IS MADE.
8) EXIT SIGNS SHALL BE WIRED TO LINE SIDE OF LOCAL LIGHTING BRANCH CIRCUIT, AHEAD OF ALL SWITCHING DEVICES. EXIT SIGNS SHALL NOT BE POWERED VIA CORRIDOR CIRCUITS CONTROLLED VIA THE NETWORKED "LCP" LIGHTING SYSTEM.
9) REFER TO DETAILS ON DRAWING E-501 FOR TYPICAL OCCUPANCY/VACANCY SENSOR WIRING SCHEMATICS.
10) CEILING MOUNTED OCCUPANCY/VACANCY SENSORS AND PHOTOCELLS SHALL BE INSTALLED A MINIMUM OF FOUR (4) FEET AWAT FROM HVAC SUPPLY DIFFUSERS.
11) ALL WIRING PASSING THROUGH FIRE RATED WALLS SHALL BE RUN IN METALLIC SLEEVES AND PROPERLY FIRESTOPPED TO MATCH THE RATING OF THE WALL PENETRATED.
12) PENETRATIONS THROUGH STAIRWELL WALLS IS NOT ACCEPTABLE, UNLESS FEEDING DEVICES WITHIN THE STAIR.
13) REFER TO DETAIL 1/E-502 FOR A TYPICAL CLASSROOM LIGHTING CONTROL DIAGRAM.
14) REFER TO ARCHITECTURAL INTERIOR ELEVATIONS FOR LOCATIONS AND DIMENSIONS OF ALL WALL MOUNTED ELECTRICAL DEVICES. ELECTRICAL DRAWINGS ARE DIAGRAMMATIC AND SHALL NOT BE SCALED.
15) ALL EXIT SIGNS AND OCCUPANCY SENSORS IN GYMNASIUM SHALL BE PROVIDED WITH PROTECTIVE WIREGUARDS.

BID ALTERNATES - ELECTRICAL

#01 DEDUCT SOLAR PHOTOVOLTAIC EXCEPT IN AREAS 1 & 3 (SEE EPV-700 AND EPV-701).

#02 DEDUCT SOLAR PHOTOVOLTAIC EXCEPT IN AREA 1 (SEE EPV-700 AND EPV-701).

#03 DEDUCT ALL SOLAR PHOTOVOLTAIC SYSTEMS (SEE EPV-700 AND EPV-701).

#05 REPLACE ALL TYPE "A" PENDANT FIXTURES WITH TYPE "B4L" 2X4 LAY-IN FIXTURE, SIMILAR TO TYPE "BL" EXCEPT 2X4 IN DIMENSIONS:
- BASIS OF DESIGN MODEL: COLUMBIA LCAT24-35HLG-LUTHU
- 5600LM, 44W, 3500K LED.

REPLACE ALL TYPE "AE" PENDANT FIXTURES WITH TYPE "B4LE" 2X4 LAY-IN FIXTURE, SIMILAR TO TYPE "BL" EXCEPT 2X4 IN DIMENSIONS AND WITH INTEGRAL BATTERY BACKUP:
- BASIS OF DESIGN MODEL: COLUMBIA LCAT24-35HLG-LUTHU-ELL14
- 5600LM, 44W, 3500K LED.

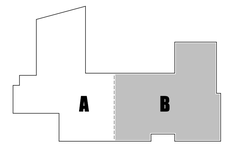
**NOTE: ALTERNATE SHALL NOT APPLY TO PENDANT FIXTURES IN MEDIA CENTER 234 OR DISCOVERY LAB 222.

#14 ADD TWO SECTIONS OF SPOT LIGHTING FOR PLATFORM THEATRICAL LIGHTING SYSTEM.

#15 ADD ELECTRICAL AND CONTROL COMPONENTS FOR MOTORIZED SHADES AT LIGHT WELL.

ELECTRICAL LIGHTING KEY NOTES

1. LIGHTING WITHIN THIS ROOM SHALL BE CONTROLLED VIA FULLY ADDRESSABLE CONTROL SYSTEM AS INDICATED IN DETAIL 1/E-502.
2. SWITCHES CONTROL CAFETERIA OVERHEAD LIGHTING. REFER TO SECOND FLOOR PLAN EL-122 FOR CIRCUITING.
3. SWITCHES CONTROL GYMNASIUM OVERHEAD LIGHTING. REFER TO SECOND FLOOR PLAN EL-121 FOR CIRCUITING.
4. FIXTURE SHALL BE MOUNTED ON METAL PANELING DIRECTLY ABOVE DOOR. PROVIDE LOW PROFILE SURFACE MOUNTED RACEWAY ALONG TOP OF MULLION INSIDE BUILDING, WITH PENETRATION TO ELECTRICAL BOX AS REQUIRED. RACEWAY SHALL BE WIREMOLD 400 SERIES OR EQUAL AND SHALL BE ROUTED TO ABOVE CEILING SPACE ALONG PATHWAY SHOWN.
5. 20A/120VAC POWER FEEDS TO THEATRICAL TOUCHSCREEN POWER SUPPLY AND DMX SPLITTER. REFER TO THEATRICAL LIGHTING RISER DIAGRAM FOR ADDITIONAL INFORMATION.
6. FIXTURES IN STAIRWELL ON OTHER FLOORS SHALL ALSO BE POWERED VIA THIS CIRCUIT. REFER TO HOMERUN TAGS ON OTHER FLOOR PLANS FOR EXACT FIXTURES. ALL FIXTURES ON THIS CIRCUIT SHALL BE CONTROLLED VIA THE INDICATED RELAY PANEL AS PART OF THE NETWORKED CONTROL SYSTEM.
7. PROVIDE TWO RUNS OF TYPE "M" RIBBON LIGHTING, ROUTED THROUGH CAVITY OF RECEPTION DESK, ONE AT TOP AND ONE AT BOTTOM (FIXTURES ARE SHOWN OFFSET FOR CLARITY). REFER TO ARCHITECTURAL MILLWORK DETAILS FOR EXACT MOUNTING SPECIFICATIONS. BOTH FIXTURES SHALL BE POWERED VIA ONE LOW VOLTAGE TRANSFORMER AS SHOWN. COORDINATE LOCATION OF L.V.T. AND TOGGLE SWITCH WITH ARCHITECT PRIOR TO ROUGH-IN.
8. LOCATION OF REMOTE BATTERY UNITS FOR TYPE "PE" FIXTURES SHOWN IN GYMNASIUM (DRAWING EL-121) AND CAFETERIA (DRAWING EL-122). SURFACE MOUNT ALL UNITS ON WALL IN THIS LOCATION.



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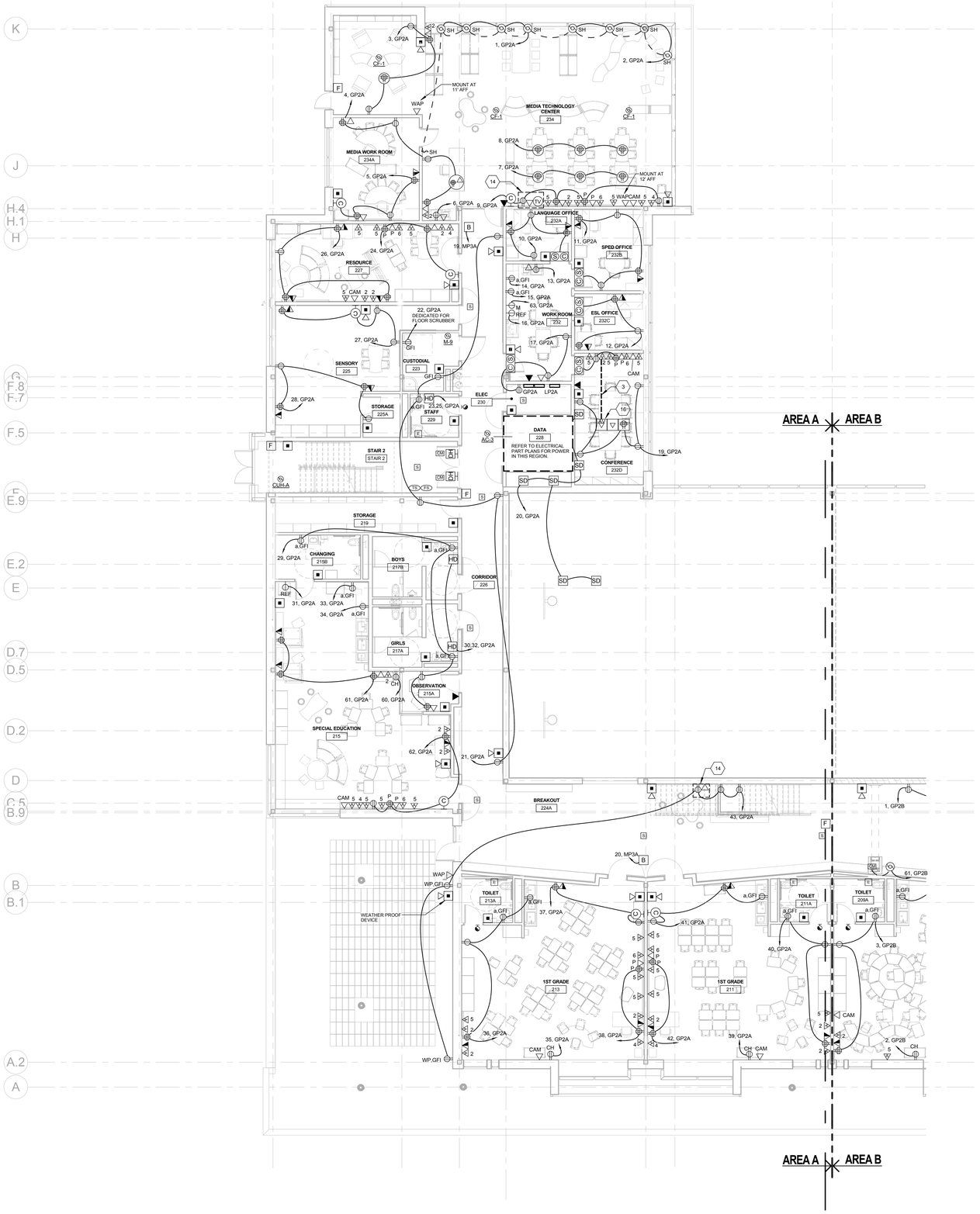
ELECTRICAL LIGHTING FLOOR PLAN - LEVEL 1 - AREA B

EL-112



1 ELECTRICAL POWER FLOOR PLAN - LEVEL 2 - AREA A
1/8" = 1'-0"

GENERAL NOTES - ELECTRICAL

1) ALL CIRCUITS SHALL BE 2#12,#12G.,3/4"C., TO NEW 20A-1P CIRCUIT BREAKER IN PANEL INDICATED UNLESS NOTED OTHERWISE.
2) ALL BRANCH CIRCUITS EXCEEDING 150' IN LENGTH SHALL BE 2#10,#10G., 3/4"C. UNLESS NOTED OTHERWISE.
3) ALL DEVICES SHALL BE LABELED WITH SOURCE PANEL AND CIRCUIT NUMBER(S).
4) REFER TO ARCHITECTS REFLECTED CEILING PLAN FOR EXACT LOCATION OF CEILING MOUNTED ELECTRICAL DEVICES.
5) REFER TO DRAWING E-000 FOR ELECTRICAL SYMBOLS, LEGENDS, AND ABBREVIATIONS.
6) REFER TO DRAWING E-600 FOR MOTOR CIRCUIT SCHEDULE.
7) PROVIDE FIRE STOPPING AND SMOKE BARRIER SEALING OF ALL PENETRATIONS THROUGH FIRE WALLS OR SMOKE BARRIERS AS REQUIRED. REFER TO ARCHITECTURAL FLOOR PLANS AND CODE SHEETS FOR WALLS.
8) ALL RECEPTACLES LOCATED WITHIN 6' FROM SINKS SHALL BE GFCI TYPE.
9) PROVIDE 5" HOUSEKEEPING CONCRETE PADS FOR ALL FLOOR MOUNTED ELECTRICAL EQUIPMENT. PAD SHALL EXTEND 6" AROUND EQUIPMENT.
10) PROVIDE CLASS "A" FIRE RETARDANT PLYWOOD BACKBOARD AT ALL ELECTRICAL/I.T. ROOMS AS PER PLANS.
11) ALL REMOTE TEST SWITCHES FOR DUCT SMOKE DETECTORS SHALL BE WALL MOUNTED IN LOCATIONS SHOWN ON PLANS, UNLESS OTHERWISE NOTED.
12) ALL DUPLEX AND QUADRUPLEX RECEPTACLES SHALL BE TAMPER RESISTANT TYPE, UNLESS DEDICATED FOR AN INSTALLED PIECE OF EQUIPMENT.
13) REFER TO ARCHITECTURAL INTERIOR ELEVATIONS FOR LOCATIONS AND DIMENSIONS OF ALL WALL MOUNTED ELECTRICAL DEVICES. ELECTRICAL DRAWINGS ARE DIAGRAMMATIC AND SHALL NOT BE SCALED.
14) ALL FIRE ALARM, AND SINGLE BATHROOM CALL-FOR-AID NOTIFICATION DEVICES IN GYMNASIUM SHALL BE PROVIDED WITH A PROTECTIVE WIREGUARD.
15) FIRE ALARM MULTI-CANDELA STROBES SHALL BE PROVIDED. CANDELA SETTINGS SHALL BE AS FOLLOWS:
    - 15/75 IN CORRIDORS.
    - 30 IN OFFICES.
    - 110 IN GYMNASIUM AND CAFETERIA.
    - 75 IN ALL OTHER AREAS.
16) ELECTRICAL CONTRACTOR SHALL PROVIDE (1)-2" CONDUIT SLEEVE ABOVE CEILING AT THE ENTRANCE TO EACH ROOM FOR LOW-VOLTAGE HORIZONTAL CABLING BY DIV.27. ALWAYS LOCATE SLEEVE ABOVE CEILING.

BID ALTERNATES - ELECTRICAL

#01 DEDUCT SOLAR PHOTOVOLTAIC EXCEPT IN AREAS 1 & 3 (SEE EPV-700 AND EPV-701).

#02 DEDUCT SOLAR PHOTOVOLTAIC EXCEPT IN AREA 1 (SEE EPV-700 AND EPV-701).

#03 DEDUCT ALL SOLAR PHOTOVOLTAIC SYSTEMS (SEE EPV-700 AND EPV-701).

#05 REPLACE ALL TYPE "A" PENDANT FIXTURES WITH TYPE "B4L" 2X4 LAY-IN FIXTURE, SIMILAR TO TYPE "BL" EXCEPT 2X4 IN DIMENSIONS:
- BASIS OF DESIGN MODEL: COLUMBIA LCAT24-35HLG-LUTHU
- 5600LM, 44W, 3500K LED.

REPLACE ALL TYPE "AE" PENDANT FIXTURES WITH TYPE "B4LE" 2X4 LAY-IN FIXTURE, SIMILAR TO TYPE "BL" EXCEPT 2X4 IN DIMENSIONS AND WITH INTEGRAL BATTERY BACKUP:
- BASIS OF DESIGN MODEL: COLUMBIA LCAT24-35HLG-LUTHU-ELL14
- 5600LM, 44W, 3500K LED.

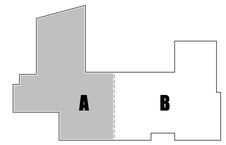
**NOTE: ALTERNATE SHALL NOT APPLY TO PENDANT FIXTURES IN MEDIA CENTER 234 OR DISCOVERY LAB 222.

#14 ADD TWO SECTIONS OF SPOT LIGHTING FOR PLATFORM THEATRICAL LIGHTING SYSTEM.

#15 ADD ELECTRICAL AND CONTROL COMPONENTS FOR MOTORIZED SHADES AT LIGHT WELL.

ELECTRICAL POWER KEY NOTES

1. PROVIDE 3/4" THICK FIRE RETARDANT PLYWOOD BACKBOARD FOR MOUNTING OF METERING AND ARTIS ENERGY EQUIPMENT. SEE RISER DIAGRAM FOR ADDITIONAL INFORMATION.
2. RECEPTACLES FOR VIDEO MONITORS, SHOWN SIDE-BY-SIDE FOR CLARITY. REFER TO SECURITY ROOM CONNECTIONS DETAIL FOR ADDITIONAL REQUIRED INFRASTRUCTURE.
3. PROVIDE (1)-2"C. AND (1)-1"C. FROM AV OUTLET TO FLOOR DEVICE AS SHOWN.
4. PROVIDE 7"X7" FURNITURE FEED FLOOR BOX WITH (2)-2" KNOCKOUTS, LEGRAND EFBFF OR EQUAL. PROVIDE (2)-2" CONDUITS IN SLAB FROM BOX TO NEAREST ACCESSIBLE WALL (ONE FOR POWER, ONE FOR DATA). PROVIDE FURNITURE FEED COVER ASSEMBLY WITH SPLIT COMPARTMENTS, LEGRAND FPFFT OR EQUAL. COORDINATE FINISH WITH ARCHITECT.
5A. CARBON MONOXIDE ALARM ASSOCIATED WITH DETECTORS IN KITCHEN.
5B. CARBON MONOXIDE ALARM ASSOCIATED WITH DETECTOR IN BOILER ROOM.
6. HEAT DETECTOR TO ACTIVATE LOCAL CONTROL MODULE AND SHUT OFF BOILER ROOM SOLENOID GAS VALVE WHEN HIGH HEAT LEVELS ARE SENSED. REFER TO BOILER ROOM EMERGENCY POWER-OFF DETAIL FOR ADDITIONAL INFORMATION.
7. HEAD-END CONTROL ENCLOSURE FOR NETWORKED LIGHTING CONTROL SYSTEM WITH DEDICATED POWER AND DATA. REFER TO "LCP" CONTROL DIAGRAM FOR ADDITIONAL INFORMATION.
8. MOUNT RECEPTACLE ADJACENT TO HOSE BIB, MOUNT ON STANCHION 24" ABOVE GRADE. PROVIDE POWER WIRING IN CONDUIT TRENCHED UNDERSLAB TO INDICATED PANELBOARD.
9. ALL WIRING SYSTEMS WITHIN THIS REGION SHALL BE PROVIDED WITH A REDUNDANT GROUNDING PATH IN ACCORDANCE WITH NEC ARTICLE 517. WIRING METHODS SHALL BE TYPE HCF-MC CABLE.
10. DEVICES SHALL BE MOUNTED DIRECTLY ON RECEPTION DESK CASEWORK. ALL WIRING SHALL BE ROUTED THROUGH MILLWORK PARTITION. E.C. SHALL COORDINATE WITH MILLWORK CONTRACTOR AND ARCHITECTURAL DETAILS.
11. PROVIDE 20A-1P CONNECTION TO DROP DOWN SCREEN. PROVIDE EMPTY "AV-5" BACKBOX WITH 1"C. TO RACK IN AV CLOSET 134B FOR CONTROL WIRING BY AV CONTRACTOR. COORDINATE EXACT POINT OF CONNECTION WITH A/V DRAWINGS BEFORE ROUGH-IN.
12. FOR FIRE PROTECTION BELL. PROVIDE CONTROL MODULE WITH WIRING TO FIRE ALARM CONTROL PANEL. BELL SHALL BE POWERED VIA FIRE ALARM SYSTEM.
13. STANDARD POWER RECEPTACLES AND DATA OUTLETS IN PRE-K CLASSROOM SHALL BE INSTALLED AT 16" AFF (INSTEAD OF 18" AFF).
14. FOR WALL MOUNTED DIGITAL SIGNAGE OR TELEVISION SCREEN. ALL DEVICES SHALL BE MOUNTED AT 72" AFF AND SHALL BE MOUNTED WITHIN RECESSED BACKBOX SPECIFIED ON AV DRAWINGS.
15. DEDICATED DUPLEX RECEPTACLE AND DATA OUTLET FOR BMS HEAD-END PANEL. COORDINATE EXACT LOCATION WITH DIV.23 CONTROLS CONTRACTOR PRIOR TO ROUGH-IN.
16. POWER AND DATA DEVICES SHALL BE MOUNTED IN AUDIOVISUAL FLOOR BOX. REFER TO "AV" SERIES DRAWINGS FOR SPECIFICATIONS.



KEY PLAN

NORTH

NEW HAVEN PUBLIC SCHOOLS

STRONG 21st CENTURY COMMUNICATIONS LAB SCHOOL

SOUTHERN CONNECTICUT STATE UNIVERSITY
FARNHAM AVENUE
NEW HAVEN, CT 06515

STATE PROJECT# : 093-0368N

JCJARCHITECTURE
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SCALE	As indicated

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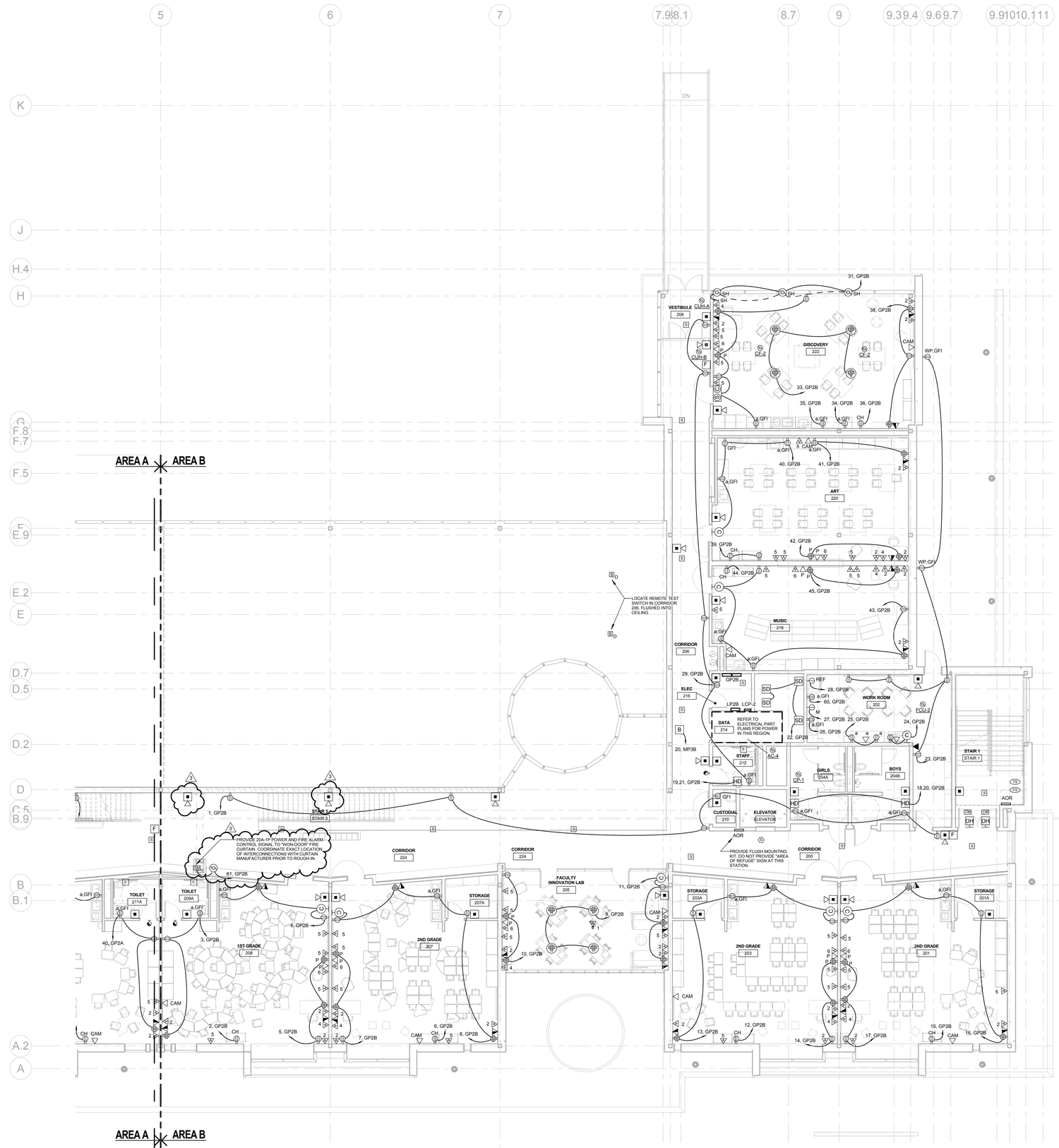
3	03/27/2018	ADDENDUM 03

ELECTRICAL POWER FLOOR PLAN - LEVEL 2 - AREA A

EP-121



1 ELECTRICAL POWER FLOOR PLAN - LEVEL 2 - AREA B
1/8" = 1'-0"

GENERAL NOTES - ELECTRICAL

1) ALL CIRCUITS SHALL BE 2#12,#12G.,3/4"C., TO NEW 20A-1P CIRCUIT BREAKER IN PANEL INDICATED UNLESS NOTED OTHERWISE.
2) ALL BRANCH CIRCUITS EXCEEDING 150' IN LENGTH SHALL BE 2#10,#10G., 3/4"C. UNLESS NOTED OTHERWISE.
3) ALL DEVICES SHALL BE LABELED WITH SOURCE PANEL AND CIRCUIT NUMBER(S).
4) REFER TO ARCHITECTS REFLECTED CEILING PLAN FOR EXACT LOCATION OF CEILING MOUNTED ELECTRICAL DEVICES.
5) REFER TO DRAWING E-000 FOR ELECTRICAL SYMBOLS, LEGENDS, AND ABBREVIATIONS.
6) REFER TO DRAWING E-600 FOR MOTOR CIRCUIT SCHEDULE.
7) PROVIDE FIRE STOPPING AND SMOKE BARRIER SEALING OF ALL PENETRATIONS THROUGH FIRE WALLS OR SMOKE BARRIERS AS REQUIRED. REFER TO ARCHITECTURAL FLOOR PLANS AND CODE SHEETS FOR WALLS.
8) ALL RECEPTACLES LOCATED WITHIN 6' FROM SINKS SHALL BE GFCI TYPE.
9) PROVIDE 5" HOUSEKEEPING CONCRETE PADS FOR ALL FLOOR MOUNTED ELECTRICAL EQUIPMENT. PAD SHALL EXTEND 6" AROUND EQUIPMENT.
10) PROVIDE CLASS "A" FIRE RETARDANT PLYWOOD BACKBOARD AT ALL ELECTRICAL/I.T. ROOMS AS PER PLANS.
11) ALL REMOTE TEST SWITCHES FOR DUCT SMOKE DETECTORS SHALL BE WALL MOUNTED IN LOCATIONS SHOWN ON PLANS, UNLESS OTHERWISE NOTED.
12) ALL DUPLEX AND QUADRUPLEX RECEPTACLES SHALL BE TAMPER RESISTANT TYPE, UNLESS DEDICATED FOR AN INSTALLED PIECE OF EQUIPMENT.
13) REFER TO ARCHITECTURAL INTERIOR ELEVATIONS FOR LOCATIONS AND DIMENSIONS OF ALL WALL MOUNTED ELECTRICAL DEVICES. ELECTRICAL DRAWINGS ARE DIAGRAMMATIC AND SHALL NOT BE SCALED.
14) ALL FIRE ALARM, AND SINGLE BATHROOM CALL-FOR-AID NOTIFICATION DEVICES IN GYMNASIUM SHALL BE PROVIDED WITH A PROTECTIVE WIREGUARD.
15) FIRE ALARM MULTI-CANDELA STROBES SHALL BE PROVIDED. CANDELA SETTINGS SHALL BE AS FOLLOWS:
    - 15/75 IN CORRIDORS.
    - 30 IN OFFICES.
    - 110 IN GYMNASIUM AND CAFETERIA.
    - 75 IN ALL OTHER AREAS.
16) ELECTRICAL CONTRACTOR SHALL PROVIDE (1)-2" CONDUIT SLEEVE ABOVE CEILING AT THE ENTRANCE TO EACH ROOM FOR LOW-VOLTAGE HORIZONTAL CABLING BY DIV.27. ALWAYS LOCATE SLEEVE ABOVE CEILING.

BID ALTERNATES - ELECTRICAL

#01 DEDUCT SOLAR PHOTOVOLTAIC EXCEPT IN AREAS 1 & 3 (SEE EPV-700 AND EPV-701).

#02 DEDUCT SOLAR PHOTOVOLTAIC EXCEPT IN AREA 1 (SEE EPV-700 AND EPV-701).

#03 DEDUCT ALL SOLAR PHOTOVOLTAIC SYSTEMS (SEE EPV-700 AND EPV-701).

#05 REPLACE ALL TYPE "A" PENDANT FIXTURES WITH TYPE "B4L" 2X4 LAY-IN FIXTURE, SIMILAR TO TYPE "BL" EXCEPT 2X4 IN DIMENSIONS:
- BASIS OF DESIGN MODEL: COLUMBIA LCAT24-35HLG-LUTHU
- 5600LM, 44W, 3500K LED.

REPLACE ALL TYPE "AE" PENDANT FIXTURES WITH TYPE "B4LE" 2X4 LAY-IN FIXTURE, SIMILAR TO TYPE "BL" EXCEPT 2X4 IN DIMENSIONS AND WITH INTEGRAL BATTERY BACKUP:
- BASIS OF DESIGN MODEL: COLUMBIA LCAT24-35HLG-LUTHU-ELL14
- 5600LM, 44W, 3500K LED.

**NOTE: ALTERNATE SHALL NOT APPLY TO PENDANT FIXTURES IN MEDIA CENTER 234 OR DISCOVERY LAB 222.

#14 ADD TWO SECTIONS OF SPOT LIGHTING FOR PLATFORM THEATRICAL LIGHTING SYSTEM.

#15 ADD ELECTRICAL AND CONTROL COMPONENTS FOR MOTORIZED SHADES AT LIGHT WELL.

ELECTRICAL POWER KEY NOTES

1. PROVIDE 3/4" THICK FIRE RETARDANT PLYWOOD BACKBOARD FOR MOUNTING OF METERING AND ARTIS ENERGY EQUIPMENT. SEE RISER DIAGRAM FOR ADDITIONAL INFORMATION.
2. RECEPTACLES FOR VIDEO MONITORS, SHOWN SIDE-BY-SIDE FOR CLARITY. REFER TO SECURITY ROOM CONNECTIONS DETAIL FOR ADDITIONAL REQUIRED INFRASTRUCTURE.
3. PROVIDE (1)-2"C. AND (1)-1"C. FROM AV OUTLET TO FLOOR DEVICE AS SHOWN.
4. PROVIDE 7"X7" FURNITURE FEED FLOOR BOX WITH (2)-2" KNOCKOUTS, LEGRAND EFBFF OR EQUAL. PROVIDE (2)-2" CONDUITS IN SLAB FROM BOX TO NEAREST ACCESSIBLE WALL (ONE FOR POWER, ONE FOR DATA). PROVIDE FURNITURE FEED COVER ASSEMBLY WITH SPLIT COMPARTMENTS, LEGRAND FPFFT OR EQUAL. COORDINATE FINISH WITH ARCHITECT.
5A. CARBON MONOXIDE ALARM ASSOCIATED WITH DETECTORS IN KITCHEN.
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6. HEAT DETECTOR TO ACTIVATE LOCAL CONTROL MODULE AND SHUT OFF BOILER ROOM SOLENOID GAS VALVE WHEN HIGH HEAT LEVELS ARE SENSED. REFER TO BOILER ROOM EMERGENCY POWER-OFF DETAIL FOR ADDITIONAL INFORMATION.
7. HEAD-END CONTROL ENCLOSURE FOR NETWORKED LIGHTING CONTROL SYSTEM WITH DEDICATED POWER AND DATA. REFER TO "LCP" CONTROL DIAGRAM FOR ADDITIONAL INFORMATION.
8. MOUNT RECEPTACLE ADJACENT TO HOSE BIB. MOUNT ON STANCHION 24" ABOVE GRADE. PROVIDE POWER WIRING IN CONDUIT TRENCHED UNDERSLAB TO INDICATED PANELBOARD.
9. ALL WIRING SYSTEMS WITHIN THIS REGION SHALL BE PROVIDED WITH A REDUNDANT GROUNDING PATH IN ACCORDANCE WITH NEC ARTICLE 517. WIRING METHODS SHALL BE TYPE HCF-MC CABLE.
10. DEVICES SHALL BE MOUNTED DIRECTLY ON RECEPTION DESK CASEWORK. ALL WIRING SHALL BE ROUTED THROUGH MILLWORK PARTITION. E.C. SHALL COORDINATE WITH MILLWORK CONTRACTOR AND ARCHITECTURAL DETAILS.
11. PROVIDE 20A-1P CONNECTION TO DROP DOWN SCREEN. PROVIDE EMPTY "AV-5" BACKBOX WITH 1"C. TO RACK IN AV CLOSET 134B FOR CONTROL WIRING BY A/V CONTRACTOR. COORDINATE EXACT POINT OF CONNECTION WITH A/V DRAWINGS BEFORE ROUGH-IN.
12. FOR FIRE PROTECTION BELL. PROVIDE CONTROL MODULE WITH WIRING TO FIRE ALARM CONTROL PANEL. BELL SHALL BE POWERED VIA FIRE ALARM SYSTEM.
13. STANDARD POWER RECEPTACLES AND DATA OUTLETS IN PRE-K CLASSROOM SHALL BE INSTALLED AT 16" AFF (INSTEAD OF 18" AFF).
14. FOR WALL MOUNTED DIGITAL SIGNAGE OR TELEVISION SCREEN. ALL DEVICES SHALL BE MOUNTED AT 72" AFF AND SHALL BE MOUNTED WITHIN RECESSED BACKBOX SPECIFIED ON AV DRAWINGS.
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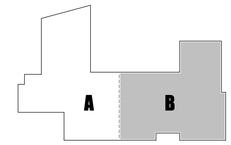

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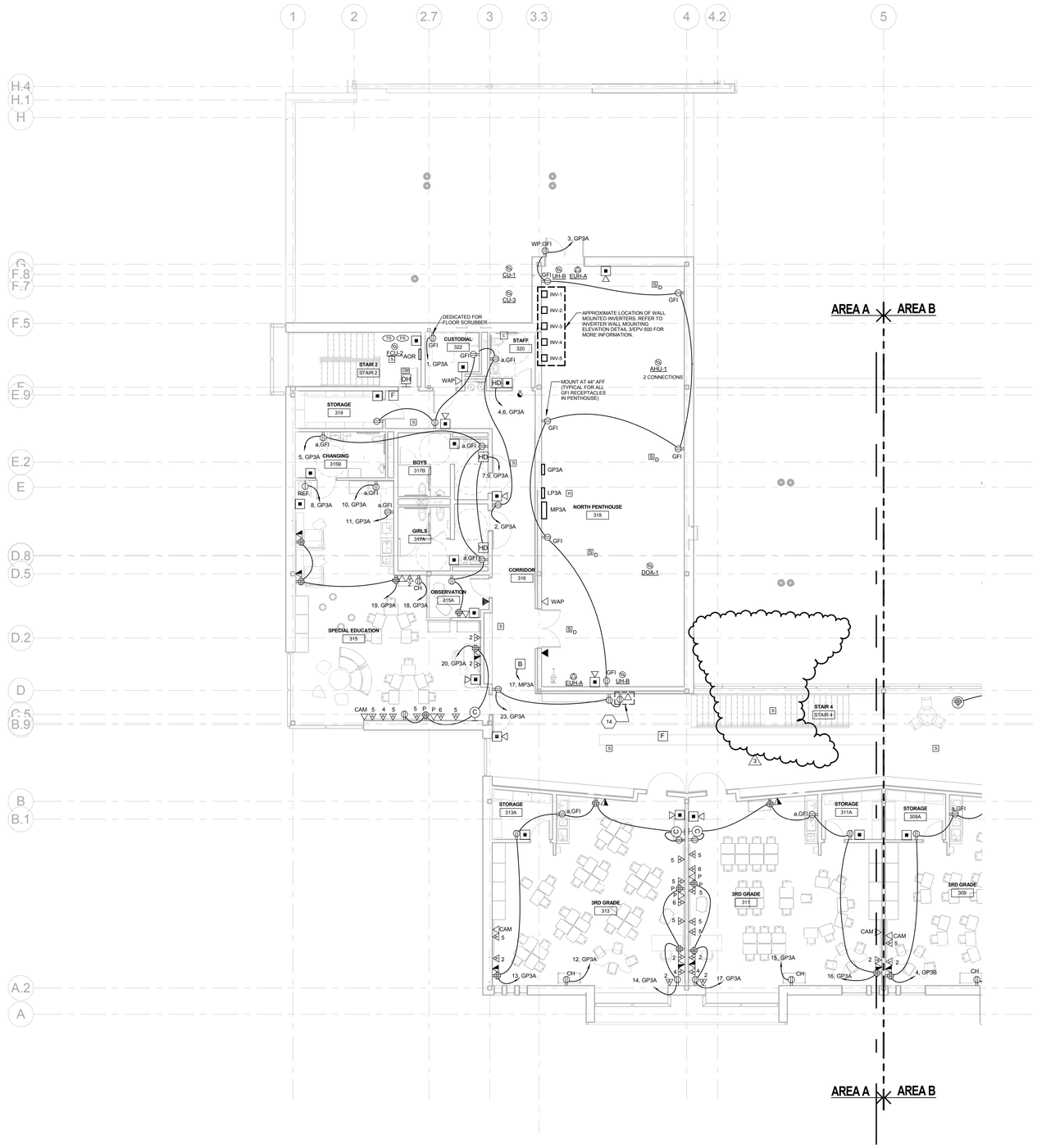
3 03/27/2018 ADDENDUM 03

ELECTRICAL POWER FLOOR PLAN - LEVEL 2 - AREA B

EP-122



1 ELECTRICAL POWER FLOOR PLAN - LEVEL 3 - AREA A
1/8" = 1'-0"

GENERAL NOTES - ELECTRICAL

1) ALL CIRCUITS SHALL BE 2#12,#12G.,3/4"C., TO NEW 20A-1P CIRCUIT BREAKER IN PANEL INDICATED UNLESS NOTED OTHERWISE.
2) ALL BRANCH CIRCUITS EXCEEDING 150' IN LENGTH SHALL BE 2#10,#10G., 3/4"C. UNLESS NOTED OTHERWISE.
3) ALL DEVICES SHALL BE LABELED WITH SOURCE PANEL AND CIRCUIT NUMBER(S).
4) REFER TO ARCHITECTS REFLECTED CEILING PLAN FOR EXACT LOCATION OF CEILING MOUNTED ELECTRICAL DEVICES.
5) REFER TO DRAWING E-000 FOR ELECTRICAL SYMBOLS, LEGENDS, AND ABBREVIATIONS.
6) REFER TO DRAWING E-600 FOR MOTOR CIRCUIT SCHEDULE.
7) PROVIDE FIRE STOPPING AND SMOKE BARRIER SEALING OF ALL PENETRATIONS THROUGH FIRE WALLS OR SMOKE BARRIERS AS REQUIRED. REFER TO ARCHITECTURAL FLOOR PLANS AND CODE SHEETS FOR WALLS.
8) ALL RECEPTACLES LOCATED WITHIN 6' FROM SINKS SHALL BE GFCI TYPE.
9) PROVIDE 5" HOUSEKEEPING CONCRETE PADS FOR ALL FLOOR MOUNTED ELECTRICAL EQUIPMENT. PAD SHALL EXTEND 6" AROUND EQUIPMENT.
10) PROVIDE CLASS "A" FIRE RETARDANT PLYWOOD BACKBOARD AT ALL ELECTRICAL/I.T. ROOMS AS PER PLANS.
11) ALL REMOTE TEST SWITCHES FOR DUCT SMOKE DETECTORS SHALL BE WALL MOUNTED IN LOCATIONS SHOWN ON PLANS, UNLESS OTHERWISE NOTED.
12) ALL DUPLEX AND QUADRUPLEX RECEPTACLES SHALL BE TAMPER RESISTANT TYPE, UNLESS DEDICATED FOR AN INSTALLED PIECE OF EQUIPMENT.
13) REFER TO ARCHITECTURAL INTERIOR ELEVATIONS FOR LOCATIONS AND DIMENSIONS OF ALL WALL MOUNTED ELECTRICAL DEVICES. ELECTRICAL DRAWINGS ARE DIAGRAMMATIC AND SHALL NOT BE SCALED.
14) ALL FIRE ALARM, AND SINGLE BATHROOM CALL-FOR-AID NOTIFICATION DEVICES IN GYMNASIUM SHALL BE PROVIDED WITH A PROTECTIVE WIREGUARD.
15) FIRE ALARM MULTI-CANDELA STROBES SHALL BE PROVIDED. CANDELA SETTINGS SHALL BE AS FOLLOWS:
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    - 30 IN OFFICES.
    - 110 IN GYMNASIUM AND CAFETERIA.
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16) ELECTRICAL CONTRACTOR SHALL PROVIDE (1)-2" CONDUIT SLEEVE ABOVE CEILING AT THE ENTRANCE TO EACH ROOM FOR LOW-VOLTAGE HORIZONTAL CABLING BY DIV.27. ALWAYS LOCATE SLEEVE ABOVE CEILING.

BID ALTERNATES - ELECTRICAL

#01 DEDUCT SOLAR PHOTOVOLTAIC EXCEPT IN AREAS 1 & 3 (SEE EPV-700 AND EPV-701).

#02 DEDUCT SOLAR PHOTOVOLTAIC EXCEPT IN AREA 1 (SEE EPV-700 AND EPV-701).

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- BASIS OF DESIGN MODEL: COLUMBIA LCAT24-35HLG-LUTHU
- 5600LM, 44W, 3500K LED.

REPLACE ALL TYPE "AE" PENDANT FIXTURES WITH TYPE "B4LE" 2X4 LAY-IN FIXTURE, SIMILAR TO TYPE "BL" EXCEPT 2X4 IN DIMENSIONS AND WITH INTEGRAL BATTERY BACKUP:
- BASIS OF DESIGN MODEL: COLUMBIA LCAT24-35HLG-LUTHU-ELL14
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**NOTE: ALTERNATE SHALL NOT APPLY TO PENDANT FIXTURES IN MEDIA CENTER 234 OR DISCOVERY LAB 222.

#14 ADD TWO SECTIONS OF SPOT LIGHTING FOR PLATFORM THEATRICAL LIGHTING SYSTEM.

#15 ADD ELECTRICAL AND CONTROL COMPONENTS FOR MOTORIZED SHADES AT LIGHT WELL.

ELECTRICAL POWER KEY NOTES

1. PROVIDE 3/4" THICK FIRE RETARDANT PLYWOOD BACKBOARD FOR MOUNTING OF METERING AND ARTIS ENERGY EQUIPMENT. SEE RISER DIAGRAM FOR ADDITIONAL INFORMATION.
2. RECEPTACLES FOR VIDEO MONITORS, SHOWN SIDE-BY-SIDE FOR CLARITY. REFER TO SECURITY ROOM CONNECTIONS DETAIL FOR ADDITIONAL REQUIRED INFRASTRUCTURE.
3. PROVIDE (1)-2"C. AND (1)-1"C. FROM AV OUTLET TO FLOOR DEVICE AS SHOWN.
4. PROVIDE 7"X7" FURNITURE FEED FLOOR BOX WITH (2)-2" KNOCKOUTS, LEGRAND EFBFF OR EQUAL. PROVIDE (2)-2" CONDUITS IN SLAB FROM BOX TO NEAREST ACCESSIBLE WALL (ONE FOR POWER, ONE FOR DATA). PROVIDE FURNITURE FEED COVER ASSEMBLY WITH SPLIT COMPARTMENTS, LEGRAND FPFFT OR EQUAL. COORDINATE FINISH WITH ARCHITECT.
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8. MOUNT RECEPTACLE ADJACENT TO HOSE BIB, MOUNT ON STANCHION 24" ABOVE GRADE. PROVIDE POWER WIRING IN CONDUIT TRENCHED UNDERSLAB TO INDICATED PANELBOARD.
9. ALL WIRING SYSTEMS WITHIN THIS REGION SHALL BE PROVIDED WITH A REDUNDANT GROUNDING PATH IN ACCORDANCE WITH NEC ARTICLE 517. WIRING METHODS SHALL BE TYPE HCF-MC CABLE.
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11. PROVIDE 20A-1P CONNECTION TO DROP DOWN SCREEN. PROVIDE EMPTY "AV-5" BACKBOX WITH 1"C. TO RACK IN AV CLOSET 134B FOR CONTROL WIRING BY A/V CONTRACTOR. COORDINATE EXACT POINT OF CONNECTION WITH A/V DRAWINGS BEFORE ROUGH-IN.
12. FOR FIRE PROTECTION BELL. PROVIDE CONTROL MODULE WITH WIRING TO FIRE ALARM CONTROL PANEL. BELL SHALL BE POWERED VIA FIRE ALARM SYSTEM.
13. STANDARD POWER RECEPTACLES AND DATA OUTLETS IN PRE-K CLASSROOM SHALL BE INSTALLAED AT 16" AFF (INSTEAD OF 18" AFF).
14. FOR WALL MOUNTED DIGITAL SIGNAGE OR TELEVISION SCREEN. ALL DEVICES SHALL BE MOUNTED AT 72" AFF AND SHALL BE MOUNTED WITHIN RECESSED BACKBOX SPECIFIED ON AV DRAWINGS.
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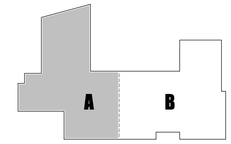

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3 03/27/2018 ADDENDUM 03

ELECTRICAL POWER FLOOR PLAN - LEVEL 3 - AREA A

EP-131

GENERAL NOTES - ELECTRICAL SITE UTILITY

1) NEW ELECTRICAL PRIMARY CONDUCTORS AND NEW PAD MOUNTED UTILITY TRANSFORMER SHALL BE PROVIDED BY UNITED ILLUMINATING COMPANY. HOWEVER, IT IS THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR TO COORDINATE INSTALLATION OF THIS EQUIPMENT WITH U.I. AND TO FOLLOW ALL LOCAL UTILITY COMPANY REQUIREMENTS.

   U.I. CONTACT: RICHARD HACKLEY, (203)-499-3289, RICHARD.HACKLEY@UINET.COM

2) ALL BRANCH CIRCUITS SHOWN ON SITE PLAN SHALL BE MINIMUM 2#10,#10G.,1"C. TO NEW 20A-1P CIRCUIT BREAKER IN PANEL INDICATED UNLESS NOTED OTHERWISE. REFER TO DETAIL 6/SU-101 FOR BRANCH CIRCUIT TRENCHING REQUIREMENTS.

3) ALL DEVICES/LIGHT FIXTURES SHALL BE LABELED WITH SOURCE PANEL AND CIRCUIT NUMBER(S).

4) REFER TO DRAWING E-000 FOR ELECTRICAL SYMBOLS AND ABBREVIATIONS.

5) REFER TO DRAWING E-600 FOR LIGHTING FIXTURE SCHEDULE.

6) COORDINATE ROUTING OF ALL CONDUITS AND TRENCHES WITH CIVIL DRAWINGS.

7) ALL HANDHOLES SHALL BE PRECAST POLYMER CONCRETE ENCLOSURES WITH ANSI 77 TIER 15 COVERS, RATED FOR TRAFFIC APPLICATIONS. HANDHOLES SHALL BE HUBBELL QUAZITE "PG" SERIES OR APPROVED EQUAL, SIZES AS INDICATED. REFER TO DETAIL 8/SU-101 FOR ADDITIONAL SPECIFICATIONS.

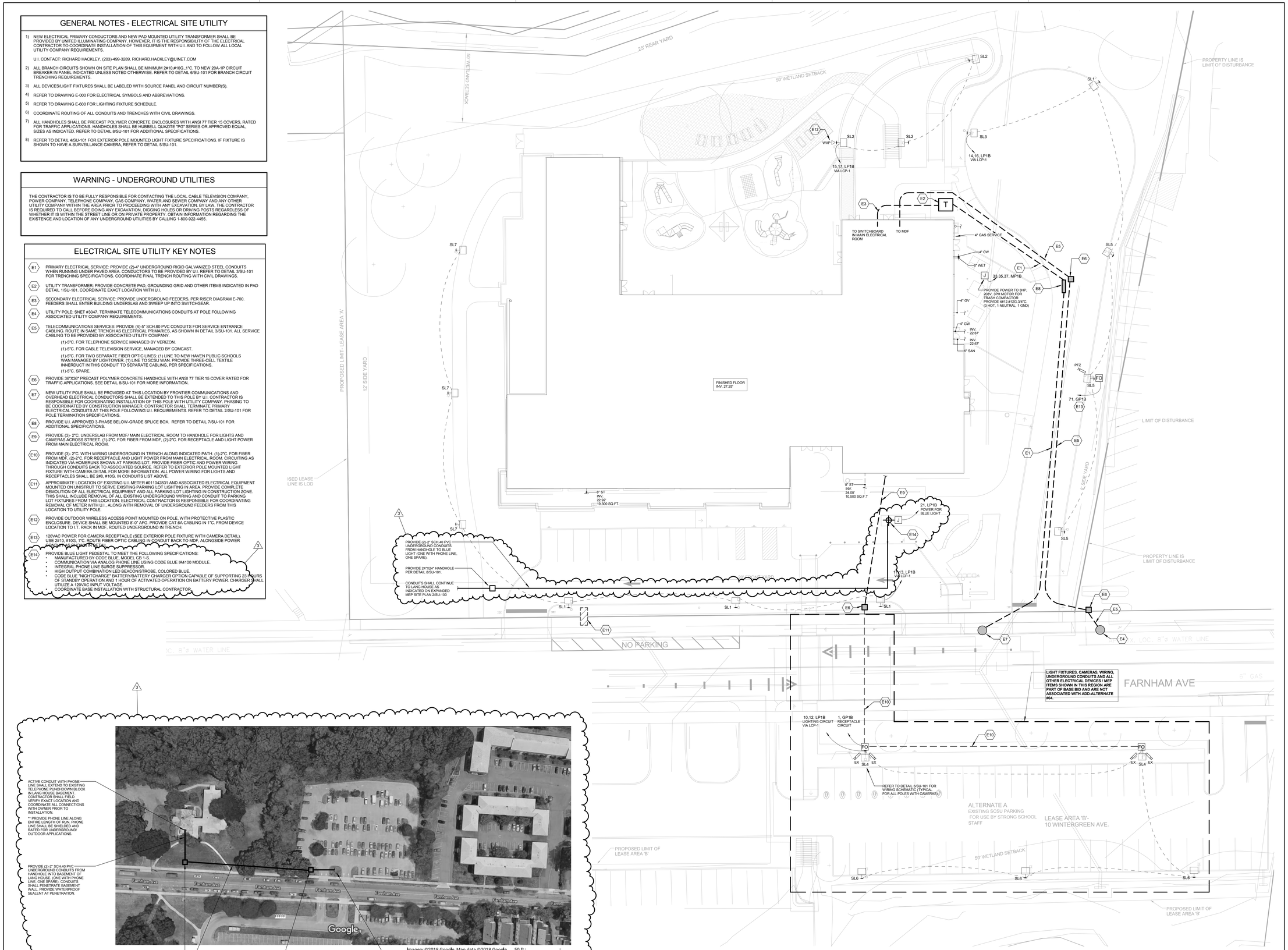
8) REFER TO DETAIL 4/SU-101 FOR EXTERIOR POLE MOUNTED LIGHT FIXTURE SPECIFICATIONS. IF FIXTURE IS SHOWN TO HAVE A SURVEILLANCE CAMERA, REFER TO DETAIL 9/SU-101.

WARNING - UNDERGROUND UTILITIES

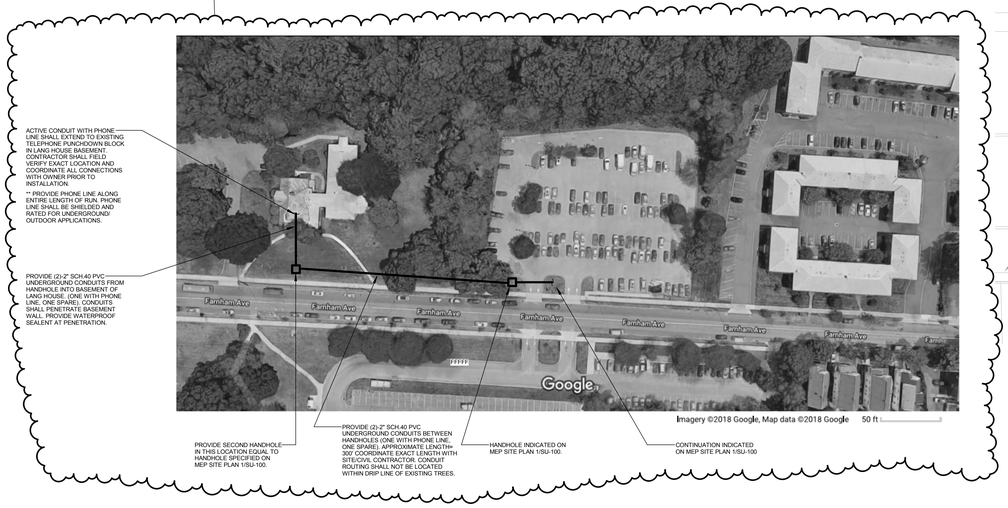
THE CONTRACTOR IS TO BE FULLY RESPONSIBLE FOR CONTACTING THE LOCAL CABLE TELEVISION COMPANY, POWER COMPANY, TELEPHONE COMPANY, GAS COMPANY, WATER AND SEWER COMPANY AND ANY OTHER UTILITY COMPANY WITHIN THE AREA PRIOR TO PROCEEDING WITH ANY EXCAVATION. BY LAW, THE CONTRACTOR IS REQUIRED TO CALL BEFORE DOING ANY EXCAVATION, DIGGING HOLES OR DRIVING POSTS REGARDLESS OF WHETHER IT IS WITHIN THE STREET LINE OR ON PRIVATE PROPERTY. OBTAIN INFORMATION REGARDING THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITIES BY CALLING 1-800-922-4455.

ELECTRICAL SITE UTILITY KEY NOTES

- E1 PRIMARY ELECTRICAL SERVICE: PROVIDE (2)-4" UNDERGROUND RIGID GALVANIZED STEEL CONDUITS WHEN RUNNING UNDER PAVED AREA. CONDUCTORS TO BE PROVIDED BY U.I. REFER TO DETAIL 3/SU-101 FOR TRENCHING SPECIFICATIONS. COORDINATE FINAL TRENCH ROUTING WITH CIVIL DRAWINGS.
- E2 UTILITY TRANSFORMER: PROVIDE CONCRETE PAD, GROUNDING GRID AND OTHER ITEMS INDICATED IN PAD DETAIL 1/SU-101. COORDINATE EXACT LOCATION WITH U.I.
- E3 SECONDARY ELECTRICAL SERVICE: PROVIDE UNDERGROUND FEEDERS, PER RISER DIAGRAM E-700. FEEDERS SHALL ENTER BUILDING UNDERSLAB AND SWEEP UP INTO SWITCHGEAR.
- E4 UTILITY POLE: SNET #3047. TERMINATE TELECOMMUNICATIONS CONDUITS AT POLE FOLLOWING ASSOCIATED UTILITY COMPANY REQUIREMENTS.
- E5 TELECOMMUNICATIONS SERVICES: PROVIDE (4)-5" SCH.80 PVC CONDUITS FOR SERVICE ENTRANCE CABLING. ROUTE IN SAME TRENCH AS ELECTRICAL PRIMARIES, AS SHOWN IN DETAIL 3/SU-101. ALL SERVICE CABLING TO BE PROVIDED BY ASSOCIATED UTILITY COMPANY.
  - (1)-5"C. FOR TELEPHONE SERVICE MANAGED BY VERIZON.
  - (1)-5"C. FOR CABLE TELEVISION SERVICE, MANAGED BY COMCAST.
  - (1)-5"C. FOR TWO SEPARATE FIBER OPTIC LINES: (1) LINE TO NEW HAVEN PUBLIC SCHOOLS WAN MANAGED BY LIGHTOWER, (1) LINE TO SCSU WAN. PROVIDE THREE-CELL TEXTILE INNERDUCT IN THIS CONDUIT TO SEPARATE CABLING, PER SPECIFICATIONS.
  - (1)-5"C. SPARE.
- E6 PROVIDE 36"X36" PRECAST POLYMER CONCRETE HANDHOLE WITH ANSI 77 TIER 15 COVER RATED FOR TRAFFIC APPLICATIONS. SEE DETAIL 8/SU-101 FOR MORE INFORMATION.
- E7 NEW UTILITY POLE SHALL BE PROVIDED AT THIS LOCATION BY FRONTIER COMMUNICATIONS AND OVERHEAD ELECTRICAL CONDUCTORS SHALL BE EXTENDED TO THIS POLE BY U.I. CONTRACTOR IS RESPONSIBLE FOR COORDINATING INSTALLATION OF THIS POLE WITH UTILITY COMPANY. PHASING TO BE COORDINATED BY CONSTRUCTION MANAGER. CONTRACTOR SHALL TERMINATE PRIMARY ELECTRICAL CONDUITS AT THIS POLE FOLLOWING U.I. REQUIREMENTS. REFER TO DETAIL 2/SU-101 FOR POLE TERMINATION SPECIFICATIONS.
- E8 PROVIDE U.I. APPROVED 3-PHASE BELOW-GRADE SPLICE BOX. REFER TO DETAIL 7/SU-101 FOR ADDITIONAL SPECIFICATIONS.
- E9 PROVIDE (3)- 2"C. UNDERSLAB FROM MDF/ MAIN ELECTRICAL ROOM TO HANDHOLE FOR LIGHTS AND CAMERAS ACROSS STREET. (1)-2"C. FOR FIBER FROM MDF, (2)-2"C. FOR RECEPTACLE AND LIGHT POWER FROM MAIN ELECTRICAL ROOM.
- E10 PROVIDE (3)- 2"C. WITH WIRING UNDERGROUND IN TRENCH ALONG INDICATED PATH. (1)-2"C. FOR FIBER FROM MDF, (2)-2"C. FOR RECEPTACLE AND LIGHT POWER FROM MAIN ELECTRICAL ROOM. CIRCUITING AS INDICATED VIA HOMERUNS SHOWN AT PARKING LOT. PROVIDE FIBER OPTIC AND POWER WIRING THROUGH CONDUITS BACK TO ASSOCIATED SOURCE. REFER TO EXTERIOR POLE MOUNTED LIGHT FIXTURE WITH CAMERA DETAIL FOR MORE INFORMATION. ALL POWER WIRING FOR LIGHTS AND RECEPTACLES SHALL BE 2#8, #10G. IN CONDUITS LIST ABOVE.
- E11 APPROXIMATE LOCATION OF EXISTING U.I. METER #011042831 AND ASSOCIATED ELECTRICAL EQUIPMENT MOUNTED ON UNISTRUT TO SERVE EXISTING PARKING LOT LIGHTING IN AREA. PROVIDE COMPLETE DEMOLITION OF ALL ELECTRICAL EQUIPMENT AND ALL PARKING LOT LIGHTING IN CONSTRUCTION ZONE. THIS SHALL INCLUDE REMOVAL OF ALL EXISTING UNDERGROUND WIRING AND CONDUIT TO PARKING LOT FIXTURES FROM THIS LOCATION. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING REMOVAL OF METER WITH U.I., ALONG WITH REMOVAL OF UNDERGROUND FEEDERS FROM THIS LOCATION TO UTILITY POLE.
- E12 PROVIDE OUTDOOR WIRELESS ACCESS POINT MOUNTED ON POLE, WITH PROTECTIVE PLASTIC ENCLOSURE. DEVICE SHALL BE MOUNTED 8'-0" AFG. PROVIDE CAT 6A CABLING IN 1"C. FROM DEVICE LOCATION TO I.T. RACK IN MDF, ROUTED UNDERGROUND IN TRENCH.
- E13 120VAC POWER FOR CAMERA RECEPTACLE (SEE EXTERIOR POLE FIXTURE WITH CAMERA DETAIL). USE 2#10, #10G, 1"C. ROUTE FIBER OPTIC CABLING IN CONDUIT BACK TO MDF, ALONGSIDE POWER CONDUITS AS SHOWN IN DETAIL.
- E14 PROVIDE BLUE LIGHT PEDESTAL TO MEET THE FOLLOWING SPECIFICATIONS:
  - MANUFACTURED BY CODE BLUE, MODEL CB 1-S.
  - COMMUNICATION VIA ANALOG PHONE LINE USING CODE BLUE IA410 MODULE.
  - INTEGRAL PHONE LINE SURGE SUPPRESSOR.
  - HIGH OUTPUT COMBINATION LED BEACON/STROBE, COLORED BLUE.
  - CODE BLUE "NIGHTCHARGE" BATTERY/BATTERY CHARGER OPTION CAPABLE OF SUPPORTING 23 HOURS OF STANDBY OPERATION AND 1 HOUR OF ACTIVATED OPERATION ON BATTERY POWER. CHARGER SHALL UTILIZE A 120VAC INPUT VOLTAGE.
  - COORDINATE BASE INSTALLATION WITH STRUCTURAL CONTRACTOR.



1 MEP SITE UTILITY PLAN
1" = 20'-0"



2 EXPANDED MEP SITE PLAN - BLUE LIGHT TELEPHONE CONDUIT
NTS

NEW HAVEN PUBLIC SCHOOLS

STRONG 21st CENTURY COMMUNICATIONS LAB SCHOOL

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860.438.7636

ISSUED FOR BID
03-05-2018

P.I.C. _____ **L.D.** _____
P.M. _____ **P.A.** _____

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JOB H16040.00
DRAWN KSK
SCALE As indicated

REVISIONS:
3 03/27/2018 ADDENDUM 03

MEP SITE UTILITY PLAN

SU-100