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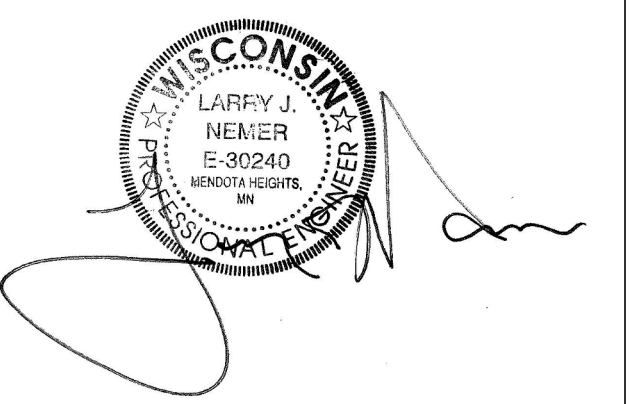
Greenhouse Design
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Olbrich Botanical Gardens Expansion Phase 1

BPW Project #8162
 3330 Atwood Avenue
 Madison, WI 53704

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the Laws of the State of Wisconsin. ENGINEER SEAL.



Signature: _____
 Print Names: Larry Nemer
 Date: JUNE 4, 2018 License No.: E-30240

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		06.04.2018	PERMIT ISSUE

PROJECT NO: 2017016
 PROJECT PHASE: BID DOCUMENTS
 DRAWN BY: MSR CHECKED BY: MSR
 Design: 2017 Copyright: Nemer, Saiki & Associates, LLC

MECHANICAL TITLE SHEET

EXHIBIT J M001

- ### GENERAL MECHANICAL NOTES
- ALL WORK SHALL BE IN COMPLIANCE WITH STATE AND LOCAL CODES.
 - THE CONTRACTOR SHALL APPLY FOR ALL PERMITS NECESSARY FOR PROPER COMPLETION OF THE WORK. THE CITY SHALL PAY THE ASSOCIATED FEES FOR ALL PERMITS.
 - INSTALL ALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
 - VERIFY ALL EXISTING CONDITIONS. NOTIFY ENGINEER OF ANY CONFLICTS BETWEEN CONTRACT DRAWINGS AND ACTUAL CONDITIONS.
 - THESE DRAWINGS ARE DIAGRAMMATIC AND SHALL NOT BE SCALED. ADDITIONAL DATA SHALL BE FROM THE ENGINEER THROUGH WRITTEN CLARIFICATION ONLY. VERIFY ALL EXISTING CONDITIONS, ELEVATIONS, AND DIMENSIONS BEFORE PROCEEDING WITH ANY PORTION OF ANY WORK. THE CONTRACTOR SHALL PROVIDE ALL OFFSETS AND TRANSITIONS REQUIRED TO MEET EXISTING CONDITIONS.
 - THE CONTRACTOR SHALL PERFORM WORK IN A SKILLED AND PROFESSIONAL MANNER.
 - ALL CONTRACTORS ARE RESPONSIBLE TO FIELD COORDINATE WORK SCHEDULE WITH OWNER REPRESENTATIVE.
 - THE CONTRACTOR SHALL WORK AND COORDINATE WITH THE OTHER TRADES.
 - ALL EQUIPMENT SHALL BE NEW AND IN UNDMAGED CONDITION. ANY EQUIPMENT FOUND DEFECTIVE SHALL BE IMMEDIATELY REMOVED FROM THE PROJECT.
 - DUCT MATERIAL SHALL BE GALVANIZED OR ALUMINUM CONSTRUCTED IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARD 2005 AND SMACNA HVAC AIR DUCT LEAKAGE MANUAL 2012 FOR THE PRESSURE AND SEAL CLASS LISTED IN THE PROJECT DUCTWORK/INSULATION SCHEDULE.
 - DUCT SIZES LISTED ON PLANS ARE THE REQUIRED CLEAR INTERIOR DIMENSIONS.
 - SUPPLY AND RETURN BRANCH DUCTS MAY BE INSULATED FLEX DUCT IF THE RUN IS LESS THAN 3 FEET IN LENGTH. ANY LENGTHS OVER 3 FEET SHALL BE RIGID DUCTWORK. DUCT SHALL BE THE SAME SIZE AS THE LISTED DIFFUSER THROAT UNLESS NOTED OTHERWISE.
 - PROVIDE VOLUME CONTROL DAMPERS WHERE INDICATED AND AT ALL TAKEOFFS. BOTH SUPPLY AND RETURN SYSTEMS, AND MAJOR DUCT RUNS. DAMPERS SHALL BE FACTORY-FABRICATED WITH ZINC-PLATED, DIE-CAST CONTROL HARDWARE. CONTROL HARDWARE SHALL INCLUDE HEAVY GAUGE DAL AND HANDLE WITH ELEVATED PLATFORM FOR INSULATED DUCT MOUNTING.
 - PROVIDE TURNING VANES IN ALL RECTANGULAR ELBOWS CONFORMING TO SMACNA HVAC DUCT CONSTRUCTION STANDARD 2005 FIG. 4-2 TYPE RE-3 WITH STANDARD RADIUS. WHERE SPACE PERMITS, PROVIDE RADIUS ELBOWS IN ACCORDANCE WITH FIGURES 4-2, TYPE RE-1.
 - ALL RECTANGULAR MAIN TO RECTANGULAR BRANCH CONNECTIONS, BOTH CONVERGING AND DIVERGING CONFIGURATIONS, SHALL HAVE A 45 DEG. ENTRY TAP CONSTRUCTED IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARD 2005 FIG. 4-6.
 - MECHANICAL CONTRACTOR TO REPAIR ANY DAMAGE DONE TO THE FIRE PROOFING WHILE INSTALLING THE MECHANICAL TRADES. SEAL ALL PENETRATIONS THROUGH RATED STRUCTURES WITH UL LISTED FIRE SEAL DESIGNED FOR THE SPECIFIED APPLICATION.
 - THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES TO PROTECT THE PUBLIC AND ADJACENT PROPERTIES FROM DAMAGE THROUGHOUT CONSTRUCTION.
 - UPON PROJECT COMPLETION, RECORD (AS-BUILT) DRAWINGS SHALL BE PROVIDED BY THE CONTRACTOR TO THE OWNER AND ENGINEER. ALL CHANGES IN PIPING AND DUCTWORK ARRANGEMENTS SHALL BE NOTED ON THE RECORD DRAWINGS.

MECHANICAL HVAC LEGEND

	EXHAUST AIR DUCT (DOWN)	ACC	AIR COOLED CHILLER
	EXHAUST AIR DUCT (UP)	AD	ACCESS DOOR
	RETURN AIR DUCT (DOWN)	AF	AIR FILTER
	RETURN AIR DUCT (UP)	AHU	AIR HANDLING UNIT
	OUTSIDE OR SUPPLY AIR DUCT (UP)	B	BOILER
	OUTSIDE OR SUPPLY AIR DUCT (DOWN)	BD	BACK DRAFT DAMPER
	DUCT SIZE	CD	CEILING DIFFUSER
	NEW DUCTWORK	CBWT	CHILLED WATER BUFFER TANK
	FLEX DUCT	CF	CEILING FAN
	EXISTING DUCTWORK	EG	EXHAUST GRILLE
	DEMOLITION LINETYPE	ERV	ENERGY RECOVERY VENTILATOR
	SUPPLY AIR CEILING DIFFUSER	ET	EXPANSION TANK
	CEILING DIFFUSER W/BLANKOFF	FD	FIRE DAMPER
	RETURN AIR GRILLE	H	HUMIDIFIER
	EXHAUST AIR GRILLE	HX	HEAT EXCHANGER
	CALL-OUTSIZE CFM	L	LOUVER
	MANUAL BALANCING DAMPER	MD	MOTOR OPERATED DAMPER
	PIPE PENETRATION THROUGH FIRE RATED WALL	NC	NORMALLY CLOSED
	FIRE DAMPER (X-F)	NO	NORMALLY OPEN
	FIRE SMOKE DAMPER (X-S)	OA	OUTSIDE AIR
	FIRE SMOKE DAMPER (X-C)	OD	OPEN END DUCT
	MOTORIZED DAMPER	RA	RETURN AIR
	SCHEDULED EQUIPMENT TAG	RG	RETURN AIR GRILLE
	THERMOSTAT	RH	HOT WATER RE-HEAT
	HUMIDISTAT	RTU	ROOF TOP UNIT
	CO2 SENSOR	SA	SUPPLY AIR
	OCCUPANCY SENSOR	SAT	SOUND ATTENUATORS
	REMOTE SENSOR	SF	SUPPLY FAN
	DUCT SMOKE DETECTOR	SG	SUPPLY GRILLE
	NEW TO EXISTING	SR	SUPPLY REGISTER
	EXTENT OF DEMO	TG	TRANSFER GRILLE
		UH	UNIT HEATER

MECHANICAL PIPING LEGEND

	DOUBLE ELBOW DOWN		DOUBLE ELBOW DOWN (AT CORNER)
	ELBOW DOWN		ELBOW UP
	TEE		TEE DOWN
	TEE UP		END CAP
	ELBOW DOWN TO TEE		REDUCER
	TYPICAL TEE CONNECTION (PLANS ONLY)		NEW TO EXISTING PIPE CONNECTION
	AUTOMATIC VENT		FLOW DIRECTION ARROW
	WATER FLOW MEASURING DEVICE		MANUAL AIR VENT (MAV)
	PIPE ANCHOR		PRESSURE GAUGE
	PIPE GUIDE / SLEEVE		UNION
	BALANCING VALVE		PRESSURE RELIEF VALVE
	CIRCUIT SETTER		PRESSURE/TEMPERATURE PORT
	PRESSURE REDUCING VALVE		AIR SEPARATOR
	BALL VALVE/SHUT-OFF VALVE		PUMP
	SILENT CHECK VALVE		OR
	GLOBE VALVE		FLEX CONNECTION
	TWO-WAY VALVE		THERMOMETER
	THREE-WAY VALVE		COIL
	SHUT-OFF COCK		PIPE VIEW
	STRAINER		
	STRAINER WITH BLOWDOWN		
	SUCTION DIFFUSER W/ STRAINER AND BLOWDOWN		
	DRAIN VALVE		
	VACUUM BREAKER		
	FLOW CONTROL VALVE W/ PRESSURE DIFFERENTIAL SENSOR		
	DIFFERENTIAL PRESSURE SENSOR		

MECHANICAL SHEET INDEX

M001	MECHANICAL TITLE SHEET
M011	GREENHOUSE MECHANICAL PIPING DEMOLITION PLAN
M013	COMMONS AREA MECHANICAL DEMOLITION PLAN
M101	LEARNING CENTER MECHANICAL DUCTWORK PLAN
M102	LEARNING CENTER MECHANICAL PIPING PLAN
M103	LEARNING CENTER RADIANT HEAT AND COOL
M111	GREENHOUSE MECHANICAL PIPING PLAN
M112	ENLARGED PLANS AND SECTIONS
M113	ENLARGED PLANS AND SECTIONS
M131	COMMONS AREA MECHANICAL PIPING PLAN
M201	MECHANICAL DETAILS
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M301	MECHANICAL CONTROLS SCHEMATICS
M302	MECHANICAL CONTROLS SCHEMATICS
M303	MECHANICAL CONTROLS SCHEMATICS
M304	MECHANICAL CONTROLS SCHEMATICS
M401	MECHANICAL SCHEDULES
M402	MECHANICAL SCHEDULES

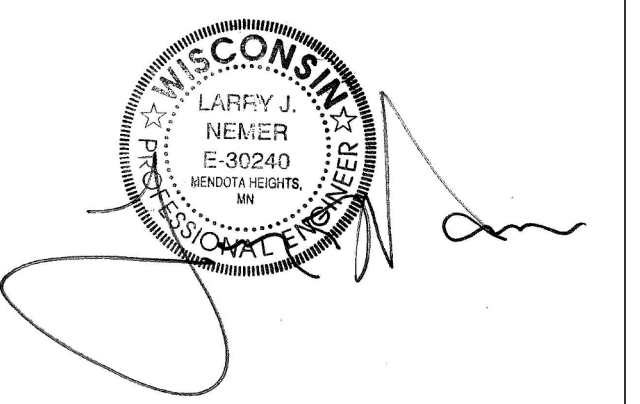
AHU-1

ROOM OR SPACE DESIGNATION	OCCUPANCY CLASSIFICATION	FLOOR AREA (square feet)	ASHRAE STANDARD 62.1-2007						SBS TABLE 364.0403 (VI. CODE)						
			PEOPLE/ 1000 SQ.FT.	# OF OCCUPANTS	EXHAUST RATE (CFM/SQ.FT.)	TOTAL EXHAUST	PEOPLE OUTDOOR AIR RATE (CFM/PERSON)	TOTAL PEOPLE OUTDOOR AIR (CFM)	AREA OUTDOOR AIR RATE (CFM/SQ.F.T.)	TOTAL AREA OUTDOOR AIR (CFM)	TOTAL OUTDOOR AIR REQ'D FOR SPACE (CFM)	PEOPLE/ 1000 SQ.FT.	# OF OCCUPANTS	PEOPLE OUTDOOR AIR RATE (CFM/PERSON)	TOTAL OUTDOOR AIR (CFM)
Classroom 1 #121	Classroom	900	10	30	NR	0	10	300	0.12	108	410	50	30	7.5	225
Classroom 2 #122	Classroom	900	10	30	NR	0	10	300	0.12	108	408	50	30	7.5	225
Classroom 3 #123	Classroom	900	10	30	NR	0	10	300	0.12	108	408	50	30	7.5	225
Circulation #110	Corridors	1500	0	0	NR	0	0	95	0.06	95	0	0	0	7.5	0
Office Space #210	Office Space	1269	5	6	NR	0	5	30	0.06	76	106	7	6	7.5	45
Director Office #213	Office Space	115	5	3	NR	0	5	15	0.06	7	22	7	3	7.5	23
Storage #211	Storage	260	0	0	NR	0	0	0	0.12	31	31	0	0	7.5	0
Lobby #201	Corridors	450	30	4	NR	0	5	20	0.06	27	47	60	0	7.5	0
JC #101**	Janitor Closet	45	NR	NR	0	2	90	0	0	0	0	0	0	7.5	0
Toilet #104**	Restroom	60	NR	1	Fixture	75	75	0	0	0	0	0	0	7.5	0
Toilet #105**	Restroom	60	NR	1	Fixture	75	75	0	0	0	0	0	0	7.5	0
Toilet #202**	Restroom	60	NR	1	Fixture	75	75	0	0	0	0	0	0	7.5	0

TOTAL EXHAUST AIR (CFM)	315			
TOTAL OUTSIDE AIR (CFM)			1528	743

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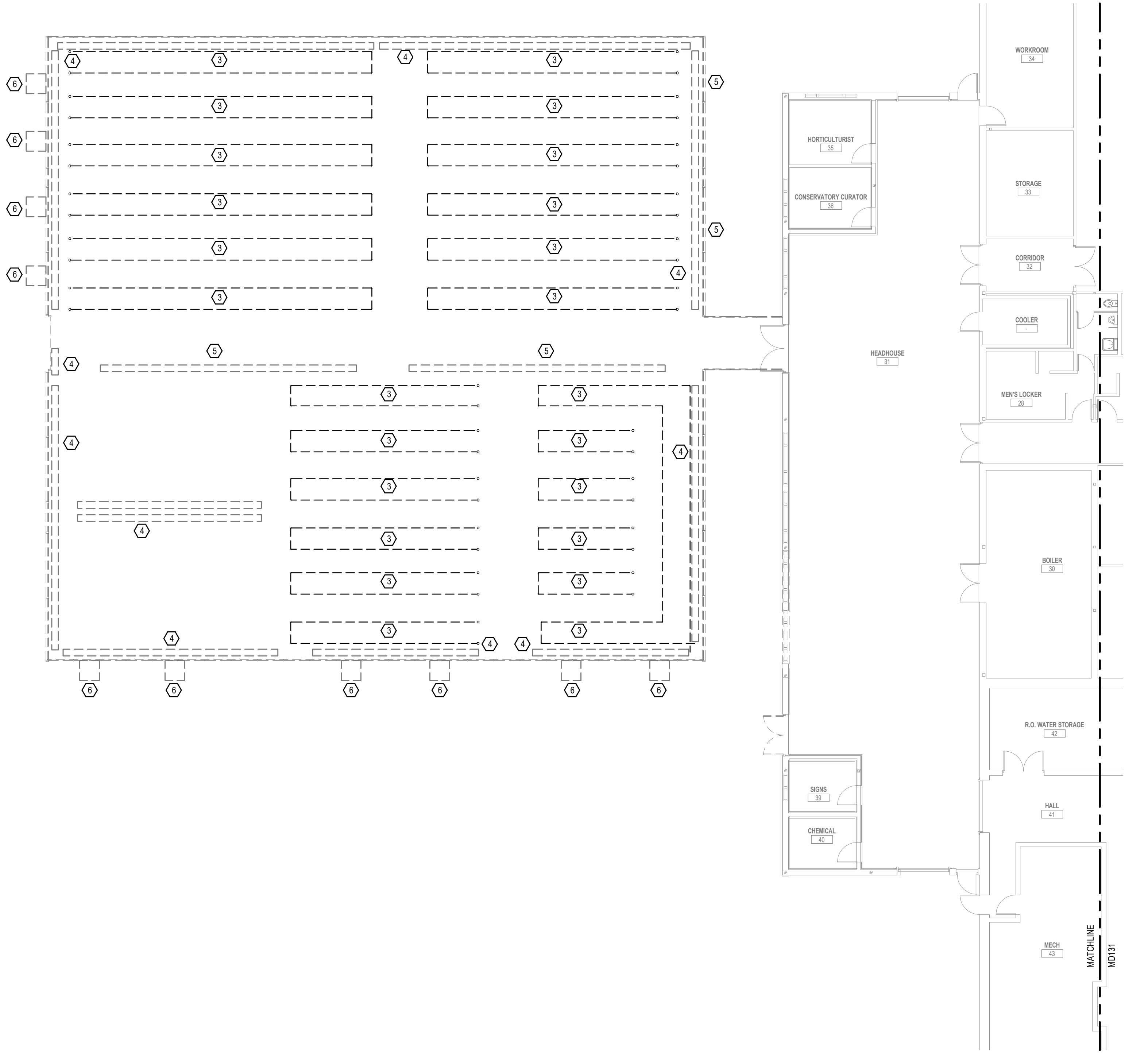
PROJECT NO. 2017016
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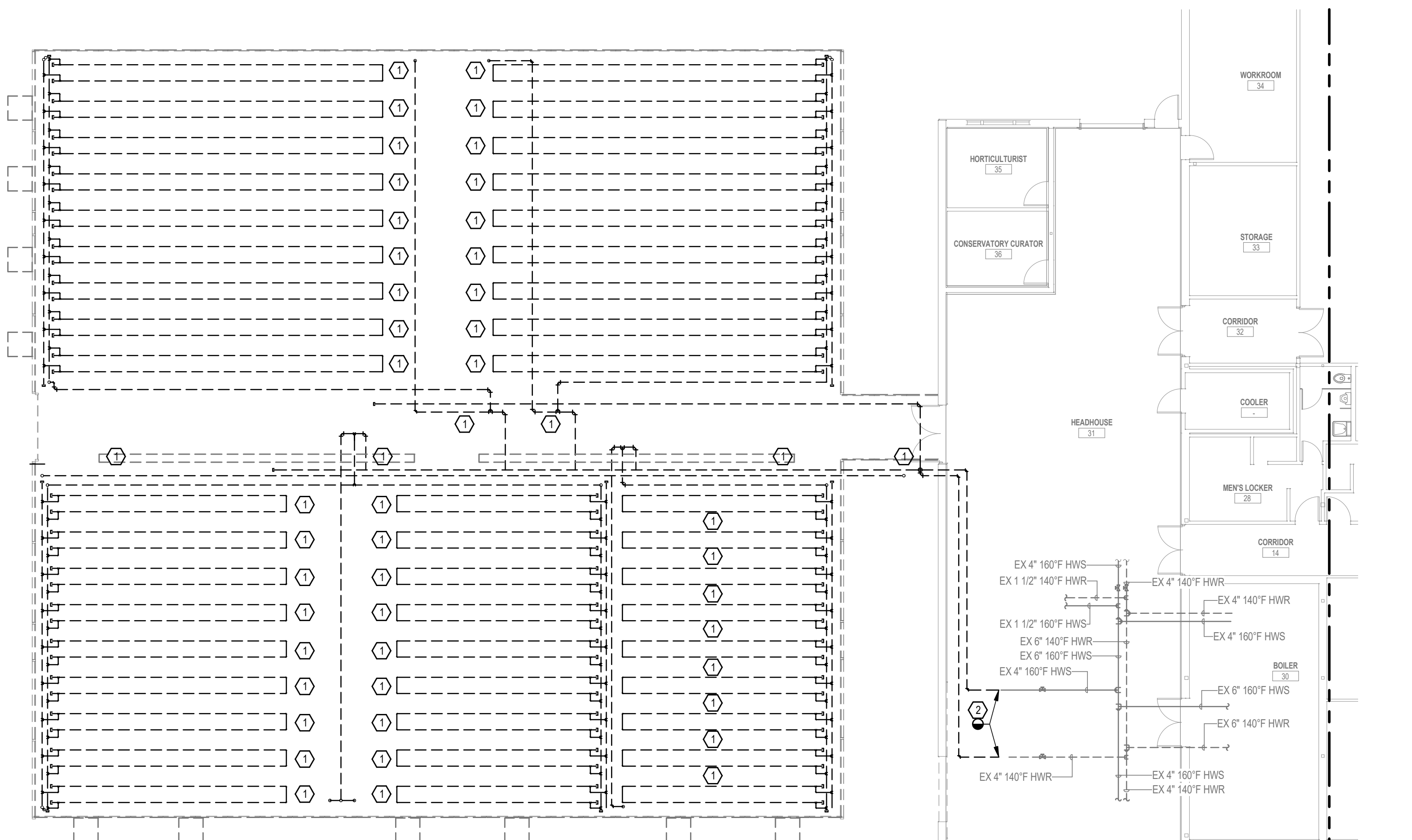
**GREENHOUSE
 MECHANICAL
 PIPING
 DEMOLITION PLAN**
 EXHIBIT J
 MD111

GENERAL NOTES
 A. BOLD DASHED LINES INDICATE EQUIPMENT AND ASSOCIATED COMPONENTS TO BE REMOVED.
 B. FOR MECHANICAL NOTES, LEGENDS AND ABBREVIATION, REFER TO MD01.

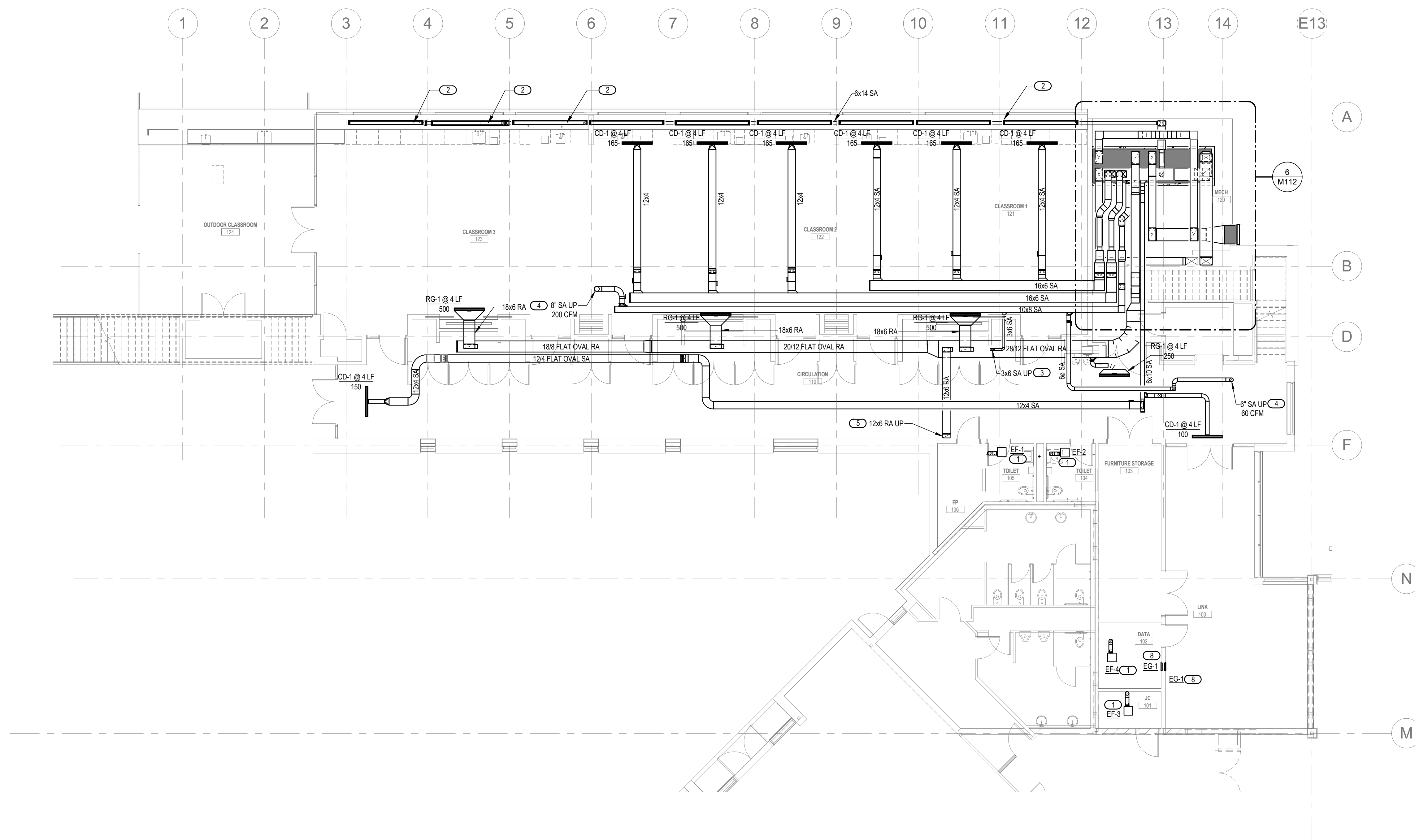
- KEYED NOTES**
- ① EXISTING GREENHOUSE TO BE DEMOLISHED. ALL HVAC PIPING SHALL BE REMOVED. PIPE LOOPS ABOVE BENCHES AT BEAM HEIGHT.
 - ② 4" HWS AND HWR SHALL BE REMOVED BACK TO THIS POINT, AND CAPPED FOR FUTURE USE. SEE NEW PLAN.
 - ③ EXISTING GREENHOUSE TO BE DEMOLISHED. ALL HVAC PIPING SHALL BE REMOVED. PIPE LOOPS BELOW BENCHES.
 - ④ DEMOLISH FIN TUBE RADIATORS AND ASSOCIATED COMPONENTS.
 - ⑤ DEMOLISH EVAPORATIVE COOLERS AND ALL ASSOCIATED COMPONENTS.
 - ⑥ DEMOLISH EXHAUST FANS AND ALL ASSOCIATED COMPONENTS.



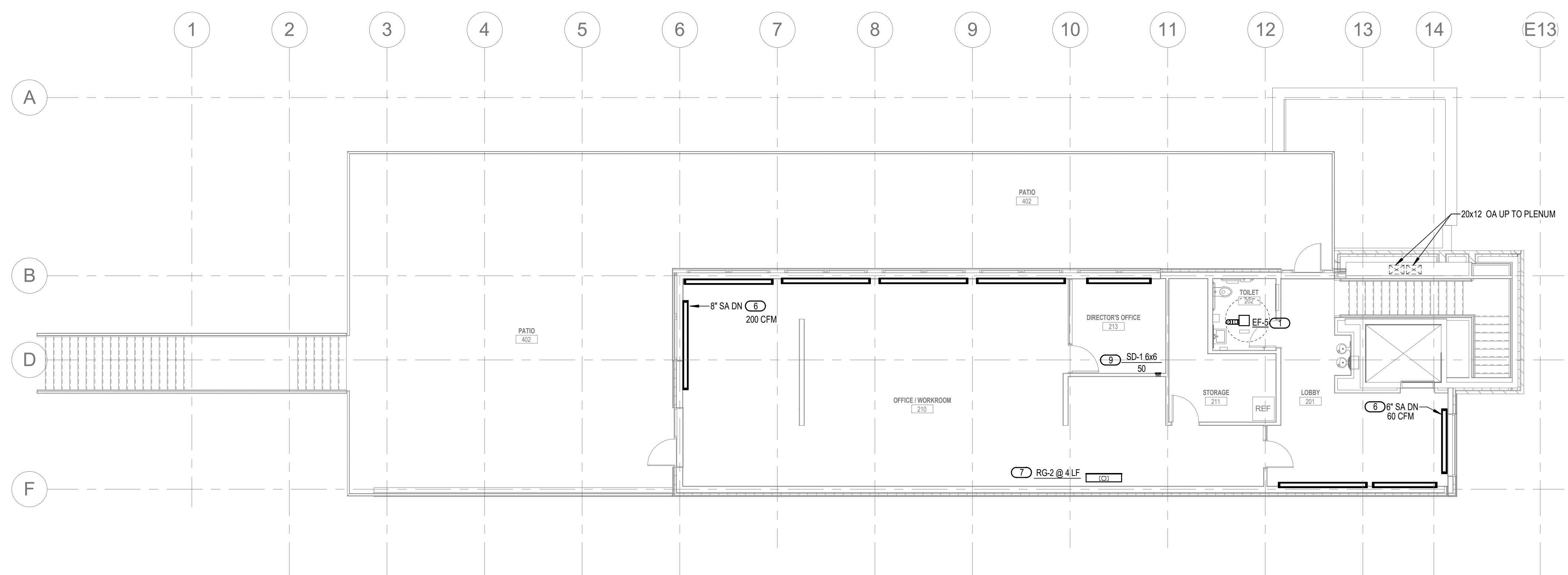
2 LOWER GREENHOUSE MECHANICAL PIPING DEMOLITION PLAN
 3/32" = 1'-0"



1 UPPER GREENHOUSE MECHANICAL PIPING DEMOLITION PLAN
 3/32" = 1'-0"



1 LEARNING CENTER MECHANICAL DUCT PLAN LEVEL 1
1/8" = 1'-0"



2 LEARNING CENTER MECHANICAL DUCT PLAN LEVEL 2
1/8" = 1'-0"

GENERAL NOTES

A. FOR MECHANICAL NOTES, LEGENDS AND ABBREVIATION, REFER TO M101.

KEYED NOTES

- 1 EXHAUST FAN SHALL BE PROVIDED WITH GOOSENECK TERMINATION AT ROOF. PROVIDE BIRD SCREEN.
- 2 ROUTE SUPPLY AIR DUCTWORK IN WALL CAVITY. SUPPLY AIR DUCTWORK, 165 CFM. SHALL CONNECT TO ALL RFG-1D IN CLASSROOM 3. EACH RFG-1D SHALL HAVE 8" DIAMETER INLET. SEE ALSO M102.
- 3 ROUTE SUPPLY AIR DUCTWORK IN RAISED FLOOR CAVITY. 3x6 SUPPLY AIR DUCTWORK SHALL CONNECT TO RFC ABOVE.
- 4 ROUTE SUPPLY AIR DUCTWORK UP TO RFC ABOVE. SEE 2/M101 FOR CONTINUATION. SEE ALSO M102.
- 5 ROUTE RETURN AIR DUCTWORK UP. SEE 2/M101 FOR CONTINUATION.
- 6 CONNECT SUPPLY DUCTWORK TO RFC.
- 7 RETURN GRILLE SET VERTICALLY AT TOE SPACE. SEE ARCHITECTURAL PLAN. CONNECT 8" RETURN DUCTWORK TO RG-2.
- 8 PROVIDE GRILLE AT LINK SIDE OF WALL, HIGH. CONNECT TO GRILLE ON DATA ROOM SIDE, LOW. WITH 8"x3" DUCT IN STUD SPACE.
- 9 INSTALL 6x6 SA DIFFUSER IN WALL, APPROXIMATELY 8" ABOVE FINISHED FLOOR. ANGLE BLADES TO OBSTRUCT VIEW INTO DUCT.

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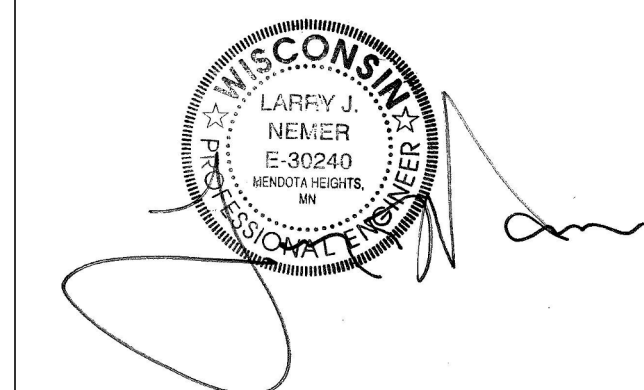
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PROJECT NO. 2017016

PROJECT PHASE BID DOCUMENTS

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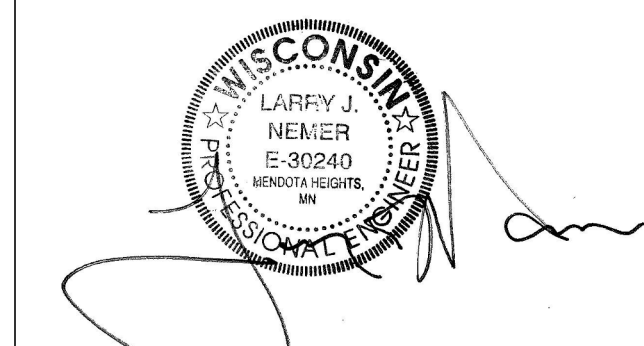
LEARNING CENTER
MECHANICAL
DUCTWORK PLAN

EXHIBIT J
M101

Drawing: 2017 Copyright: West, Shreve & Reynolds, LLC 10/25/2018 11:48 AM C:\Users\larry.nemer\Documents\1017016\1017016_M101.dwg LARRY NEMER

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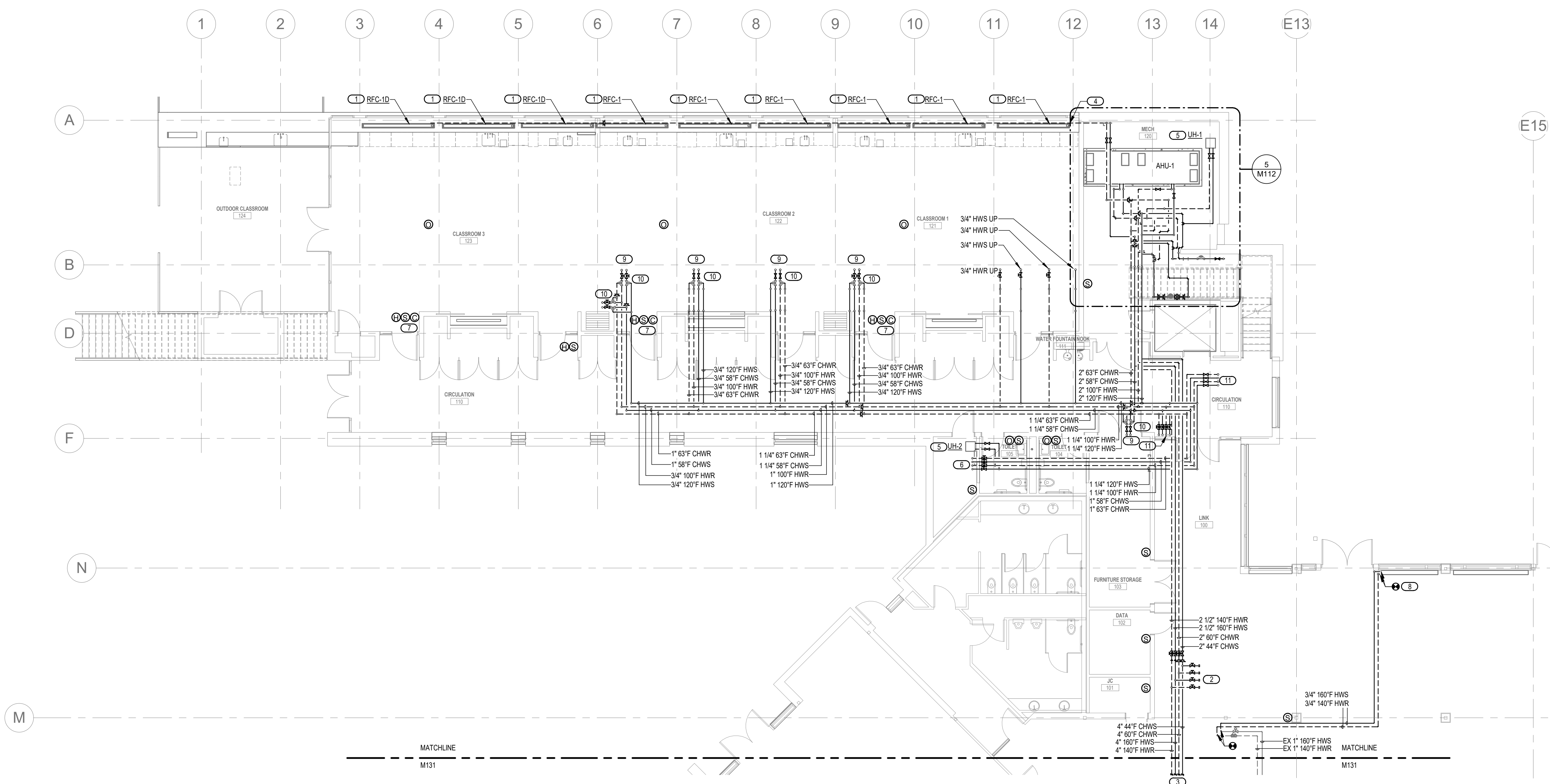
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**LEARNING CENTER
 MECHANICAL
 PIPING PLAN**

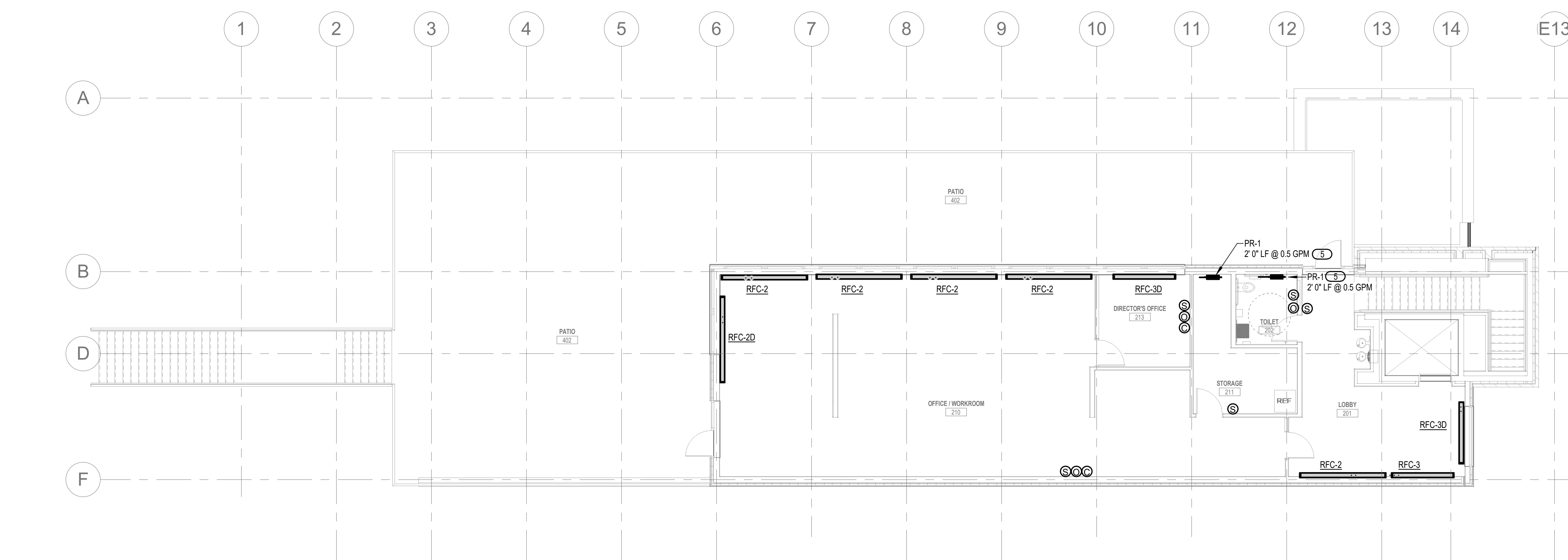
**EXHIBIT J
 M102**



- GENERAL NOTES**
- FOR MECHANICAL NOTES, LEGENDS AND ABBREVIATION, REFER TO M001.
- KEYED NOTES**
- ROUTE 3/4" CHWS, 3/4" CHWR PIPE TO RECESSED FAN COIL UNIT. SEE ALSO 2/M102.
 - 3" HWS, 3" HWR, 3" CHWS, AND 3" CHWR FOR FUTURE EXPANSION. PIPING SHALL BE CAPPED AND VALVED.
 - REFER TO COMMONS AREA MECHANICAL PIPING PLAN, M131, FOR CONTINUATION.
 - ROUTE 1 1/2" CHWS, AND 1 1/2" CHWR IN WALL CAVITY.
 - UH-1, UH-2, PR-1, AND PR-2 SHALL BE PIPED PER DETAIL 10/M202 & 8/M201.
 - ROUTE 1" HWS, 1" HWR, 1" CHWS, 1" CHWR PIPE DOWN TO RADIANT MANIFOLD.
 - MOUNT THERMOSTAT, HUMIDITY SENSOR, AND CO2 SENSOR ON WALL.
 - ROUTE HWS AND HWR DOWN IN DOOR COLUMN. SEE ARCHITECTURAL DETAIL. CONNECT TO EXISTING FIN TUBE RADIATION SUPPLY AND RETURN IN THIS AREA, CUT DURING DEMOLITION PHASE.
 - ROUTE 3/4" CHWS/HWS AND 3/4" CHWR/HWR PIPE TO RECESSED FAN COIL UNIT. ABOVE. SEE ALSO 2/M102.
 - CONTRACTOR SHALL CONVERT 4-PIPE SYSTEM INTO 2-PIPE SYSTEM VIA 3-WAY MODULATING VALVE. REFER TO CONTROLS SCHEMATIC 3/M303.
 - ROUTE 3/4" HWS, 3/4" HWR, 3/4" CHWS, 3/4" CHWR PIPE TO RECESSED FAN COIL UNIT. SEE ALSO 2/M102.

1 LEARNING CENTER MECHANICAL PIPING PLAN LEVEL 1

1/8" = 1'-0"

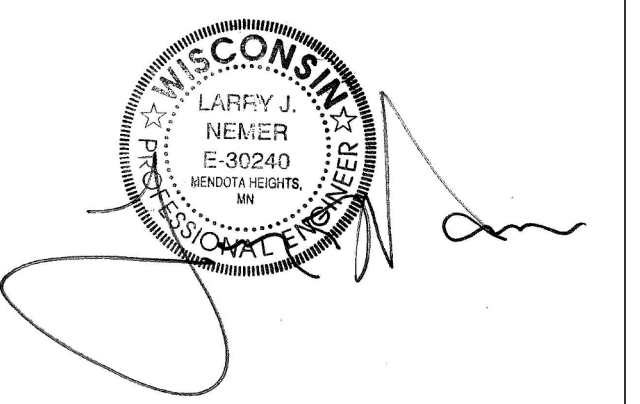


2 LEARNING CENTER MECHANICAL PIPING PLAN LEVEL 2

1/8" = 1'-0"

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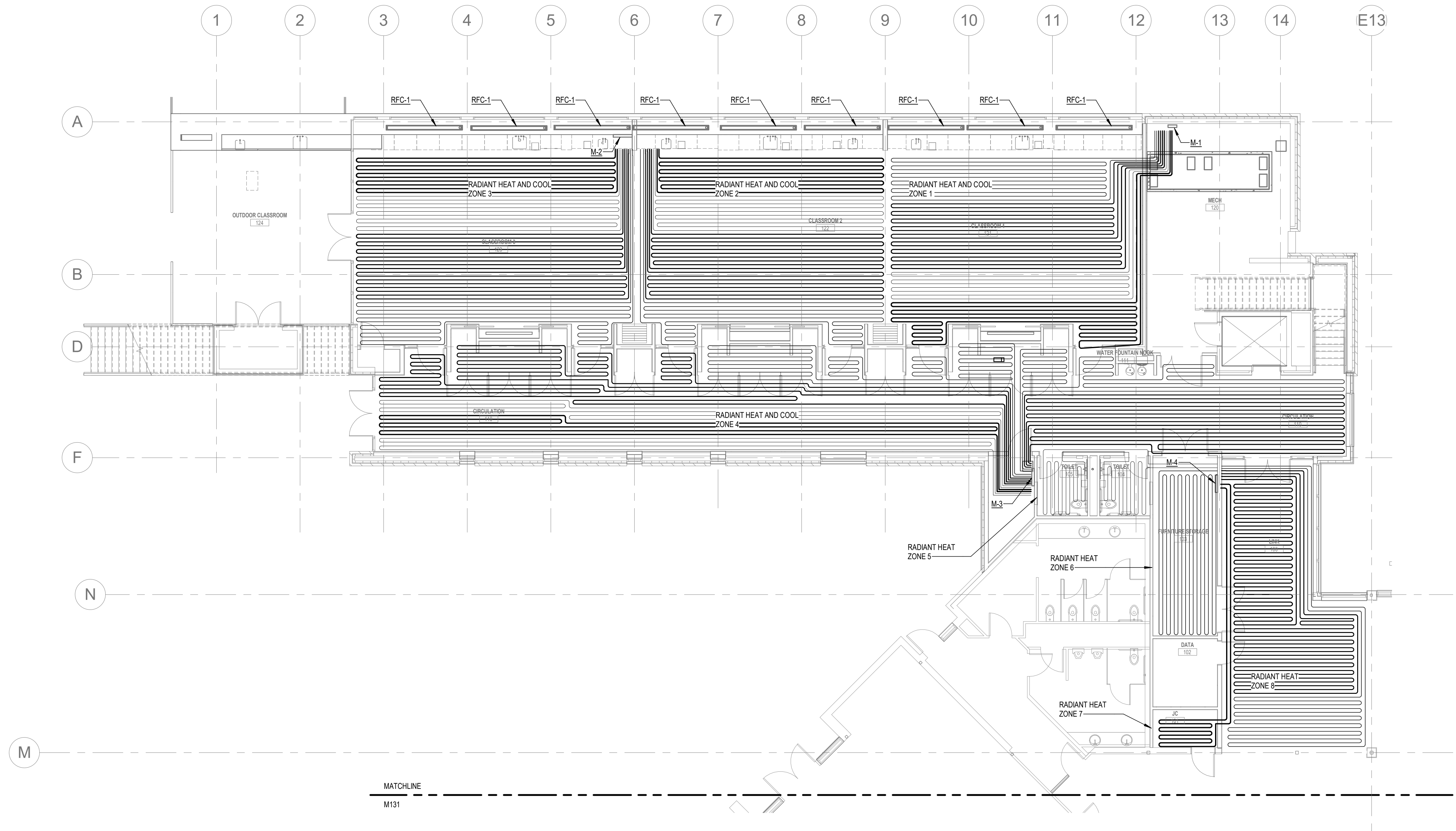
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**LEARNING CENTER
 RADIANT HEAT AND COOL**

**EXHIBIT J
 M103**



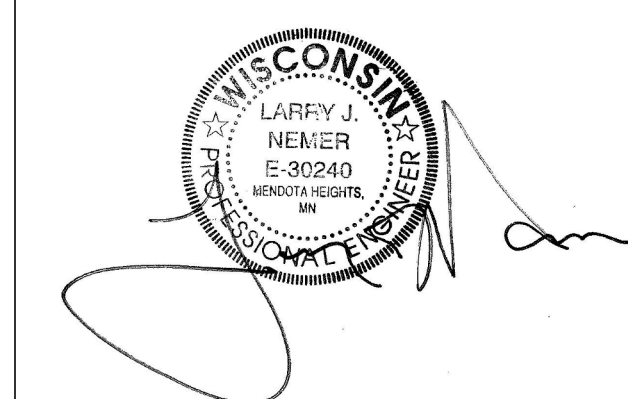
GENERAL NOTES
 A. COORDINATE WITH ELECTRICAL, PLUMBING AND OTHER TRADES.
 B. FOR MECHANICAL NOTES, LEGENDS AND ABBREVIATION, REFER TO M001.

1 LEARNING CENTER RADIANT HEAT AND COOL
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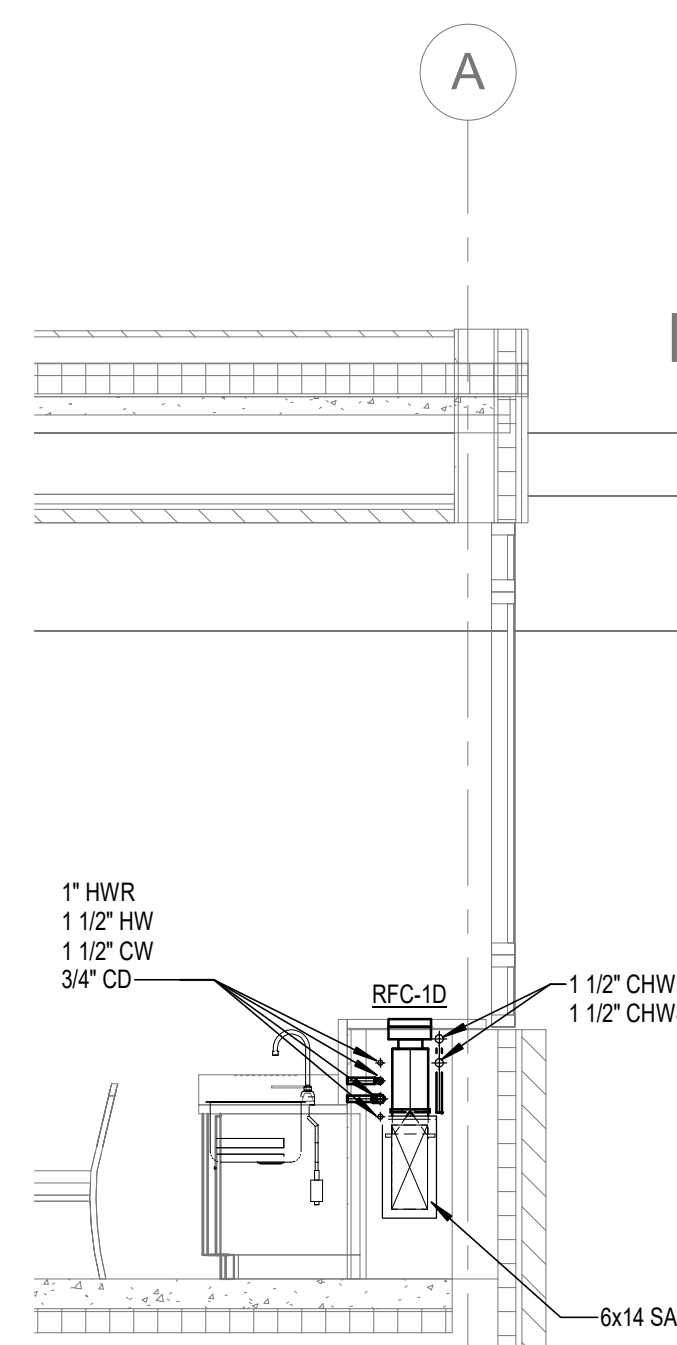
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06.04.2018	PERMIT ISSUE

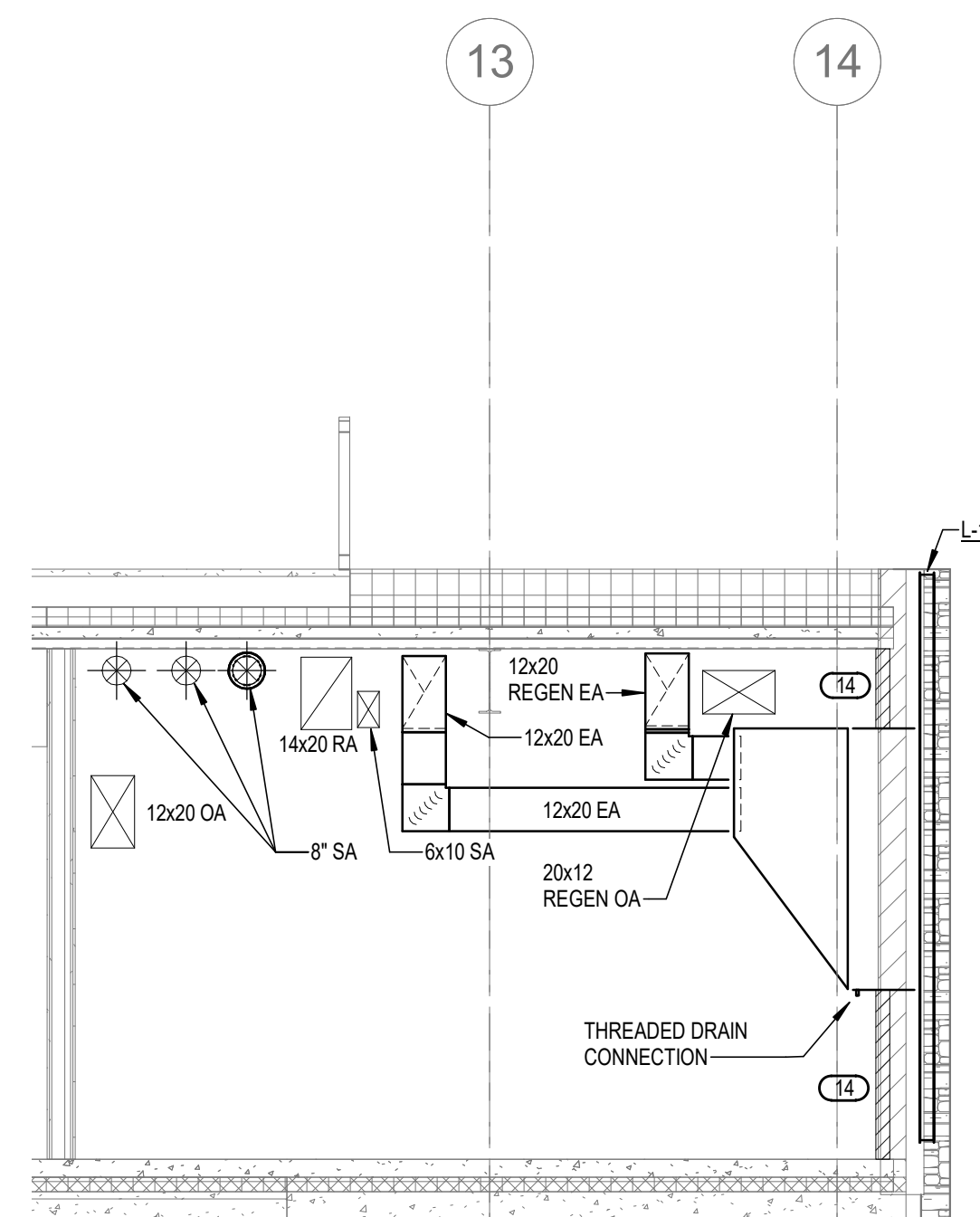
PROJECT NO. 2017016
 PROJECT PHASE BID DOCUMENTS
 DRAWN BY: MSR CHECKED BY: MSR
 Design 2017 Copyright West, Shover & Rosenthal, Ltd.

ENLARGED PLANS
 AND SECTIONS

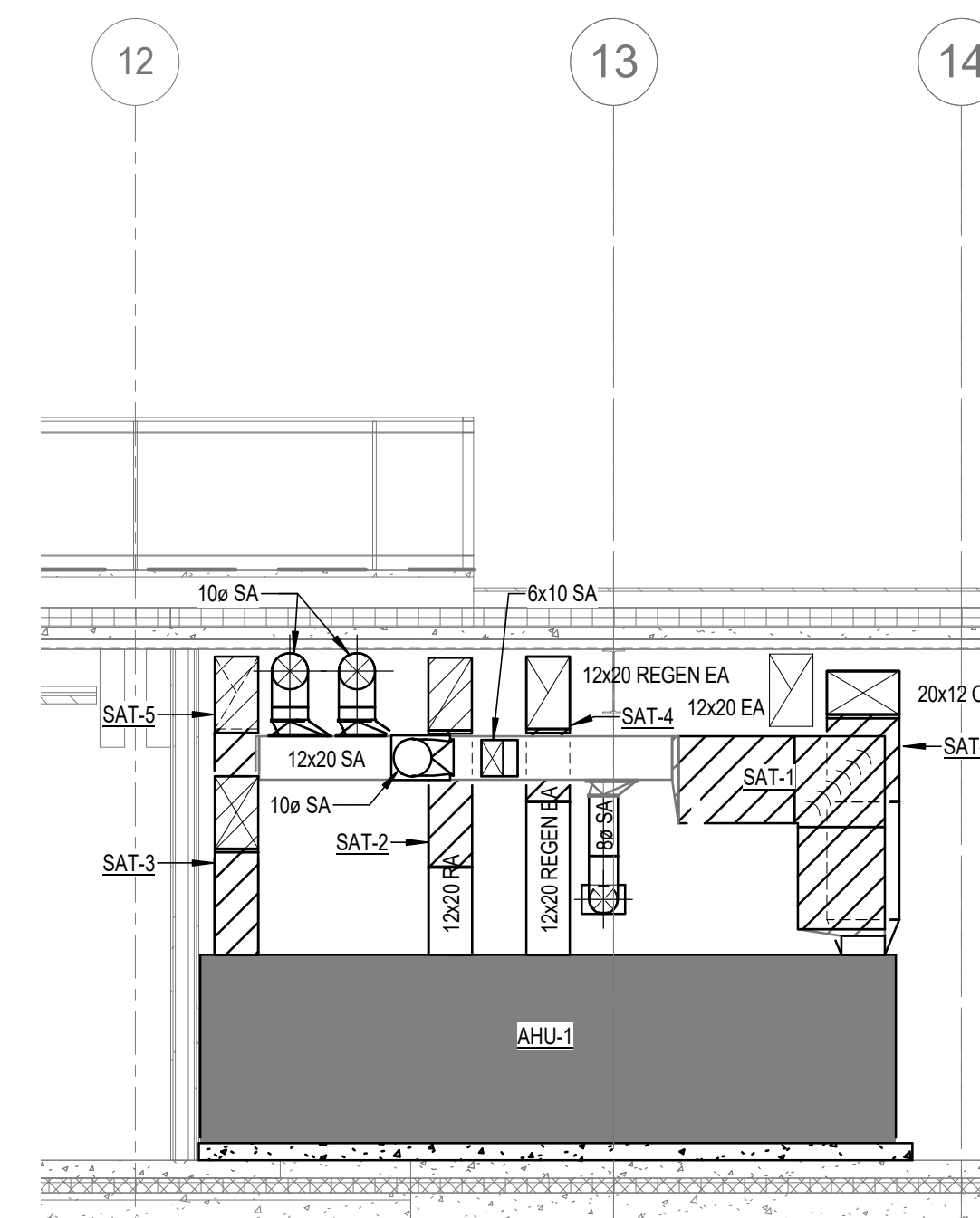
EXHIBIT J
M112



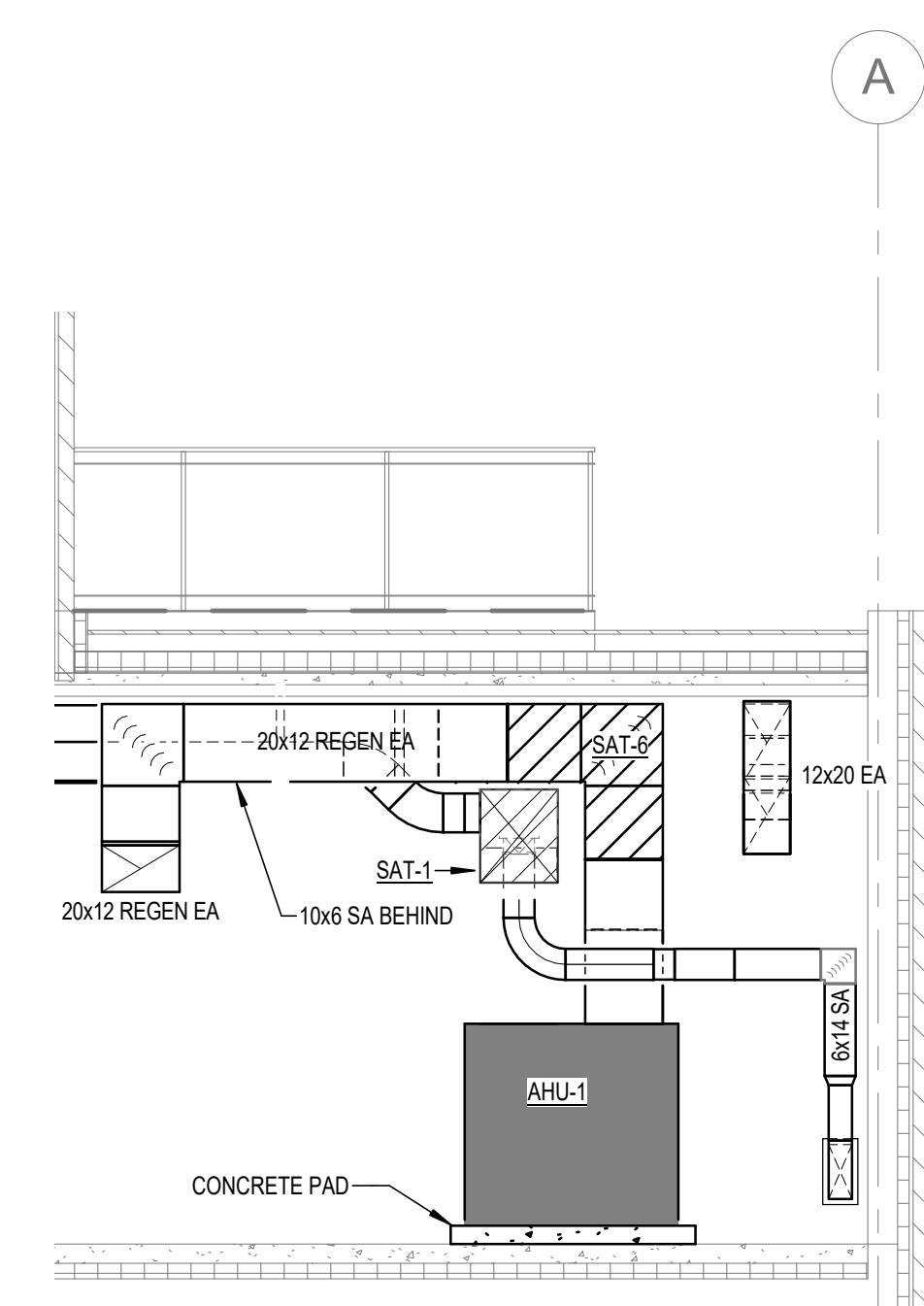
4 LEARNING CENTER WALL CAVITY DETAIL- LEVEL 1
 3/8" = 1'-0"



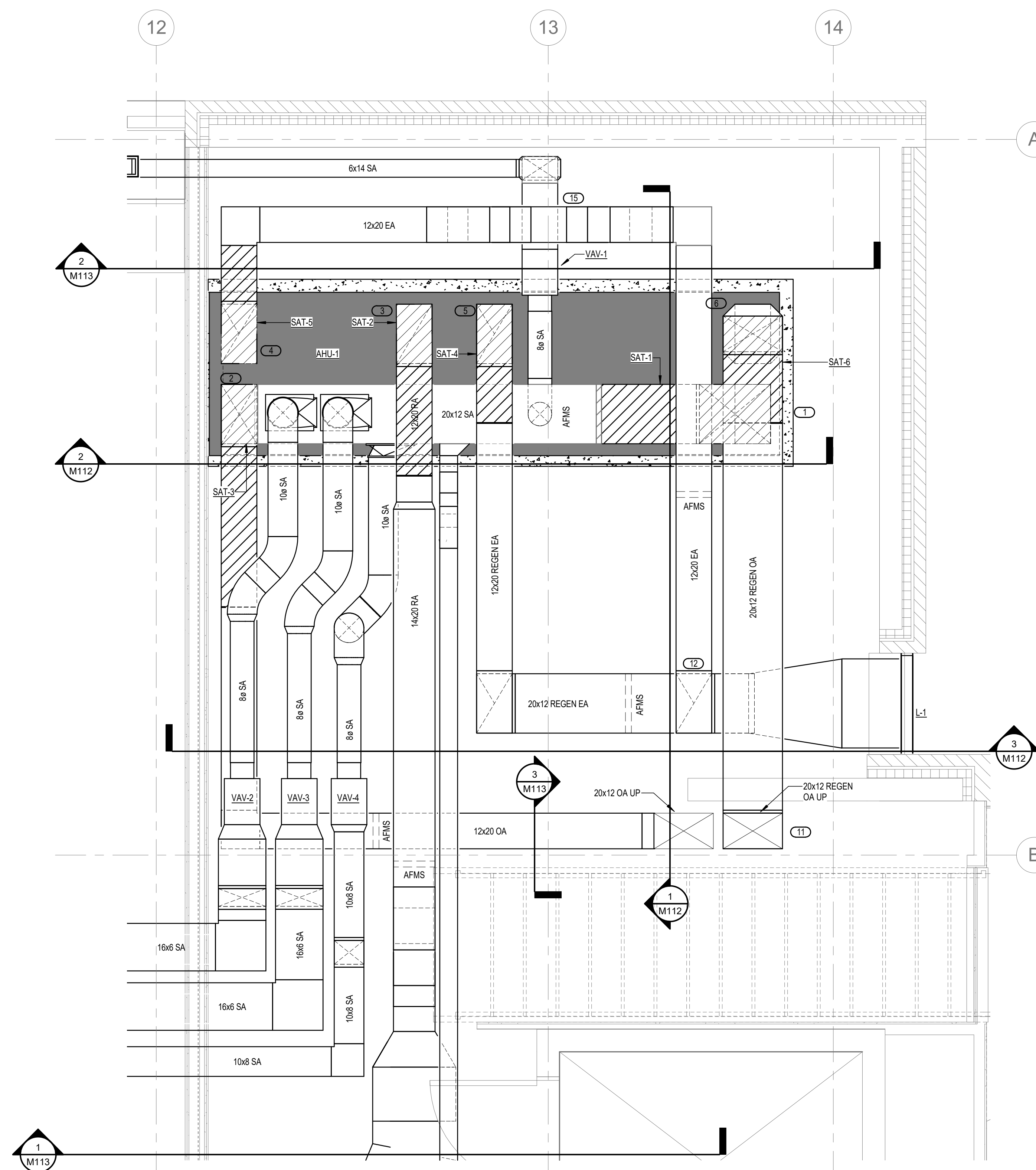
3 MECH. ROOM SECTION VIEW 3
 1/4" = 1'-0"



2 MECH. ROOM SECTION VIEW 2
 1/4" = 1'-0"



1 MECH. ROOM SECTION VIEW 1
 1/4" = 1'-0"

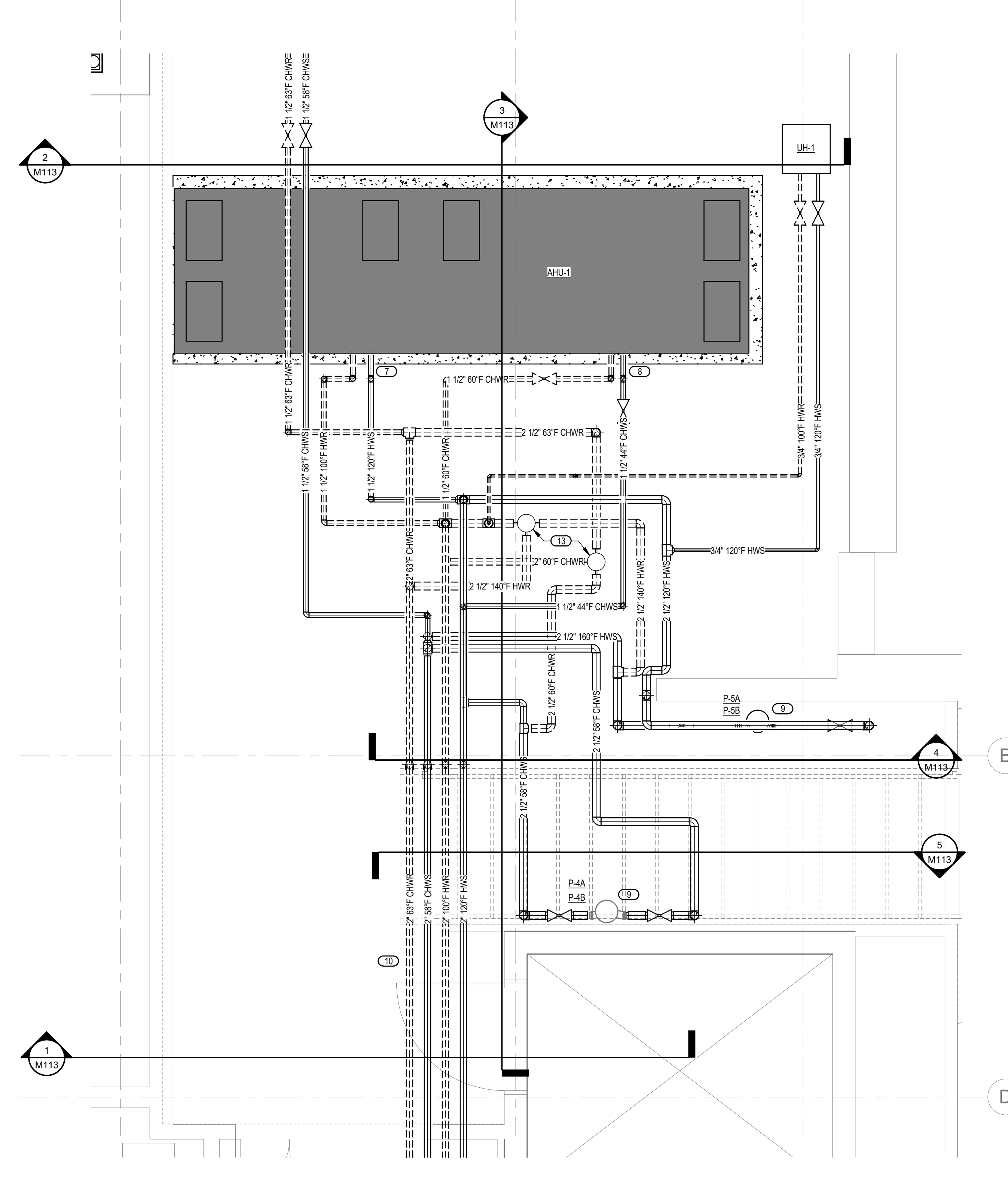


6 DUCTWORK ENLARGED PLAN
 1/2" = 1'-0"

GENERAL NOTES

- ALL PIPING IN MECHANICAL ROOM SHALL BE HUNG WITH VIBRATION ISOLATION. REFER TO SPECIFICATIONS.
- ALL DUCTWORK IN MECHANICAL ROOM SHALL BE HUNG WITH VIBRATION ISOLATION. REFER TO SPECIFICATIONS.

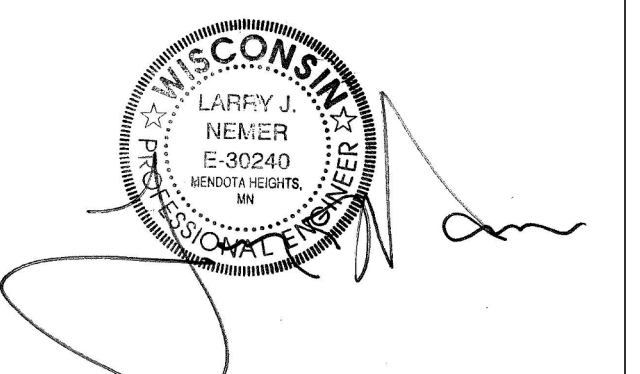
- KEYED NOTES**
- 12x20 SUPPLY AIR INLET TO AHU-1.
 - 12x20 OUTDOOR AIR INLET TO AHU-1.
 - 12x20 RETURN AIR INLET TO AHU-1.
 - 12x20 EXHAUST AIR INLET TO AHU-1.
 - 12x20 REGENERATION EA INLET TO AHU-1.
 - 12x20 REGENERATION OA INLET TO AHU-1.
 - 1 1/2" HWS AND 1 1/2" CHWR DOWN TO AHU-1 HEATING COIL. HEATING COIL SHALL BE PIPED PER DETAIL 6/M202.
 - 1 1/2" CHWS AND 1 1/2" CHWR DOWN TO AHU-1 POST-COOLING COIL. AHU-1 DX AND CHILLED WATER COILS SHALL BE PROVIDED WITH POSITIVE PRESSURE CONDENSATE DRAIN. REFER TO DETAIL 9/M201.
 - REFER TO DETAIL 1/M202 FOR P-4A, P-4B, P-5A, AND P-5B PIPING AND STRUCTURAL SUPPORT.
 - REFER TO SECTION 1/M113 FOR PIPING ARRANGEMENT.
 - DUCT UP, BEYOND DAMPERS SHOWN SHALL BE CONSIDERED IN ATTIC SPACE FOR PURPOSE OF INSULATION. REFER TO SPECIFICATIONS.
 - ROUTE 20x12 EA DUCT BELOW 20x12 REGEN EA DUCT.
 - 3-WAY MIXING VALVE, SEE CONTROL SCHEMATICS.
 - BLANK OFF APPROXIMATELY 30x22 AREA AT TOP OF LOUVER, AND APPROXIMATELY 30x46 AREA AT BOTTOM OF LOUVER, WITH 2" RIGID INSULATION.
 - ROUTE EXHAUST DUCT UNDER STRUCTURAL BEAM. SEE DETAIL 5/M113.



5 PIPING ENLARGED PLAN
 1/2" = 1'-0"

**Olbrich Botanical Gardens
 Expansion Phase 1**
 BPW Project #8162
 3330 Atwood Avenue
 Madison, WI 53704

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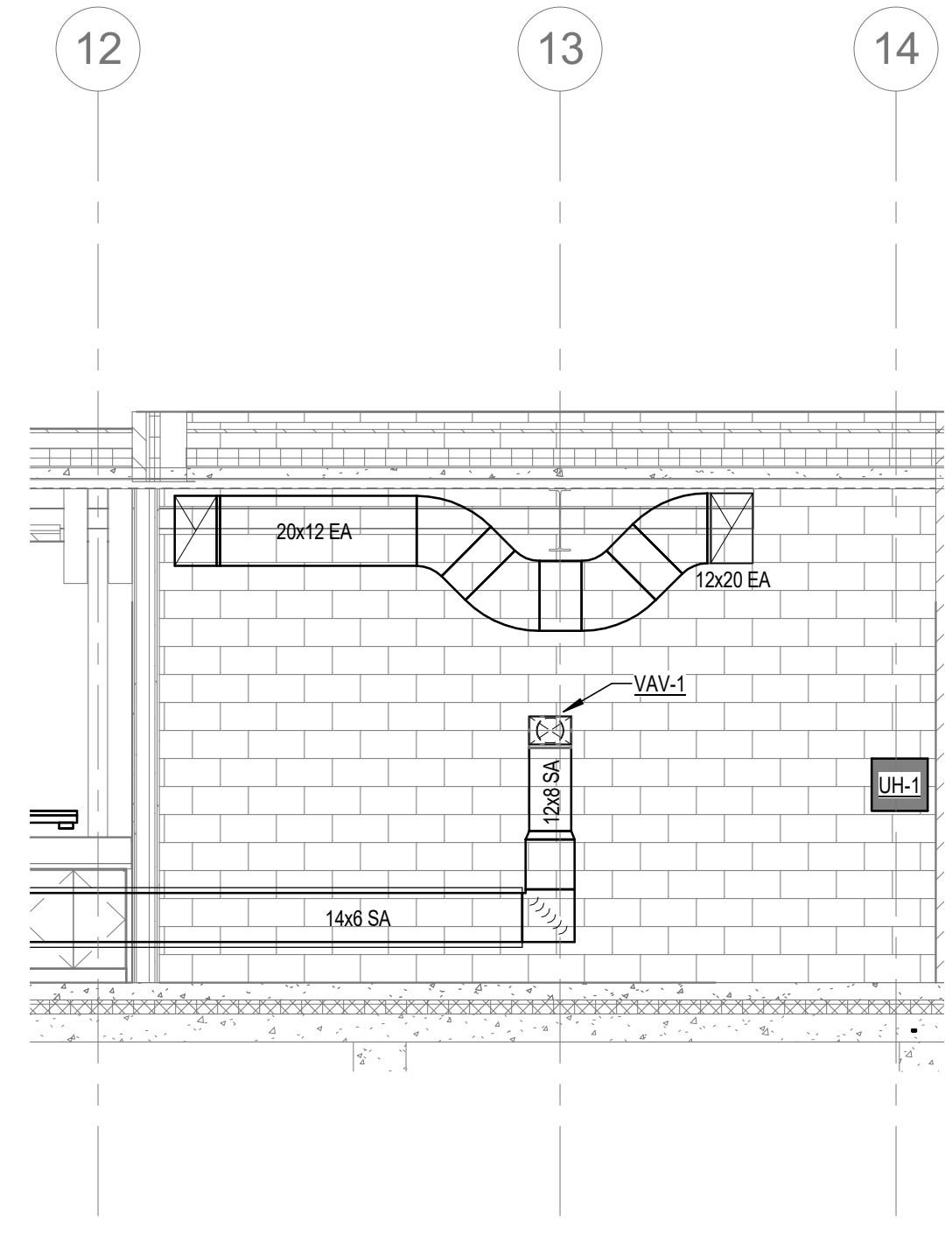
Signature: _____
 Print Names: Larry Nemer
 Date: JUNE 4, 2018 License No.: E-30240

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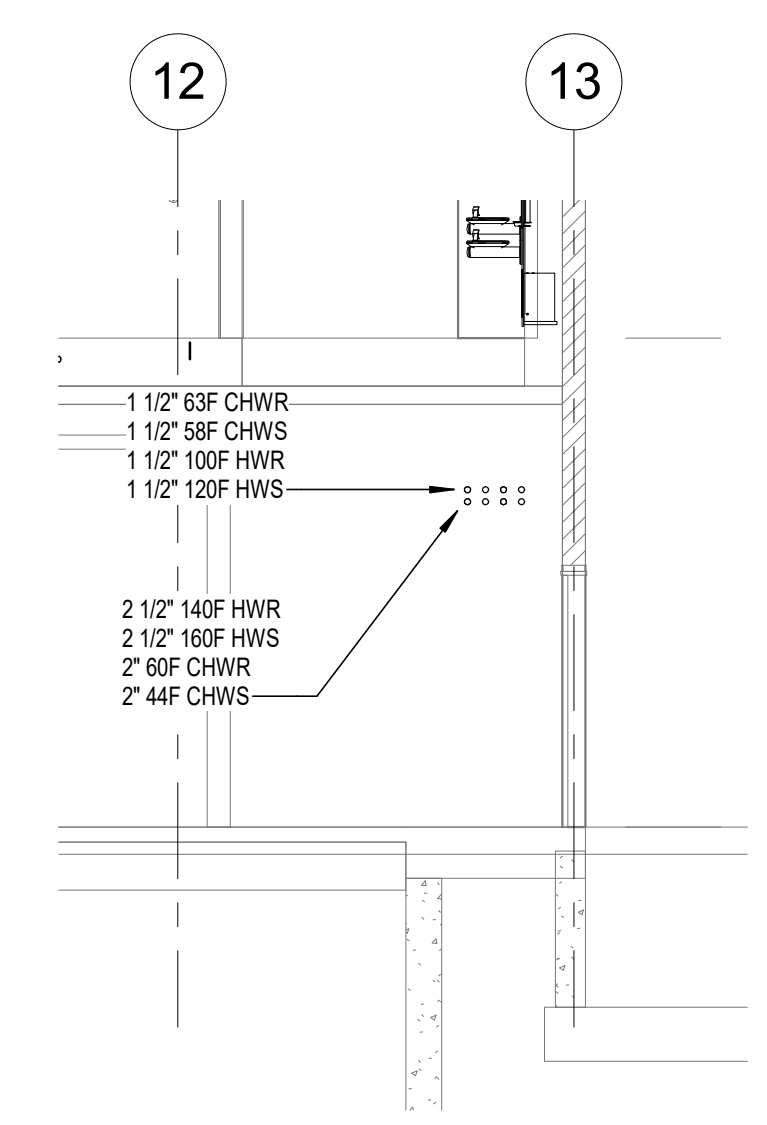
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**ENLARGED PLANS
 AND SECTIONS**

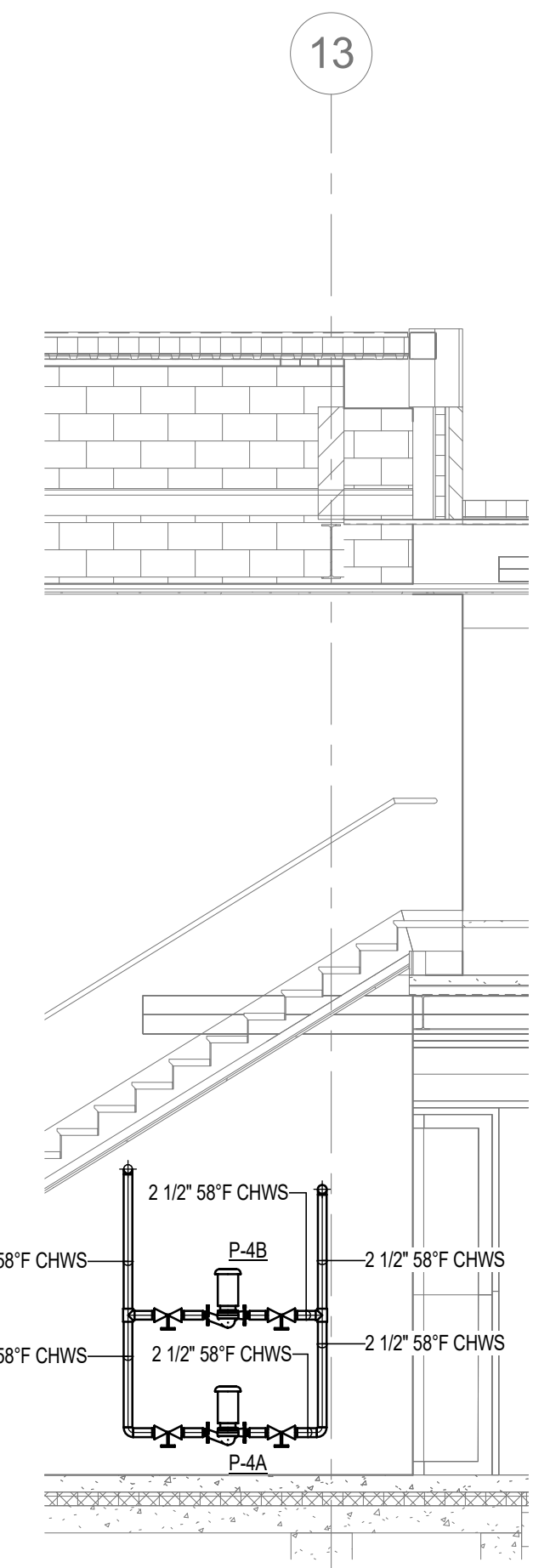
**EXHIBIT J
 M113**



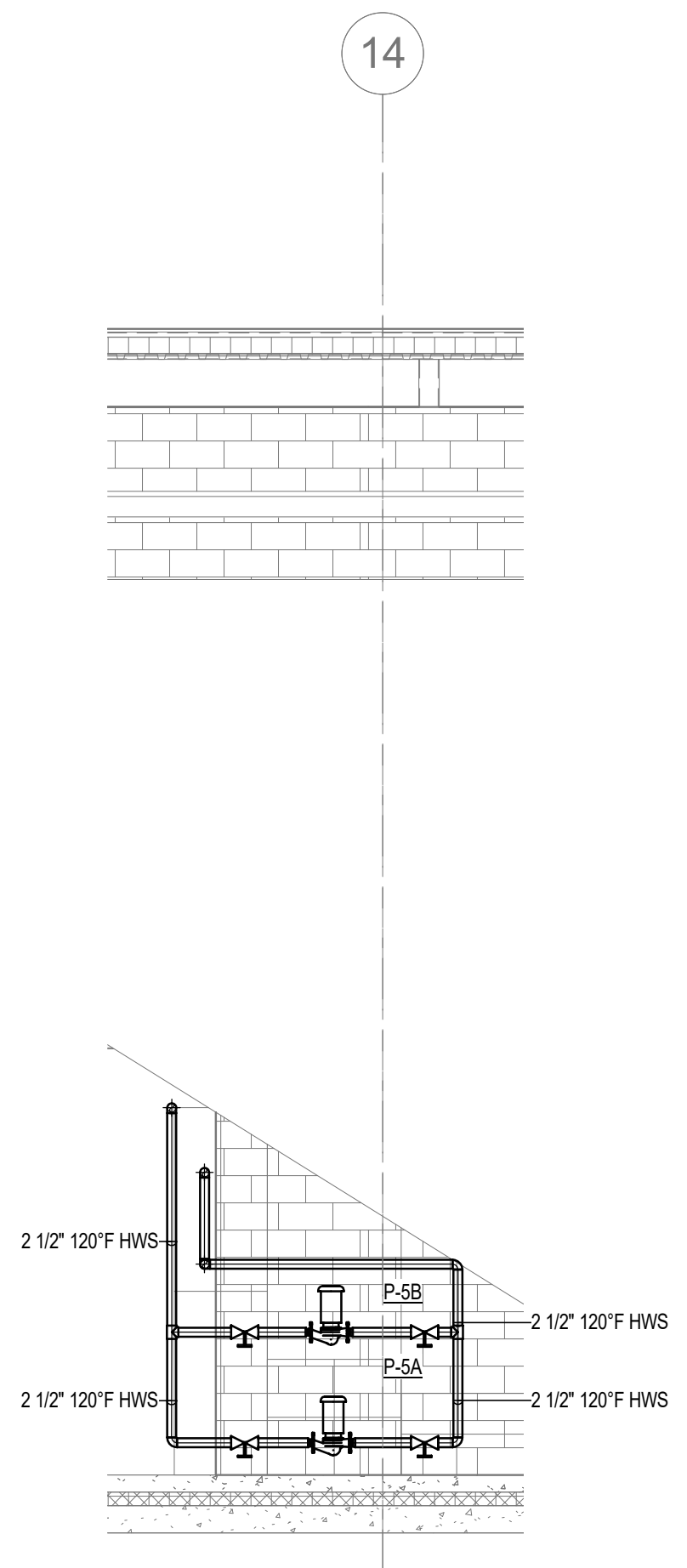
2 MECH. ROOM SECTION VIEW 5
 1/4" = 1'-0"



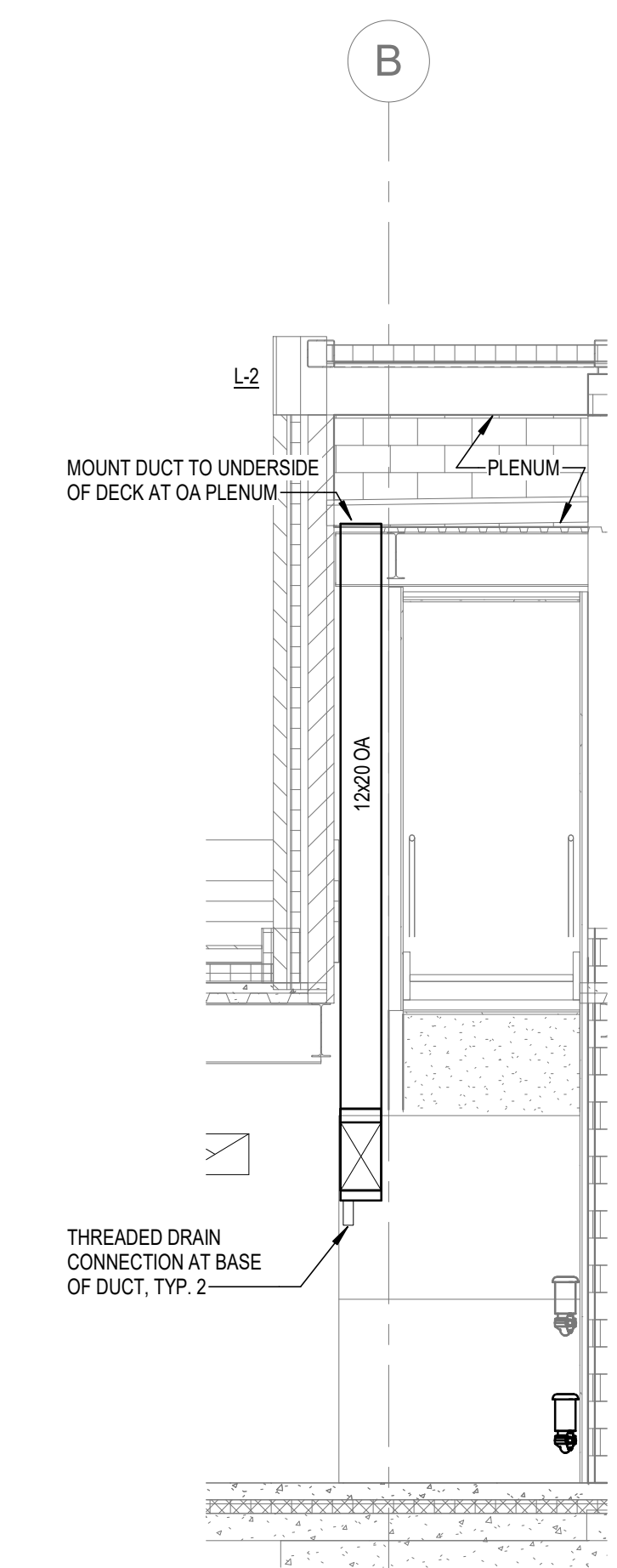
1 MECHANICAL SECTION VIEW 4
 3/16" = 1'-0"



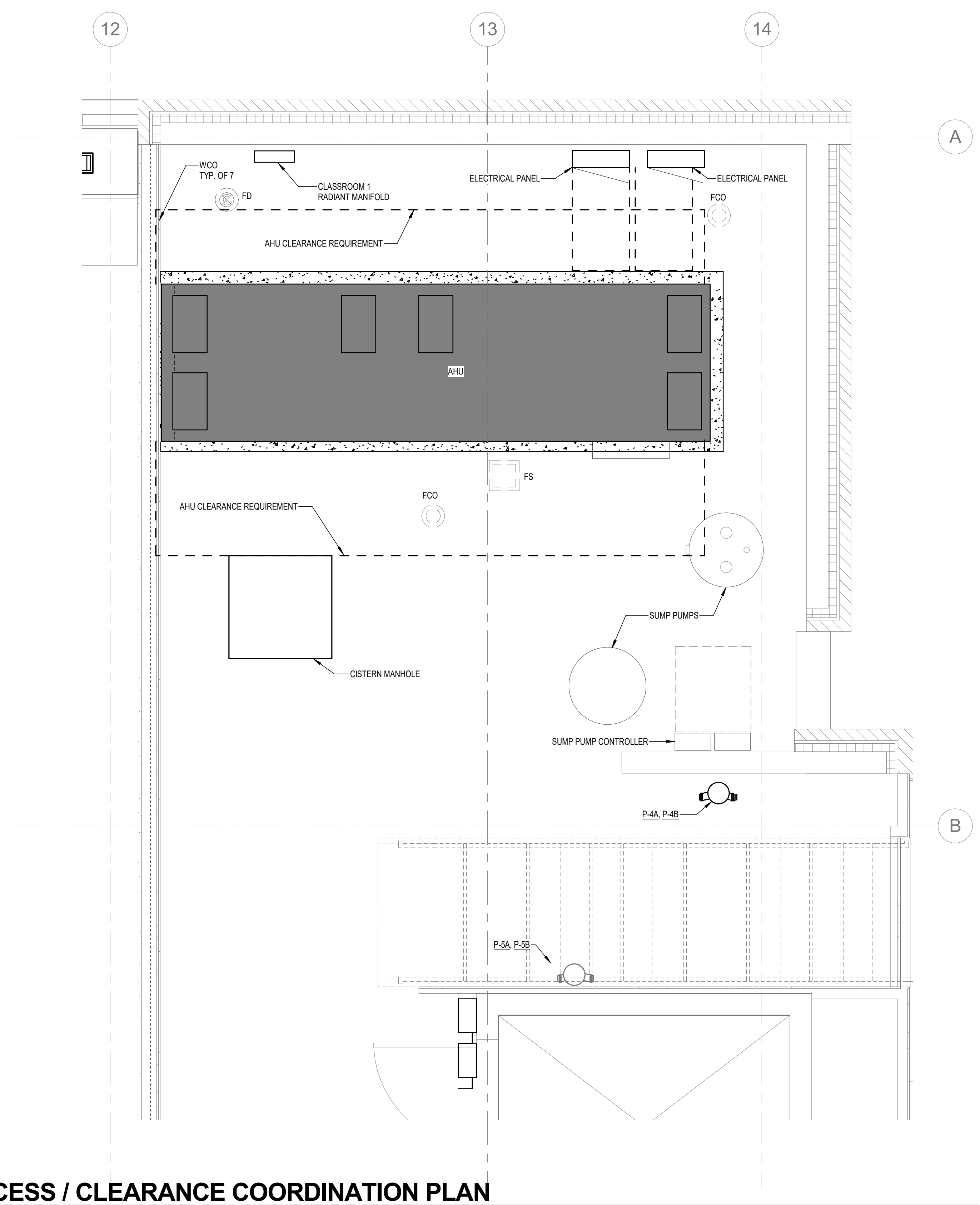
5 MECH. ROOM SECTION VIEW 8
 1/4" = 1'-0"



4 MECH. ROOM SECTION VIEW 7
 1/4" = 1'-0"

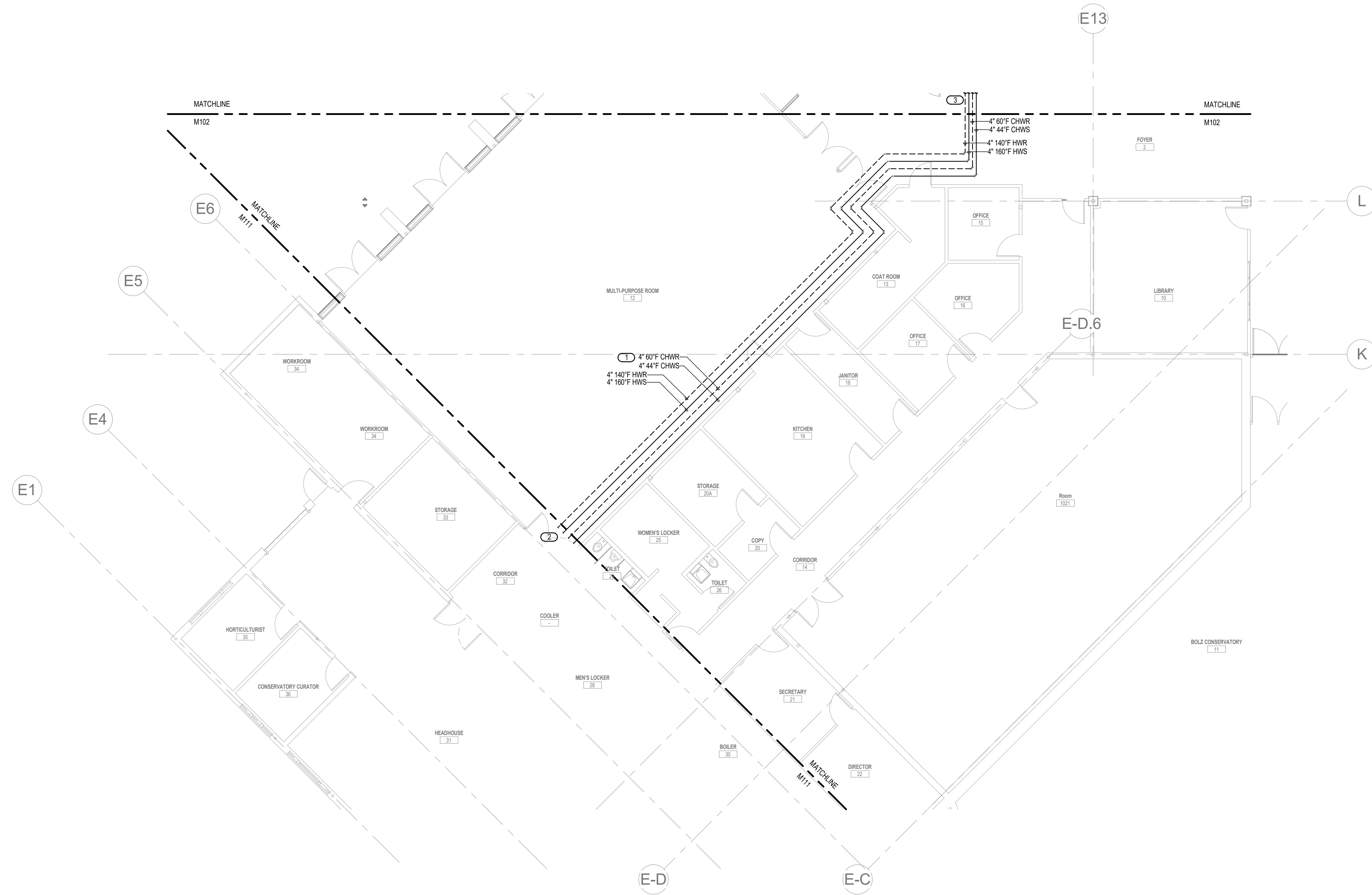


3 MECH. ROOM SECTION VIEW 6
 1/4" = 1'-0"



6 ACCESS / CLEARANCE COORDINATION PLAN
 1/2" = 1'-0"

Drawing: 2017 Copyright: Nemer, Scherer & Rasmussen, LLC 10/25/2018 11:48:00 AM C:\Nemer\olbrichbotanicalgardens\101002-0217016-M113.dwg Plot: 10/25/2018 11:48:00 AM



GENERAL NOTES

1. FOR MECHANICAL NOTES, LEGENDS AND ABBREVIATION, REFER TO M001.

KEYED NOTES

① NEW PIPING TO BE INSTALLED IN CEILING/CATWALK AREA ABOVE COMMONS. COORDINATE WITH OWNER NEEDS FOR ACCESS IN THIS AREA. COORDINATE WITH PLUMBING CONTRACTOR FOR ADDITIONAL PIPING IN THIS AREA.

② REFER TO M111 FOR CONTINUATION.

③ REFER TO M102 FOR CONTINUATION.

1 COMMONS AREA MECHANICAL PIPING
1/8" = 1'-0"

MSR 710 South 2nd Street, 8th Floor
Minneapolis, Minnesota 55401-2282
Architecture 612.375.0336 tel
Interiors and 612.342.2216 fax
Urban Design www.msrdesign.com

Civil Engineer
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999 Fournier Drive, Suite 201
Madison, WI 53717
608.828.0532 tel

Landscape Architect
Ken Saiki Design, Inc.
303 South Paterson Street, Suite 1
Madison, WI 53703
608.251.3600 tel

Structural Engineer, Technology and AV
IMEG Corp.
1800 Deming Way, Suite 200
Middleton, WI 53562
608.223.9600 tel

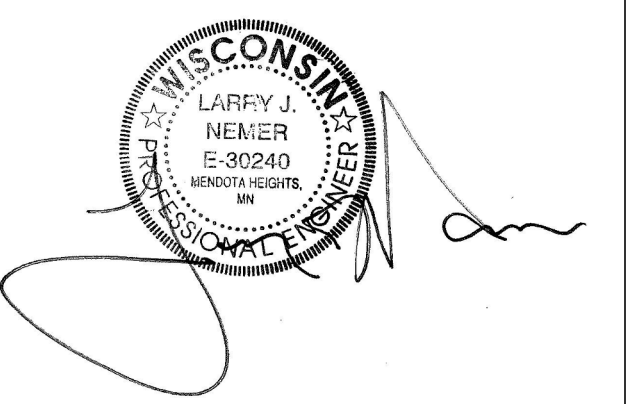
MEP Engineer
MEP Associates, LLC
860 Blue Garden Road, Suite 175
Eagan, MN 55121
651.379.9120 tel

Fire Protection Engineer and Code Consultant
Summit Fire Consulting
575 Minnehaha Ave West
St. Paul, MN 55103
651.251.1880 tel

Greenhouse Design
Rough Brothers, Inc.
5513 Vine Street
Cincinnati, OH 45217
513.242.0310 tel

**Olbrich Botanical Gardens
Expansion Phase 1**
BPW Project #8162
3330 Atwood Avenue
Madison, WI 53704

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ENGINEER SEAL



Signature: _____
Print Names: Larry Nemer
Date: JUNE 4, 2018 License No.: E-30240

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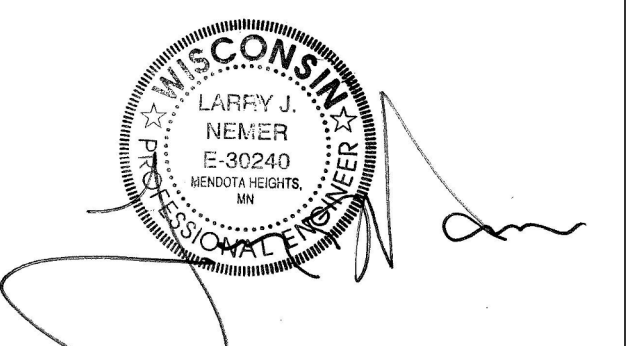
PROJECT NO. 2017016
PROJECT PHASE BID DOCUMENTS
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Drawing ©2017 Copyright West, Shinn & Reynolds, LLC

**COMMONS AREA
MECHANICAL
PIPING PLAN**

**EXHIBIT J
M131**

**Olbrich Botanical Gardens
 Expansion Phase 1**
 BPW Project #8162
 3330 Atwood Avenue
 Madison, WI 53704

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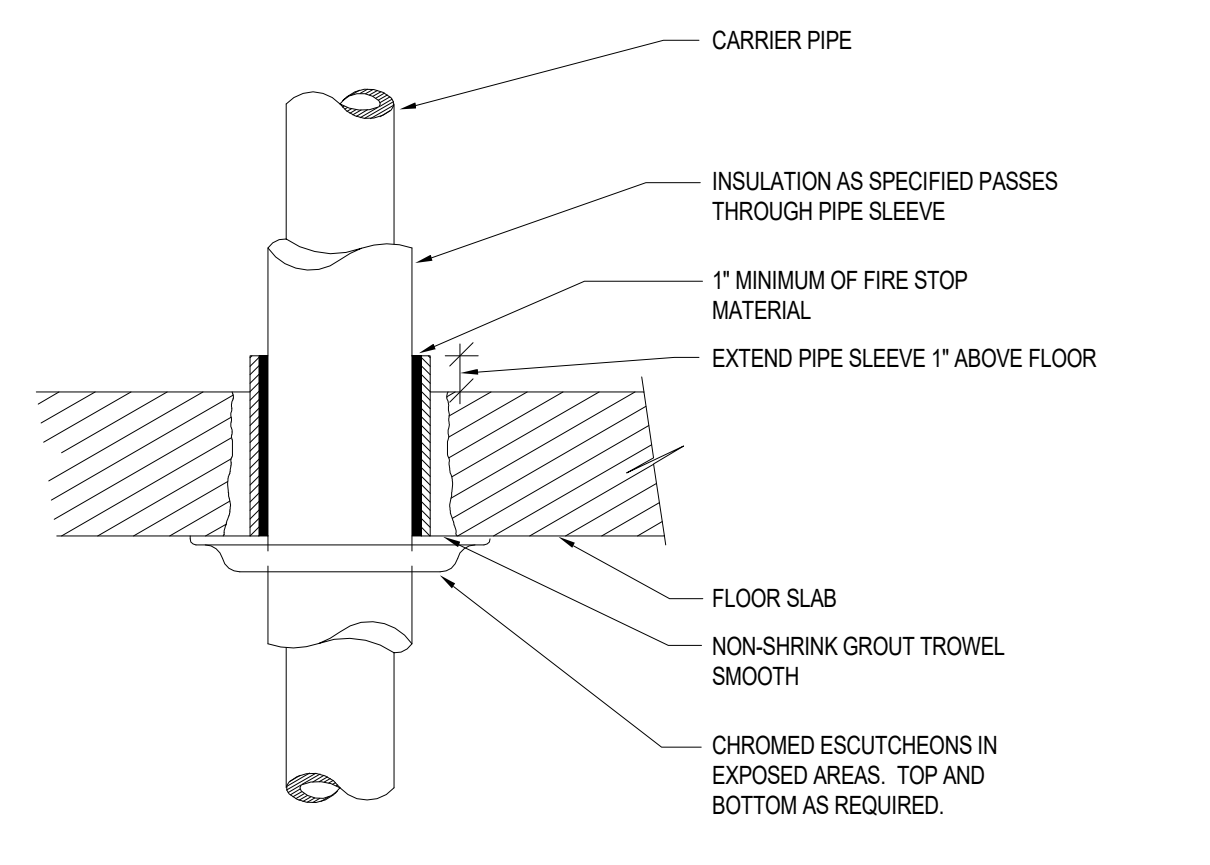
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 Print Name: Larry Nemer
 Date: JUNE 4, 2018 License No.: E-30240

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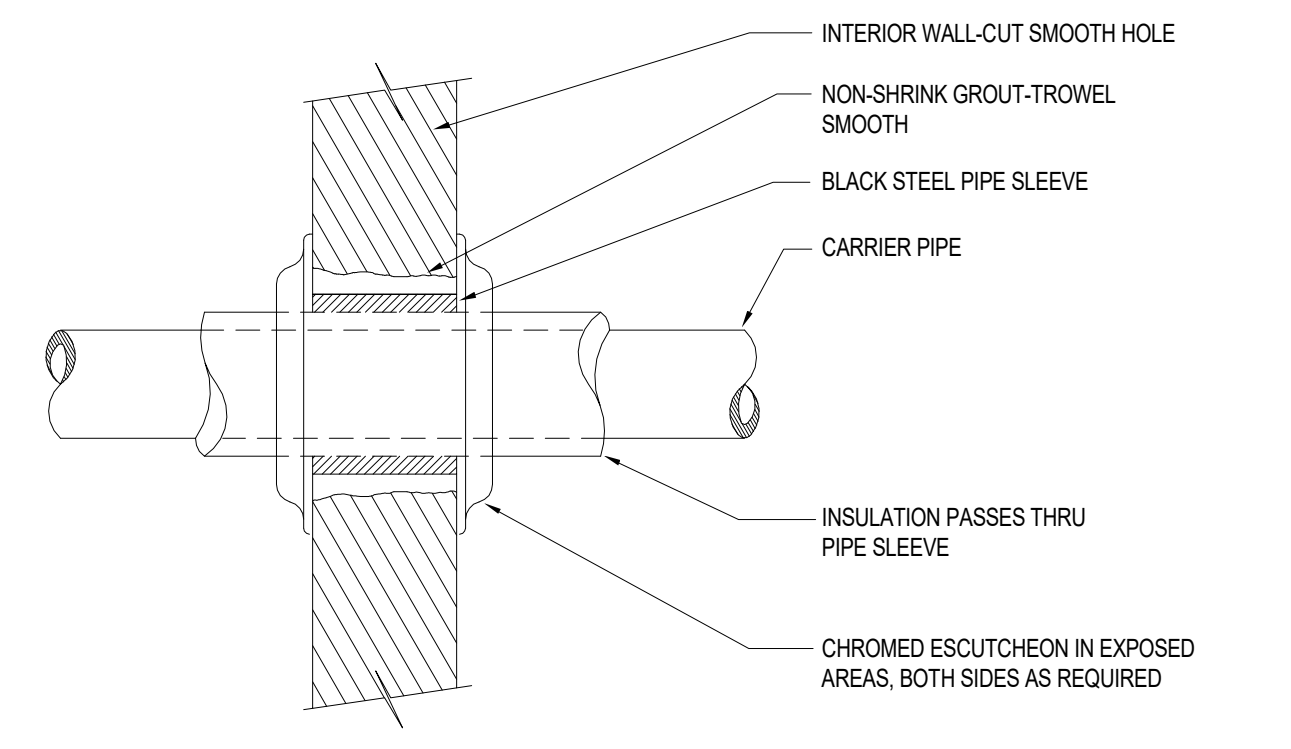
PROJECT NO.	2017016
PROJECT PHASE	BID DOCUMENTS
DRAWN BY:	MSR
CHECKED BY:	MSR

**MECHANICAL
 DETAILS**

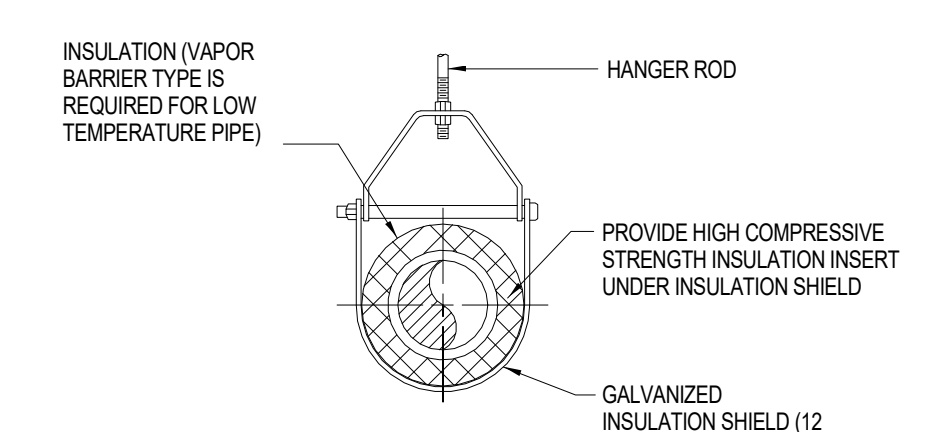
**EXHIBIT J
 M201**



**3 PIPE FLOOR SLAB PENETRATION
 DETAIL**
 NOT TO SCALE

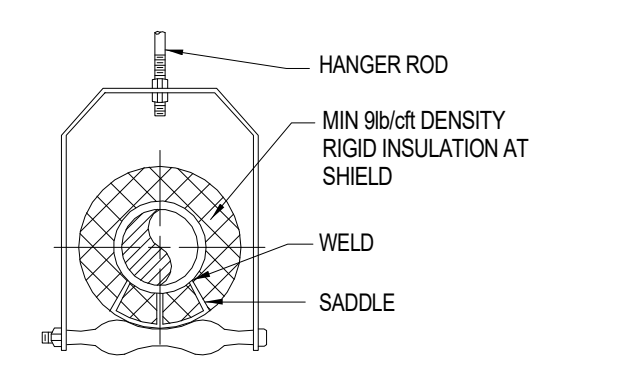


**2 PIPE INTERIOR WALL PENETRATION
 DETAIL**
 NOT TO SCALE

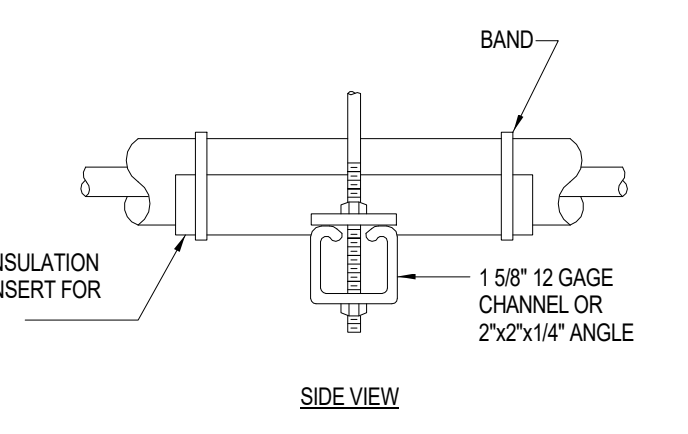


ADJUSTABLE CLEVIS HANGER

NOMINAL PIPE SIZE (INCHES)	MINIMUM ROD DIAMETER (INCHES)
2	3/8
3	1/2
3 1/2	1/2
4	5/8
5	5/8
6	3/4
8	7/8



ADJUSTABLE ROLLER HANGER



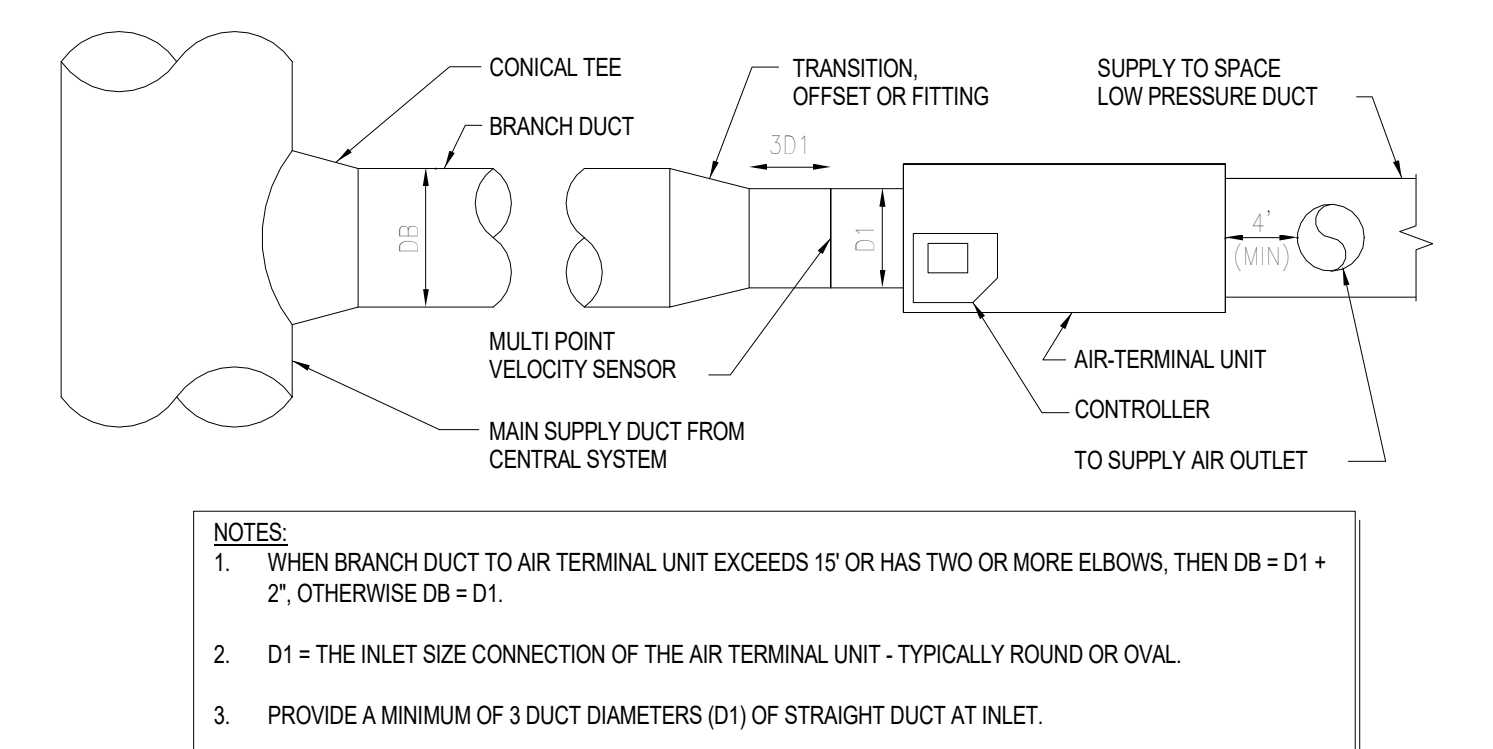
TRAPEZE HANGER FOR UP TO 1000 LB. UNIFORM LOAD

TYPICAL PIPE HANGERS

NOM. SIZE	THRU 3/4"	MAXIMUM PIPE/TUBING SUPPORT SPACING (FEET)								
		1	1 1/4	1 1/2	2	2 1/2	3	4	5	6
STEEL	7'-0"	7	7	9	10	11	12	14	14	14
COPPER	5'-0"	6	6	8	8	9	10	10	10	10

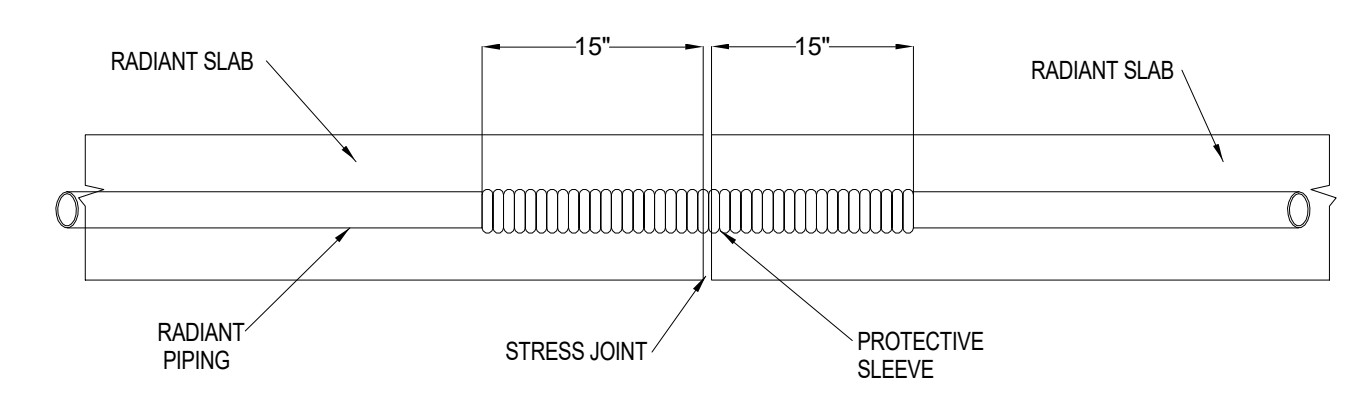
NOTE: FOR TRAPEZE HANGER TAKE SPACING OF SMALLEST SIZE ON TRAPEZE.

1 TYPICAL PIPE HANGER DETAILS
 NOT TO SCALE

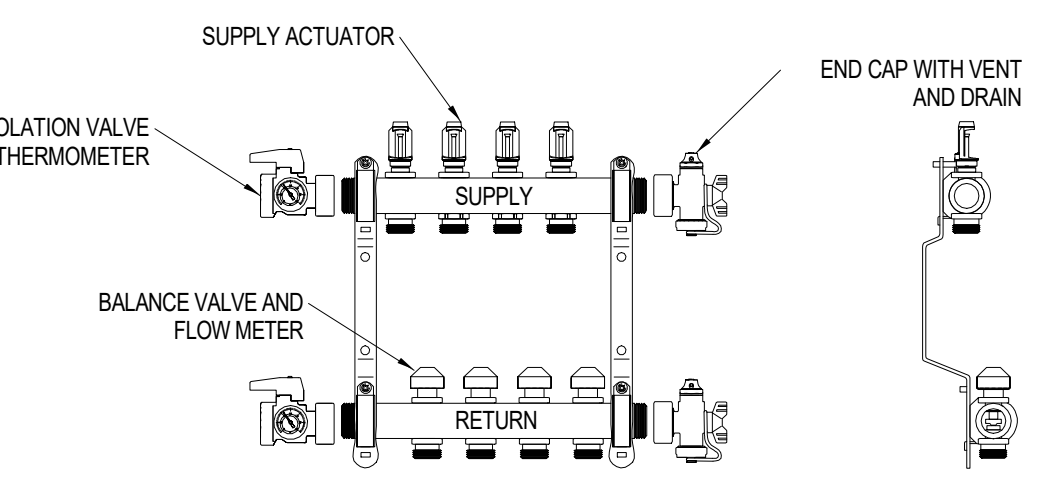


7 AIR TERMINAL UNIT CONNECTION DETAIL
 NOT TO SCALE

- NOTES:**
- WHEN BRANCH DUCT TO AIR TERMINAL UNIT EXCEEDS 15' OR HAS TWO OR MORE ELBOWS, THEN DB = D1 + 2"; OTHERWISE DB = D1.
 - D1 = THE INLET SIZE CONNECTION OF THE AIR TERMINAL UNIT - TYPICALLY ROUND OR OVAL.
 - PROVIDE A MINIMUM OF 3 DUCT DIAMETERS (D1) OF STRAIGHT DUCT AT INLET.

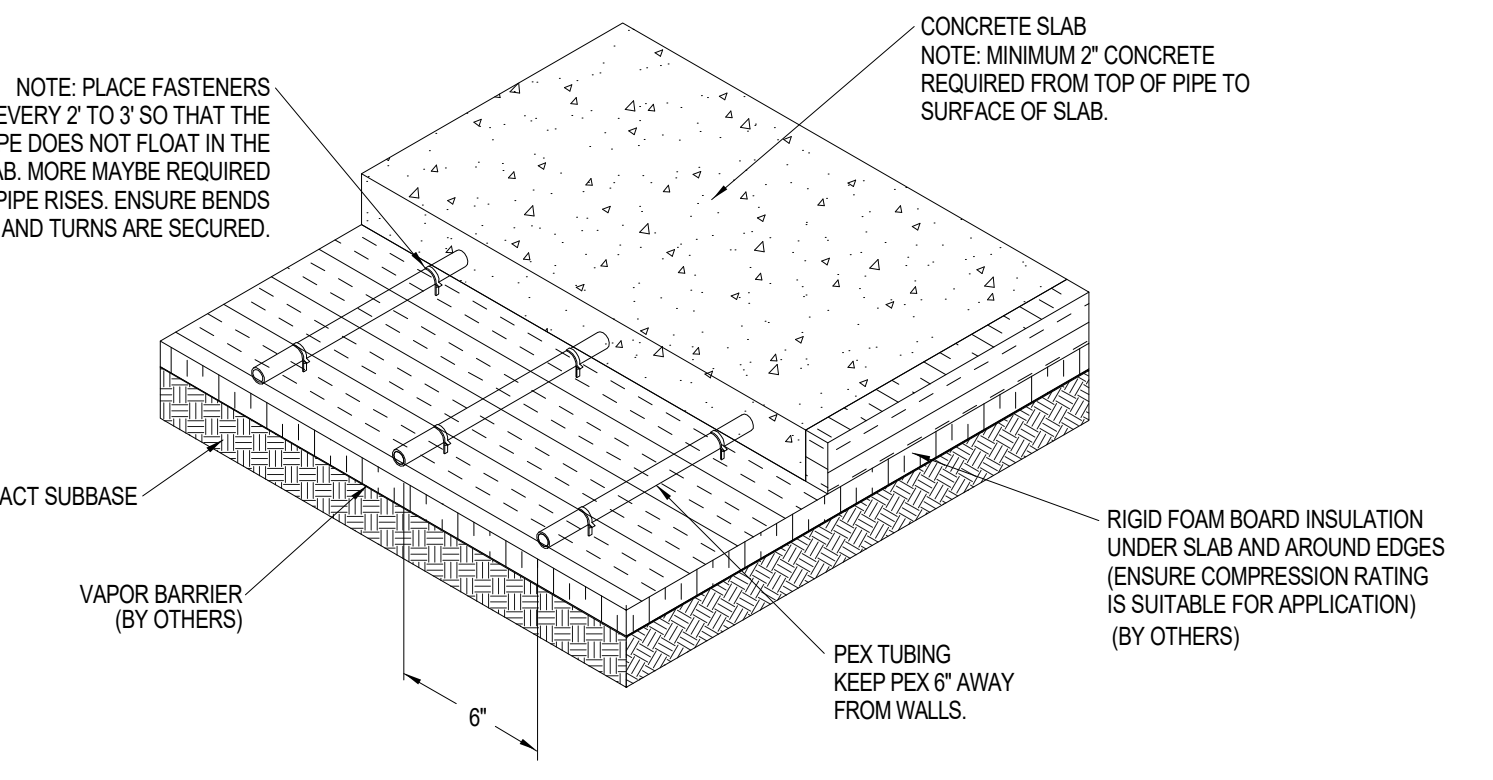


6 RADIANT FLOOR PROTECTIVE SLEEVE DETAIL
 NOT TO SCALE

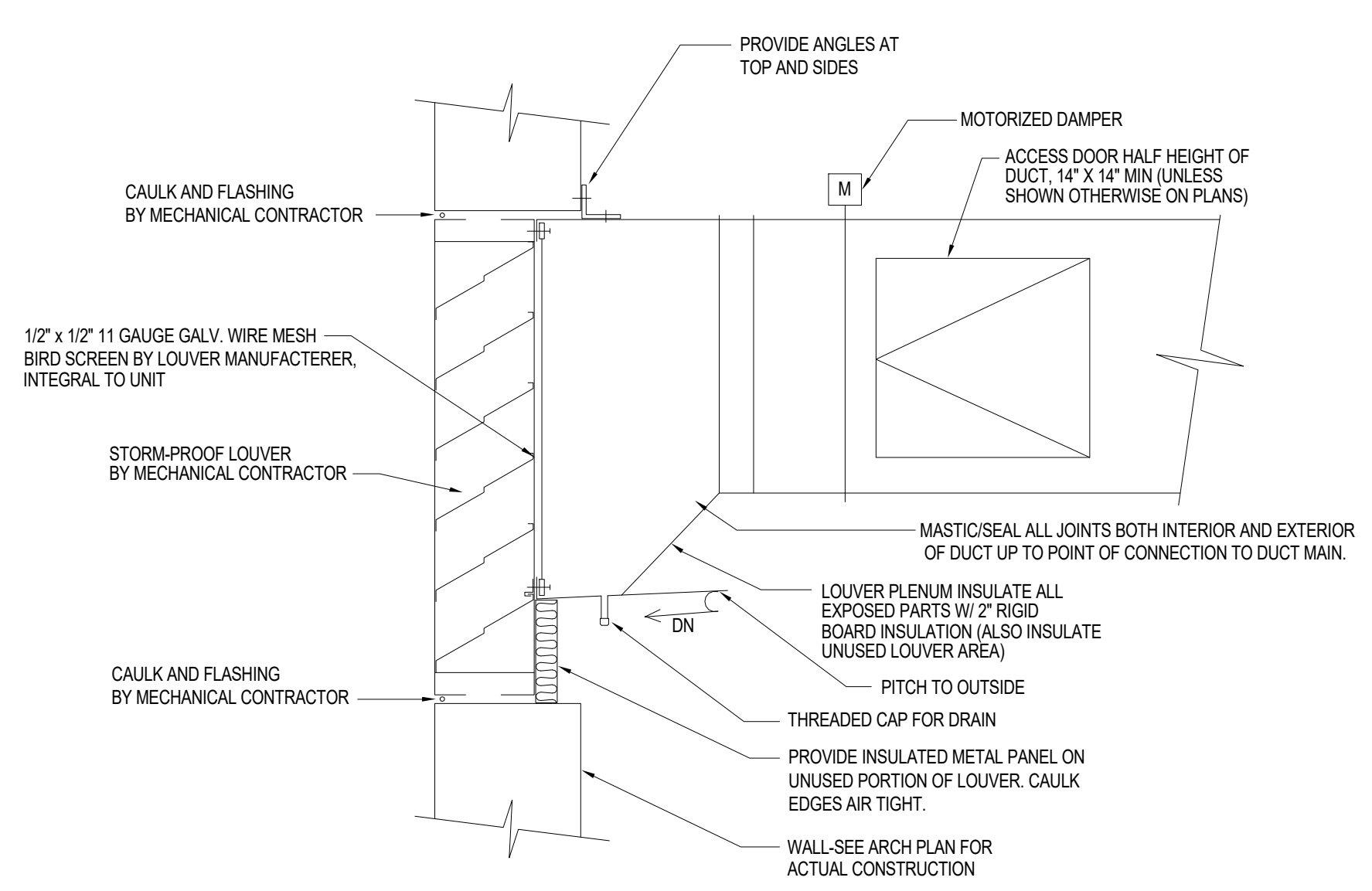


NOTE:
 1. REFER TO HEATING AND COOLING RADIANT FLOOR SCHEDULE FOR NUMBER OF CIRCUITS PER MANIFOLD.

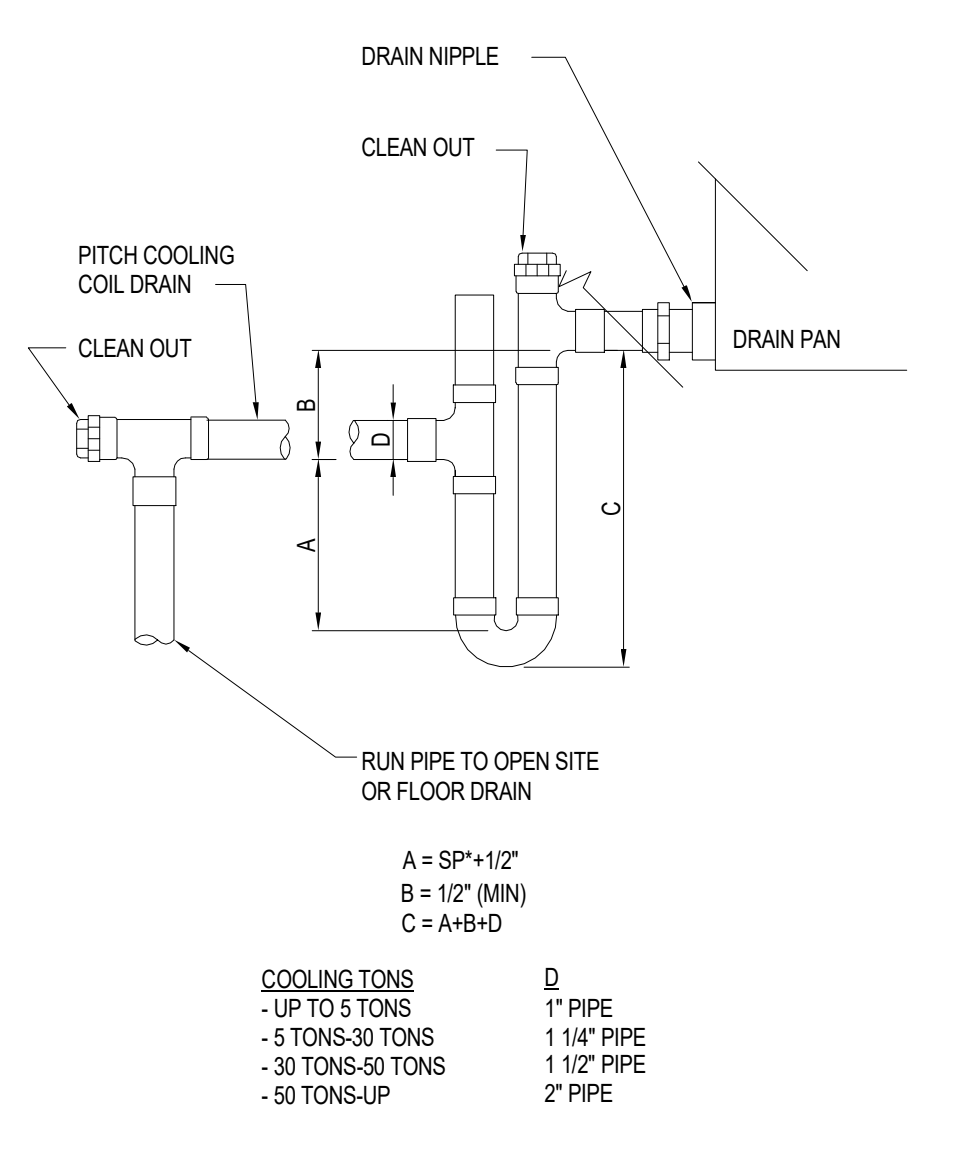
5 RADIANT FLOOR MANIFOLD DETAIL
 NOT TO SCALE



4 SLAB ON GRADE RADIANT FLOOR
 NOT TO SCALE



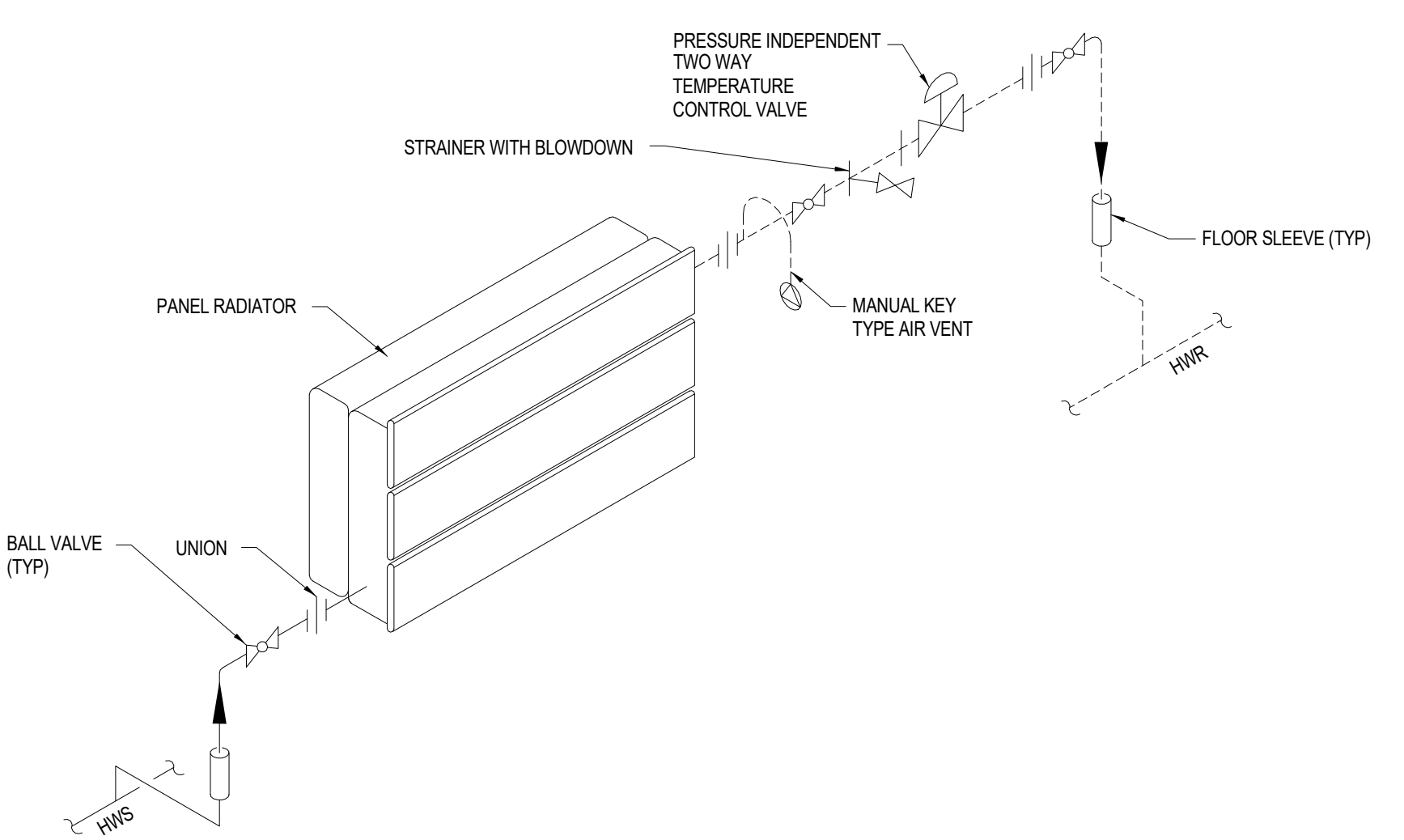
11 DUCT CONNECTION TO LOUVER
 NOT TO SCALE



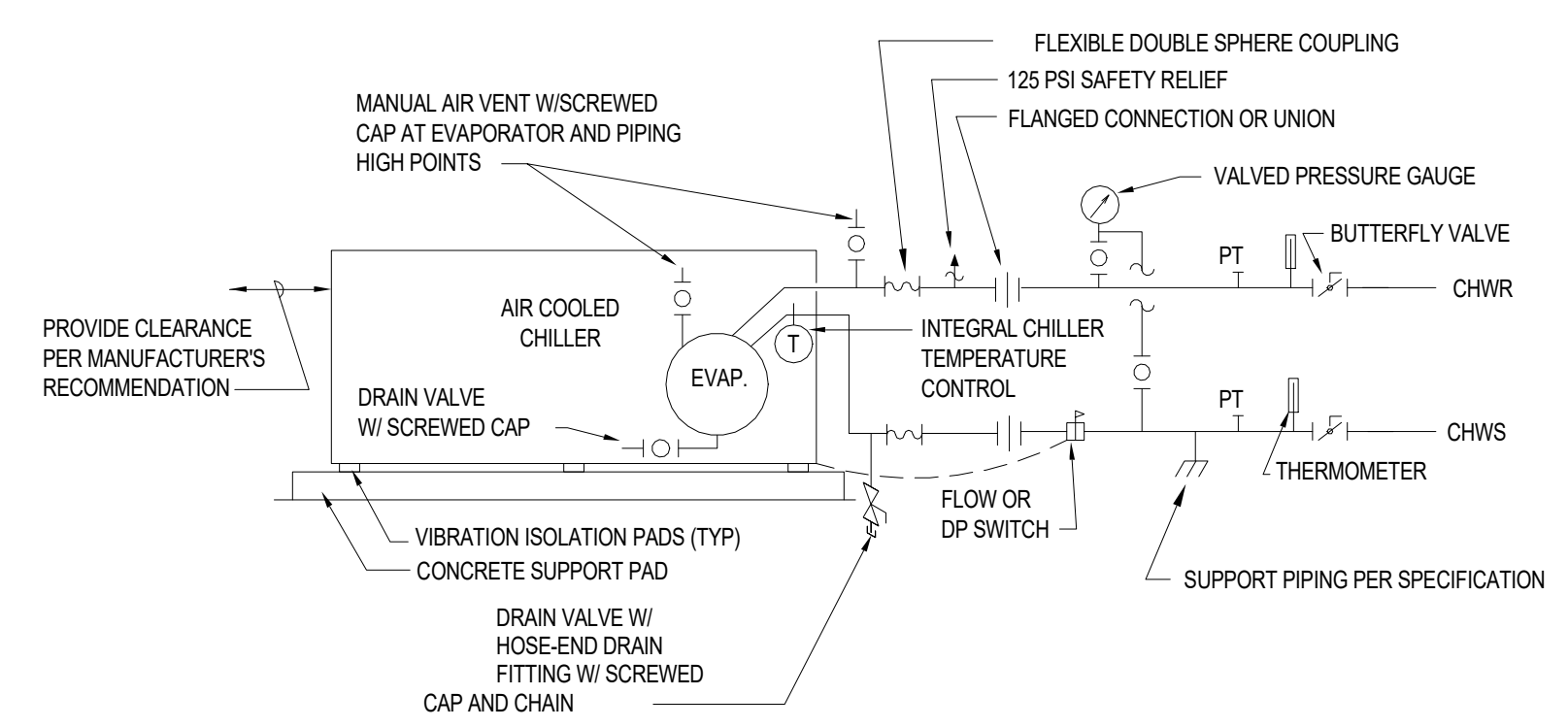
9 POSITIVE PRESSURE CONDENSATE DRAIN DETAIL
 X = 1'-0"

COOLING TONS	D
- UP TO 5 TONS	1" PIPE
- 5 TONS-30 TONS	1 1/4" PIPE
- 30 TONS-50 TONS	1 1/2" PIPE
- 50 TONS-UP	2" PIPE

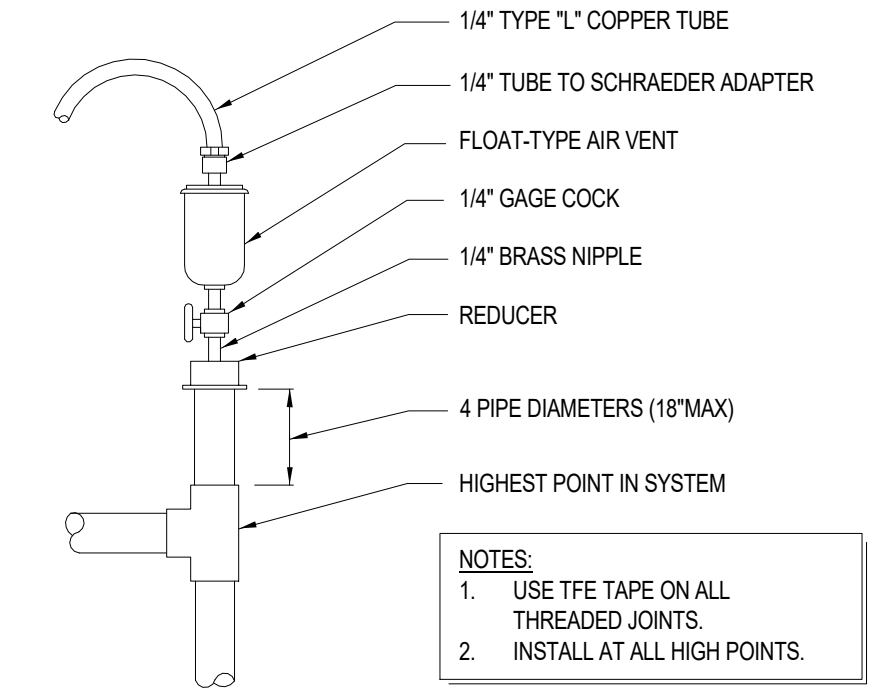
NOTE:
 * SF EQUALS POSITIVE STATIC PRESSURE AT FAN DISCHARGE FOR BLOW THROUGH AIR HANDLING UNIT.



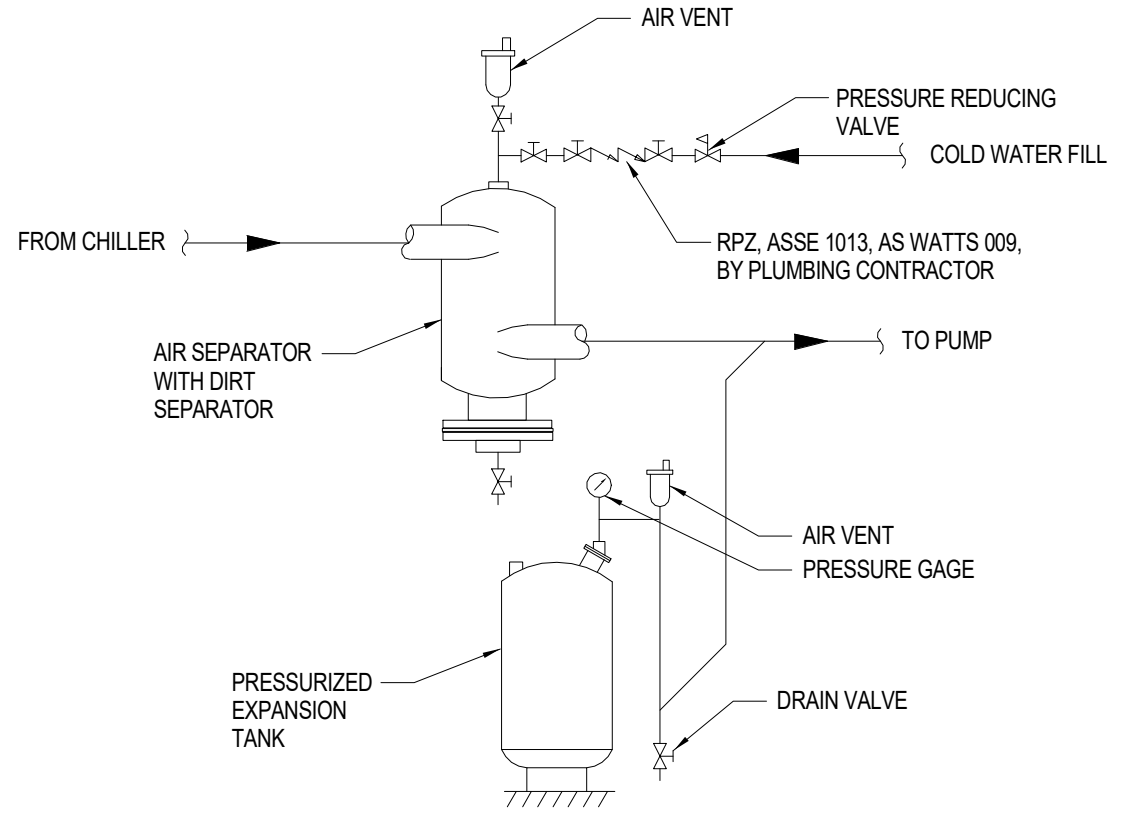
8 PANEL RADIATION PIPING DIAGRAM
 NOT TO SCALE



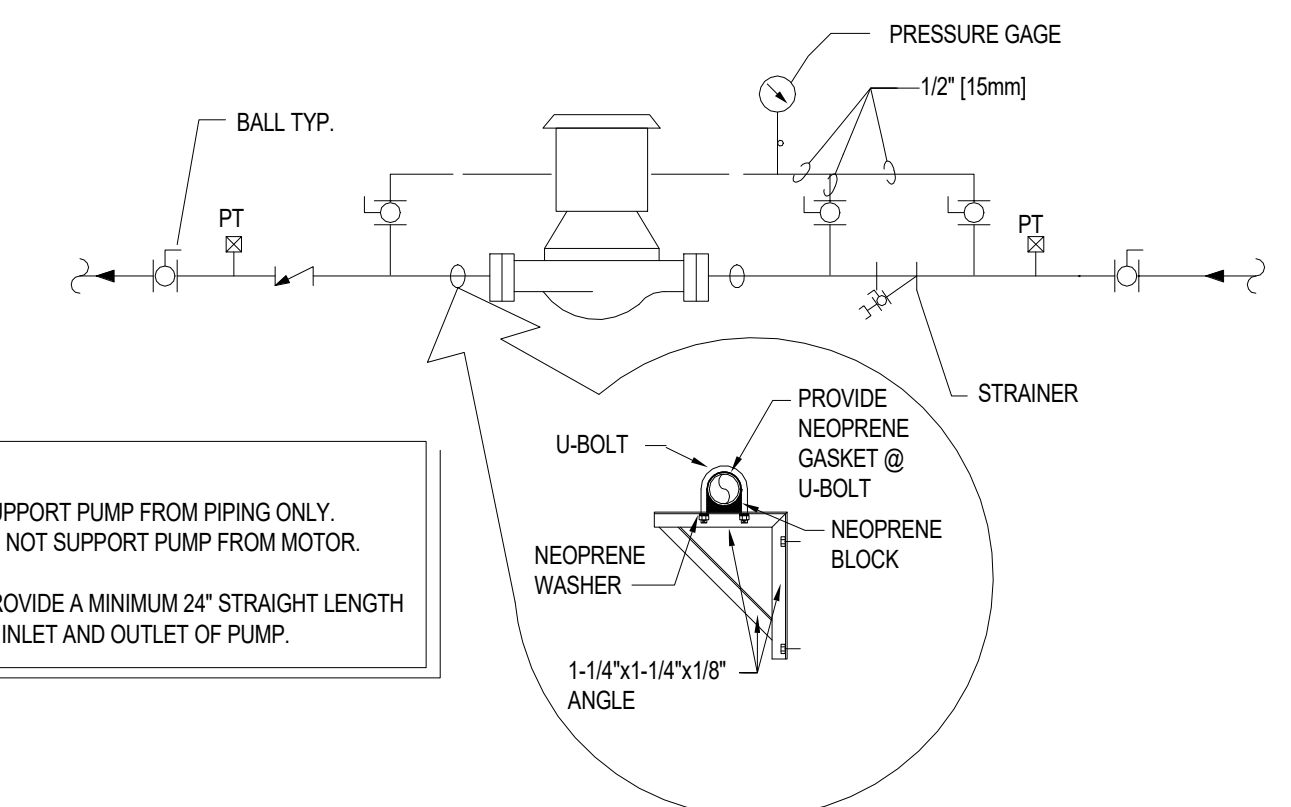
4 AIR COOLED CHILLER DETAIL
NOT TO SCALE



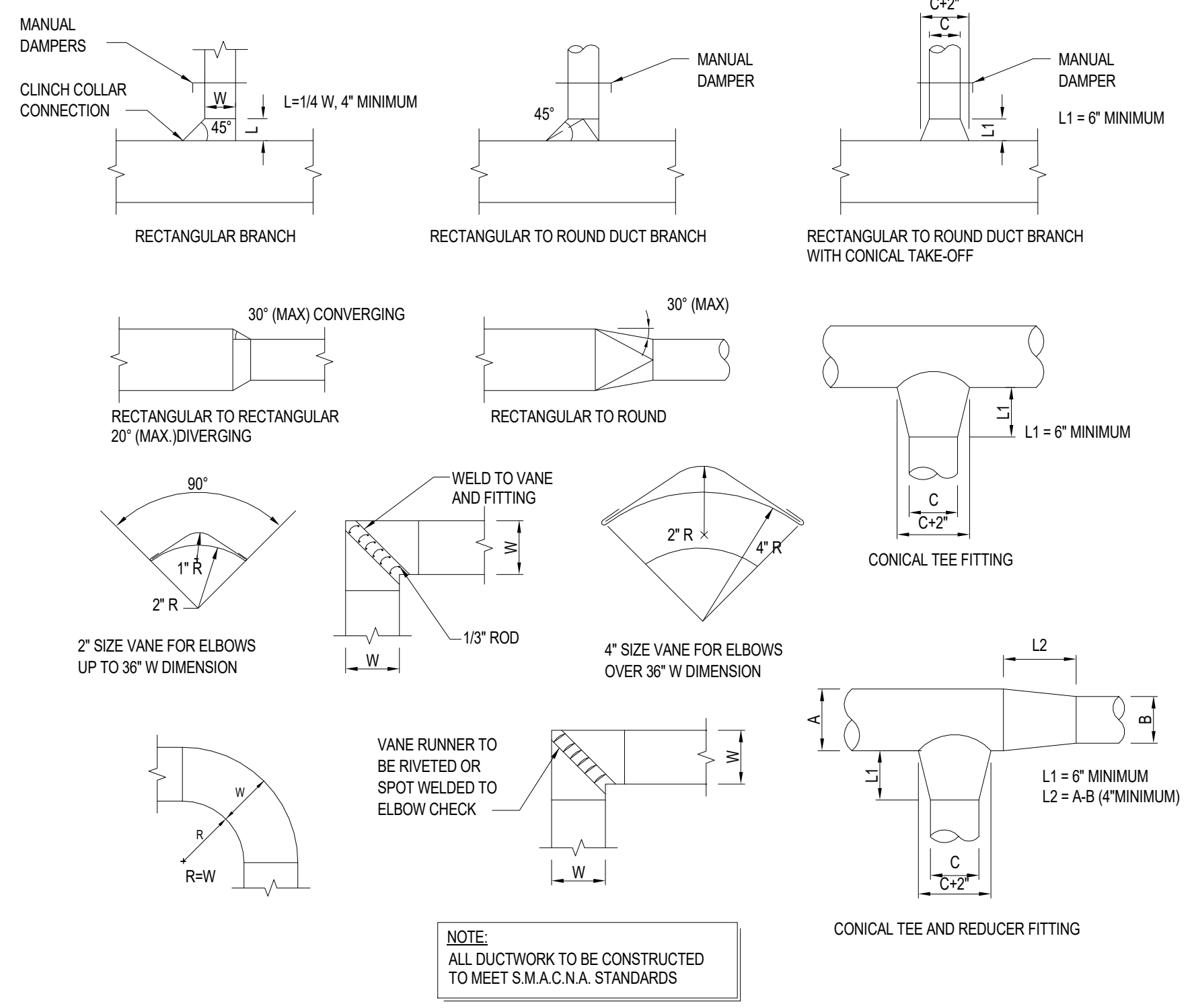
3 AUTOMATIC AIR VENT ASSEMBLY DETAIL
NOT TO SCALE



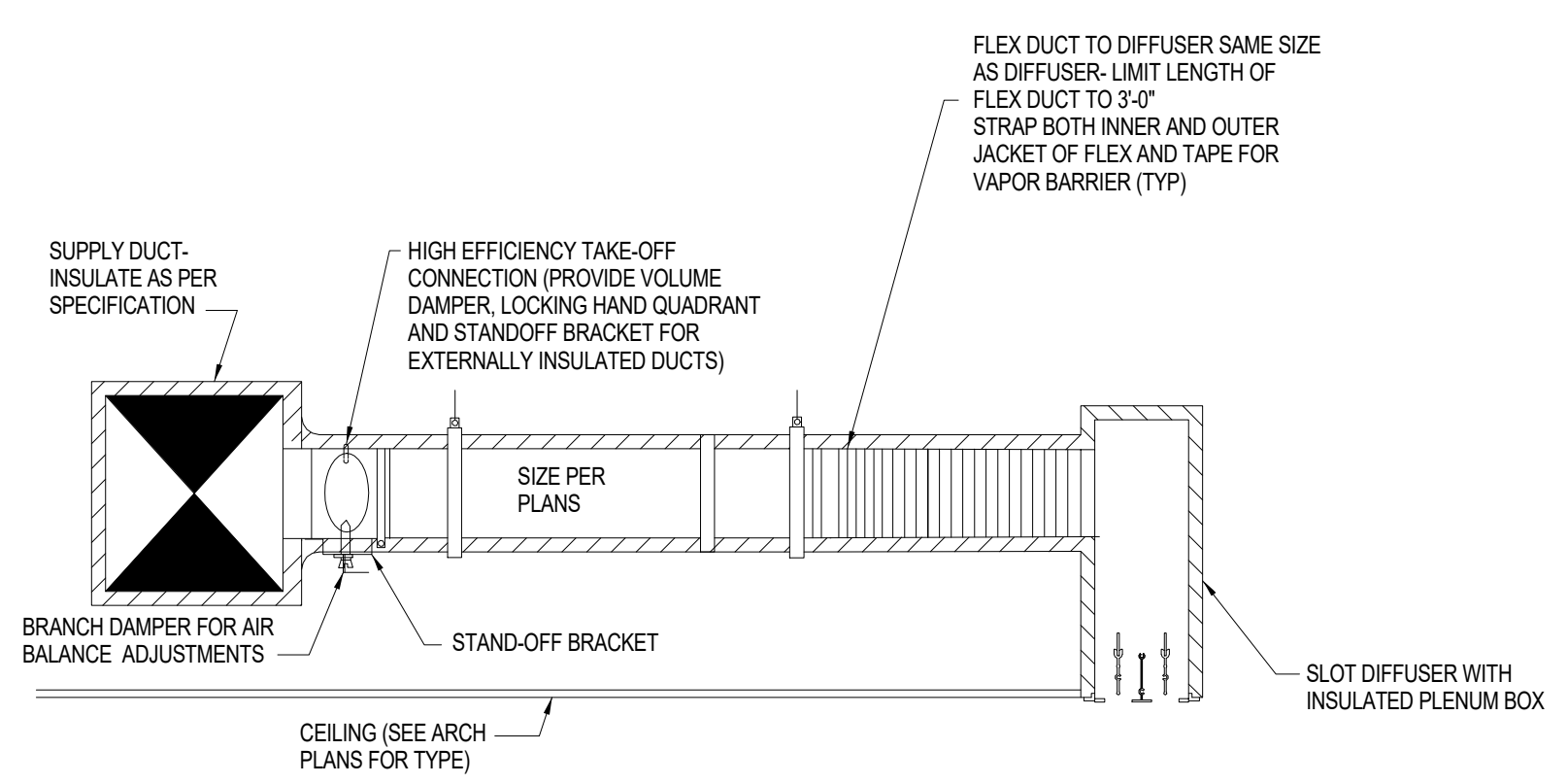
2 EXPANSION TANK/AIR SEPARATOR ASSEMBLY
NOT TO SCALE



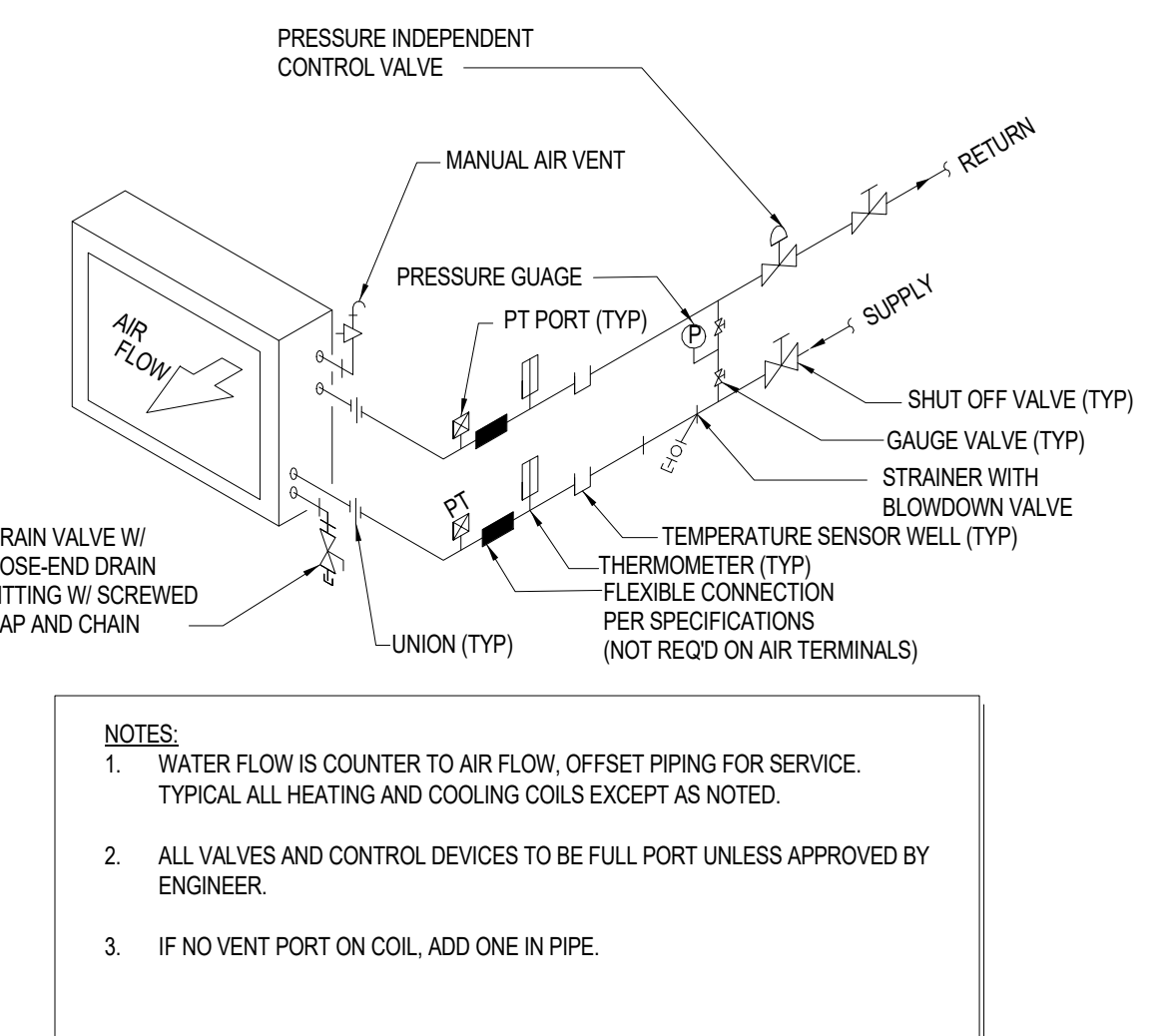
1 IN-LINE PUMP DETAIL
NOT TO SCALE



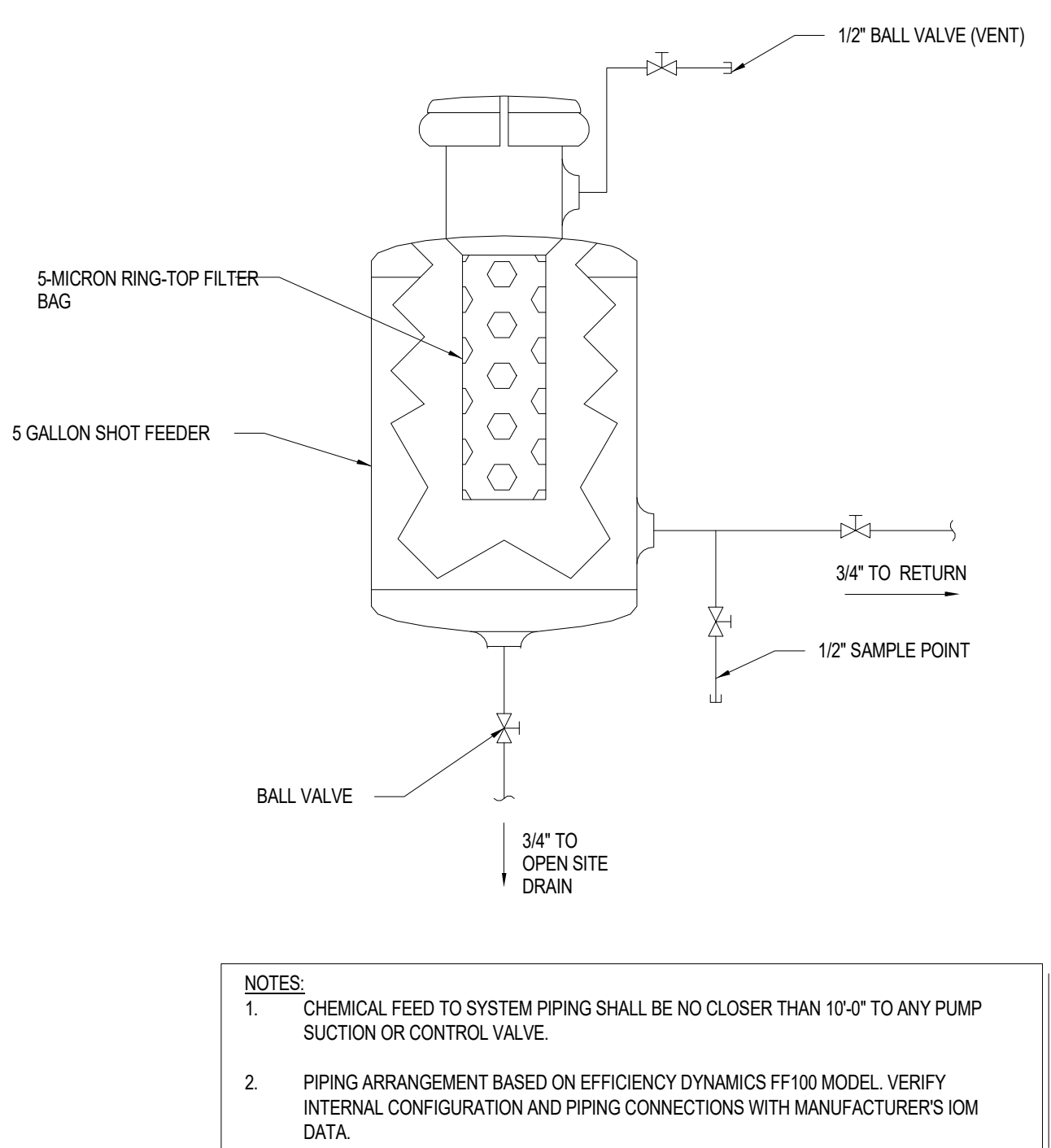
8 TYPICAL DUCTWORK DETAILS
NOT TO SCALE



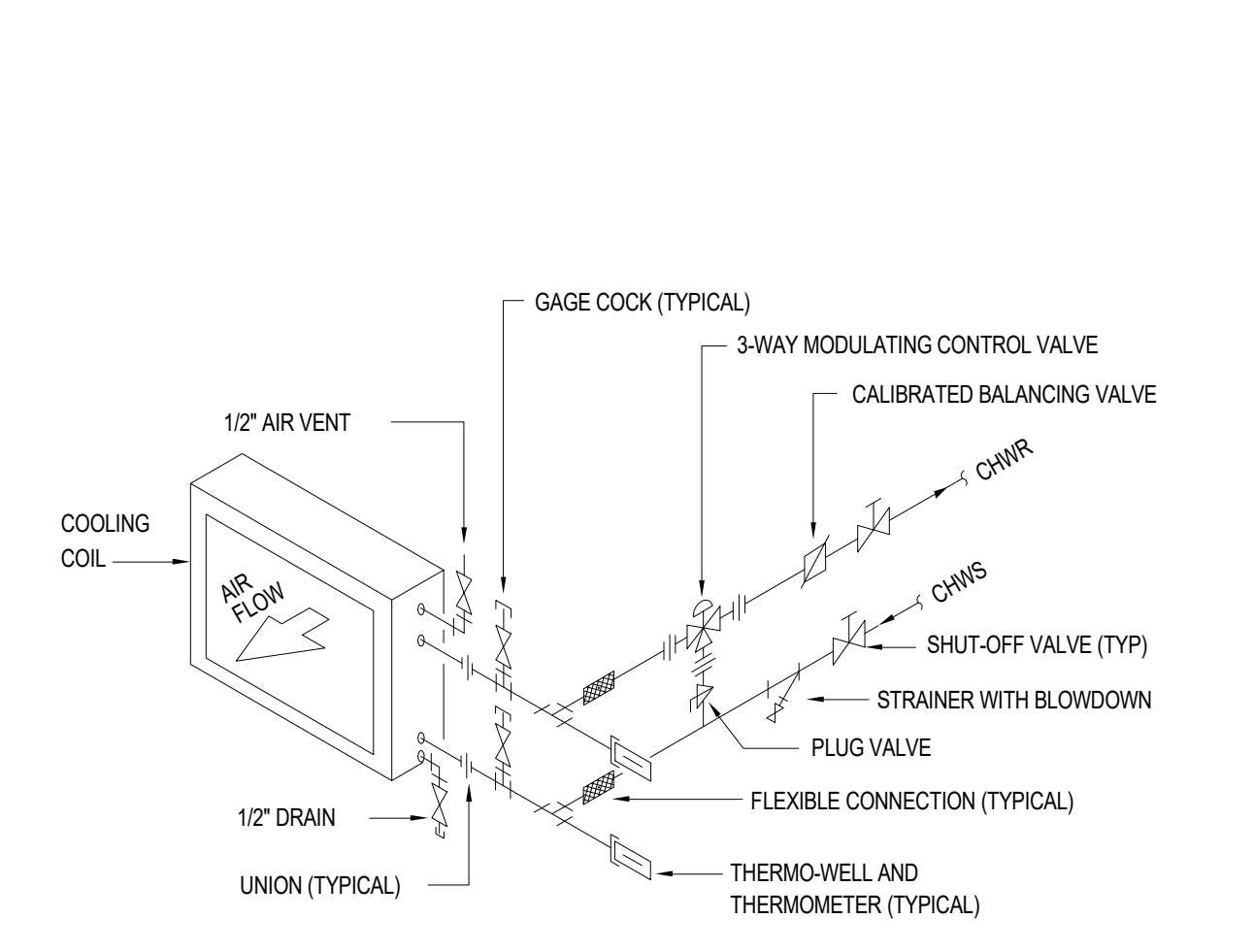
7 SLOT DIFFUSER DETAIL
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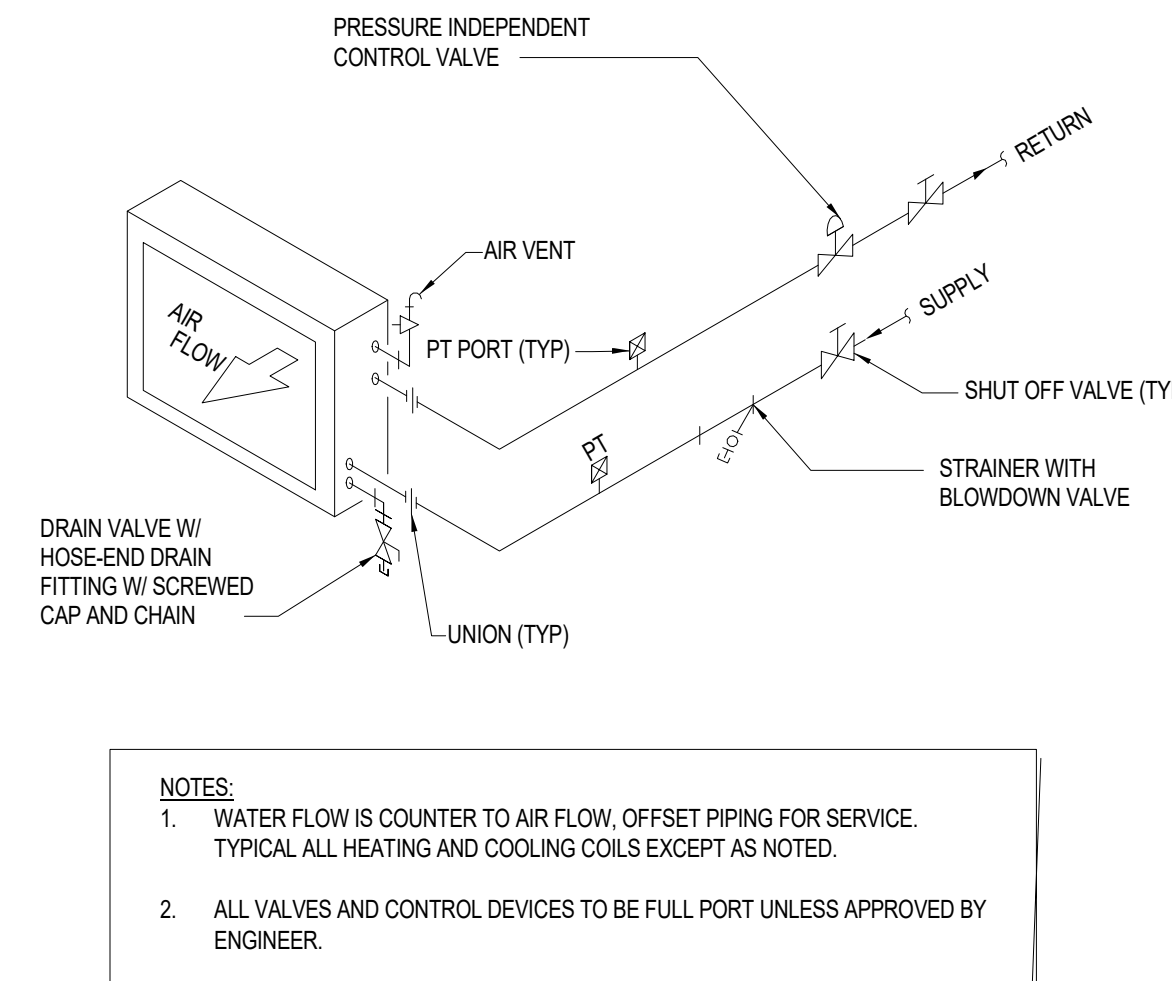
6 2-WAY AHU COIL DETAIL
NOT TO SCALE



5 CHEMICAL BY-PASS FILTER FEEDER
NOT TO SCALE



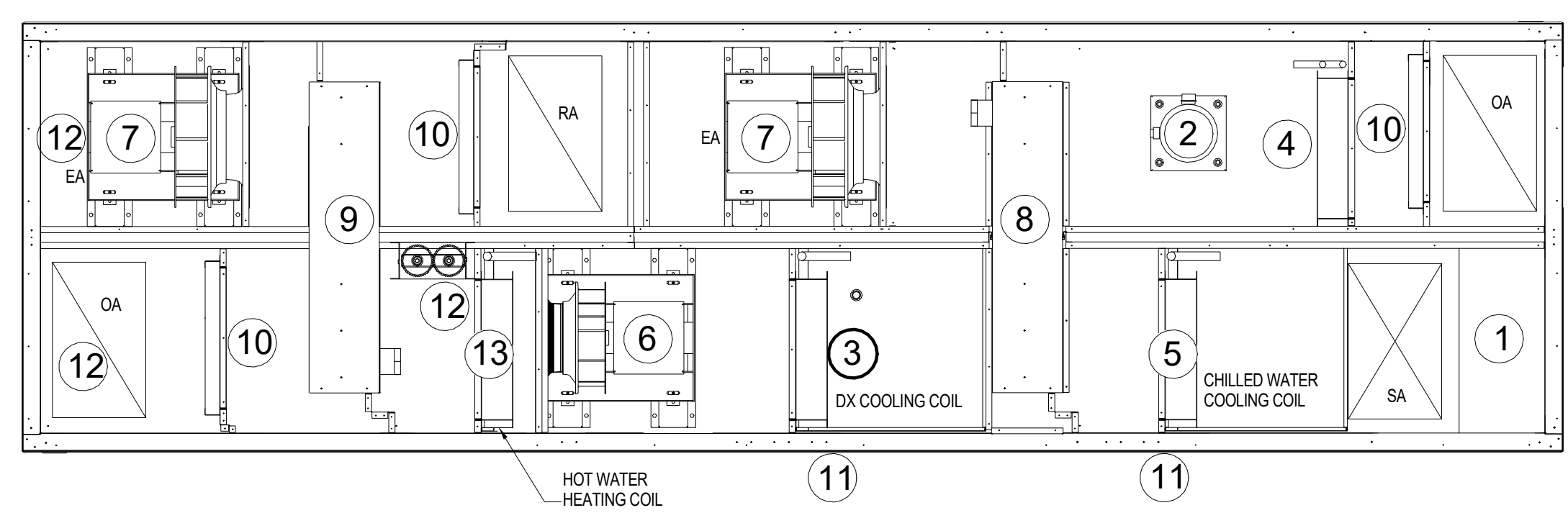
11 THREE-WAY MODULATING CHILLED WATER COIL DETAIL
NOT TO SCALE



10 TERMINAL UNIT WATER COIL DETAIL
NOT TO SCALE

COMPONENT LIST

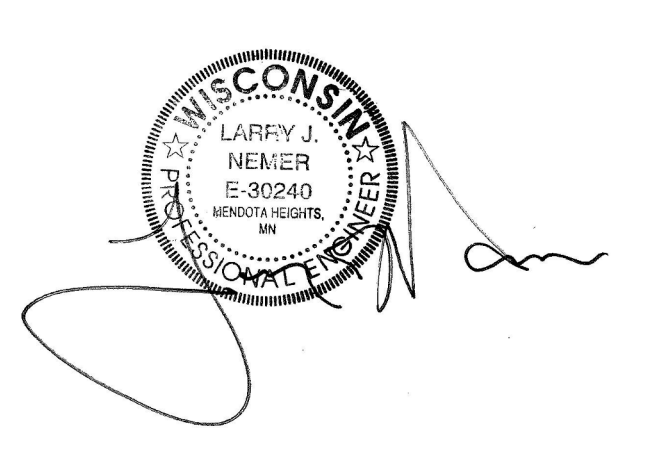
ITEM	DESCRIPTION
1	ELECTRICAL
2	COMPRESSOR
3	EVAPORATOR COIL
4	CONDENSER COIL
5	WATER COIL
6	SUPPLY BLOWER
7	EXHAUST BLOWER
8	DESICCANT WHEEL
9	ENTHALPY WHEEL
10	FILTERS
11	DRAIN LINE
12	DAMPER
13	HEATING COIL



9 AIR HANDLING UNIT 1 SECTION/GENERAL ARRANGEMENT - PLAN VIEW
NOT TO SCALE

**Olbrich Botanical Gardens
Expansion Phase 1**
BPW Project #8162
3330 Atwood Avenue
Madison, WI 53704

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Signature: _____
Print Name: Larry Nemer
Date: JUNE 4, 2018 License No.: E-30240

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PROJECT NO. 2017016
PROJECT PHASE BID DOCUMENTS
DRAWN BY: MSR **CHECKED BY:** MSR
Design: 2017 Copyright: MSR, Gilman & Rosales, LLC

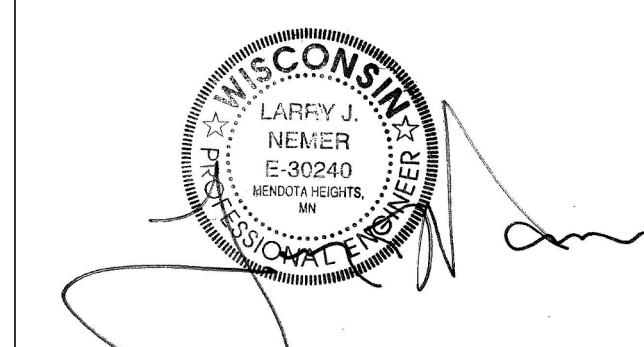
**MECHANICAL
DETAILS**

**EXHIBIT J
M202**

Olbrich Botanical Gardens Expansion Phase 1

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 3330 Atwood Avenue
 Madison, WI 53704

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PROJECT NO.	2017016
PROJECT PHASE	BID DOCUMENTS
DRAWN BY:	MSR
CHECKED BY:	MSR

MECHANICAL CONTROLS SCHEMATICS

EXHIBIT J M302

System Description:
 Extension of existing boiler plant to include low-temperature Learning Center area.

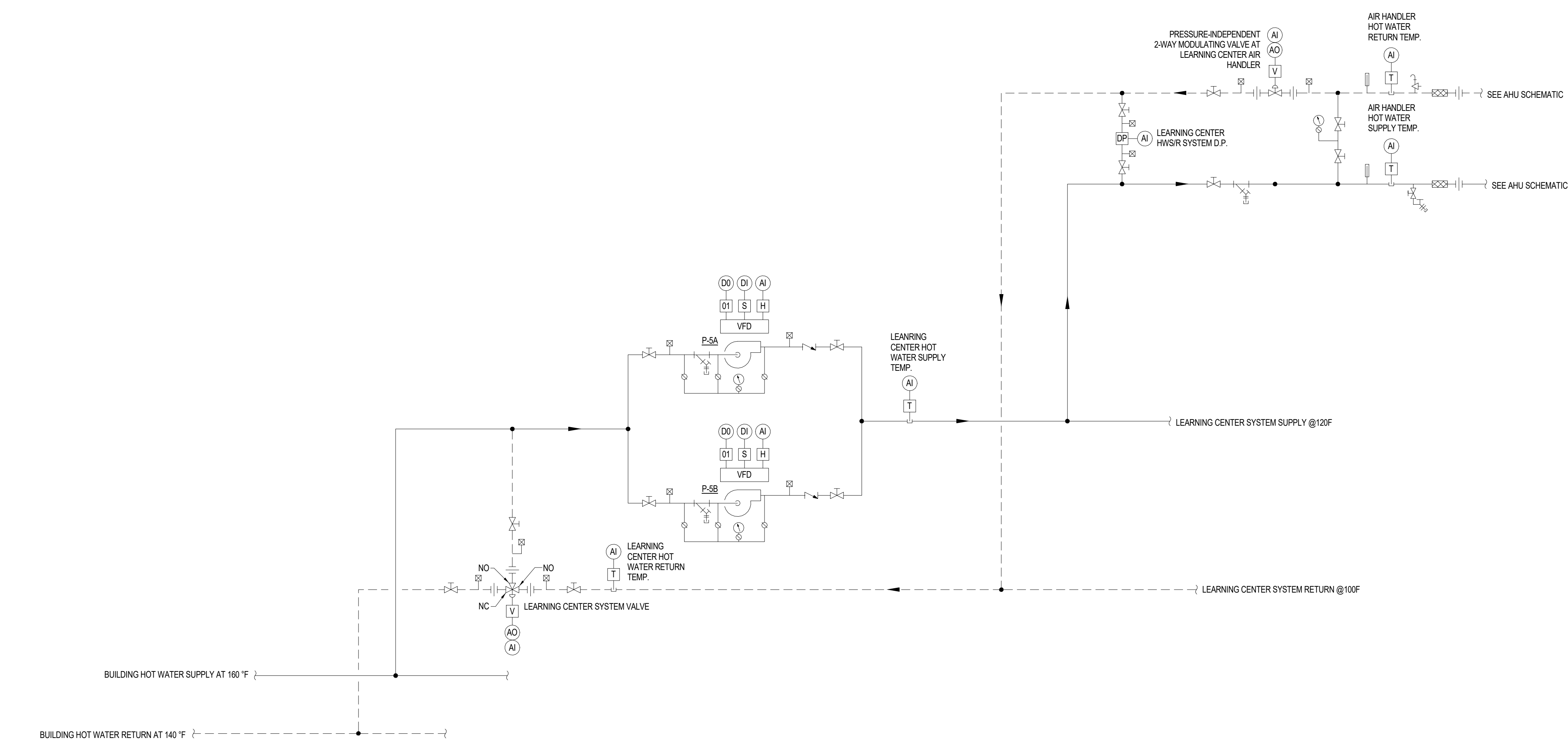
Building Water Temperature Control:
 Existing Boiler Water Temperature Control: existing outdoor air reset, not under current scope, provided for reference only
 1. At 10F outdoor air temperature and below, hot water setpoint shall be 160F
 2. At 60F outdoor air temperature and above, hot water setpoint shall be 90F
 3. A linear function shall determine setpoint between these outdoor air temperatures

New Learning Center Low Temperature Water Control:
 Hot water for low temperature systems shall be an outdoor air reset, with demand-based reset as follows
 1. At 50F (adj) outdoor air and above, water setpoint shall be 90F (adj)
 2. At 60F (adj) outdoor air and below, water setpoint shall be 120F (adj)
 3. Between maximum and minimum outdoor air temperatures noted, setpoint shall be determined by a linear function between the values given.
 4. A demand-based component shall be provided based on a poll of all valve positions, and allow up to 10F (adj) to be added or subtracted from the setpoint calculated based on outdoor air temperature.
 5. A call for heat is generated when a valve is 99% open.
 6. Every 2 minutes (adj) add 0.2F (adj) to the setpoint if there are 3 (adj) or more calls for heat.
 7. Every 2 minutes (adj) subtract 0.2F (adj) from the setpoint if there are less than 3 (adj) calls for heat.
 8. If there are 3 (adj) calls for heat, setpoint shall remain as determined by outdoor air reset.

New Learning Center System Valve Control:
 Diverting 3-way modulating pressure-independent control valve controls Learning Center low temperature hot water as follows
 1. 3-way valve shall be normally closed as noted on plan to re-circulate all water back to Learning Center pumps.
 2. If water temperature, as detected at the Learning Center hot water supply temperature sensor, falls below setpoint, the valve shall modulate open to maintain setpoint at the sensor.
 3. The valve shall modulate back to closed upon a return of water to setpoint.

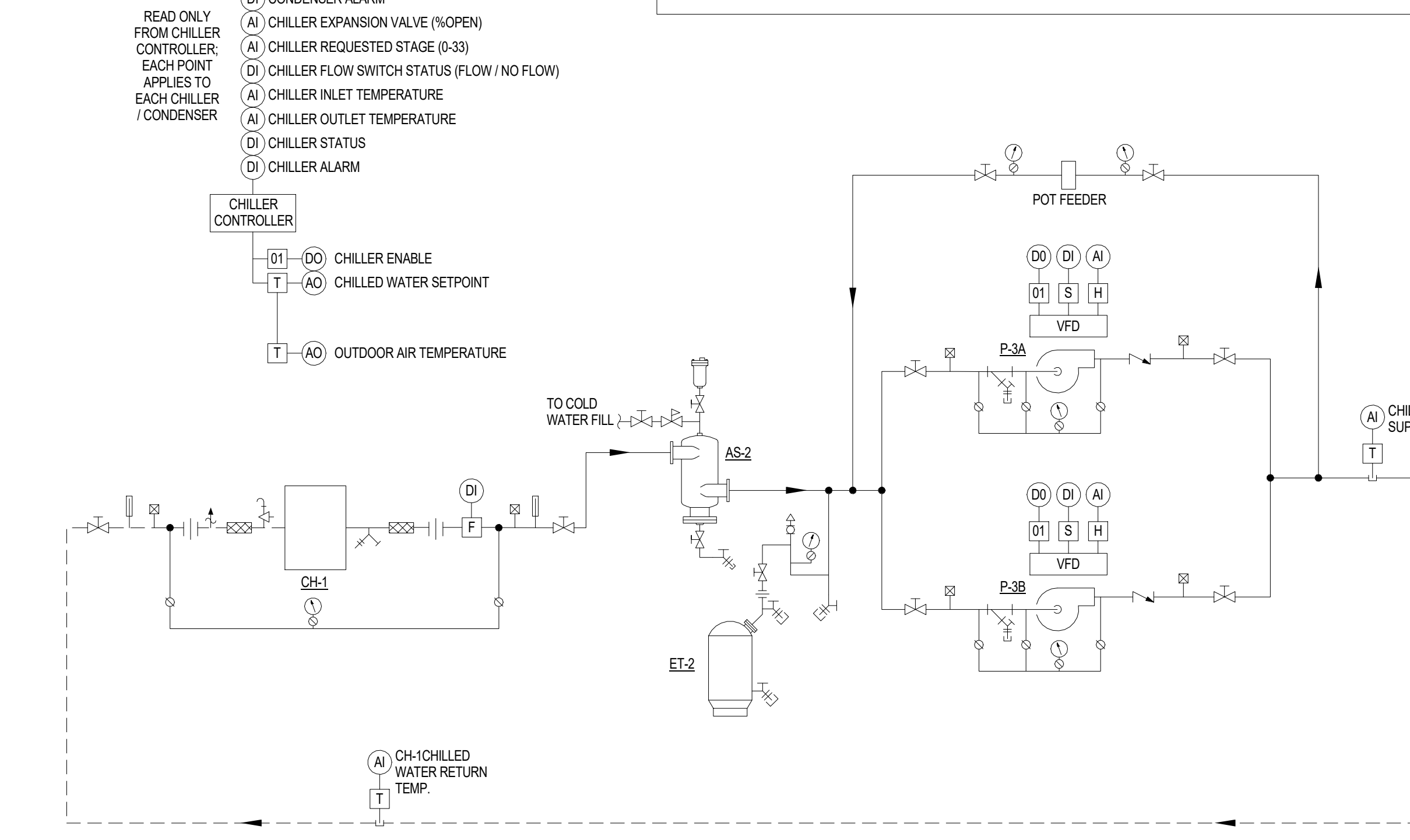
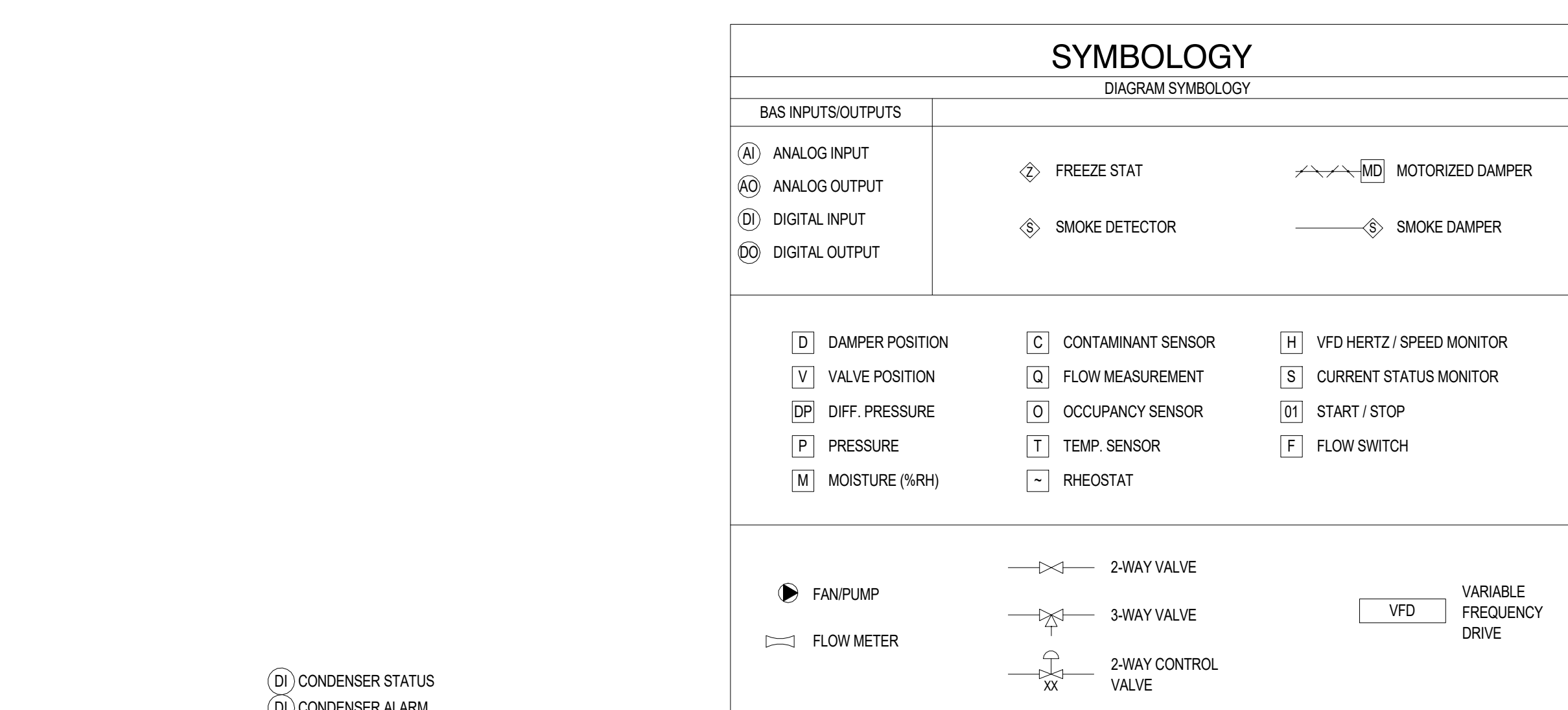
New Learning Center Circulation Pumps:
 System pumps shall modulate speed based on system differential pressure, with a pressure reset schedule.
 1. Pumps operate as lead / lag, as follows:
 A. The lead pump shall be able to be chosen through a selectable day of the week and time of day, through the BAS.
 B. Coordinate with owner for scheduling switchover and frequency. Unless otherwise directed, switchover shall be 10am Tuesday.
 C. In any event, the lag pump shall be commanded on if the lead pump fails.
 2. Pumps shall operate only when boilers are enabled.
 3. Lead pump shall modulate speed to maintain differential setpoint.
 4. Differential setpoint shall be determined by balancing contractor, but shall be a minimum of 5 psig, and a maximum of 10 psig.
 5. Differential pressure shall be reset based on a trim and respond logic using a poll of all system valve positions.
 6. If a valve is 99% open, a pressure request shall be sent.
 7. Increase pressure setpoint by 0.1 (adj) psig every 10 (adj) minutes if there are 3 (adj) or more pressure requests.
 8. Decrease pressure setpoint by 0.1 (adj) psig every 10 (adj) minutes if there are less than 3 (adj) pressure requests.
 9. Make no adjustments to pressure setpoint if there are 3 (adj) requests.

Alarms:
 See also alarms section in specifications.
 1. Alarm if any valve fails (all valves shall provide feedback on position).
 2. Alarm if either circulation pump fails, or associated VFD fails / is in fault
 3. Alarm if Learning Center supply water temperature remains 15F (adj) or more below setpoint for 30 (adj) minutes.



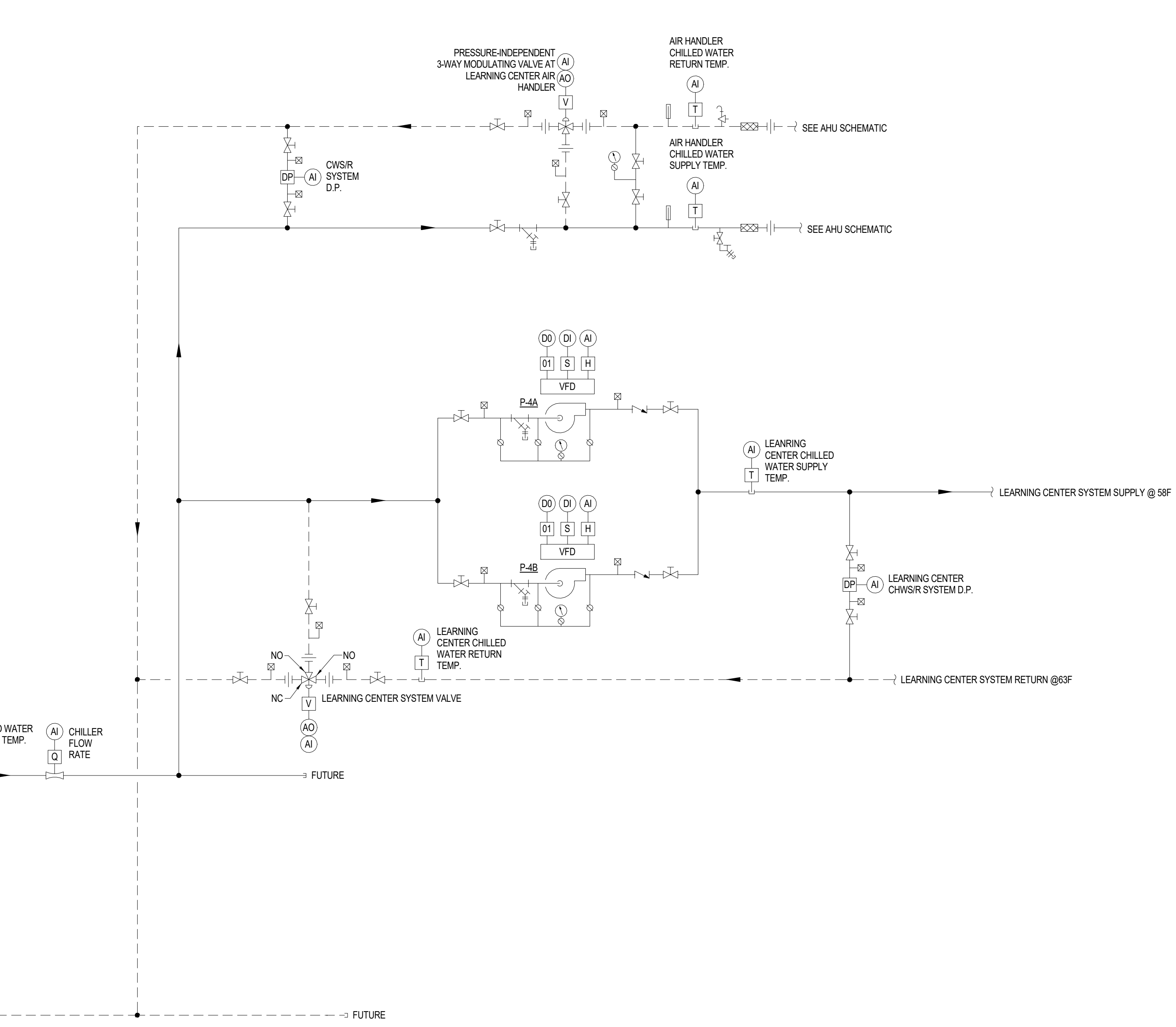
1 HOT WATER PIPING SCHEMATIC

NOT TO SCALE



2 CHILLED WATER PIPING SCHEMATIC

NOT TO SCALE



System description:
 Air-cooled chiller plant with variable primary flow and differential pressure pump operation.

Chiller plant enable:
 Chiller plant shall be enabled when outdoor air temperature is above 50F (adj).

Water temperature control:
 Water temperature control shall be based on zone temperature and sent to the chiller controller by the BAS.
 1. All zone temperatures and setpoints shall be compared.
 2. The zone with temperature furthest from setpoint shall determine supply water setpoint.
 3. If the zone furthest from setpoint is 3F (adj) from setpoint, the supply water temperature setpoint shall be 44F (adj).
 4. If the zone furthest from setpoint is 6F (adj) from setpoint, the supply water temperature setpoint shall be 48F (adj).
 5. Between maximum and minimum distance from setpoints noted, setpoint shall be determined by a linear function between the values given.

Chiller staging:
 Chiller shall be controlled by manufacturer-furnished chiller controller. This contractor is responsible for installing the chiller controller and providing complete control wiring for the installation.
 1. Chiller supply water temperature shall be maintained internally by the chiller controller.

Chiller system pumps:
 System pumps shall modulate speed based on system differential pressure, with a pressure reset schedule and minimum flow rate (based on chiller requirements).
 1. Pumps operate as lead / lag, as follows:
 A. The lead pump shall be able to be chosen through a selectable day of the week and time of day, through the bas.
 B. Coordinate with owner for scheduling switchover and frequency. Unless otherwise directed, switchover shall be 10am Tuesday.
 C. In any event, the lag pump shall be commanded on if the lead pump fails.
 2. Pumps shall operate only when chiller is enabled and shall receive this signal from the BAS.
 3. Lead pump shall modulate speed to maintain differential setpoint.
 4. Differential setpoint shall be determined by balancing contractor, but shall be a minimum of 5 psig, and a maximum of 10 psig.
 5. Differential pressure shall be reset based on a trim and respond logic using a poll of all system valve positions.
 6. If a valve is 99% open, a pressure request shall be sent.
 7. Increase pressure setpoint by 0.1 (adj) psig every 10 (adj) minutes if there are 3 (adj) or more pressure requests, up to a maximum of 10 (adj) psi.
 8. Decrease pressure setpoint by 0.1 (adj) psig every 10 (adj) minutes if there are less than 3 (adj) pressure requests.
 9. Make no adjustments to pressure setpoint if there are 3 (adj) requests.
 10. In any event, flow rate when chiller is active shall never be allowed to drop below chiller minimum flow rate (18gpm, adj.)

New Learning Center High Temperature Water Control:
 Chilled water for high temperature systems shall be constant temperature, with reset based on zone humidity level
 1. High temperature water setpoint shall be 58F (adj), nominal.
 2. Every 2 minutes (adj) the BAS shall poll the Learning Center temperature and humidity sensors, and calculate dewpoint; BAS shall also poll space slab temperature sensors where in-floor cooling exists.
 A. If all zone dewpoints are 2.0F (adj) or more lower than all in-floor slab temperature sensors, high temperature water setpoint shall remain unchanged.
 B. If any zone dewpoints are within 2.0F (adj) of any in-floor slab temperature sensor, the high temperature water setpoint shall be adjusted upward by 0.5F (adj).
 C. The high temperature water setpoint shall likewise be decreased by 0.5F (adj) if all zone dewpoints are 2.0F (adj) or more lower than all in-floor slab temperature sensors AND if high temperature water setpoint is not at nominal 58F (adj).
 D. BAS shall continue to poll all zones, then, and increase or decrease by 0.5F (adj) until setpoint returns to 58F (adj) / nominal setpoint.

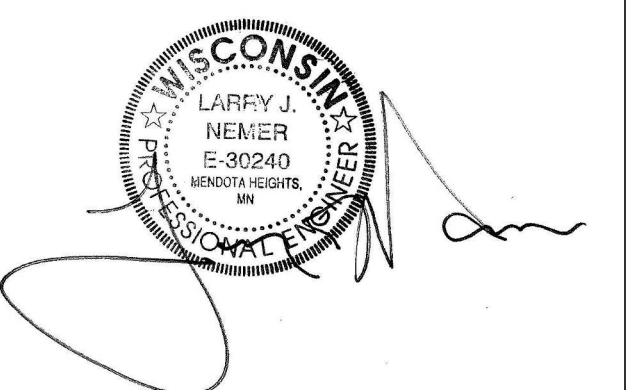
New Learning Center System Valve Control:
 Diverting 3-way modulating pressure-independent control valve controls Learning Center high temperature chilled water as follows
 1. 3-way valve shall be normally closed as noted on plan to re-circulate all water back to Learning Center pumps.
 2. If water temperature, as detected at the Learning Center chilled water supply temperature sensor, exceeds setpoint, the valve shall modulate open to maintain setpoint at the sensor.
 3. The valve shall modulate back to closed upon a return of water to setpoint.

New Learning Center Circulation Pumps:
 System pumps shall modulate speed based on system differential pressure, with a pressure reset schedule.
 1. Pumps operate as lead / lag, as follows:
 A. The lead pump shall be able to be chosen through a selectable day of the week and time of day, through the BAS.
 B. Coordinate with owner for scheduling switchover and frequency. Unless otherwise directed, switchover shall be 10am Tuesday.
 C. In any event, the lag pump shall be commanded on if the lead pump fails.
 2. Pumps shall operate only when chiller is enabled.
 3. Lead pump shall modulate speed to maintain differential setpoint.
 4. Differential pressure shall be determined by balancing contractor, but shall be a minimum of 5 psig, and a maximum of 10 psig.
 5. Differential pressure shall be reset based on a trim and respond logic using a poll of all system valve positions.
 6. If a valve is 99% open, a pressure request shall be sent.
 7. Increase pressure setpoint by 0.1 (adj) psig every 10 (adj) minutes if there are 3 (adj) or more pressure requests.
 8. Decrease pressure setpoint by 0.1 (adj) psig every 10 (adj) minutes if there are less than 3 (adj) pressure requests.
 9. Make no adjustments to pressure setpoint if there are 3 (adj) requests.

Alarms:
 See also alarms section in specifications.
 1. Alarm if any valve fails (all valves shall provide feedback on position).
 2. Alarm if any lead/lag fails, requiring lag start-up.
 3. Alarm if any chilled water pump fails, or associated VFD fails / is in fault
 4. Alarm on any chiller controller alarm.
 5. Alarm if chiller is manually shut off.
 6. Alarm if chiller remains off 5 (adj) minutes after commanded on.
 7.

**Olbrich Botanical Gardens
 Expansion Phase 1**
 BPW Project #8162
 3330 Atwood Avenue
 Madison, WI 53704

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the Laws of the State of Wisconsin.
 ENGINEER SEAL



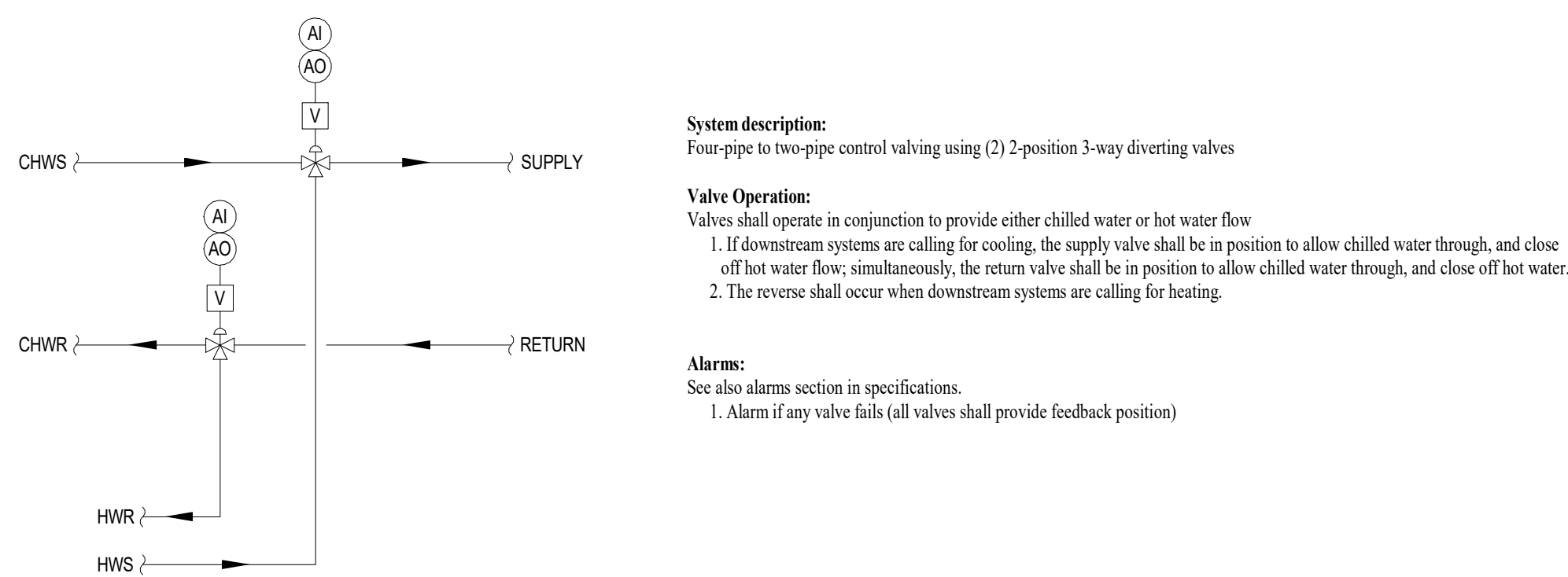
Signature: _____
 Print Names: Larry Nemer
 Date: JUNE 4, 2018 License No.: E-30240

MARK	DATE	DESCRIPTION
	09.09.2017	SCHEMATIC DESIGN SUBMISSION
	12.08.2017	50% PRICING SET
	01.10.2018	DESIGN DEVELOPMENT SUBMISSION
	01.17.2018	UDC SUBMISSION
	03.31.2018	75% CD PRICING ISSUE
	05.04.2018	90% CONSTRUCTION DOCUMENTS
	06.01.2018	BID ISSUE
	06.04.2018	PERMIT ISSUE

PROJECT NO.	2017016
PROJECT PHASE	BID DOCUMENTS
DRAWN BY:	MSR
CHECKED BY:	MSR

**MECHANICAL
 CONTROLS
 SCHEMATICS**

**EXHIBIT J
 M303**



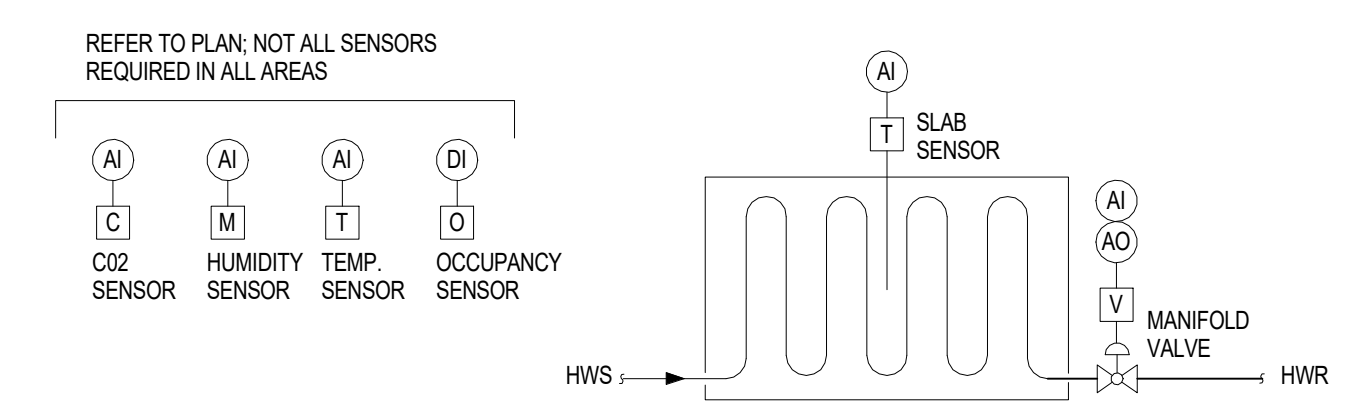
3 FOUR-PIPE TO TWO-PIPE VALVE CONTROL
 NOT TO SCALE

System description:
 Heating-only in-floor radiant system

System Setpoints:
 Space setpoint shall be controlled through the building automation system, and shall include occupied and unoccupied setpoints as scheduled below (all values adj).
 1. Storage, Janitor, Restrooms, and Circulation areas:
 A. Heating, occupied: 70
 B. Heating, unoccupied: 65
 C. Heating, hold: NA
 D. Cooling, occupied: NA
 E. Cooling, unoccupied: NA
 F. Cooling, hold: NA

In-Floor Radiant Slab:
 Space sensor and in-floor sensor shall control radiant slab as follows
 1. In-floor heating shall be disabled above 70F (adj) outdoor air temperature
 2. When space temperature is below setpoint, the in-floor manifold valve or valves shall modulate open to allow hot water flow, the valve or valves shall operate to maintain a slab temperature (as measured at the in-slab sensor) based on an outdoor air reset as follows:
 A. At 50F (adj) outdoor air and above, slab setpoint shall be 80F (adj)
 B. At 10F (adj) outdoor air and below, slab setpoint shall be 100F (adj)
 C. A linear function shall determine slab setpoint between these points

Alarms:
 See also alarms section in specifications.
 1. Alarm if any valve fails (all valves shall provide feedback on position)



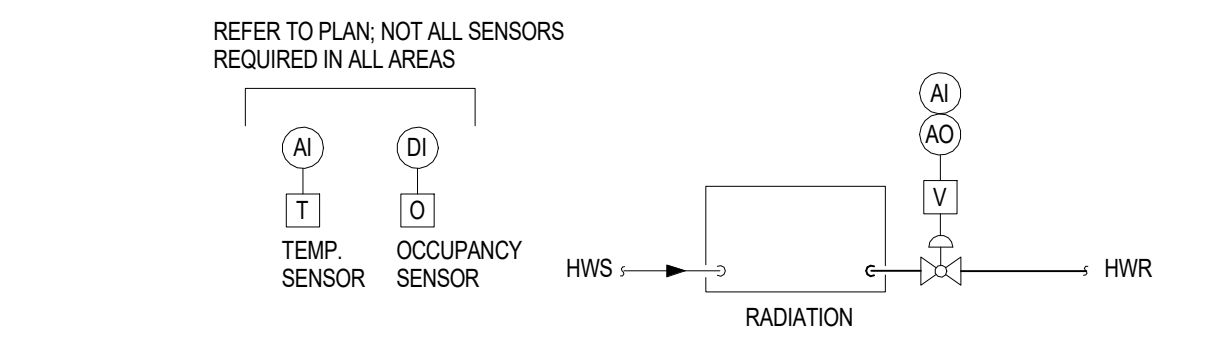
2 IN FLOOR RADIATION CONTROL DIAGRAM
 NOT TO SCALE

System description:
 Heating only panel radiation

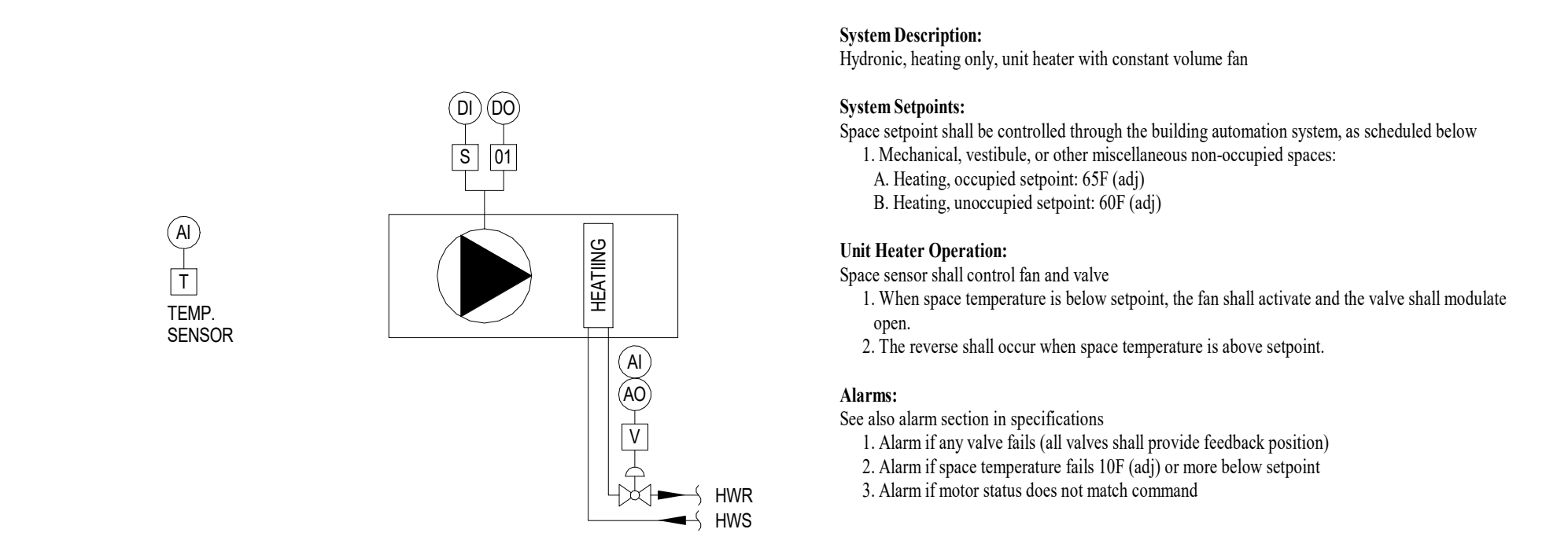
System setpoints:
 Space setpoint shall be controlled through the building automation system, as scheduled below
 1. Restrooms, storage, and other partially occupied spaces:
 a. Heating, occupied setpoint: 65F (adj)
 b. Heating, unoccupied setpoint: 60F (adj)

Radiation operation:
 Space sensor shall control the radiation.
 1. When space temperature is below setpoint, the radiation valve shall modulate open.
 2. The reverse shall occur when space temperature is above setpoint.

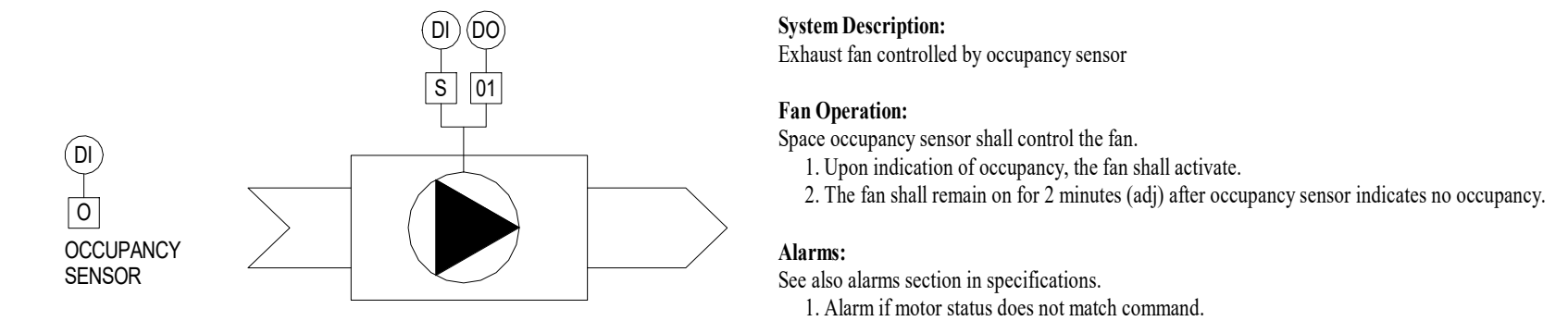
Alarms:
 See also alarms section in specifications.
 1. Alarm if any valve fails (all valves shall provide feedback position)
 2. Alarm if space temperature falls 10F (adj) or more below setpoint



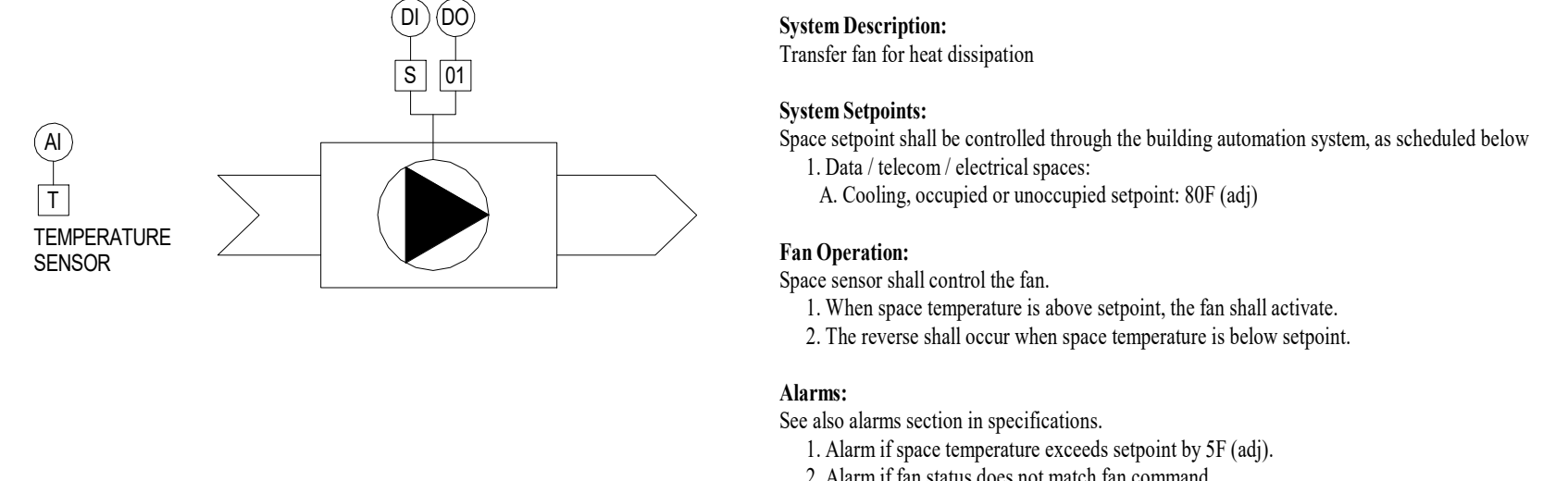
1 PANEL RADIATION CONTROL DIAGRAM
 NOT TO SCALE



6 UNIT HEATER CONTROL DIAGRAM
 NOT TO SCALE



5 EXHAUST FAN (RESTROOM, OCC SENSOR)
 NOT TO SCALE



4 HEAT DISSIPATION FAN (EF-4)
 NOT TO SCALE

SYMBOLOLOGY		
DIAGRAM SYMBOLOLOGY		
BAS INPUTS/OUTPUTS		
(A) ANALOG INPUT	◇ FREEZE STAT	⚡(M) MOTORIZED DAMPER
(AO) ANALOG OUTPUT	◇ SMOKE DETECTOR	◇ SMOKE DAMPER
(DI) DIGITAL INPUT		
(DO) DIGITAL OUTPUT		
(D) DAMPER POSITION	(C) CONTAMINANT SENSOR	(H) VFD HERTZ / SPEED MONITOR
(V) VALVE POSITION	(Q) FLOW MEASUREMENT	(S) CURRENT STATUS MONITOR
(DP) DIFF. PRESSURE	(O) OCCUPANCY SENSOR	(DI) START / STOP
(P) PRESSURE	(T) TEMP. SENSOR	(F) FLOW SWITCH
(M) MOISTURE (%RH)	(R) RHEOSTAT	
▶ FAN/PUMP	↔ 2-WAY VALVE	◻ VFD VARIABLE FREQUENCY DRIVE
≡ FLOW METER	↔ 3-WAY VALVE	
	↔ 2-WAY CONTROL VALVE	

**Olbrieh Botanical Gardens
 Expansion Phase 1**
 BPW Project #8162
 3330 Atwood Avenue
 Madison, WI 53704

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the Laws of the State of Wisconsin. ENGINEER SEAL.



Signature: _____
 Print Names: Larry Nemer
 Date: JUNE 4, 2018 License No.: E-30240

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		06.04.2018	PERMIT ISSUE

PROJECT NO. 2017016
 PROJECT PHASE BID DOCUMENTS
 DRAWN BY: MSR CHECKED BY: MSR
 Design: 2017 Copyright: Nemer, Saiki & Associates, LLC

**MECHANICAL
 CONTROLS
 SCHEMATICS**

**EXHIBIT J
 M304**

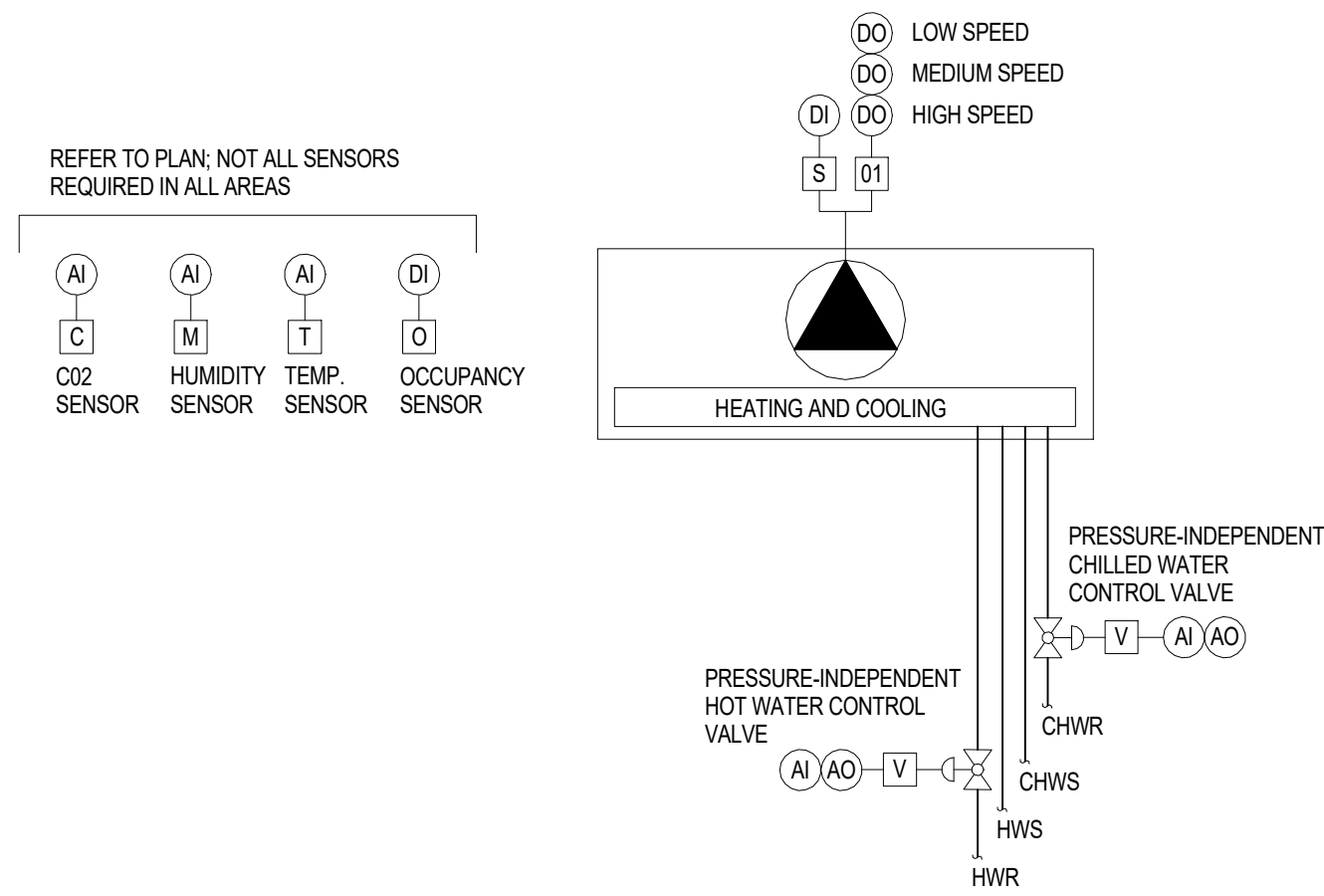
System description:
 Recessed fan coil unit, independent of other systems [I][E. LOBBY, L2, ONLY]

System Setpoints:
 Space setpoint shall be controlled through the building automation system, and shall include occupied, unoccupied, and hold setpoints as scheduled below (all values adj).
 1. Corridors, Lobbies:
 A. Heating, occupied: 70
 B. Heating, unoccupied: 65
 C. Heating, hold: not applicable
 D. Cooling, occupied: 75
 E. Cooling, unoccupied: 80
 F. Cooling, hold: not applicable
 2. Spaces shall be provided with limited user control (+/-2F, adj) available at the local sensor where scheduled.

Recessed Fan Coil Sequence of Operation:
 Space sensor shall control fan and valve operations for the recessed fan coil unit as follows

- When the space sensor indicates temperature within deadband
 - During occupied hours, fan coil fan shall be on low speed
 - During unoccupied hours, fan coil fan shall be off
 - In either case, the fan coil valve shall be closed
- When space temperature is below setpoint, the fan coil fan shall modulate to medium speed, and the valve shall open to allow hot water flow.
- When space temperature is above setpoint, the fan coil fan shall modulate to medium speed, and the valve shall open to allow chilled water flow.
- If the fan coil has been at medium speed with valve open (per 2, 3 above) for more than 10 minutes (adj), and space temperature remains above or below setpoint, the fan coil fan shall modulate to high speed.

- Alarms:**
- See also alarms section in specifications.
 - Alarm if any valve fails (all valves shall provide feedback on position).



3 RECESSED FAN COIL UNIT (RFCU), INDEPENDENT
 NOT TO SCALE

System description:
 Recessed fan coil unit, with variable air volume box to same zone [I][E. L2 OFFICES]

System Setpoints:
 Space setpoint shall be controlled through the building automation system, and shall include occupied, unoccupied, and hold setpoints as scheduled below (all values adj).
 1. Office areas, meeting rooms:
 A. Heating, occupied: 70
 B. Heating, unoccupied: 65
 C. Heating, hold: 70
 D. Cooling, occupied: 75
 E. Cooling, unoccupied: 80
 F. Cooling, hold: 75
 2. Spaces shall be provided with limited user control (+/-2F, adj) available at the local sensor where scheduled.

Recessed Fan Coil Sequence of Operation:
 Space sensor shall control fan and valve operations for the recessed fan coil unit as follows

- When the space sensor indicates temperature within deadband
 - During occupied hours, fan coil fan shall be on low speed
 - During unoccupied hours, the fan coil fan shall be off
 - In either case, the fan coil valve shall be closed
- When space temperature is below setpoint, the fan coil fan shall modulate to medium speed, and the valve shall open to allow hot water flow.
- When space temperature is above setpoint, the fan coil fan shall modulate to medium speed, and the valve shall open to allow chilled water flow.
- If the fan coil has been at medium speed with valve open (per 2, 3 above) for more than 10 minutes (adj), and space temperature remains above or below setpoint, the fan coil fan shall modulate to high speed.

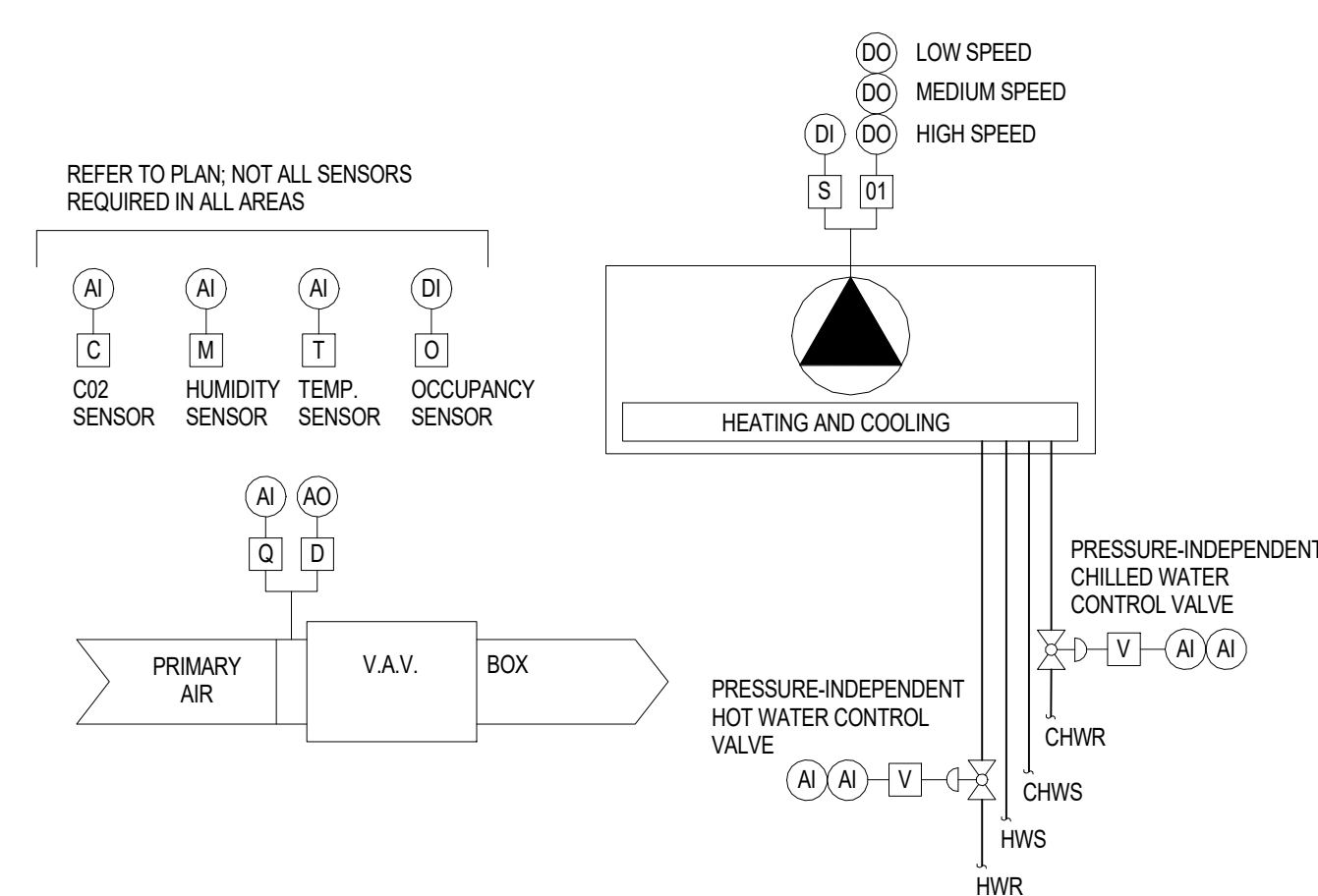
Occupancy and Occupancy Sensor:
 Occupancy sensor shall work in conjunction with building automation system to determine occupancy for space
 1. Primary occupancy is scheduled through the building automation system, refer also to specifications.
 2. Where scheduled or shown on plan, an occupancy sensor shall be provided for the specified zone.
 3. Where occupancy sensors are provided:
 A. IFBAS occupancy schedule and sensor occupancy agree, all setpoints and airflow rates shall be as the specified states.
 B. IFBAS is scheduled occupied, and the sensor indicates unoccupied, then the space temperature setpoint shall revert to the 'hold' value noted above.
 C. IFBAS is scheduled unoccupied, and the sensor indicates occupancy, then the setpoint and airflow rates shall be set to the occupied value

CO2 sensor / VAV:
 CO2 sensor shall increase airflow to the space, via the associated variable air volume box
 1. Where scheduled or shown on plan, a CO2 sensor shall be provided
 2. CO2 levels shall alter sequences only during scheduled occupied hours
 3. Nominal / setpoint CO2 level is 1000 (adj) ppm.
 4. If CO2 level is below setpoint, the variable air volume box associated with the zone shall maintain an airflow rate equal to 55% of design; this is nominal airflow, and shall not be user adjustable
 5. If CO2 is above setpoint, the variable air volume box shall modulate open
 6. If the variable air volume box is 100%, and has remained at 100% for more than 10 minutes (adj), and CO2 levels remain above setpoint, then the associated air handler shall modulate towards more outdoor air; refer to air handler sequences of operation
 7. Upon return of CO2 levels to setpoint / nominal or below, the associated VAV shall return to nominal flow

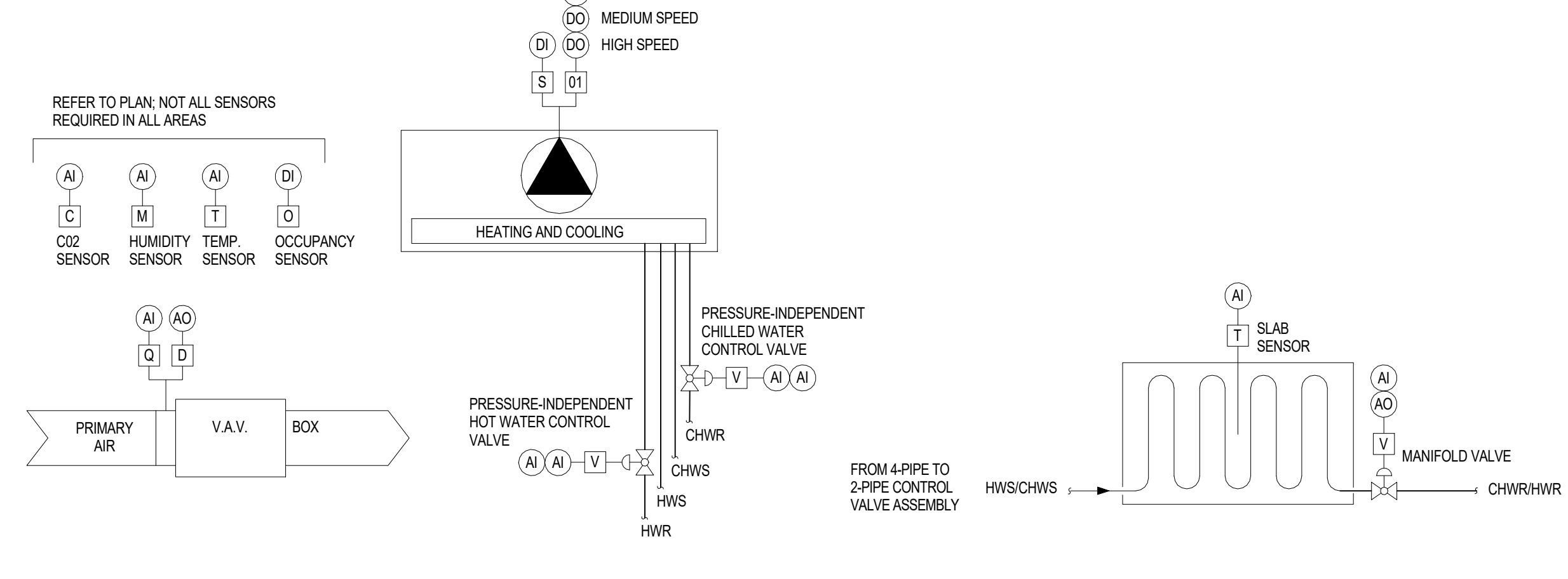
Humidity sensor / VAV:
 Humidity sensor shall increase airflow to the space, via the associated variable air volume box
 1. Where scheduled or shown on plan, a humidity sensor shall be provided
 2. The building automation system shall calculate space dewpoint based on space temperature and humidity levels
 3. Humidity levels shall alter sequences during occupied hours as follows:
 A. Nominal / setpoint dewpoint is 58F with a 1F deadband, and shall not be user adjustable
 B. If humidity level is below setpoint, the variable air volume box associated with the zone shall maintain an airflow rate equal to 55% of design; this is nominal airflow, and shall not be user adjustable
 C. If humidity is above setpoint, the variable air volume box shall modulate open
 D. Upon return of humidity levels to setpoint / nominal or below, the associated VAV shall return to nominal flow
 4. Humidity levels shall alter sequences during unoccupied hours as follows:
 E. Nominal / setpoint dewpoint is 58F with a 1F deadband, and shall not be user adjustable
 F. If humidity level is below setpoint, no airflow is required to the space
 G. If humidity is above setpoint, a signal shall start the associated air handler (see air handling unit sequences of operation), and the variable air volume box shall modulate open
 H. Upon return of humidity levels to setpoint / nominal or below, the associated VAV shall return to nominal flow and the air handler shall be off

Humidity / CO2 sensor interaction:
 Either CO2 or humidity sensors may drive variable air volume box open; VAV shall return to nominal flow only if both are satisfied

- Alarms:**
- See also alarms section in specifications
- Alarm if any valve fails (all valves shall provide feedback on position)
 - Alarm if space CO2 exceeds setpoint for more than 1 hour (adj)
 - Alarm if space humidity exceeds setpoint for more than 1 hour (adj)



2 RECESSED FCU WITH VAV
 NOT TO SCALE



1 RECESSED FCU WITH IN FLOOR RADIATION CONTROL DIAGRAM
 NOT TO SCALE

SYMBOLGY			
DIAGRAM SYMBOLGY			
BAS INPUTS/OUTPUTS			
(A) ANALOG INPUT	FREEZE STAT	MOTORIZED DAMPER	
(AO) ANALOG OUTPUT			
(D) DIGITAL INPUT	SMOKE DETECTOR	SMOKE DAMPER	
(DO) DIGITAL OUTPUT			
(D) DAMPER POSITION	(C) CONTAMINANT SENSOR	(H) HERTZ / SPEED MONITOR	
(V) VALVE POSITION	(Q) FLOW MEASUREMENT	(S) CURRENT STATUS MONITOR	
(DP) DIFF. PRESSURE	(O) OCCUPANCY SENSOR	(ST) START / STOP	
(P) PRESSURE	(T) TEMP. SENSOR	(F) FLOW SWITCH	
(M) MOISTURE (%RH)	(R) RHEOSTAT		
FAN/PUMP	2-WAY VALVE	VFD VARIABLE FREQUENCY DRIVE	
FLOW METER	3-WAY VALVE		
	2-WAY CONTROL VALVE		

AIR HANDLER SCHEDULE	
AHU #	1
TYPE	AIR HANDLING UNIT
OA AIRFLOW (CFM)	2100
EA AIRFLOW (CFM)	2100
AIRSIDE P.D. (IN W.C.)	2.0
OA DB (°F)	80.6
OA WB (°F)	75.1
RA DB (°F)	68.0
RA WB (°F)	65.2
SA DB (°F)	63.0
SA WB (°F)	52.8
EA DB (°F)	76.9
EA WB (°F)	69.3
REGENERATION AIR FILTER (TYPE/SIZE)	MERV-11
RETURN AIR FILTER (TYPE/SIZE)	MERV-13
OUTDOOR AIR FILTER (TYPE/SIZE)	MERV-13
SUPPLY AIRFLOW (CFM)	2100
OUTDOOR AIRFLOW (CFM)	2100
EXTERNAL STATIC PRESSURE (IN W.C.)	2.3
TYPE	PLENUM
MOTOR HP	5.0
MOTOR ELEC. CHAR. (V/Hz/PH)	208/3/60
EXHAUST AIRFLOW (CFM)	2100
EXTERNAL STATIC PRESSURE (IN W.C.)	0.5
TYPE	PLENUM
MOTOR HP	1.5
MOTOR ELEC. CHAR. (V/Hz/PH)	208/3/60
REGENERATION OUTDOOR AIRFLOW	2100
REGENERATION EXHAUST AIRFLOW	2100
EXTERNAL STATIC PRESSURE (IN W.C.)	0.8
TYPE	PLENUM
MOTOR HP	3.0
MOTOR ELEC. CHAR. (V/Hz/PH)	208/3/60
RETURN AIRFLOW (CFM)	2100
EA AIRFLOW (CFM)	2100
OA AIRFLOW (CFM)	2100
OA DB (°F)	80.6
OA WB (°F)	75.1
RA DB (°F)	68.0
RA WB (°F)	65.2
SA DB (°F)	63.0
SA WB (°F)	52.8
EA DB (°F)	76.9
EA WB (°F)	69.3
OA DB (°F)	-15.0
OA WB (°F)	-15.0
RA DB (°F)	68.0
RA WB (°F)	51.0
SA DB (°F)	29.9
SA WB (°F)	25.9
EA DB (°F)	23.1
EA WB (°F)	23.0
TOTAL MBH	158.5
SENSIBLE MBH	46
EER	18.2
SA AIRFLOW (CFM)	2100
EA AIRFLOW (CFM)	2100
REFRIGERANT TYPE	R410A
EAT (DB °F)	73.9
EAT (WB °F)	63.7
LAT (DB °F)	53.6
LAT (WB °F)	53.6
FLUID	100% WATER
EAT (DB °F)	73.3
EAT (WB °F)	56.9
LAT (DB °F)	63.0
LAT (WB °F)	52.8
EWTT (°F)	44.0
LWTT (°F)	60.0
FLOW (GPM)	3.0
WATERSIDE PD (FT)	1.1
TOTAL MBH	136.3
AIR PRESSURE DROP	N/A
EAT (°F)	29.9
LAT (°F)	90.0
EWTT (°F)	120
LWTT (°F)	105.0
FLOW (GPM)	18.6
WATERSIDE PD (FT)	7.9
MANUFACTURER	NOVEL AIRE TECHNOLOGIES
MODEL	2000 DES/IX ERV
NOTES	1, 2, 3, 4, 5, 6, 7

- NOTES:
1. INSTALL PER MANUFACTURER'S WRITTEN INSTRUCTIONS.
 2. UNIT TO BE INSTALLED ON HOUSEKEEPING PAD PROVIDED BY MECHANICAL.
 3. ALL FANS SHALL BE PROVIDED WITH VFD. ALL VFDs ARE FURNISHED BY CONTROLS CONTRACTOR AND WIRED BY ELECTRICAL.
 4. PROVIDE UNIT WITH SINGLE POINT CONNECTION.
 5. DUCT SMOKE DETECTOR FURNISHED AND WIRED BY ELECTRICAL; INSTALLED BY MECHANICAL.
 6. REFER TO DETAIL FOR COIL PIPING CONNECTIONS.
 7. AHU DATA BASED ON ASHRAE DEHUMIDIFICATION DAY.

SOUND ATTENUATOR SCHEDULE																		
MARK	LOCATION	SERVICE	TYPE	(CFM)	DYNAMIC INSERTION LOSS							FACE VELOCITY (FPM)	MAXIMUM AIR PD (FT)	LENGTH (IN)	DIMENSIONS (WxH) (IN)	MANUFACTURER	MODEL	
					63 (HZ)	125 (HZ)	250 (HZ)	500 (HZ)	1000 (HZ)	2000 (HZ)	4000 (HZ)							8000 (HZ)
SAT-1	MECHANICAL 120	AHU-1 SA	ELBOW WITH EXTENDED WIDTH	2100	12	15	22	29	33	29	24	20	1200	0.15	84	12x20, 24x20	VAW SYSTEMS	REL-EW
SAT-2	MECHANICAL 120	AHU-1 RA	ELBOW	2000	9	13	18	26	29	24	20	1200	0.11	96	20x12	VAW SYSTEMS	REL	
SAT-3	MECHANICAL 120	AHU-1 OA	ELBOW WITH EXTENDED WIDTH	2100	10	16	20	28	36	32	27	1200	0.11	108	20x12	VAW SYSTEMS	REL	
SAT-4	MECHANICAL 120	AHU-1 REGENERATION EA	ELBOW	2100	5	6	11	18	27	29	25	18	1200	0.08	60	20x12	VAW SYSTEMS	REL
SAT-5	MECHANICAL 120	AHU-1 EA	ELBOW	2100	9	13	17	25	31	30	26	20	1200	0.11	96	20x12	VAW SYSTEMS	REL
SAT-6	MECHANICAL 120	AHU-1 REGENERATION OA	ELBOW	2100	4	7	10	18	24	25	25	16	1200	0.14	60	12x20	VAW SYSTEMS	REL

AIR COOLED CHILLER SCHEDULE																		
MARK	LOCATION	REFRIGERANT TYPE	CAPACITY TONS	EER	EVAPORATOR				CONDENSER				ELECTRICAL		OPERATING WEIGHT (LBS)	MANUFACTURER	MODEL	NOTES
					FLUID PROPERTY	EWTT (°F)	LWTT (°F)	GPM	PD (FT)	EAT (°F)	FAN QTY	COMPRESSOR QTY	V / PH / HZ	MCA				
CH-1	OUTSIDE	410A	13.21	9.9	100% WATER	60	44.0	20	5.0	95.0	1	1	208/3/60	64.5	800	CARRIER	30R4P16	1, 2, 3

- NOTES:
1. INSTALL PER MANUFACTURER'S WRITTEN INSTRUCTIONS.
 2. SINGLE POINT CONNECTION. DISCONNECT FURNISHED BY MANUFACTURER AND WIRED BY ELECTRICAL.
 3. CHILLER IS TO BE INSTALLED ON GRADE. PAD AND SUPPORT BY MECHANICAL.

HVAC EXPANSION TANK													
EXPANSION TANK #	SYSTEM	LOCATION	SIZE		CAPACITY		PRE-CHARGE (PSIG)	MAXIMUM PRESSURE IN TANK (PSI)	SYSTEM WATER VOLUME (GAL)	SYSTEM CONNECTION SIZE (IN)	MANUFACTURER	MODEL	NOTES
			HEIGHT (IN)	DIAMETER (IN)	ACCEPT. VOLUME (GAL.)	MIN. TANK VOLUME (GAL.)							
ET-2	CHILLED WATER	HEADHOUSE	37	10	10	10	15	40	715	1	BELL & GOSSETT	B-38LA	1, 2, 3, 4

- NOTES:
1. REFER TO DETAIL 2/M202.
 2. ASME RATED BLADDER TYPE VESSEL.
 3. INCLUDE OPTIONAL SIGHT GLASS.
 4. INSTALL PER MANUFACTURER'S WRITTEN INSTRUCTIONS.

HVAC FANS															
MARK	ROOM LOCATION	SYSTEM	AIRFLOW (CFM)	STATIC PRESSURE (IN WG)	WHEEL TYPE & SIZE (IN)	RPM	V/Hz	AMPS	DAMPER	DRIVE	FAN TYPE	WEIGHT	MANUFACTURER	MODEL	NOTES
EF-1	RESTROOM 105	EXHAUST	75	0.5	FORWARD CURVED, 7.64	935	115/1/60	0.1	BACK DRAFT	DIRECT	CEILING		Greenheck	SP-80-VG	1, 2, 3
EF-2	RESTROOM 104	EXHAUST	75	0.5	FORWARD CURVED, 7.64	935	115/1/60	0.1	BACK DRAFT	DIRECT	CEILING		Greenheck	SP-80-VG	1, 2, 3
EF-3	JC 101	EXHAUST	90	0.5	FORWARD CURVED, 7.64	935	115/1/60	0.1	BACK DRAFT	DIRECT	CEILING		Greenheck	SP-80-VG	2, 3, 5
EF-4	DATA 102	EXHAUST	90	0.5	FORWARD CURVED, 7.64	935	115/1/60	0.1	BACK DRAFT	DIRECT	CEILING		Greenheck	SP-80-VG	2, 3, 4
EF-5	RESTROOM 202	EXHAUST	75	0.5	FORWARD CURVED, 7.64	935	115/1/60	0.1	BACK DRAFT	DIRECT	CEILING		Greenheck	SP-80-VG	1, 2, 3

- NOTES:
1. EXHAUST FAN SHALL BE INTERLOCKED WITH OCCUPANCY SENSOR. CONTROLS BY CONTROLS CONTRACTOR. LINE VOLTAGE WIRING BY ELECTRICAL.
 2. INSTALL PER MANUFACTURER'S WRITTEN INSTRUCTIONS.
 3. DISCONNECT BY ELECTRICAL.
 4. EXHAUST FAN CONTROLLED BY THERMOSTAT. CONTROLS BY CONTROLS CONTRACTOR. LINE VOLTAGE WIRING BY ELECTRICAL.
 5. EXHAUST FAN ALWAYS ON.

AIR SEPARATOR SCHEDULE								
MARK	LOCATION	SYSTEM	GPM	MAXIMUM PRESSURE DROP (FEET)	SIZE (IN)	MANUFACTURER	MODEL	NOTES
AS-2	HEADHOUSE	BUILDING CHILLED WATER	20	1.0	4	SPROTHERM	VDR400	1, 2, 3, 4, 5, 6

- NOTES:
1. UNIT IS COMBINATION OF AIR ELIMINATOR AND DIRT SEPARATOR.
 2. REFER TO DETAIL 2/M202.
 3. UNIT SHALL BE WITH REMOVABLE HEAD.
 4. TRANSITION TO CONNECTION SIZE 1/2" BEFORE AND AFTER UNIT.
 5. TREADED OR FLANGED CONNECTION ACCEPTABLE.
 6. INSTALL PER MANUFACTURER'S WRITTEN INSTRUCTIONS.

LOUVER SCHEDULE								
MARK	SERVES	SIZE W" x H"	CFM	LOUVER FACE VELOCITY (FPM)	TYPE	MANUFACTURER	MODEL	NOTES
L-1	AHU-1 EXHAUST AND REGENERATION EXHAUST	30x78	4000	1000	ACOUSTIC LOUVER	PRICE INDUSTRIES	QAF845	1, 2, 4
L-2	AHU-1 OA INTAKE	48x18	4000	400	LOUVER	GREENHECK	ESD-202	1, 2, 3

- NOTES:
1. LOUVERS SPECIFIED IN DIV 8 FURNISHED AND INSTALLED BY MECHANICAL CONTRACTOR.
 2. FACE VELOCITY AT MAXIMUM AHU AIRFLOW.
 3. REFER TO ARCHITECTURAL PLANS FOR QUANTITY. FIELD VERIFY PRIOR TO START OF WORK.
 4. FACE VELOCITY CALCULATED OVER ACTIVE AREA OF LOUVER. REFER TO PLAN FOR BLANK OFF SECTION.

UNIT HEATER SCHEDULE																
UNIT HEATER #	LOCATION	FAN DATA					HOT WATER HEATING COIL					DIMENSIONS H"WxWxD"	MANUFACTURER	MODEL	NOTES	
		TOTAL CFM	HP	RPM	VOLTS	PHASE	MBH	NO. OF ROWS	EWTT (°F)	LWTT (°F)	GPM					PD (FT)
UH-1	MECH. 120	400	FRAC.	1550	115	1	24	1	120	100	0.5	0.11	16x16x18	REZNOR	WS	1, 2
UH-2	FP 106	400	FRAC.	1550	115	1	18	1	120	100	0.5	0.11	16x16x18	REZNOR	WS	1, 2

- NOTES:
1. INSTALL PER MANUFACTURER'S WRITTEN INSTRUCTIONS.
 2. DISCONNECT AND WIRING BY ELECTRICAL.

GRILLE, REGISTER & DIFFUSER					
PLAN SYMBOL	DISCRPTION	MANUFACTURER	MODEL NUMBER	MATERIAL	NOTES
CD-1	8" INLET, (2)1.0" SLOTS, 4' LONG WITH 8" HIGH INSULATED PLENUM.	TITUS	TSD-10	ALUMINUM	1, 2
RG-1	4' LONG, (4) 1.0" SLOTS	TITUS	TBR-30	ALUMINUM	1, 2
RG-2	LINEAR BAR DIFFUSE, 18" BARS, 0 DEGREE DEFLECTION, 2" NOMINAL DUCT SIZE.	TITUS	CT-580	ALUMINUM	1, 3
SD-1	RECTANGULAR SUPPLY DIFFUSER WITH 1/2" BLADE SPACING AND 35 DEGREE DEFLECTION	TITUS	355RL	STEEL	1

- NOTES:
1. SEE PLANS FOR SPECIFIC SIZE.
 2. INSULATED PLENUM BOX PROVIDED BY MANUFACTURER.
 3. FABRICATED PLENUM BOX, PER PLAN.

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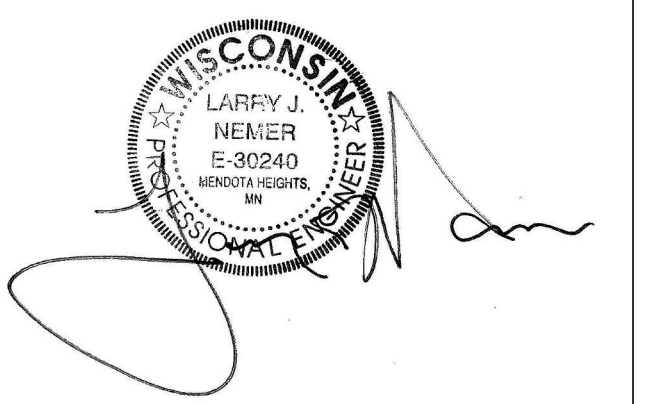
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5513 Vine Street
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Olbrich Botanical Gardens
Expansion Phase 1
 BPW Project #8162
 3330 Atwood Avenue
 Madison, WI 53704

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the Laws of the State of Wisconsin.
 ENGINEER SEAL



Signature:
 Print Names: Larry Nemer
 Date: JUNE 4, 2018 License No.: E-30240

MARK	DATE	DESCRIPTION
	09.09.2017	SCHEMATIC DESIGN SUBMISSION
	12.08.2017	DD PRICING SET
	01.10.2018	DESIGN DEVELOPMENT SUBMISSION
	01.17.2018	UDC SUBMISSION
	03.31.2018	75% CD PRICING ISSUE
	05.04.2018	90% CONSTRUCTION DOCUMENTS
	06.01.2018	BID ISSUE
	06.04.2018	PERMIT ISSUE

PROJECT NO: 2017016
 PROJECT PHASE: BID DOCUMENTS
 DRAWN BY: MSR CHECKED BY: MSR
 Design: JDT Copyright: West, Green & Rosales, LLC

MECHANICAL SCHEDULES

EXHIBIT J
M401

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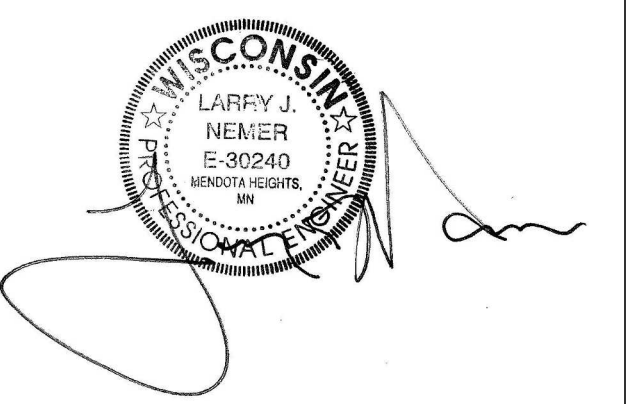
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PROJECT NO. 2017016
 PROJECT PHASE BID DOCUMENTS
 DRAWN BY: MSR CHECKED BY: MSR
 Design: 2017 Copyright: West, Shover & Rasmussen, LLC

**MECHANICAL
 SCHEDULES**

**EXHIBIT J
 M402**

RECESSED FAN COIL UNIT SCHEDULE																								
MARK	PRIMARY SA (CFM)	FAN CFM (RSH/ME2)	LENGTH (IN)	FAN		MOTOR		COOLING COIL								HEATING COIL						MANUFACTURER	MODEL	NOTES
				DRIVE TYPE	CHAR. (V / @ / HZ)	SENSIBLE (MBH)	WATER SIDE				AIR SIDE				WATER SIDE			AIR SIDE						
							EWT (°F)	LWT (°F)	GPM	EAT (DB°F)	EAT (WB°F)	LAT (DB°F)	LAT (WB°F)	EWT (°F)	LWT (°F)	GPM	PD (FT)	EAT (°F)	LAT (°F)					
RFC-1	-	650/300	110	DIRECT	24 V	5300	58	63	2.0	68	55.2	63	52.8	-	-	-	-	-	-	JAGA	QUAF 019280342/BNA	1,2,3		
RFC-1D	-	650/300	120	DIRECT	24 V	5300	58	63	1.7	63	52.8	63	52.8	-	-	-	-	-	-	JAGA	QUAF 019280342/BNA	1,2,3,4		
RFC-2	-	650/430	110	DIRECT	24 V	4965	58	63	1.9	68	55.2	63	52.8	120	100	1.11	1.0	70	90	JAGA	QUAF 019280342/BNA	1,2,3		
RFC-2D	-	650/430	120	DIRECT	24 V	4965	58	63	1.9	63	52.8	63	52.8	120	100	1.11	1.0	90	90	JAGA	QUAF 019280342/BNA	1,2,3,4		
RFC-3	-	440/200	79	DIRECT	24 V	3560	58	63	1.5	68	55.2	63	52.8	120	100	0.75	1.0	70	90	JAGA	QUAF 019200342/BNA	1,2,3		
RFC-3D	-	650/430	87	DIRECT	24 V	3560	58	63	1.4	68	55.2	63	52.8	120	100	1.11	1.0	70	90	JAGA	QUAF 019200342/BNA	1,2,3,4		

- NOTES:
 1. UNIT INCLUDES 24 V SPEED CONTROL.
 2. PROVIDE OAK VARNISHED WOODEN GRILLE.
 3. INSTALL PER MANUFACTURERS WRITTEN INSTRUCTIONS.
 4. UNIT SHALL BE EXTENDED TO SPECIFIED LENGTH TO ALLOW 6" PRIMARY AIR CONNECTION.

HVAC PUMP SCHEDULE													
MARK	LOCATION	SERVES	PUMP TYPE	DESIGN FLOW (GPM)	HEAD (FT)	MOTOR		PUMP SIZE		MANUFACTURER	MODEL	NOTES	
						ELECTRICAL CHAR	HP	SUCTION (IN)	DISCHARGE (IN)				
P-3A	HEADHOUSE	HOUSE CHILLED WATER	INLINE	20	10	208/180	1/8	1 1/2	1 1/2	BELL AND GOSSETT	ECOCIRC-XL-36-45	1,2,3	
P-3B	HEADHOUSE	HOUSE CHILLED WATER	INLINE	20	10	208/180	1/8	1 1/2	1 1/2	BELL AND GOSSETT	ECOCIRC-XL-36-45	1,2,3	
P-4A	MECH. ROOM 120	LEARNING CENTER CHILLED WATER	INLINE	49	33	208/180	1.0	1 1/2	1 1/2	BELL AND GOSSETT	ECOCIRC-XL-65-130	1,2,3	
P-4B	MECH. ROOM 120	LEARNING CENTER CHILLED WATER	INLINE	49	33	208/180	1.0	1 1/2	1 1/2	BELL AND GOSSETT	ECOCIRC-XL-65-130	1,2,3	
P-5A	MECH. ROOM 120	LEARNING CENTER HOT WATER	INLINE	49	32	208/180	1.0	1 1/2	1 1/2	BELL AND GOSSETT	ECOCIRC-XL-65-130	1,2,3	
P-5B	MECH. ROOM 120	LEARNING CENTER HOT WATER	INLINE	49	32	208/180	1.0	1 1/2	1 1/2	BELL AND GOSSETT	ECOCIRC-XL-65-130	1,2,3	

- NOTES:
 1. INSTALL PER MANUFACTURERS WRITTEN INSTRUCTIONS.
 2. DISCONNECT AND WIRING BY ELECTRICAL.
 3. REFER TO DETAIL 1M202.

PANEL RADIATOR SCHEDULE								
MARK	LOCATION	CAPACITY (BTU/HFT)	GPM	EWT (DEG F)	LWT (DEG F)	PANEL LENGTH	MANUFACTURER & MODEL NO.	NOTES
PR-1	SEE PLAN	541.0	SEE PLAN	120	100	SEE PLAN	RUNTAL_R3F	1,2
PR-2	SEE PLAN	541.0	SEE PLAN	120	100	SEE PLAN	RUNTAL_R3F	1,2

- NOTES:
 1. INSTALL PER MANUFACTURERS WRITTEN INSTRUCTIONS.
 2. REFER TO DETAIL 8M201.

RADIANT HEAT/COOL MANIFOLD SCHEDULE									
MARK	SERVES	NUMBER OF CIRCUITS	HOT WATER SUPPLY TEMP (°F)	CHILLED WATER SUPPLY TEMP (°F)	MANIFOLD Δ P (FT H2O)	MAX Δ P (FT H2O)	FLOW RATE (GPM)	NOTES	
M-1	ZONE 1	5	120	58	1.0	4.0	3.8	1,3,4	
M-2	ZONE 2,3	10	120	58	1.0	3.5	7.4	1,3,4	
M-3	ZONE 4	9	120	58	1.1	4.2	7.4	1,3,4	
M-4	ZONE 4,5,6,7,8	6	120	-	1.1	4.0	4.0	1,2,3	

- NOTES:
 1. INSTALL PER MANUFACTURERS WRITTEN INSTRUCTIONS.
 2. MANIFOLD HAS HEATING ONLY.
 3. REFER TO DETAIL 5M201.
 4. WHERE MANIFOLD SUPPLIES HOT OR CHILLED WATER, INCLUDE 4-WAY TO 2-WAY VALVING ASSEMBLY (BY CONTROLS CONTRACTOR).

VAV SCHEDULE								
MARK	LOCATION	SERVES	MAX. CFM	MIN. CFM	INLET SIZE (IN)	TOTAL DELTA P (IN WG)	MANUFACTURER & MODEL NO.	NOTES
VAV-1	MECH. ROOM 120	CLASSROOM 3	500	250	7	0.5	TITUS, DESV	1,2,3,4
VAV-2	MECH. ROOM 120	CLASSROOM 1	500	250	7	0.5	TITUS, DESV	1,2,3,4
VAV-3	MECH. ROOM 120	CLASSROOM 2	500	250	7	0.5	TITUS, DESV	1,2,3,4
VAV-4	MECH. ROOM 120	SECOND FLOOR	310	160	6	0.5	TITUS, DESV	1,2,3,4

- NOTES:
 1. VAV WITH LOW VOLTAGE CONTROLLER.
 2. REFER TO DETAIL 7M201.
 3. INSTALL WITH CONTROL BOX AT THE BOTTOM OF UNIT, TO ALLOW 3" CLEAR ACCESS TO SAME.
 4. REFER TO PLAN FOR SENSOR TYPE ASSOCIATED WITH EACH VAV.