



ADDENDUM

Date Issued:	Nov 24, 2020
Project:	Intermountain Healthcare Intermountain Logan Regional Hospital – Sleep Lab 1350 North 500 East Logan, UT 84341
Addendum Number:	1

The Contractors submitting proposals on the above-captioned project shall be governed by the following addendum, changes and explanations to the drawings and specifications and shall submit their bids in accordance therewith.

Item Number	General Items Description
1	<p>Questions by contractors and their response:</p> <p>Question # 1: Is the Nurse Call System going direct to Owner? Should we cover the cabling for this system? Response: Hill-Rom will be contracted directly with Intermountain for nurse call systems. The contractor is responsible for rough-in and cabling between the TDR/head end location to the RCB2 controller at each space. Refer to general scope note added to sheet EYA101.</p> <p>Question #2: Where does the TV signal come in for this building? Do you have a plan showing the location so we can pull a length off of it? Response: In the sleep lab space the existing cable television connection is located in the plan northwest corner of the space.</p> <p>Question #3: Where is panel Q? What is in the path to that panel? T-bar ceilings? Hard ceilings? Also how do we get time in the other suite to install conduit/conductors to that panel. Response: The "Q" suite is presently unoccupied so access should be coordinated with Intermountain. The ceilings are hard ceilings and will require access. The panel in the "Q" suite is within 50'-0" of the new tele/data room.</p> <p>Question #4: Outside HVAC units have to go through exterior and then inside to the panel. Any directions on how to pipe on the exterior of the building? There will be 6 conduits that need to exit the ground and enter the building. Wondering if they are planning a cover or just leave the conduits to the weather. Response: Contractor to comply with specifications for conduit types in exposed and exterior areas. Yes, the conduits running up to the ceiling space on the exterior wall shall be enclosed in a sheet metal cover - painted. Color to match door and window mullions.</p>



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Sheet Number	Drawings
Architectural Drawings	
	None
Mechanical Drawings	
	See attached mechanical addendum.
Electrical Drawings	
	See attached electrical addendum.

Attachments:

Architectural Drawings: None



ADDENDUM #1

DATE: November 24, 2020

PROJECT NO: 19296

PROJECT: Intermountain Logan Regional Hospital Sleep Lab

The following revision, additions, deletions, and/or items of clarification shall hereby be included as an integral part of the Contract Documents for the above-listed project and shall be fully binding. All other requirements of the original plans and specification shall remain in effect in their respective order.

DIVISION – 21, 23

GENERAL

1.

DRAWINGS

SHEET - M112 – MECHANICAL PLAN

1. Remove EF-3 serving STAFF TOILET A108. 6"Ø exhaust duct shall tie into roof exhaust fan EF-1.

SHEET - M113 – MECHANICAL ROOF PLAN

1. Remove exhaust duct riser associated with ceiling exhaust fan EF-3.
2. Add roof exhaust duct connected to ERV-1.

SHEET - M501 – MECHANICAL DETAILS

1. Replace ceiling exhaust fan detail 13/M501 with duct support on roof detail.

SHEET - M601 – MECHANICAL SCHEDULES

1. Revise airflow performance of EF-1.
2. Revise fan schedule to eliminate EF-3 and associated notes #3 & 4.

SPECIFICATIONS

SECTION - 223436 HIGH EFFICIENCY GAS DOMESTIC WATER HEATERS

1. Add Compression Tank warranty of five years to Part 1.6-A-1-D.
2. Add Water Heater Accessories Part 2.8. See attached.

SECTION - 230993 SEQUENCES OF OPERATION

1. Eliminate 230993-7-C-b to remove control sequence for eliminated fan EF-3.

PRIOR APPROVALS

The following manufacturers, trade names and products are allowed to bid on a name brand only basis with the provision that they completely satisfy all and every requirement of the drawings, specifications and all addenda shall conform to the design, quality and standards specified, established and required for the complete and satisfactory installation and performance of the building and all its respective parts.

<u>Item</u>	<u>Manufacturer</u>	<u>Comments</u>
VRF Heat Recovery System	Lennox	Not Approved

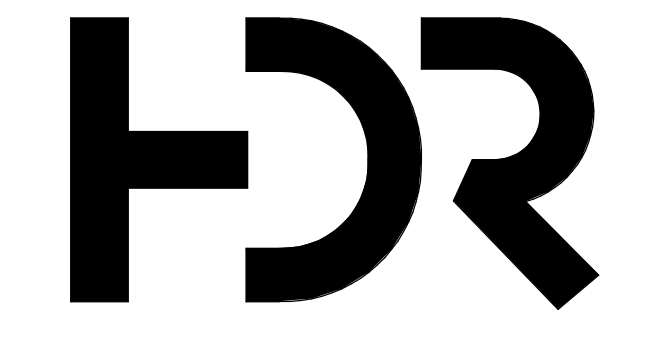
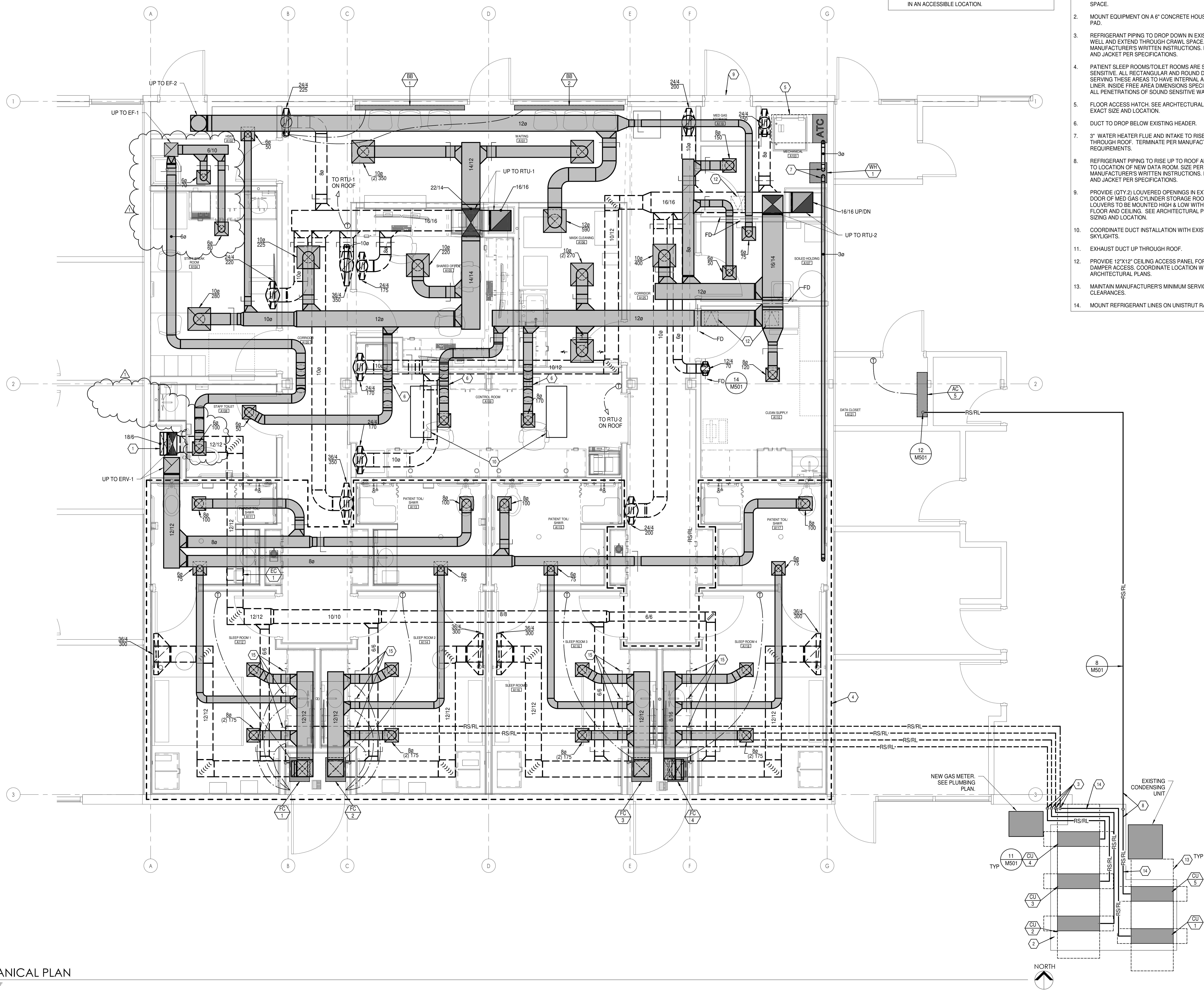
Split System Air Conditioners	Lennox	Not Approved
Electric Duct Heaters	Warren	Not Approved
Domestic Expansion Tanks	Taco Comfort Solutions	Approved
Domestic Pumps	Taco Comfort Solutions	Approved
Energy Recovery Unit	LG	Not Approved
Energy Recovery Unit	Valent	Not Approved
Energy Recovery Unit	Renewaire	Approved
Variable Refrigerant Flow System	LG	Approved
Exhaust Fans	Twin City Fan	Not Approved
Lavatory	American Standard	Not Approved
Flush Valves	American Standard	Not Approved
Faucets	American Standard	Not Approved
Toilet Seats	American Standard	Approved

GENERAL NOTES

- CONTRACTOR TO PROVIDE REMOTE CABLE DAMPER OPERATORS WITH CONCEALED CEILING PLATE FOR ALL BALANCING DAMPERS ABOVE HARD CEILINGS. LOCATE IN AN ACCESSIBLE LOCATION.

KEYED NOTES

- DROP 18" RETURN DUCT AROUND ROOF JOIST AND DOWN IN CHASE FROM RTU DOWN TO UNDERFLOOR CRAWL SPACE. TRANSITION TO SIZE NOTED IN CRAWL SPACE.
- MOUNT EQUIPMENT ON A 6" CONCRETE HOUSEKEEPING PAD.
- REFRIGERANT PIPING TO DROP DOWN IN EXISTING AREA WELL AND EXTEND THROUGH CRAWL SPACE. SIZE PER MANUFACTURER'S WRITTEN INSTRUCTIONS. INSULATE AND JACKET PER SPECIFICATIONS.
- PATIENT SLEEP ROOMS/TOILET ROOMS ARE SOUND SENSITIVE. ALL RECTANGULAR AND ROUND DUCT SERVING THESE AREAS TO HAVE INTERNAL ACOUSTIC LINER. INSIDE FREE AREA DIMENSIONS SPECIFIED. SEAL ALL PENETRATIONS OF SOUND SENSITIVE WALLS.
- FLOOR ACCESS HATCH. SEE ARCHITECTURAL PLAN FOR EXACT SIZE AND LOCATION.
- DUCT TO DROP BELOW EXISTING HEADER.
- 3" WATER HEATER FLUE AND INTAKE TO RISE UP THROUGH ROOF. TERMINATE PER MANUFACTURER'S REQUIREMENTS.
- REFRIGERANT PIPING TO RISE UP TO ROOF AND EXTEND TO LOCATION OF NEW DATA ROOM. SIZE PER MANUFACTURER'S WRITTEN INSTRUCTIONS. INSULATE AND JACKET PER SPECIFICATIONS.
- PROVIDE (QTY 2) LOUVERED OPENINGS IN EXTERIOR DOOR OF MED GAS CYLINDER STORAGE ROOM. LOUVERS TO BE MOUNTED HIGH & LOW WITHIN 6" OF FLOOR AND CEILING. SEE ARCHITECTURAL PLAN FOR SIZING AND LOCATION.
- COORDINATE DUCT INSTALLATION WITH EXISTING SKYLIGHTS.
- EXHAUST DUCT UP THROUGH ROOF.
- PROVIDE 12"X12" CEILING ACCESS PANEL FOR FIRE DAMPER ACCESS. COORDINATE LOCATION WITH ARCHITECTURAL PLANS.
- MAINTAIN MANUFACTURER'S MINIMUM SERVICE CLEARANCES.
- MOUNT REFRIGERANT LINES ON UNISTRUT RACK.



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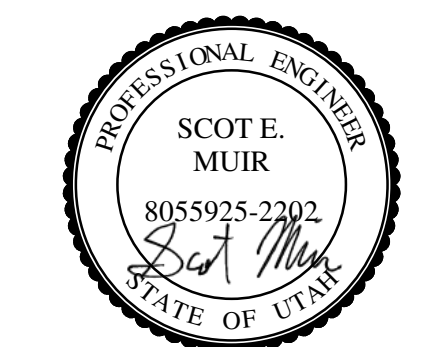
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Project Designer	ERIC MEUB
Project Architect	FRANK PENROSE
Landscape Architect	ARCOSTO
Civil Engineer	GREAT BASIN
Structural Engineer	REAVELEY
Mechanical Engineer	VAN BOERUM & FRANK
Electrical Engineer	SPECIUM
Plumbing Engineer	VAN BOERUM & FRANK
Interior Designer	RUBY THORP
Equipment Planner	ROBERT GRIESCHE
Wayfinding	

MARK	DATE	DESCRIPTION
1	11/24/2020	Addendum 1

Project Number: 10173823
Original Issue: 11/6/20



Sheet Name: **MECHANICAL PLAN**

Sheet Number: **M112**

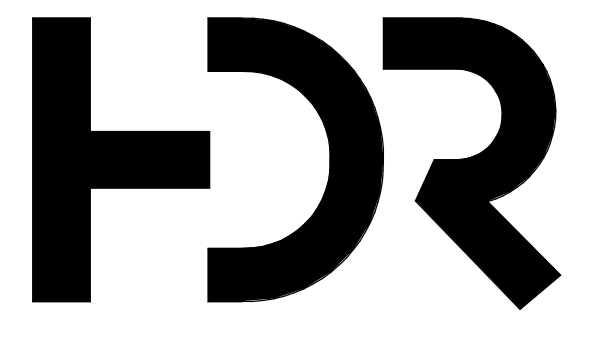
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11/24/2020 11:32:01 AM BIM 360://19395 - Logan Regional Hospital Reconfiguration/19395 - Mech Sleep Center_2019.rvt

MECHANICAL PLAN
SCALE: 3/8" = 1'-0"

KEYED NOTES

1. EXTEND ROOF MOUNTED EXHAUST DUCT ON ROOF AS SHOWN. MAINTAIN 25 FT FROM NEAREST OA INTAKE. DUCT SHALL TERMINATE WITH DUCT AT 45 DEGREE ANGLE. PROVIDE BIRD SCREEN.
2. MAINTAIN 25'-0" BETWEEN OUTDOOR AIR INTAKE AND ANY SOURCE OF EXHAUST, VENT, OR FLUE.



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Sheet Reviewer	Author	
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1	11/24/2020	Addendum 1

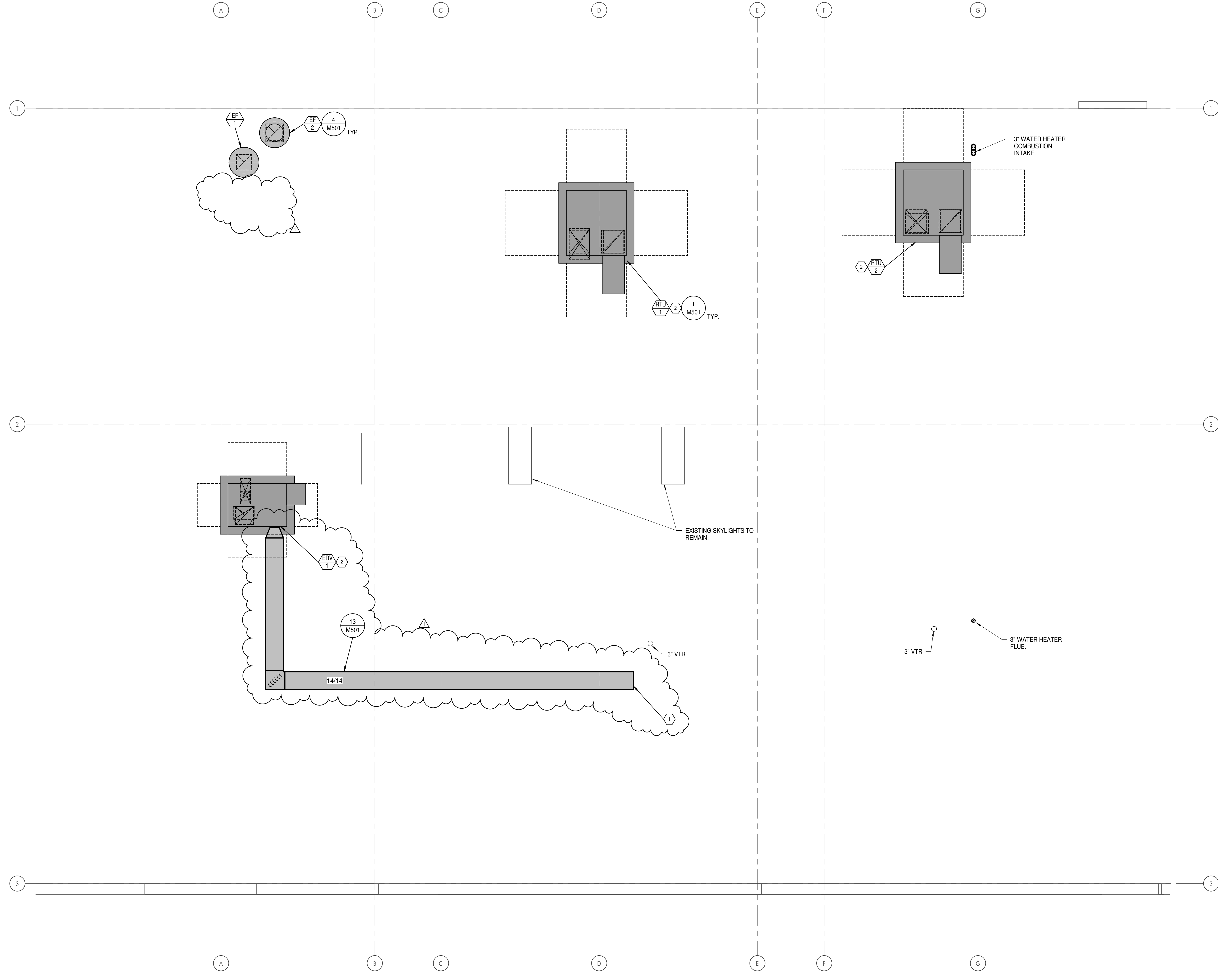
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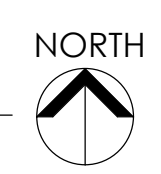
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MECHANICAL ROOF PLAN

Sheet Number
M113

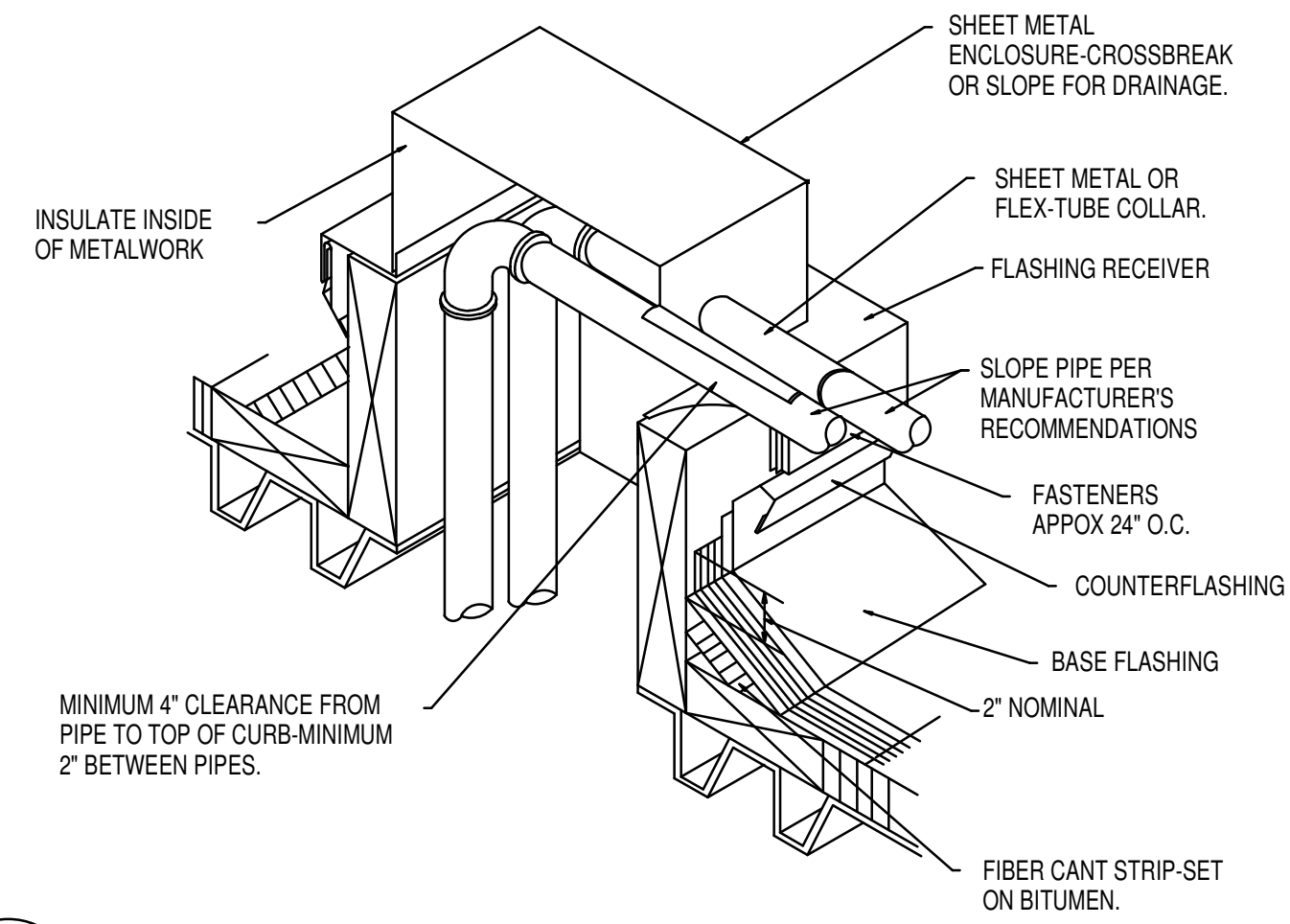
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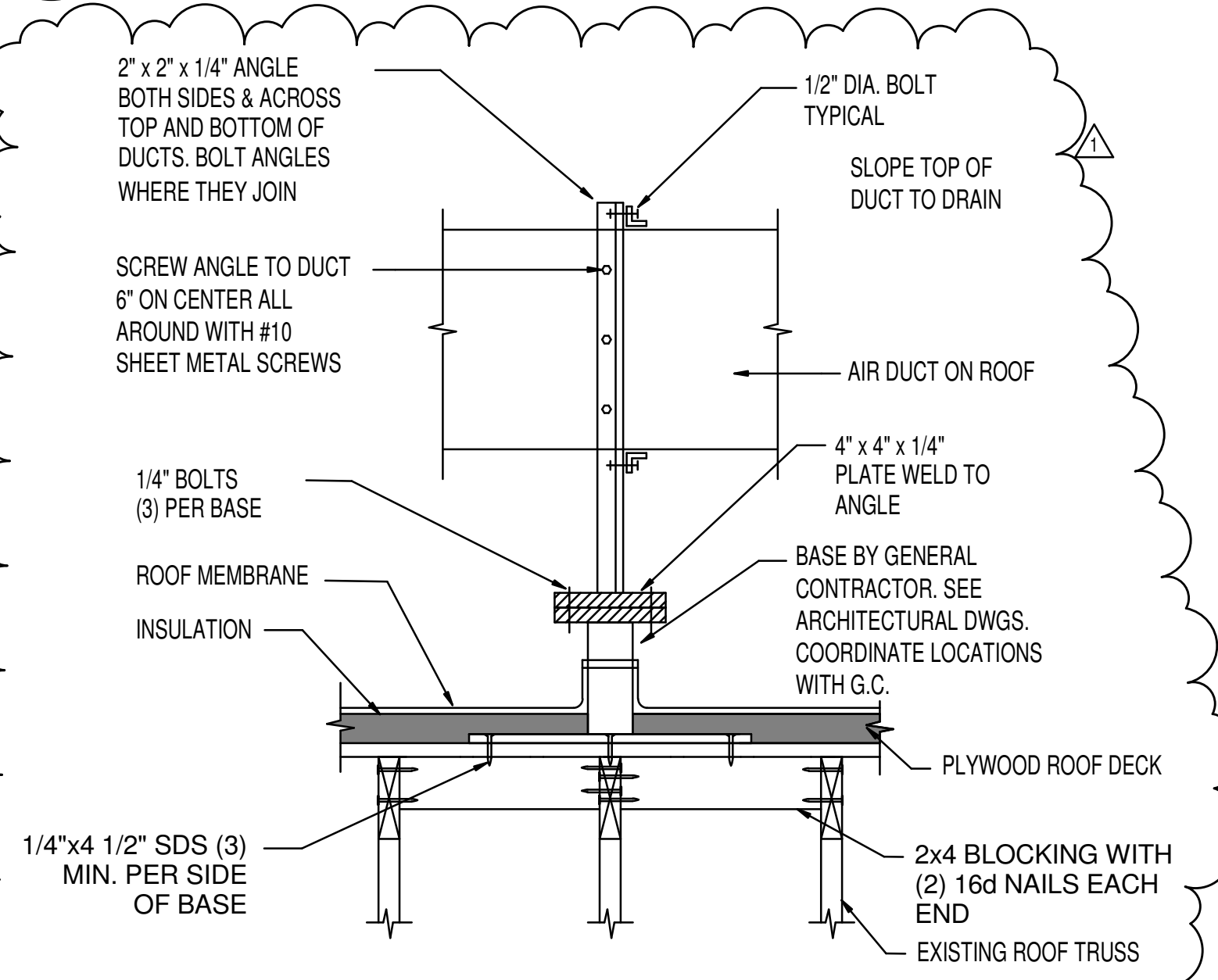
1 ROOF MECHANICAL PLAN
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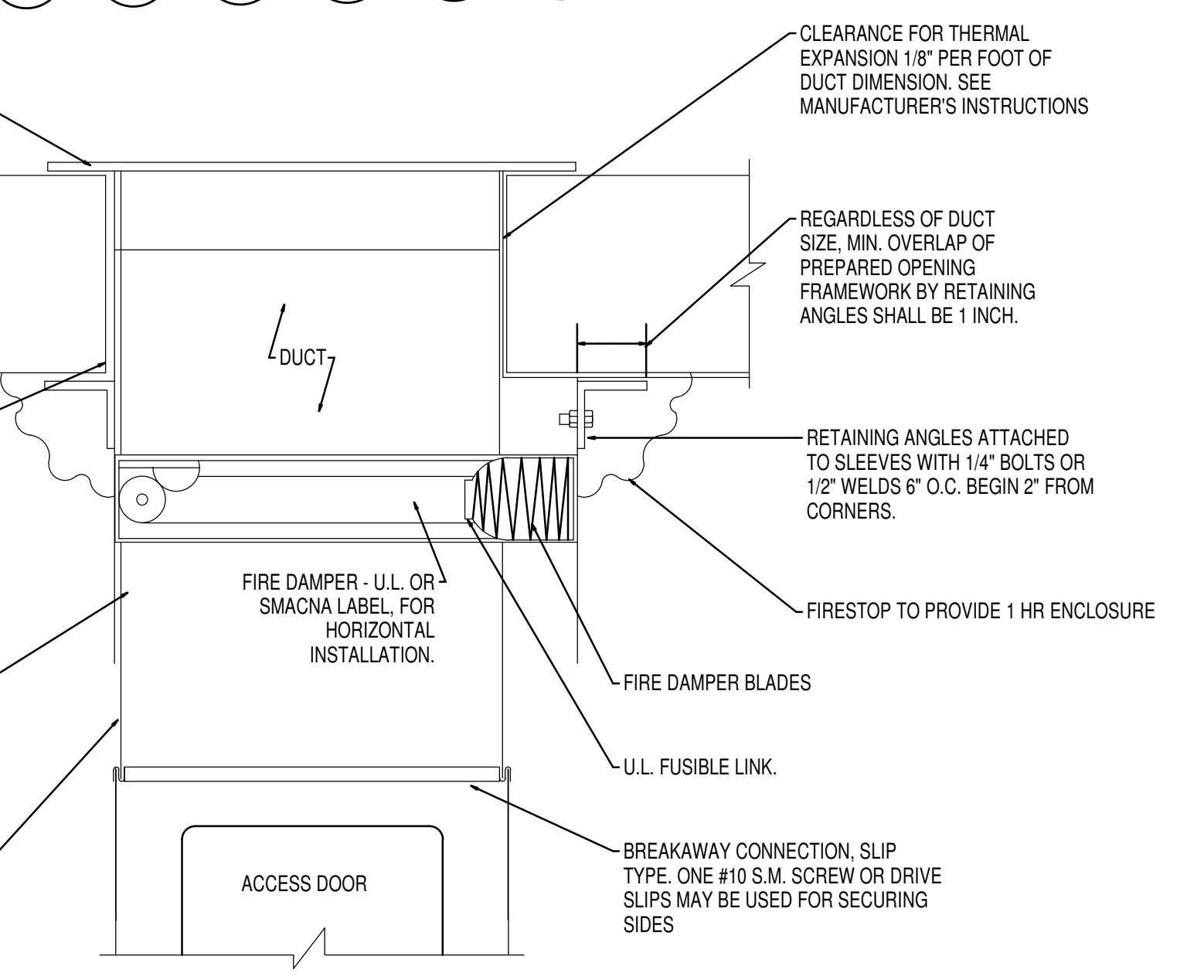


12 REFRIGERANT PIPING THROUGH ROOF DECK
M501 NO SCALE

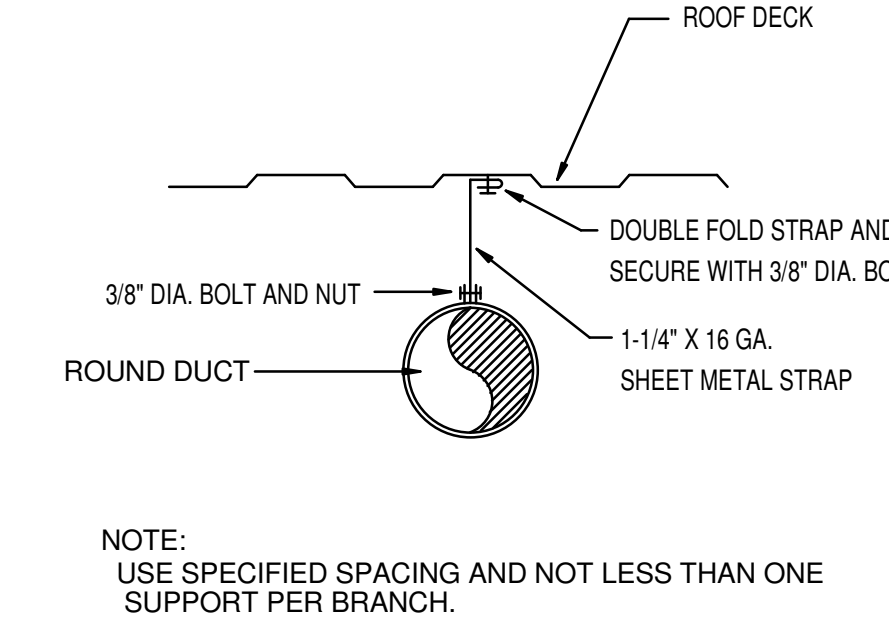


8 ROOF PIPE SUPPORT
M501 NO SCALE

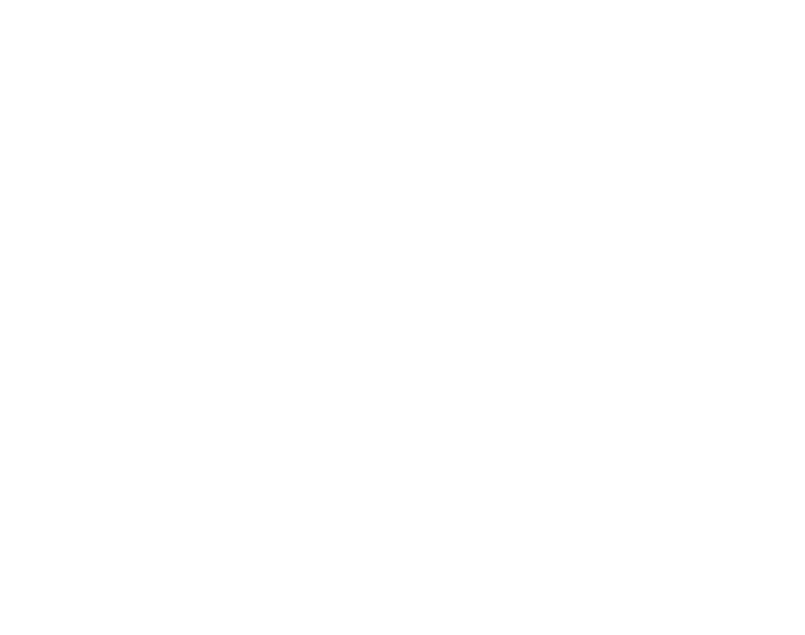
13 DUCT SUPPORT ON ROOF DETAIL
M501 NO SCALE



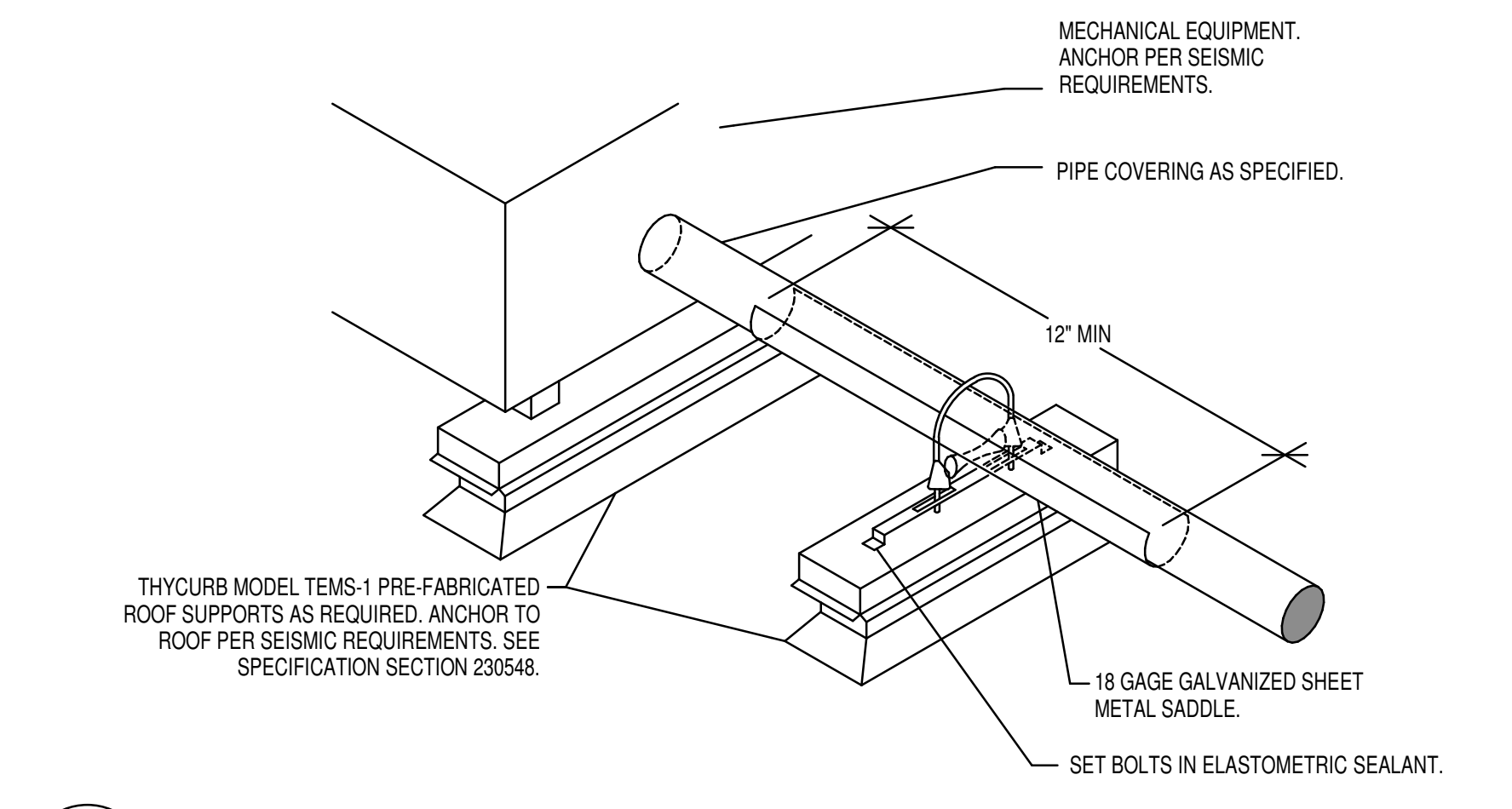
14 FLOOR MOUNTED FIRE DAMPER
M501 NO SCALE



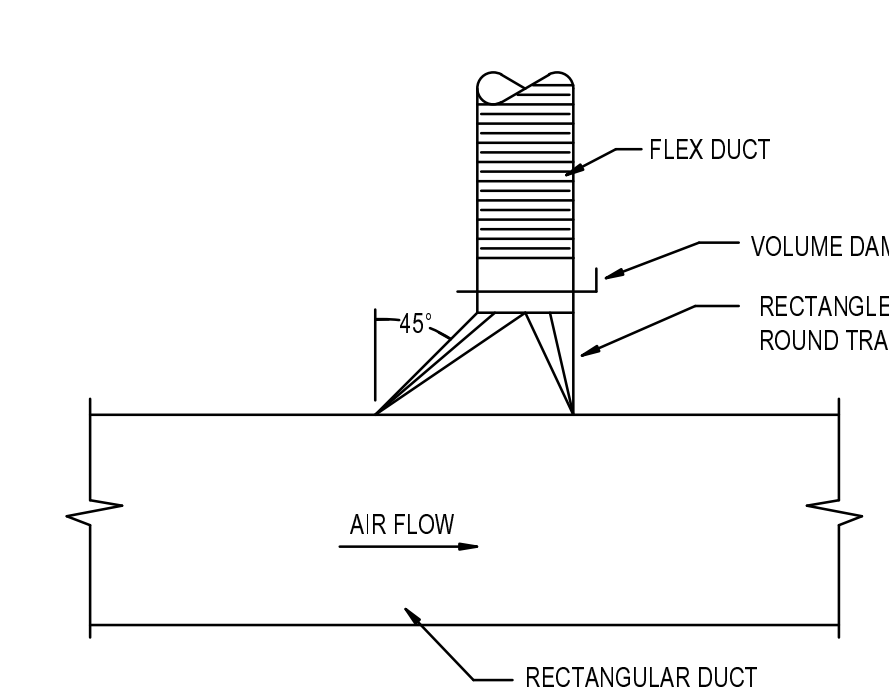
6 ROUND DUCT SUPPORT DETAIL
M501 NO SCALE



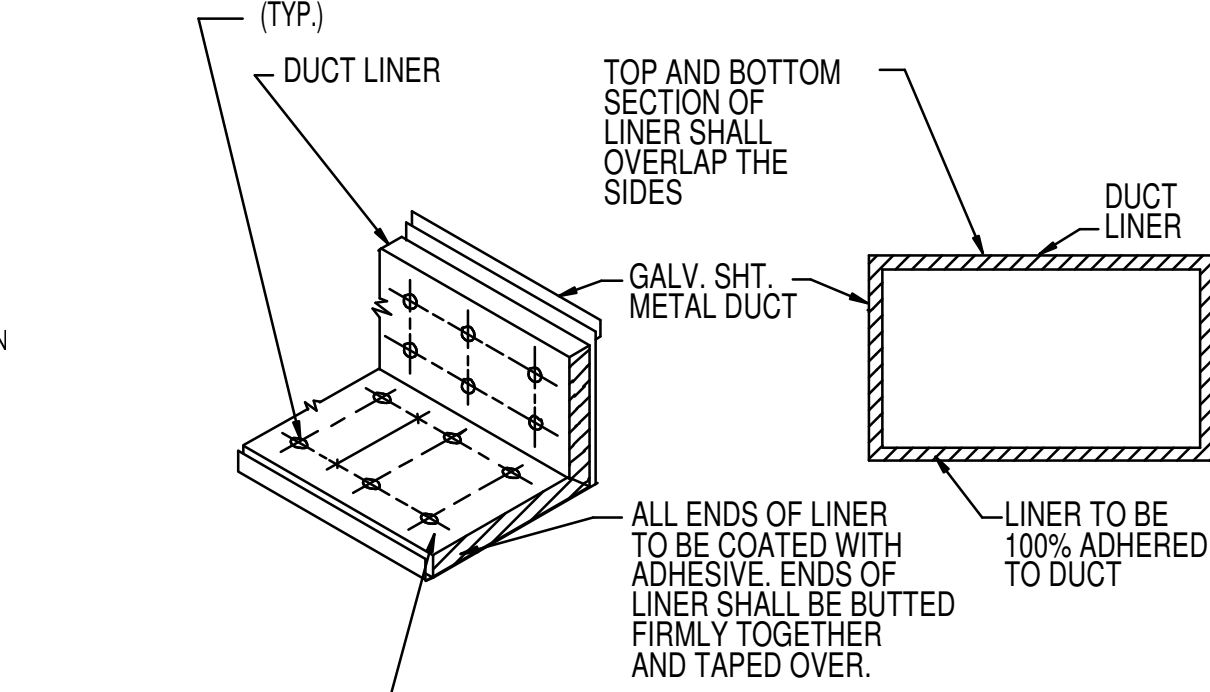
7 NOT USED
M501 NO SCALE



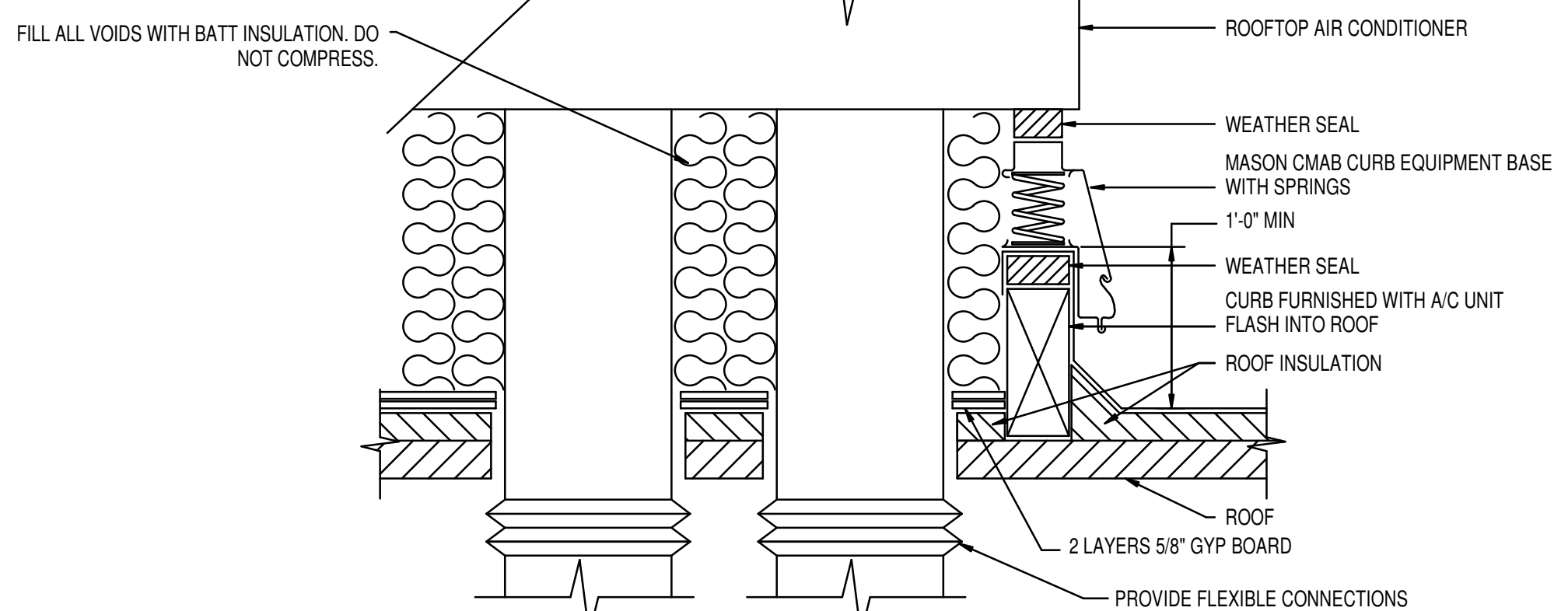
8 ROOF PIPE SUPPORT
M501 NO SCALE



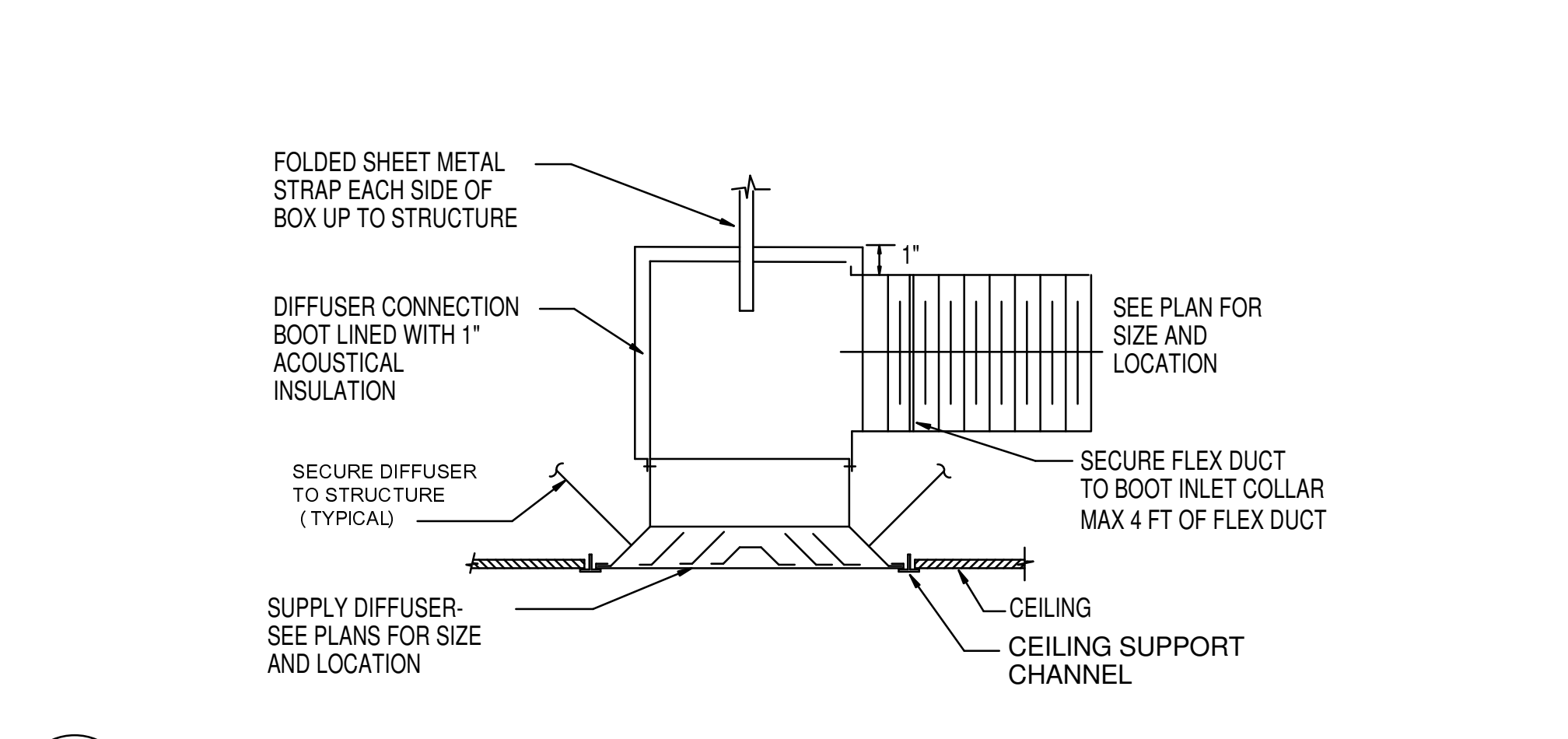
9 HIGH EFFICIENCY TAKE-OFF DETAIL
M501 NO SCALE



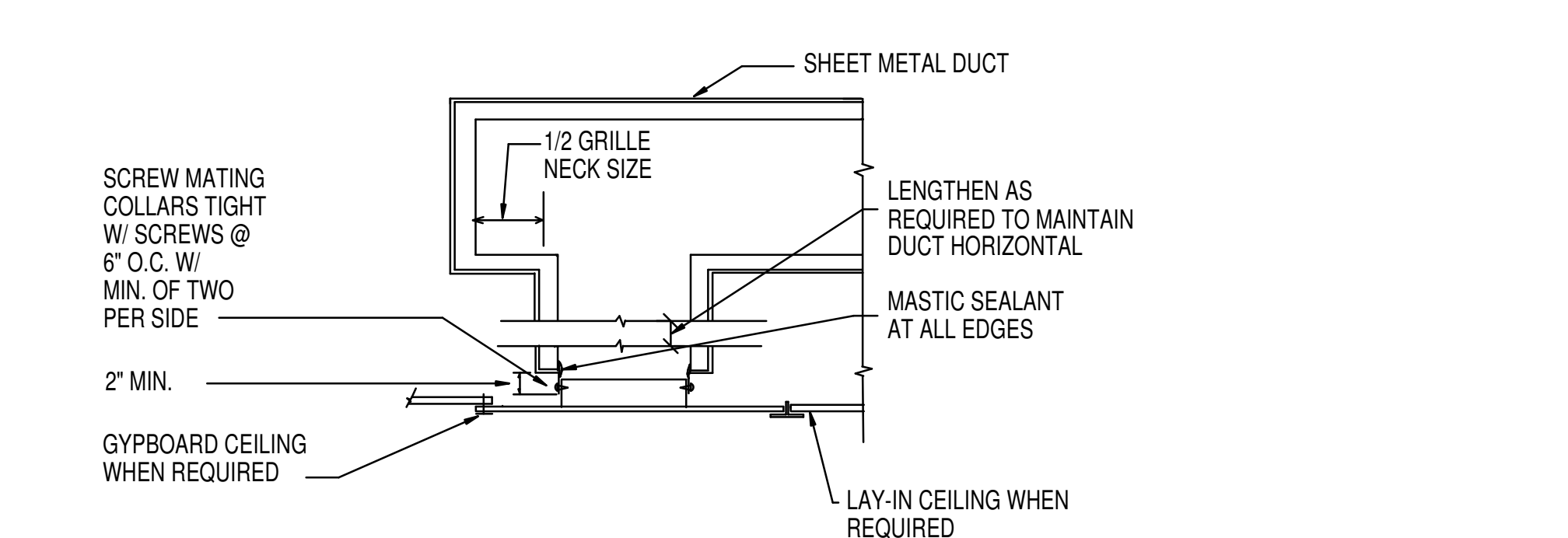
10 DUCT LINER DETAIL
M501 NO SCALE



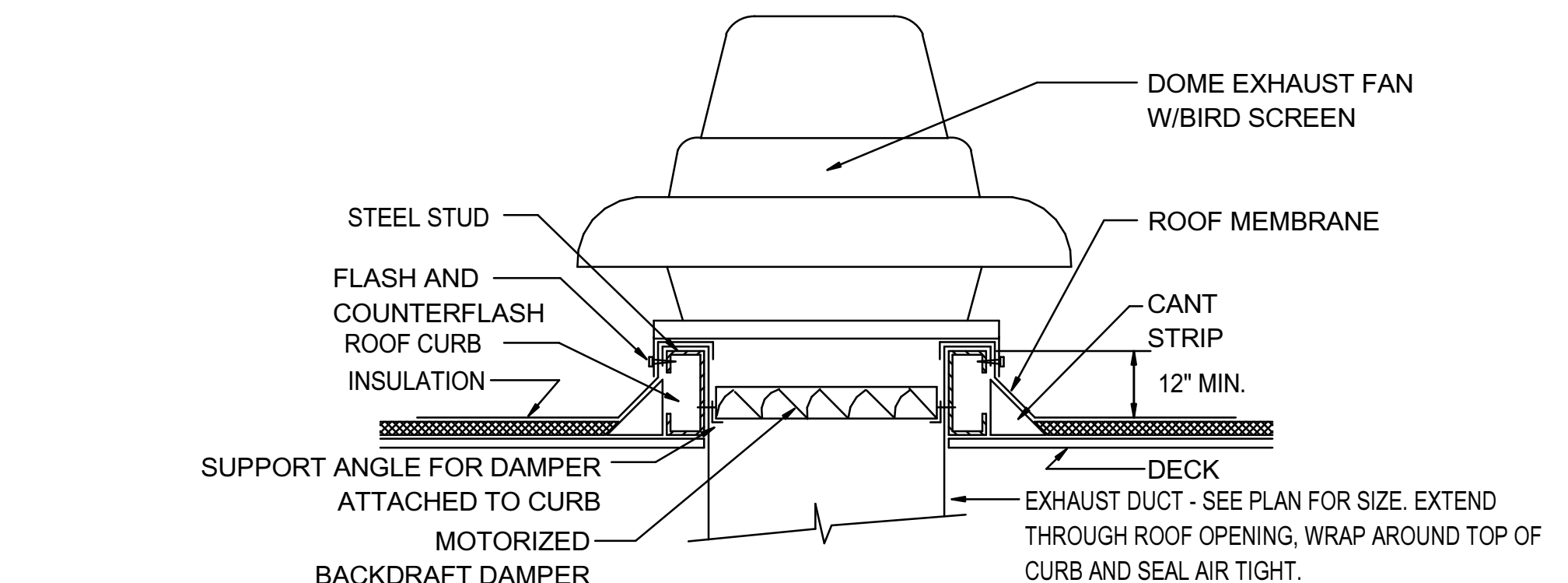
1 ROOFTOP UNIT ON SPRING BASE DETAIL
M501 NO SCALE



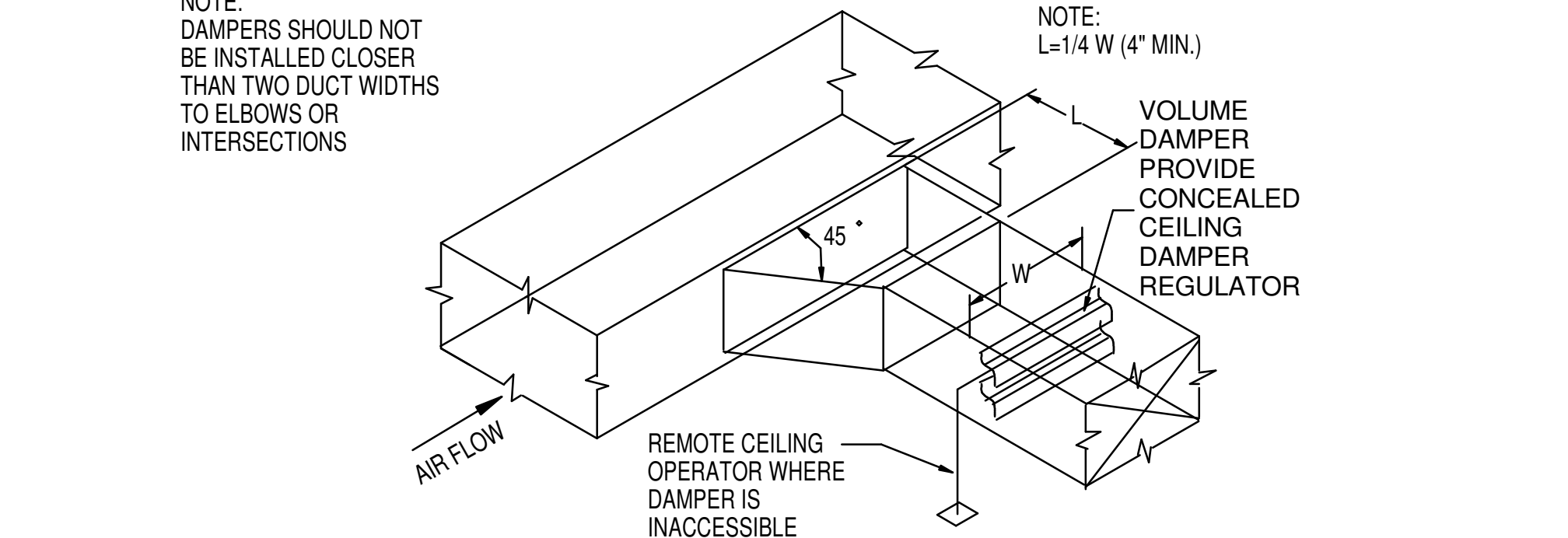
2 DIFFUSER CONNECTION DETAIL
M501 NO SCALE



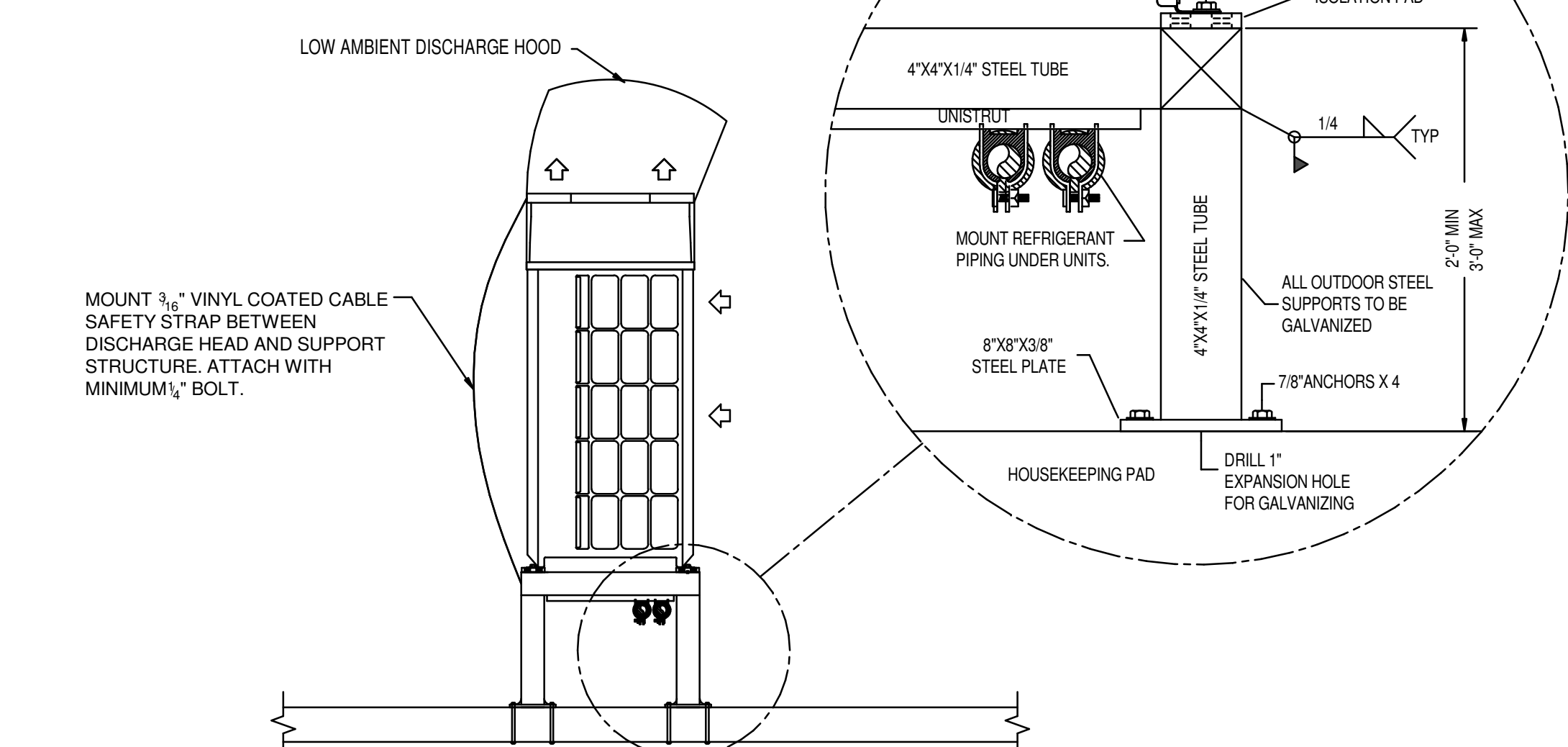
3 TYPICAL EXHAUST GRILLE DETAIL
M501 NO SCALE



4 EXHAUST FAN DETAIL
M501 NO SCALE



5 BRANCH DUCT TAKE-OFF & DAMPER
M501 NO SCALE



11 VRF - OUTDOOR UNIT MOUNTIN DETAIL
M501 NO SCALE



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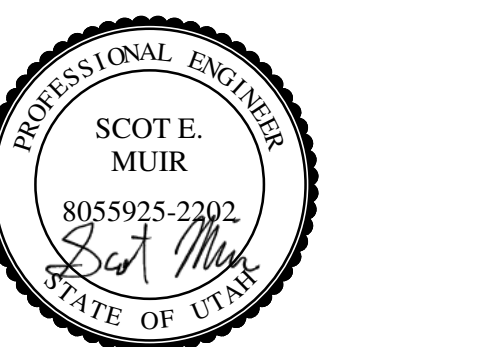
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Project Number 10173823
Original Issue 11/6/20



Sheet Name
MECHANICAL DETAILS

Sheet Number
M501
Project Status
100% Construction Documents

AIR TO AIR ENERGY RECOVERY AIR HANDLER SCHEDULE

ID	MANUFACTURER AND MODEL NUMBER	AIR				HEAT RECOVERY (3)						FILTERS		ELECTRICAL				PHYSICAL		NOTES
		SUPPLY AIRFLOW (CFM)	EXHAUST AIRFLOW (CFM)	SUPPLY FAN EXTERNAL S.P. (IN. WATER)	EXHAUST FAN EXTERNAL S.P. (IN. WATER)	RATING CONDITION	CAPACITY SENSIBLE/LATENT (MBH)	SUPPLY EAT DB/WB	SUPPLY LAT DB/WB	EXHAUST EAT DB/WB	EXHAUST LAT DB/WB	SUPPLY FILTER (MERV)	RETURN FILTER (MERV)	VOLT/PH/ HZ	MCA/MOP	SUPPLY FAN MOTOR BHP / HP	EXHAUST FAN MOTOR BHP / HP	CABINET LENGTH/ WIDTH/HEIGHT (IN)	WEIGHT (LBS)	
ERV-1	GREENHECK ERV-10-20L-VG	400	400	0.5	0.5	SUMMER	4.68	95/62	77.3/62.2	75/62	89.1/64.6	8	8	208/1/60	8.9/15	0.5	0.5	46/34/28	447	(1)(2)(3)(4)
						WINTER	34.5	-20	59.3	70/53.3										

- (1) CAPACITY BASED ON 4,500 FEET ELEVATION, 95 DB / 62 WB (SUMMER AMBIENT); -20 DEG F (WINTER AMBIENT).
- (2) COMPLETE WITH LOW LEAKAGE OUTDOOR & EXHAUST DAMPERS, ELECTRICAL DISCONNECT, AND SPRING ISOLATED SEISMIC ROOF CURB SIZED TO LOCATE OA INTAKE 36" ABOVE THE ROOF.
- (3) ENERGY RECOVERY WHEEL COMPLETE WITH TIMED EXHAUST FROST CONTROL.
- (4) COMPLETE WITH MICROPROCESSOR BASED CONTROL, BACNET MSTP INTERFACE TO CAMPUS BAS WITH REMOTE ENABLE/DISABLE, DIRTY FILTER SENSORS ON OUTDOOR & EXHAUST, ROTATION SENSOR, FROST CONTROL, AND OA INTAKE AND DISCHARGE TEMPERATURE MONITORING.

ELECTRIC BASEBOARD HEATER SCHEDULE

ID	MANUFACTURER AND MODEL NUMBER	LOCATION	EFFECTIVE LENGTH (FT)	HEAT CAPACITY (BTU/H)	ELECTRICAL			PHYSICAL WIDTH/DEPTH/HEIGHT (IN)	NOTES
					WATTS	AMPS	VOLT/PH/HZ		
BB-1	MARLEY 25408NW	WAITING A101	8	6416	1880	9.1	208/1/60	96/3/7	(1)(2)
BB-2	MARLEY 25408NW	WAITING A101	8	6416	1880	9.1	208/1/60	96/3/7	(1)(2)

- (1) EQUIPPED WITH HIGH TEMPERATURE CUTOFF AND ELECTRICAL DISCONNECT. ALL ACCESSORIES REQUIRED FOR FLOOR MOUNTING.
- (2) REMOTE MOUNTED LINE VOLTAGE THERMOSTAT TO CONTROL BOTH BB-1&2. SEE PLANS FOR LOCATION.

GRILLES, REGISTERS AND DIFFUSERS

ID	MANUFACTURER	MODEL	SIZE	MAX CFM	MAX NC	DESCRIPTION
CD-1	EH PRICE	SPD	6" DIA 8" DIA 10" DIA 12" DIA 14" DIA	90 180 300 450 600	30	SQUARE PLAQUE CEILING DIFFUSERS. REMOVABLE FACE & CORE PROVIDE PLASTER LAY-IN FRAME FOR SURFACE MOUNTING IN GYPSUM BOARD CEILING. DIFFUSER & FRAMES SHALL BE 20" x 20" OR 12" x 12" AS REQUIRED TO FIT CEILING SPACE. SEE PLANS FOR FACE AND NECK SIZE.
RG-1	EH PRICE	LBMH 25B	4" WIDE SEE PLANS FOR LENGTH	135 CFM/FT	30	ALUMINUM FLOOR MOUNTED LINEAR BAR SUPPLY GRILLE. GRILLE SHALL HAVE 3/16" FIXED 0° DEFLECTION BLADES SPACED AT 1/2" ON CENTER RATED FOR FOOT TRAFFIC. BLADES SHALL RUN PARALLEL TO THE LONG DIMENSION OF THE GRILLE. PROVIDE HEAVY DUTY NARROW FACE BORDER DESIGNED FOR FLUSH AND RECESSED MOUNTING IN FLOORS. PROVIDE FIELD FABRICATED INSULATED PLENUM SIZED TO MATCH SIZE OF FLOOR GRILL.
EG-1	EH PRICE	80FF	6" DIA 8" DIA 10" DIA 12" DIA 14" DIA 15" DIA	100 210 380 600 750 1000	30	CRATE TYPE CEILING EXHAUST AIR UNIT, REMOVABLE FACE & CORE. FRAME SHALL BE FOR SURFACE MOUNTING IN GYPSUM BOARD CEILING. UNIT & FRAMES SHALL BE 20"x20" OR 12" x 12" AS REQUIRED TO FIT CEILING SPACE AVAILABLE. SEE PLANS FOR FACE AND NECK SIZE. PROVIDE ROUND NECK ADAPTER.

ELECTRIC COIL SCHEDULE

ID	MANUFACTURER AND MODEL NUMBER	LOCATION	EQUIPMENT SERVED	AIR				ELECTRICAL			PHYSICAL DUCT WIDTH/HEIGHT (IN)	NOTES
				AIRFLOW RATE (CFM)	CAPACITY (MBH)	ENTERING TEMP. (°F)	LEAVING TEMP. (°F)	MINIMUM KW	VOLT/PH/HZ			
EC-1	GREENHECK IDHC	CRAWLSPACE	ERV-1	400	25.76	-20	50	7.5	208/1/60	10/10	(1)(2)(3)	

- (1) CAPACITY BASED ON 4,500 FEET ELEVATION.
- (2) UNIT COMPLETE WITH FAN INTERLOCK, FLANGED CONNECTION, ELECTRICAL DISCONNECTING CONTACTOR, TERMINAL BLOCKS FOR CONTROL INTEGRATION, MERCURY SWITCH CONTACTORS FOR SILENT OPERATION, AND CONTROL TRANSFORMER.
- (3) TWO-STAGE HEATING CONTROL (INTEGRATED WITH ERV CONTROLS).

FAN SCHEDULE

ID	MANUFACTURER AND MODEL NUMBER	AREA SERVED	TYPE	AIR		FAN				ELECTRICAL			PHYSICAL		NOTES
				MAXIMUM AIRFLOW RATE (CFM)	STATIC PRESSURE (IN. WATER)	OUTLET VELOCITY (FPM)	FAN SPEED (RPM)	MAX FAN SPEED (RPM)	MOTOR SIZE (HP)	BHP	VOLT/PH/HZ	DIAMETER/HEIGHT (IN)	WEIGHT (LBS)		
EF-1	GREENHECK G-095-VG	GEN EXHAUST - WEST	DOME	275	0.5	237	1430	1725	1/6	0.06	115/1/60	22/16	75		(1)(2)
EF-2	GREENHECK G-099-VG	GEN EXHAUST - EAST	DOME	800	0.5	833	1488	1725	1/4	0.14	115/1/60	24/25	75		(1)(2)

- (1) ALL CAPACITIES AT 4,500 FEET ELEVATION.
- (2) ROOF MOUNTED DIRECT DRIVEN EXHAUST FAN, COMPLETE WITH DC BRUSHLESS MOTOR (MINIMUM 85% EFFICIENT), INTEGRAL THERMAL OVERLOAD PROTECTION, ELECTRICAL DISCONNECT, SPEED DIAL, MOTORIZED BACKDRAFT DAMPER, AND PREFABRICATED 14" ROOF CURB.

PACKAGED ROOFTOP UNIT SCHEDULE

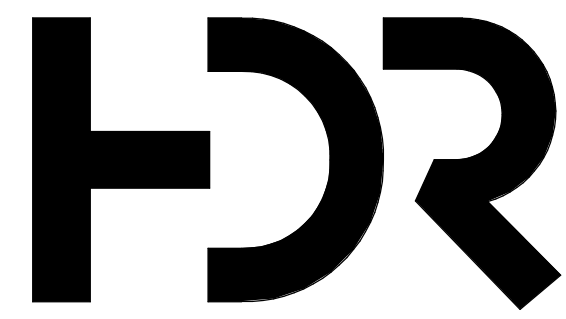
ID	MANUFACTURER AND MODEL NUMBER	AREA SERVED	NOMINAL CAPACITY (TONS)	SUPPLY FAN		HEATING SECTION				COOLING SECTION				FILTER	ELECTRICAL		PHYSICAL			NOTES				
				SUPPLY AIRFLOW (CFM)	EXTERNAL STATIC PRESSURE (IN. WATER)	MINIMUM VENTILATION RATE (CFM)	HEATING INPUT (1) (MBH)	HEATING OUTPUT (1) (MBH)	ENTERING/LEAVING AIR TEMP (°F)	MEDIUM	CAPACITY SENSIBLE (MBH)	TOTAL (MBH)	ENTERING AIR TEMP (°F)		LEAVING AIR TEMP (°F)	MEDIUM	EER	MINIMUM EFFICIENCY (MERV)	MCA/MOCP		SUPPLY FAN MOTOR (HP)	SINGLE POINT VOLT/PH/HZ	CABINET LENGTH/ WIDTH/HEIGHT (IN)	WEIGHT (LB)
				RTU-1	YORK PCG6B481002X4	STAFF AREA	4	1,525	1.0	310	82	65.6	50.4/97.4		NAT. GAS	32.1	40.4	76.5/59.9	53.5/49.6		R-410A	12.5	14	30.9/45
RTU-2	YORK PCG6B481252X4	STAFF AREA	4	1,600	1.0	640	102.5	82.8	31/87.5	NAT. GAS	40.5	40.5	81/60.4	53.4/50.7	R-410A	12.5	14	30.9/45	0.75	230/1/60	51/46/47	766	(1)(2)(3)(4)(5)(6)(7)	

- (1) ALL CAPACITIES AT 4,500 FEET ELEVATION.
- (2) COOLING BASED ON 95DB/62WB DEG F AMBIENT. HEATING BASED ON -20 DEG F AMBIENT.
- (3) PROVIDE AND INSTALL DES CHAMPS RLC-SERIES WATERLESS CONDENSATE TRAP.
- (4) UNIT COMPLETE WITH AND SPRING ISOLATED SEISMIC RATED ROOF CURB SIZED TO LOCATE OUTDOOR INTAKE A MINIMUM OF 36" ABOVE THE ROOF.
- (5) COMPLETE WITH 100% ECONOMIZER & MODULATING POWER EXHAUST. SINGLE POINT POWER CONNECTION TO RTU, ECONOMIZER, & POWERED EXHAUST.
- (6) UNIT COMPLETE WITH STAINLESS STEEL HEAT EXCHANGER, 2 STAGE HEATING, 2-STAGE COOLING.
- (7) PROVIDE BACNET CONTROLLER TO ALLOW REMOTE MONITORING AND CONTROL WITH JCI BUILDING AUTOMATION SYSTEM.

SPLIT AIR CONDITIONING UNIT SCHEDULE

ID	MANUFACTURER	LOCATION	TYPE	COOLING CAPACITY RANGE (MBH)	INDOOR UNIT			OUTDOOR UNIT							EFFICIENCY SEER	REFRIGERANT	NOTES	
					MODEL	AIRFLOW (CFM)	DIMENSIONS WxDxH (IN)	WEIGHT (LBS)	VOLT/PH/HZ	MODEL	DIMENSIONS WxDxH (IN)	WEIGHT (LBS)	MCA	MFA (AMPS)				VOLT/PH/HZ
AC-5/CU-5	DAIKIN	DATA CLOSET A132	WALL MOUNTED	22.2-6.0	FTK24AXVJU	405-555	46x9x13	31	208/1/60	RKB24AXVJU	34x13x26	97	13.2	20	208/1/60	17.0	R-410A	(1)(2)(3)(4)(5)(6)

- (1) SINGLE POINT POWER CONNECTION FOR INDOOR AND OUTDOOR UNITS. DISCONNECT BY DIVISION 26 (QTY. 2; 1 EACH FOR INDOOR AND OUTDOOR UNIT).
- (2) SYSTEM COMPLETE WITH FACTORY SUPPLIED FIELD INSTALLED WALL MOUNTED (WIRED) CONTROLLER AND LOW AMBIENT KIT TO 0 DEG F.
- (3) REFRIGERANT LINES SIZED IN ACCORDANCE WITH MANUFACTURER'S SUGGESTED LINE SIZE.
- (4) EQUIPPED WITH VARIABLE SPEED INVERTER DRIVEN COMPRESSOR PROVIDING THE RANGE OF CAPACITIES NOTED. MODULATING COMPRESSOR SPEED TO REDUCE CYCLING.
- (5) PROVIDE AND INSTALL INLINE CONDENSATE PUMP. PUMP SHALL BE CAPABLE OF 5.8 GAL/H @ 10 FT HD, 120V/1PH/60HZ, 1/10 HP. BASIS OF DESIGN SHALL BE ASPEN PUMPS MAXI ORANGE (OR EQUAL). PROVIDE CHECK VALVE AT DISCHARGE OF PUMP.
- (6) UNIT MANUFACTURER SHALL MATCH THAT PROVIDED FOR THE VRF EQUIPMENT. SEE SPECIFICATIONS...



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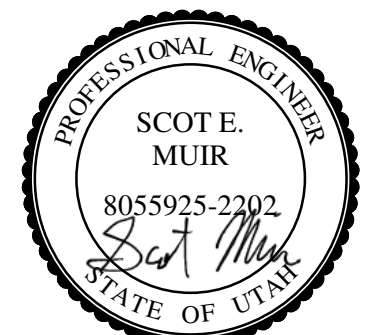
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SECTION 223436 - HIGH EFFICIENCY GAS DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes packaged, factory-fabricated and -assembled, gas-fired, high efficiency condensing domestic water heaters, trim and accessories for generating hot potable water.

1.3 SUBMITTALS

- A. Product Data: Include performance data, operating characteristics, furnished specialties and accessories.
 - 1. Prior to flue vent installation, engineered calculations and drawings must be submitted to Architect/Engineer to thoroughly demonstrate that size and configuration conform to recommended size, length and footprint for each submitted water heater.
- B. Efficiency Curves: At a minimum, submit efficiency curves for 100%, 80%, 60%, 40%, 20% and the lowest input firing rates at incoming water temperatures ranging from 70°F to 140°F.
- C. Pressure Drop Curve: Submit pressure drop curve for flows ranging from 0 GPM to maximum value of water heater.
- D. Shop Drawings: For water heaters, water heater trim and accessories, include:
 - 1. Plans, elevations, sections, details and attachments to other work
 - 2. Wiring Diagrams for power, signal and control wiring
- E. Source Quality Control Test Reports: Reports shall be included in submittals.
- F. Field Quality Control Test Reports: Reports shall be included in submittals.
- G. Operation and Maintenance Data: Data to be included in water heater emergency, operation and maintenance manuals.
- H. Warranty: Standard warranty specified in this Section.
- I. Other Informational Submittals.

1. ASME Stamp Certification and Report: Submit "A," "S," or "PP" stamp certificate of authorization, as required by authorities having jurisdiction, and document hydrostatic testing of piping external to water heater.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices and Accessories: Condensing water heaters must be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Performance Compliance: Condensing water heaters must be rated in accordance with ASHRAE 118.1 testing methods and verified by UL or AHRI as capable of achieving the energy efficiency and performance ratings as tested within prescribed tolerances.
- C. ASME Compliance: Condensing water heaters must be constructed in accordance with ASME Water heater and Pressure Vessel Code, Section IV (HLW) Potable Water Heaters.
- D. ASHRAE/IESNA 90.1 Compliance: Condensing water heaters shall have minimum efficiency according to "Gas and Oil Fired water heaters - Minimum Efficiency Requirements," when tested in accordance with Section G.1 "Method of Test for Measuring Thermal Efficiency" and G.2 "Method of Test for Measuring Standby Loss" of ANSI Z21.10.3
- E. UL Compliance. Condensing water heaters must be tested for compliance with UL 795, "Commercial-Industrial Gas Heating Equipment." Condensing water heaters shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.
- F. NOx Emission Standards. When installed and operated in accordance with manufacturer's instructions, condensing water heaters shall comply with the NOx emission standards outlined in South Coast Air Quality Management District (SCAQMD), Rule 1146.2; and the Texas Commission on Environmental Quality (TCEQ), Title 30, Chapter 117, Rule 117.465.
- G. Low Lead Compliance: Condensing water heaters must be third party classified to meet the requirements of ANSI/NSF 372, hence that the weighted average of the wetted surface area in contact with potable water must be no greater than 0.25% lead content.

1.5 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement and formwork requirements are specified in Division 03.

1.6 WARRANTY

- A. Standard Warranty: Water heaters shall include manufacturer's standard form in which manufacturer agrees to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Fire-Tube Condensing Water heaters:
 - a. The pressure vessel shall carry a 10-year from shipment, non-prorated, limited warranty against any failure due to waterside corrosion, mechanical defects, or workmanship. The heat exchanger shall carry a 10-year from shipment, prorated, limited warranty against any failure due to condensate corrosion, thermal stress, mechanical defects, or workmanship.
 - b. Manufacturer labeled control panels are conditionally warranted against failure for two (2) years from shipment.
 - c. All other components, with the exception of the igniter and flame detector, are conditionally guaranteed against any failure for 18 months from shipment.
 - d. Compression Tanks: Five Years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. AERCO International, Inc.
 2. Intellihot Green Technologies Inc.
 3. Prior approved equal

2.2 CONSTRUCTION

- A. General: Each water heater shall be UL Listed; ASME Section IV (HLW) coded and stamped and shall incorporate a double block and bleed style -formerly IRI. Gas train. Each unit shall operate with a minimum ASHRAE 118.1 efficiency of 96% at full fire.
- B. Description: Water heater shall be direct fired, fully condensing, fire-tube design. Power burner shall have full modulation. The minimum firing rate shall not exceed 50,000 BTU/HR input. Water heaters that have an input greater than 50,000 BTU/Hr at minimum fire will not be considered equal. The water heater shall have the capability of discharging into a positive pressure vent. Water heater thermal efficiency shall increase with decreasing load (output), while maintaining setpoint. Water heater shall have an operational setpoint capability of 50 °F to 190 °F and shall maintain the outlet temperature within an accuracy of +/- 4 °F during load changes of up to 50% rated capacity. Heater shall operate quietly, less than 55 dba. Water heater shall be factory-fabricated, factory-assembled and factory-tested, fire-tube condensing water heater with heat exchanger sealed pressure-tight, built on a steel base, including a sealed insulated sheet metal enclosure that acts as combustion-air intake plenum, flue-gas vent, water supply, return and condensate drain connections, and controls. Each water heater shall have an ASME approved temperature/pressure relief valve with a setting of 150 psig and 210 °F.

- C. Heat Exchanger: The heat exchanger shall be constructed with 316L stainless steel helical fire tubes, combustion chamber and dished tubesheet, with a two-pass combustion gas flow design. The heat exchanger shall be electroless nickel plated. The fire tubes shall be 3/4" OD, with no less than 0.035" wall thickness. The upper and lower stainless steel tubesheet shall be no less than 0.625" thick. The heat exchanger shall be welded and brazed construction. The heat exchanger shall be ASME Sect IV (HLW) stamped for a working pressure not less than 160 psig.
- D. Shell Assembly Pressure Vessel: The shell assembly pressure vessel shall have a maximum water volume of 26 gallons. The water heater water pressure drop shall not exceed 2 psig at 30 gpm. The water heater water connections shall be 2-inch NPT male connections. The shell assembly pressure vessel shall be constructed of 304 stainless steel of 0.25-inch wall thickness. The shell assembly pressure vessel shall be electroless nickel plated. Inspection openings in the pressure vessel shall be in accordance with ASME Section IV pressure vessel code. The shell assembly pressure vessel shall be ASME Sect IV (HLW) stamped for a working pressure not less than 160 psig.
- E. Modulating Air/Fuel Valve and Burner: The water heater burner shall be capable of a 24-to-1 turndown ratio of the firing rate without loss of combustion efficiency or staging of gas valves. The burner shall produce less than 20 ppm of NOx corrected to 3% excess oxygen. The burner shall be metal-fiber mesh covering a stainless steel body with spark ignition and flame rectification. All burner material exposed to the combustion zone shall be of stainless steel construction. There shall be no moving parts within the burner itself. A modulating air/fuel valve shall meter the air and fuel input. The modulating motor must be linked to both the gas valve body and air valve body with a single linkage. The linkage shall not require any field adjustment. A variable frequency drive (VFD), controlled cast aluminum pre-mix blower shall be used to ensure the optimum mixing of air and fuel between the air/fuel valve and the burner.
- F. Minimum water heater efficiencies shall be as follows at a 70 degree delta-T:

EWT	100% Fire	80% Fire	60% Fire	40% Fire	20% Fire	<10% Fire
70 °F	96%	97%	97.5%	98%	98.5%	99%

- G. The exhaust manifold shall be of corrosion resistant cast aluminum with a 6-inch diameter flue connection. The exhaust manifold shall have a collecting reservoir and a gravity drain for the elimination of condensation.
- H. Blower. The water heater shall include a variable-speed, DC centrifugal fan to operate during the burner firing sequence and pre-purge the combustion chamber.
 - 1. Motors: Blower motors shall comply with requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - a. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require a motor to operate in the service factor range above 1.0.
- I. Ignition: Ignition shall be via spark ignition with 100 percent main-valve shutoff and electronic flame supervision.

2.3 CONTROLS

- A. Refer to Division 23, Section "Instrumentation and Control of HVAC."
- B. The control panel shall consist of one individual circuit board using state-of-the-art surface-mount technology in a single enclosure. These circuit boards shall include:
 - 1. A display board incorporating LED display to indicate temperature and a vacuum fluorescent display module for all message enunciation
 - 2. A CPU board housing all control functions

Each board shall be individually field replaceable.

- C. The combustion safeguard/flame monitoring system shall use spark ignition and a rectification-type flame sensor.
- D. The control panel hardware shall support both RS-232 and RS-485 remote communications.
- E. The controls shall annunciate water heater and sensor status and include extensive self-diagnostic capabilities that incorporate a minimum of eight separate status messages and 34 separate fault messages.
- F. The control panel shall incorporate three self-governing features designed to enhance operation in modes where it receives an external control signal by eliminating nuisance faults due to over-temperature, improper external signal or loss of external signal. These features include:
 - 1. Setpoint High Limit: Setpoint high limit allows for a selectable maximum water heater outlet temperature and acts as temperature limiting governor. Setpoint limit is based on a PID function that automatically limits firing rate to maintain outlet temperature within a 0 to 10 degree selectable band from the desired maximum water heater outlet temperature.
 - 2. Setpoint Low Limit: Setpoint low limit allows for a selectable minimum operating temperature.
 - 3. Failsafe Mode: Failsafe mode allows the water heater to switch its mode to operate from an internal setpoint if its external control signal is lost, rather than shut off. This is a selectable mode, enabling the control can to shut off the unit upon loss of external signal, if so desired.
- G. The water heater control system shall incorporate the following additional features for enhanced external system interface:
 - 1. System start temperature feature
 - 2. Pump delay timer
 - 3. Auxiliary start delay timer
 - 4. Auxiliary temperature sensor
 - 5. Analog output feature to enable simple monitoring of temperature setpoint, outlet temperature or fire rate
 - 6. Remote interlock circuit

7. Delayed interlock circuit
 8. Fault relay for remote fault alarm
- H. Water Heater Management: the water heater control system shall incorporate onboard multi-unit sequencing logic that would allow lead-lag functionality & sequencing between multiple water heaters operating in parallel and must have the following capabilities:
1. Efficiently sequence 2 up to 8 units on the same system to meet the load requirement.
 2. Individual unit feed-forward logic will still be enabled for accurate temperature control equal to individual unit's specification.
 3. Operate one motorized valve per unit as an element of the load sequencing. Valves shall close with decreased load as heaters turn off, minimum of one (quantity must be selectable) must always stay open for recirculation.
 4. Automatically rotate lead/lag amongst the units on the chain and monitor run hours per unit and balance load in an effort to equalize unit run hours.
 5. Automatic bump-less transfer of master function to next unit on the chain in case of designated master unit failure; master/slave status should be shown on the individual unit displays.
 6. Units will default to individual control upon failure of the communications chain.
 7. Night temperature setback.
 8. Designated master control, used to display and adjust key system parameters.
- I. The water heater shall be supplied with a factory packaged and pre-wired motorized ball valve. This valve shall be controlled by the water heater control system as an element of the onboard water heater management.
- J. The water heater shall include an electric, single-seated combination safety shutoff valve/regulator with proof of closure switch in its gas train. Each water heater shall incorporate dual over-temperature protection with manual reset, in accordance with ASME Section IV and CSD-1.

2.4 ELECTRICAL POWER

- A. Controllers, Electrical Devices and Wiring: Electrical devices and connections are specified in Division 26 sections.
- B. Single-Point Field Power Connection: Factory-installed and factory-wired switches, motor controllers, transformers and other electrical devices shall provide a single-point field power connection to the water heater.
- C. Electrical Characteristics:
1. Voltage: 120 V
 2. Phase: Single
 3. Frequency: 60 Hz
 4. Full-Load Current 9 Amps

2.5 CONDENSATE

- A. Low-profile condensate neutralizing tubes. Each tube shall be suitable for no less than 12 months continuous operation at full condensing rate. Tubes shall be refillable;
- B. Condensate traps, manufactured from only non-corrosive materials. In order to guarantee flue gasses cannot leak into the boiler room, the traps shall be float-type traps NO EXCEPTIONS.

2.6 VENTING

- A. The exhaust vent must be UL Listed for use with Category II, III and IV appliances and compatible with positive pressure, condensing flue gas service. UL- listed vents of PVC, CPVC, PP, or Al 29-4C stainless steel must be used with water heaters.
- B. The minimum exhaust vent duct size for each water heater is three-inch diameter.
- C. Combustion-Air Intake: Water heaters shall be capable of drawing combustion air from the outdoors via a metal or PVC duct connected between the water heater and the outdoors.
- D. The minimum sealed combustion air duct size for each water heater is three-inch diameter.
- E. Common Vent and Common Combustion Air must be an available option for water heater installation. Consult manufacturer for common vent and combustion air sizing.
- F. Follow guidelines specified in manufacturer's venting guide.

2.7 SOURCE QUALITY CONTROL

- A. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions and carbon monoxide in flue gas, and to achieve combustion efficiency. Perform hydrostatic testing.
- B. Test and inspect factory-assembled water heaters, before shipping, according to ASME Boiler and Pressure Vessel Code.
 - 1. If water heaters are not factory assembled and fire-tested, the local vendor is responsible for all field assembly and testing.
- C. Allow Owner access to source quality-control testing of water heaters. Notify Architect fourteen days in advance of testing.

2.8 WATER HEATER ACCESSORIES

A. Domestic Water Compression Tanks:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. AMTROL Inc.
 - b. Honeywell International Inc.
 - c. Pentair Pump Group (The); Myers.
 - d. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
 - e. State Industries.
 - f. Taco, Inc.
2. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
 3. Construction:
 - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
 - b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Air-Charging Valve: Factory installed.
 4. Capacity and Characteristics: see drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before water heater installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations. Examine piping and electrical connections to verify actual locations, sizes and other conditions affecting water heater performance, maintenance and operations.
 1. Final water heater locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.
- B. Examine mechanical spaces for suitable conditions where water heaters will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WATER HEATER INSTALLATION

- A. Install water heaters level on concrete bases. Concrete base is specified in Division 23 Section "Common Work Results for HVAC," and concrete materials and installation requirements are specified in Division 03.
- B. Install gas-fired water heaters in accordance with
 1. Local, state provincial, and national codes, laws, regulations, and ordinances.
 2. National Fuel Gas Code, ANSI Z223.1/NFPA 54 – latest edition.
 3. National Electrical Code, ANSI/NFPA 70 - latest edition.
 4. Manufacturer's installation instructions, including required service clearances and venting guidelines.

- C. Assemble and install water heater trim.
- D. Install electrical devices furnished with water heater but not specified to be factory mounted.
- E. Install control wiring to field-mounted electrical devices.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 sections. Drawings indicate general arrangement of piping, fittings and specialties.
- B. Install piping adjacent to water heater to permit service and maintenance.
- C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.
- D. Connect gas piping to water heater gas-train inlet with unions. Piping shall be at least full size of gas train connection. Provide a reducer if required.
- E. Connect hot-water piping to supply and return water heater tapplings with shutoff valve and union or flange at each connection.
- F. Multiple heaters shall be piped in reverse return or provided with balancing valves on hot water outlet. Each water heater shall have individual isolation valves for servicing and a hot water hose connection for start-up and field testing.
- G. Install piping from safety relief valves to nearest floor drain.
- H. Water heater Venting
 - 1. Install flue venting kit and combustion-air intake.
 - 2. Connect venting full size to water heater connections. Comply with requirements in Division 23 Section "Breechings, Chimneys and Stacks."
- I. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- J. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections

1. Installation and Startup Test: Perform installation and startup checks according to manufacturer's written instructions.
 2. Leak Test: Perform hydrostatic test. Repair leaks and retest until no leaks exist.
 3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
 4. Controls and Safeties: Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.
 - b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Occupancy Adjustments: When requested within 2 months of date of Substantial Completion, provide on-site assistance adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.
- E. Performance Tests

The water heater manufacturer is expected to provide partial load thermal efficiency curves. These thermal efficiency curves must include at least three separate curves at various BTU input levels. If these curves are not available, it is the responsibility of the water heater manufacturer to complete the following performance tests:

1. Engage a factory-authorized service representative to inspect component assemblies and equipment installations, including connections, and to conduct performance testing.
2. Water heaters shall comply with performance requirements indicated, as determined by field performance tests. Adjust, modify, or replace equipment to comply.
3. Perform field performance tests to determine capacity and efficiency of water heaters.
 - a. Test for full capacity.
 - b. Test for water heater efficiency at low fire, 20, 40, 60, 80, 100, 80, 60, 40 and 20 percent of full capacity. Determine efficiency at each test point.
4. Repeat tests until results comply with requirements indicated.
5. Provide analysis equipment required to determine performance.
6. Provide temporary equipment and system modifications necessary to dissipate the heat produced during tests if building systems are not adequate.
7. Notify Architect in advance of test dates.
8. Document test results in a report and submit to Architect.

END OF SECTION 223436

SECTION 230993 - SEQUENCES OF OPERATION

1. SCHEDULE

- A. Although specific set points, time periods and reset values are listed in the sequence of operation, all values shall be changeable through the Facility Management System console or portable operators' terminal. The initial occupied/unoccupied schedules shall be as designated by the owners representative.

2. POINT DATABASE

- A. Inputs and outputs required to meet the sequence of operation shall be provided, whether or not they are listed in the Input/Output schedule. All points listed in the Input/Output schedule shall also be provided.

3. PACKAGED ROOFTOP UNITS; (RTU-1, RTU-2)

- A. The rooftop unit shall come equipped with a packaged controller with the manufacturer's sequence of operations. The packaged controller shall be programmed to meet the owner supplied occupancy schedule and temperature setpoints. The BAS shall monitor the RTU through a BACnet communication card and display available status and control points.
- B. Run Conditions - Scheduled: The unit shall run according to a user definable time schedule in the following modes:
 - a. Occupied Mode: The unit shall maintain a 75°F (adj.) cooling setpoint and 70°F (adj.) heating setpoint.
 - b. Unoccupied Mode: The unit shall maintain an 85°F (adj.) cooling setpoint and 55°F (adj.) heating setpoint.
 - c. Zone Setpoint Adjust: The occupant shall be able to adjust the zone temperature heating and cooling setpoints at the zone sensor.
- C. Supply Fan: The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.
- D. Cooling Stages: The controller shall measure the zone temperature and stage the cooling to maintain its cooling setpoint. To prevent short cycling, there shall be a user definable (adj.) delay between stages, and each stage shall have a user definable (adj.) minimum runtime.
 - a. The cooling shall be enabled whenever:
 - i. Outside air temperature is greater than 60°F (adj.).
 - ii. AND the economizer is disabled or fully open.
 - iii. AND the zone temperature is above cooling setpoint.
 - iv. AND the supply fan status is on.
 - v. AND the heating is not active.

- E. Gas Heating Stages: The controller shall measure the zone temperature and stage the heating to maintain its heating setpoint. To prevent short cycling, there shall be a user definable (adj.) delay between stages, and each stage shall have a user definable (adj.) minimum runtime.
- a. The heating shall be enabled whenever:
 - i. Outside air temperature is less than 65°F (adj.).
 - ii. AND the zone temperature is below heating setpoint.
 - iii. AND the supply fan status is on.
 - iv. AND the cooling is not active.
- F. Economizer: The controller shall measure the zone temperature and modulate the economizer dampers in sequence to maintain a setpoint 2°F (adj.) less than the zone cooling setpoint. The outside air dampers shall maintain a minimum adjustable position whenever occupied. The minimum damper position shall be set to maintain the minimum ventilation rate and shall be determined with careful coordination with the TAB contractor.
- a. The economizer shall be enabled whenever:
 - i. Outside air temperature is less than 65°F (adj.).
 - ii. AND the outside air temperature is less than the return air temperature.
 - iii. AND the supply fan status is on.
 - b. The economizer shall close whenever:
 - i. Mixed air temperature drops from 45°F (adj.) to 40°F (adj.).
 - ii. OR on loss of supply fan status.
 - iii. OR the freeze stat (if present) is on.
 - iv. The outside and exhaust air dampers shall close and the return air damper shall open when the unit is off. If Optimal Start Up is available, the mixed air damper shall operate as described in the occupied mode except that the outside air damper shall modulate to fully closed.
- G. Alarms shall be provided as follows:
- a. High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
 - b. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
 - c. Return Air Smoke Detection: The unit shall shut down and generate an alarm upon receiving a return air smoke detector status.
4. VRF – VARIABLE REFRIGERANT FLOW
- A. The VRF unit shall come equipped with a packaged controller with the manufacturer's sequence of operations. The packaged controller shall be programmed to meet the owner supplied occupancy schedule and temperature setpoints. The BAS shall monitor the unit through a BACnet communication card. A control graphic will be provided which shall display at a minimum the following control points:
- a. Compressor Run Status
 - b. Fan Status
 - c. Zone Temperature Setpoint
 - d. Zone Temperature
 - e. Occupancy Status
- B. Run Conditions - Scheduled: The unit shall run according to a user definable time schedule in the following modes:

- a. Occupied Mode: The unit shall maintain a 75°F (adj.) cooling setpoint and 70°F (adj.) heating setpoint. The supply fan shall run continuously to supply ventilation.
 - b. Unoccupied Mode: The unit shall maintain an 85°F (adj.) cooling setpoint and 55°F (adj.) heating setpoint.
 - c. Zone Setpoint Adjust: The occupant shall be able to adjust the zone temperature heating and cooling setpoints at the zone sensor.
- C. Supply Fan: The supply fan shall run anytime the unit is in occupied mode or when it is commanded to run in unoccupied mode, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.
- D. Heating and Cooling – Air Source Heat Pump: The controller shall measure the zone temperature and stage the compressor to maintain its setpoint. The compressor shall run subject to its own internal safeties and controls. To prevent short cycling, there shall be a user definable (adj.) delay between stages, and each stage shall have a user definable (adj.) minimum runtime.
- a. The heating shall be enabled whenever:
 - i. Outside air temperature is less than 65°F (adj.).
 - ii. AND the zone temperature is below heating setpoint.
 - iii. AND the supply fan status is on.
 - iv. AND the reversing valve is in heat mode.
 - b. The cooling shall be enabled whenever:
 - i. Outside air temperature is greater than 60°F (adj.).
 - ii. AND the zone temperature is above cooling setpoint.
 - iii. AND the supply fan status is on.
 - iv. AND the reversing valve is in cooling mode.
- E. Electric Supplemental Heating: The units include an integral electric supplemental heating coil. The electric heaters are intended for backup operation during very cold ambient conditions when the VRF system is not able to maintain setpoint. The unit controls shall measure the discharge temperature and modulate the electric heating to maintain its heating setpoint.
- a. The duct heaters shall be controlled through the VRF controls.
 - b. The duct heaters shall be enabled based on the following conditions:
 - i. Outdoor ambient temperature is less than 10°F (adjustable).
 - ii. Zone temperature varies from room setpoint by >4°F (adjustable).
 - iii. Duct heater to integrate with and be staged by the VRF controls.
- F. The BAS shall integrate the operation of the VRF and ERV equipment to enable operation of the ventilation system when any VRF fan coil is enabled for operation in Occupied mode.
- G. Provide graphical floor plans showing the zone layouts for each floor of the building to be displayed through the BMS.
- H. Alarms shall be provided as follows:
- a. High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
 - b. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
 - c. Maintenance alarms and all other points available through the VRF.

Point Name	Hardware Points				Software Points						Show On Graphic
	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	
Zone Setpoint Adjust	X										X
Zone Temp	X								X		X
Fan Status			X						X		X
Freezestat			X						X	X	X
Compressor Stage 1				X					X		X
Fan Start/Stop				X					X		X
Reversing Valve				X					X		X
Cooling Setpoint					X				X		X
Heating Setpoint					X				X		X
Schedule								X			
Compressor Runtime Exceeded										X	
Fan Failure										X	
Fan in Hand										X	
Fan Runtime Exceeded										X	
High Zone Temp										X	
Low Zone Temp										X	

5. ENERGY RECOVERY VENTILATOR (ERV-1 & EC-1)

- A. The rooftop unit consists of a supply fan, exhaust fan, a wheel type sensible heat exchanger (air-to-air), filters, outdoor air & exhaust air dampers, and a 2-stage duct mounted electric heating coil mounted in the underfloor crawl space.
- B. The energy recovery unit shall come equipped with a packaged controller with the manufacturer's sequence of operations. The packaged controller shall be programmed to meet the owner supplied occupancy schedule and temperature setpoints. The BAS shall monitor the ERV through a BACnet communication card and display available status and control points.
- C. Run Conditions - Scheduled: The unit shall run according to a user definable time schedule in the following modes:

- a. Occupied Mode: The unit shall maintain a 80°F (adj.) cooling setpoint and 50°F (adj.) heating setpoint.
 - b. Unoccupied Mode: The unit shall be off. During unoccupied hours the VRF system provides zone temperature control without ventilation.
- D. Unit Start Command: The supply and exhaust fan shall run anytime the unit is commanded to run, unless shutdown on safeties. The following shall occur on a command to enable:
- a. Outdoor air and exhaust control damper shall open
 - b. Exhaust fan shall start
 - c. Supply fan and energy recovery wheel shall start
- E. Unit Stop Command: The following shall occur on a unit stop command:
- a. Supply fan, exhaust fan, and energy wheel shall be de-energized.
 - b. Outdoor air and exhaust damper shall close.
- F. Supply and Exhaust Fan: The supply and exhaust blower operate at a constant speed during unit operation. The speed shall be set during test and balance of the unit.
- G. Heat Recovery Wheel: The heat recovery wheel shall operate whenever the unit is enabled.
- a. Frost Control: Frost control for the energy wheel is enabled when frost is present on the wheel; based on the outdoor air temperature and the pressure drop across the wheel. If the outdoor air temperature is below 5°F (adj.) and the differential pressure across the wheel exceeds 1.5" w.g. (adj.) the frost control will enable.
 - i. Timed exhaust: When frosting is occurring, the supply blower is cycled (30 minutes ON/5 minutes OFF (adj.)) to allow the warm exhaust to defrost the wheel. Once the outdoor air temperature increases above 36°F (adj.) or the pressure drop decreases below the pressure switch set point, the unit will resume normal operation.
- H. Electric Heating: The controller shall measure the discharge temperature and modulate the electric heating to maintain its heating setpoint.
- a. The heating shall be enabled whenever:
 - i. Outside air temperature is less than 40°F (adj.).
 - ii. AND the supply temperature is below heating setpoint.
 - iii. AND the supply fan status is on.
 - iv. AND the cooling is not active.
- I. Alarms shall be provided as follows:
- a. Airflow Alarm: The controller monitors the airflow proving switch on each blower. The controller will send an alarm if either of the airflow proving switches are not engaged.
 - b. Temperature Sensor Alarm: The controller sends an alarm if the temperature sensor fails.
 - c. Energy Wheel Rotation Alarm: The controller monitors the wheel rotation. If the wheel does not rotate for a set period of time (adj.), an alarm will generate.
 - d. Dirty Filter Alarm: A digital signal is sent to the controller indicating an increased pressure drop across the outdoor or exhaust air filters.

Point Name	Hardware Points				Software Points						
	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Totals	5	0	5	7	1	0	0	0	17	15	18
Exhaust Air Temp	X								X		X
Heat Wheel Discharge Air Temp	X								X		X
Outside Air Temp	X								X		X
Return Air Temp	X								X		X
Supply Air Temp	X								X		X
Exhaust Fan Status			X						X		X
Freezestat			X						X	X	X
Heat Wheel Status			X						X		X
Outside Air Damper Status			X						X		X
Supply Fan Status			X						X		X
Exhaust Fan Start/Stop				X					X		X
Heat Wheel Start/Stop				X					X		X
Electric Heating Stage 1				X					X		X
Electric Heating Stage 2				X					X		X
Outside Air Damper				X					X		X
Supply Fan Start/Stop				X					X		X
Supply Air Temp Setpoint					X				X		X
Exhaust Fan Failure										X	
Exhaust Fan in Hand										X	
Exhaust Fan Runtime Exceeded										X	
Heat Wheel in Hand										X	
Heat Wheel Rotation Failure										X	

Heat Wheel Runtime Exceeded									X	
High Supply Air Temp									X	
Low Supply Air Temp									X	
Outside Air Damper Failure									X	
Outside Air Damper in Hand									X	
Supply Fan Failure									X	
Supply Fan in Hand									X	
Supply Fan Runtime Exceeded									X	

6. SPLIT AC UNIT (AC/CU-5)

- A. The split systems serve Data Closet A121 and shall not be reset during un-occupied hours.
- B. Run Conditions: The unit shall run continuously and shall maintain setpoint temperatures as required by the IT manager.
- C. Zone Setpoint Adjust: The setpoint temperature shall be adjustable thru the building automation system or zone thermostat.
- D. Alarms shall be provided as follows:
 - a. High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
 - b. Fan Failure: Commanded on, but the status is off.

7. EXHAUST FANS (EF-1,2,3)

- A. Exhaust fans shall run continuously unless noted otherwise below. The operator shall be able to override the exhaust fan control at the operator workstation in case of maintenance or emergency. The exhaust fan is controlled in Occupied and Unoccupied modes as follows:
 - a. Occupied: The DDC system opens the exhaust damper and turns on the exhaust fan.
 - b. Unoccupied: The exhaust fan is off.
- B. The DDC system uses a current switch to monitor the exhaust fan status and generates an alarm if status deviates from DDC start/stop control.
- C. Exhaust Fan Control Schedule Shall Be As Follows:
 - a. General Exhaust (EF-1&2): Run continuously during occupied hours. Off during unoccupied.

~~b. Staff Toilet (EF-3): Fan interlocked with light switch by Division 26.~~

Point Name	Hardware Points				Software Points						
	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Fan Status			X						X		X
Exhaust Air Damper				X					X		X
Fan Start/Stop				X					X		X
Schedule								X			
Fan Failure										X	
Fan in Hand										X	
Fan Runtime Exceeded										X	

8. DOMESTIC HOT WATER

- A. The domestic water heater operates on its own controls. The supply and return water temperature shall be monitored and generates an alarm if the temperature deviates from the pre-set parameters. The water heaters shall produce 140-degF supply domestic hot water.
- B. A current switch is installed on the load side of the recirculation pump. The DDC system uses the switch to confirm the pump is in the desired state and generates an alarm if status is off. The domestic water re-circ pump shall run continuously to prevent the growth of legionella.

9. MEDICAL OXYGEN SYSTEM

- A. Provide wiring in accordance with the manufacturer's instructions. Provide wiring between the pipe sensors and the area alarm panel located as shown on the drawings or directed by the engineer. Provide wiring between the medical oxygens manifolds and the building management system as directed by the engineer. The wiring responsibility of the ATC contractor is limited to wiring not shown on Division 26 drawings. The DDC system will monitor and alarm the oxygen manifold system thru the BacNET interface.

END OF SECTION



Mechanical Engineering
Electrical Engineering
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Phone: 404.614.5092
Date: November 24, 2020
Copied:

Re: Sleep Lab Addendum #1

From: Carlton A. Getz
Job: Salt Lake City Convention
Center Hotel

[p]: 801.401.8461
Distributed Via: E-Mail

Job No.: 20190083
Email: cag@spectrum-engineers.com

Memo

This memorandum summarizes the revisions in Addendum #2 dated November 24, 2020:

Sheet EPC101

- Conduits between building and condenser unit farm shown.

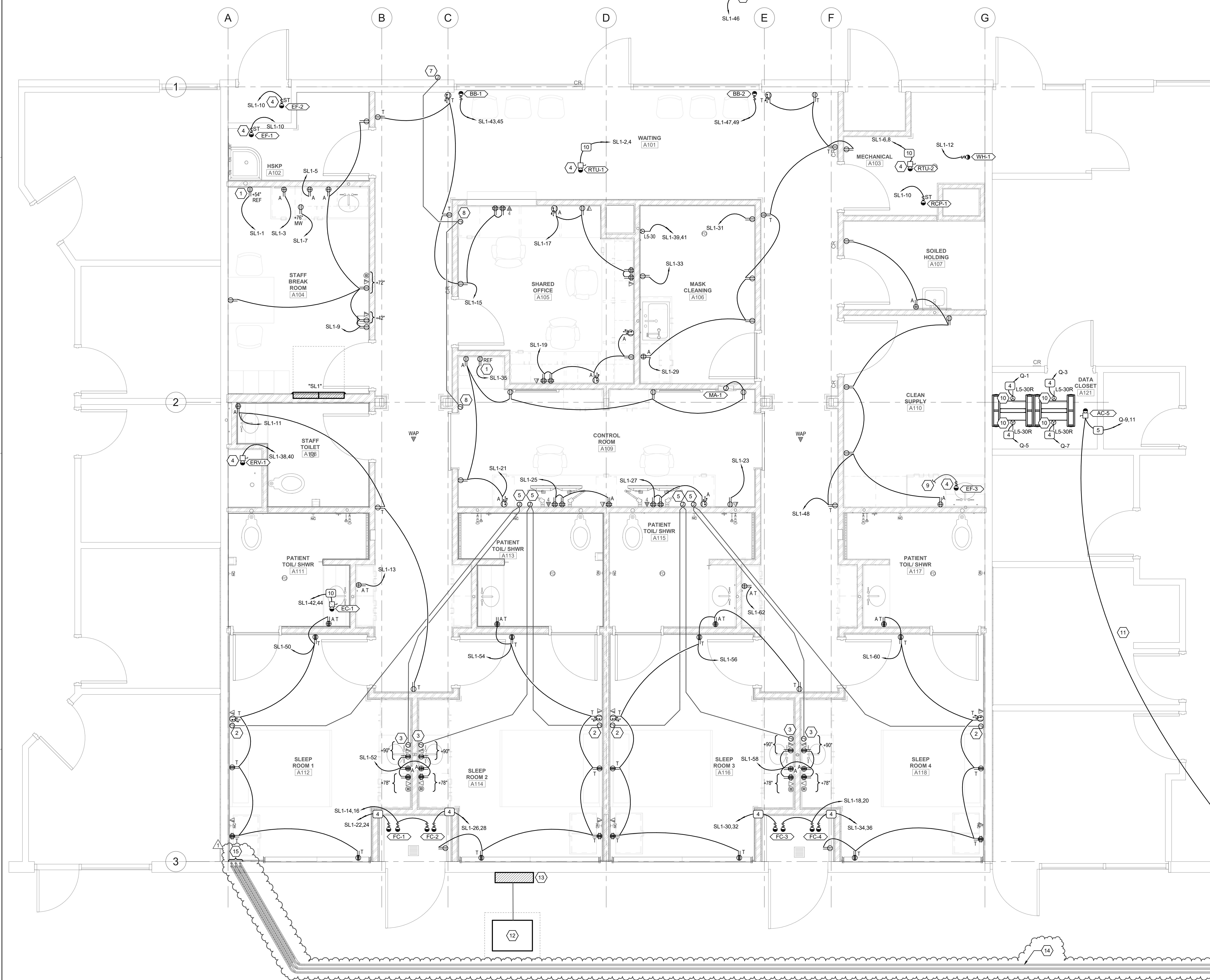
Sheet EPC602

- AC-5/CU-5 load values updated.

If you require any additional information, please contact me at (801).401.8461.

Regards,

Carlton A. Getz, P.E.
Principal
Spectrum Engineers, Inc.

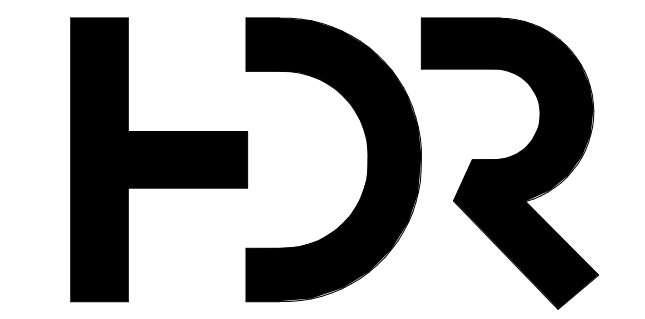


GENERAL SHEET NOTES

- 1 PROVIDE LABELS ON ALL NEW DEVICES PER PROJECT SPECIFICATIONS CONFORMING WITH DIVISION 26 SPECIFICATIONS FOR IDENTIFICATION OF ELECTRICAL EQUIPMENT AND INTERMOUNTAIN'S DIVISION 27 SPECIFICATIONS PRIOR TO SUBSTANTIAL COMPLETION.

SHEET KEYNOTES

- 1 PROVIDE GFCI CIRCUIT BREAKER FOR INDICATED DEVICE.
- 2 PROVIDE RECESSED COMBINATION SPEAKER/MICROPHONE INTERCOM STATION (LOUROE ELECTRONICS TLM-E). PROVIDE CONTROL CABLES BACK TO CONTROL ROOM PER MANUFACTURER INSTALLATION INSTRUCTIONS. COORDINATE EXACT MOUNTING HEIGHT WITH OWNER IN FIELD.
- 3 PROVIDE JUNCTION BOX FOR CONNECTION TO CAMERA. PROVIDE CONTROL CABLES BACK TO CONTROL ROOM.
- 4 PROVIDE MECHANICAL CONNECTION ON ROOF. COORDINATE EXACT LOCATION WITH MECHANICAL PLANS.
- 5 PROVIDE JUNCTION BOX BELOW COUNTER FOR SINGLE INTERCOM BASE STATION. PROVIDE INTERCOM BASE STATION (LOUROE ELECTRONICS AP-1TB) AND ASSOCIATED CABLING CONNECTIONS.
- 6 RECEPTACLE AND TELE/DATA CONNECTION IN TDR FOR SECURITY SYSTEM POWER SUPPLY.
- 7 PROVIDE ALIPHONE JO-DV VIDEO DOOR STATION.
- 8 PROVIDE ALIPHONE GT-1M3 VIDEO TENANT STATION. PROVIDE CABLING PER MANUFACTURER'S INSTALLATION INSTRUCTIONS.
- 9 CONNECT POWER TO LIGHTING CIRCUIT SERVING SPACE.
- 10 MOUNT SPECIAL RECEPTACLE ON THE TOP OF DATA RACK IN SPACE. COORDINATE EXACT LOCATION IN THE FIELD.
- 11 PROVIDE ADDITIONAL CONDUIT BETWEEN INDOOR AND OUTDOOR UNIT FOR CONTROL WIRING PER MANUFACTURER INSTALLATION INSTRUCTION.
- 12 EXISTING UTILITY TRANSFORMER TO BE REMOVED AND REPLACED BY LOGAN POWER. COORDINATE REMOVAL AND REINSTALLATION WITH LOGAN POWER.
- 13 NEW METER BANK.
- 14 PROVIDE CONDUIT UNDERGROUND BETWEEN BUILDING AND CONDENSER UNIT FARM.
- 15 COORDINATE EXACT STUB-UP AND MOUNTING LOCATION OF CONDUITS WITH ARCHITECTURE PRIOR TO ROUGH-IN.



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Project Designer	ERIC MEUB
Project Architect	FRANK PENROSE
Landscape Architect	ARCSITO
Civil Engineer	GREAT BASIN
Structural Engineer	REAVELEY
Mechanical Engineer	VAN BOERUM & FRANK
Electrical Engineer	SPECTRUM
Plumbing Engineer	VAN BOERUM & FRANK
Interior Designer	RUBY THORP
Equipment Planner	ROBERT GRIESCHE
Wayfinding	

MARK	DATE	DESCRIPTION
1	11/24/2020	Addendum #1

Project Number: 10173823
Original Issue: 11/6/20



Sheet Name: **LEVEL 1 POWER PLAN**

Sheet Number: **EPC101**

Project Status: 100% Construction Documents

11/23/2020 11:58:01 AM C:\Users\jpd\Documents\2019\620 - ELEC CENTRAL - SLEEP LAB - jpd\2020\G1.dwg 2019.620

A5 LEVEL 1 POWER PLAN
SCALE: 3/8" = 1'-0"

