

**MECHANICAL NOTES:**

**A: GENERAL**

1. THIS CONTRACTOR SHALL COORDINATE ALL HIS/HER WORK WITH THE OTHER TRADES.
2. THE CONTRACTOR SHALL DISCONNECT OF AND DISPOSE OF ALL EXISTING EQUIPMENT AND ASSOCIATED APPURTENANCES NO LONGER REQUIRED, UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS.
3. THIS MECHANICAL CONTRACTOR SHALL COORDINATE PARTITION AND BUILDING ENVELOPE OPENINGS REQUIRED FOR THIS INSTALLATION OF HIS/HER CONTRACT WORK WITH THE WORK OF THE GENERAL CONTRACTOR.
4. ALL PIPING, CONDUIT, DUCTWORK AND OTHER PENETRATIONS REQUIRED THROUGH THE BUILDING PARTITION OR THE BUILDING ENVELOPE SHALL BE CUT AND SEALED BY THE MECHANICAL CONTRACTOR, UNLESS OTHERWISE NOTED. THIS CONTRACTOR SHALL REVIEW THE GENERAL CONSTRUCTION DOCUMENTS TO COORDINATE THE TYPE OF OPENING REQUIRED RELATIVE TO THE PARTITION CONSTRUCTION, I.E.: FIRE PARTITION, SMOKE PARTITION, COMBINATION THEREOF OF NON-RATED PARTITION. SEALS THROUGH SMOKE-RATED PARTITIONS SHALL PREVENT SMOKE PASSAGE. THE WALLS MUST COMPLY WITH THE REQUIREMENTS FOR SMOKE-BARRIER WALLS AS DESCRIBED IN 2000 EDITION FOR THE LIFE SAFETY CODE, N.F.P.A. 101, PARAGRAPH 14.3.7 AND, IN ADDITION, BE ONE-HOUR FIRE-RATED.
5. DUCT ACCESS DOORS SHALL BE PROVIDED AT ALL DAMPER LOCATIONS. DUCT ACCESS DOORS SHALL BE NOMINALLY TWO INCHES SMALLER THAN THE OUTSIDE EDGE OF THE DUCT DIMENSION TO FACILITATE REMOVAL OF DEVICE IN THE DUCTWORK.
6. FOR ACCESS PANELS LOCATED IN PARTITIONS CONSTRUCTED BY THE GENERAL CONTRACTOR, THE HVAC CONTRACTOR SHALL PROVIDE THE GENERAL CONTRACTOR WITH ROUGH OPENINGS AND FRAMING REQUIREMENTS NECESSARY FOR PROPER INSTALLATION OF THE ACCESS DOORS. ACCESS DOORS SHALL BE PROVIDED IN THESE PARTITIONS OR CEILINGS WHEREVER VALVES, DUCT ACCESS DOORS, DAMPERS OR TERMINAL EQUIPMENT CONCEALED BEHIND PARTITIONS OR CEILINGS PROVIDED ON THE GENERAL CONSTRUCTION DOCUMENTS. THE MECHANICAL CONTRACTOR SHALL COORDINATE LOCATIONS OF ALL ACCESS DOORS AND KEYING SYSTEMS WITH THE GENERAL CONSTRUCTION DOCUMENTS.
7. ALL HORIZONTAL PIPE RUNS SHALL BE RUN LEVEL WITHOUT POCKETS.
8. ALL UPFEED PIPE RISERS SHALL BE MADE WITH TOP CONNECTIONS AT MAINS. ALL DOWNFEED PIPE DROPS SHALL BE MADE WITH BOTTOM CONNECTIONS.
9. ALL PIPING SUPPLY AND RETURN RUNOUTS SHALL BE 3/4" UNLESS NOTED OTHERWISE.
10. PROVIDE AIR VENTS AT THE TOP OF ALL HIGH POINTS.
11. ALL LISTED DUCTWORK DIMENSIONS ARE CLEAR INSIDE OPENING.
12. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ANY EXISTING CEILING GRIDS, LIGHT FIXTURES AS MAY BE REQUIRED FOR THE INSTALLATION OF NEW EQUIPMENT, DUCTWORK, PIPING OR CONDUITS. CONTRACTOR SHALL REINSTALL GRIDS, TILES, FIXTURES AFTER NEW WORK HAS BEEN INSTALLED AND TESTED. CONTRACTOR SHALL BE RESPONSIBLE FOR SAFE STORAGE OF REMOVED GRIDS, TILES & FIXTURES.
13. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ROOFING, CUTTING, PATCHING, CURB INSTALLATION AND DECKING ANGLE SUPPORTS FOR ROOF DECK OPENINGS.
14. THIS CONTRACTOR MUST REQUEST ANY UTILITY SHUTDOWN WITH (SCRANTON) MAINTENANCE PERSONNEL.

**B: DIFFUSERS AND GRILLES**

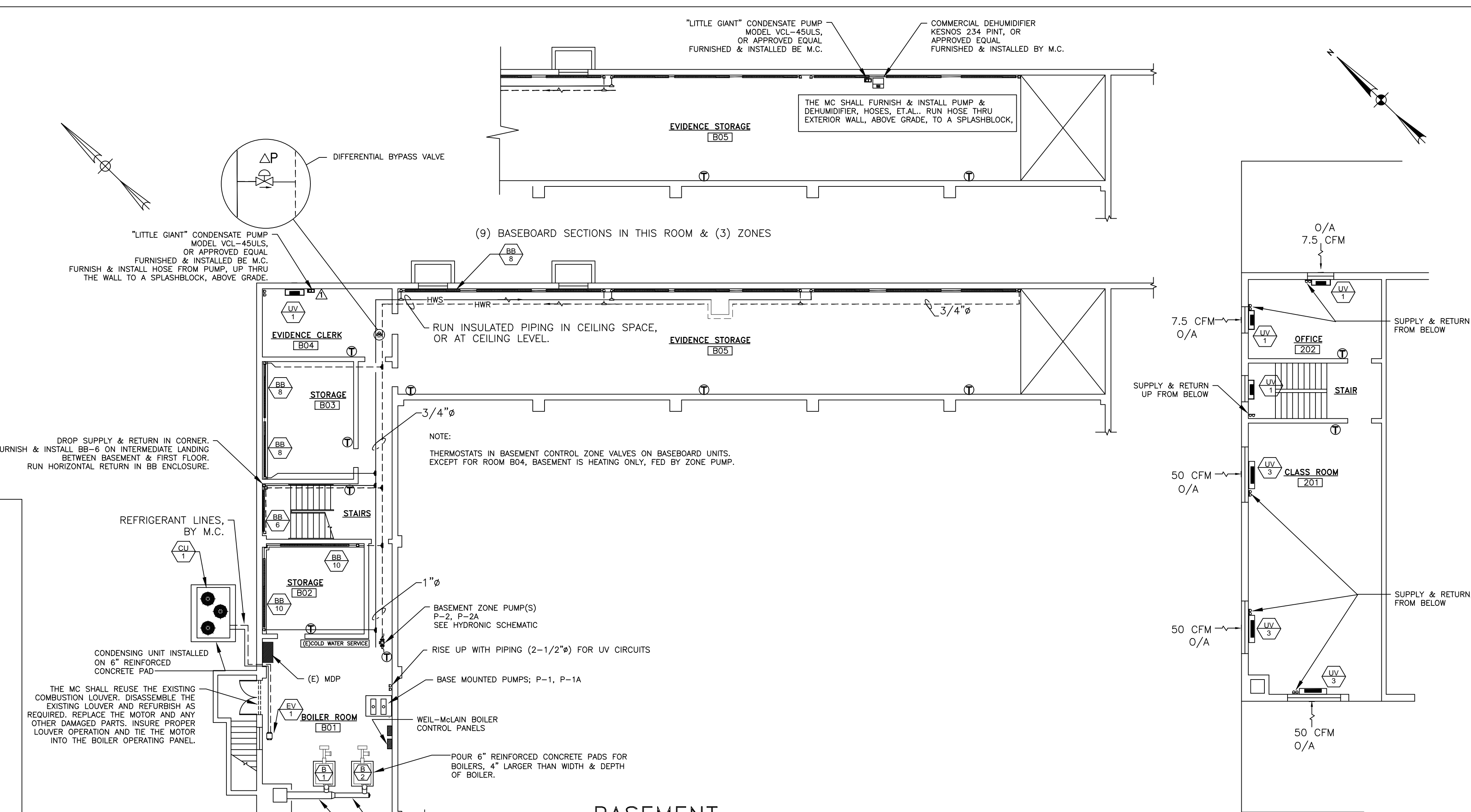
1. ALL DIFFUSERS, REGISTERS AND GRILLES SHALL BE MANUFACTURED BY ANEMOSTAT, OR APPROVED EQUAL.
2. FINISHES SHALL BE COORDINATED WITH ARCHITECT.

**C: BALANCING**

1. THE HYDRONIC SYSTEMS ARE TO BE BALANCED BY AN ABC CERTIFIED BALANCING CONTRACTOR. SUBMIT QUALIFICATIONS TO THE MECHANICAL ENGINEER BEFORE STARTING.

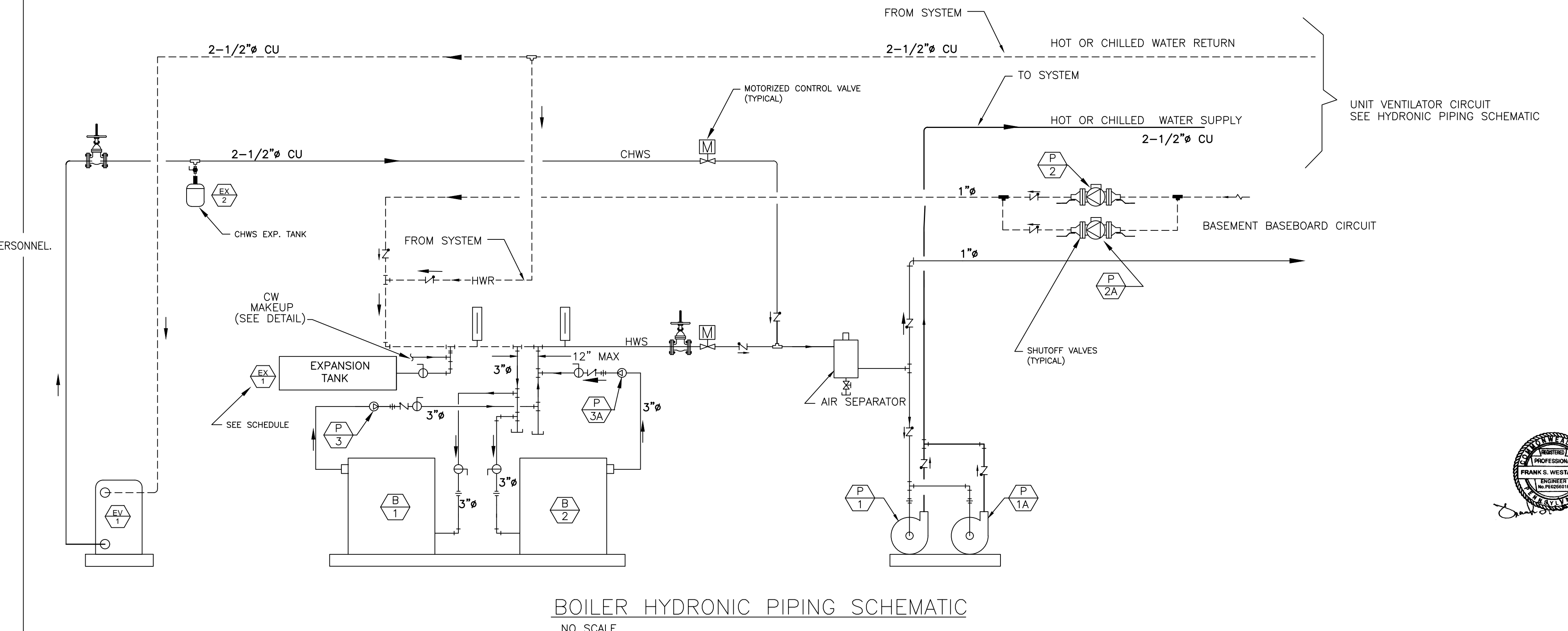
**D: COORDINATION**

1. THE MECHANICAL CONTRACTOR SHALL FURNISH AND INSTALL ALL STARTERS AND DISCONNECTS REQUIRED FOR HIS EQUIPMENT. POWER WIRING SHALL BE BY THE ELECTRICAL CONTRACTOR; CONTROL WIRING SHALL BE BY THE MECHANICAL CONTRACTOR. REFER TO THE ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ELECTRICAL REQUIREMENTS.
2. CUTTING AND PATCHING FOR THE MECHANICAL WORK AND EQUIPMENT ARE A PART OF THE MECHANICAL CONTRACT.
3. CURBS FOR THE MECHANICAL EQUIPMENT ARE FURNISHED BY THE M.C. AND INSTALLED BY THE G.C.
4. ROOF OPENINGS LOCATION AND LAYOUT ARE BY THE M.C.; OPENINGS CUT & FRAMED BY THE G.C.



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

**2ND FLOOR MECHANICAL PLAN**  
SCALE: 1/8" = 1'-0"



**BOILER HYDRONIC PIPING SCHEMATIC**  
NO SCALE

INSTALL BOILERS IN ACCORDANCE WITH PENNSYLVANIA BOILER LAW, RULES AND REGULATIONS, INCLUDING ALL SAFETY AND CLEARANCE REQUIREMENTS.

**CITY OF SCRANTON**  
340 NORTH WASHINGTON AVENUE  
SCRANTON, PA 18503  
LACKAWANNA COUNTY, PA  
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**SCRANTON PUBLIC SAFETY BUILDING RENOVATIONS**  
CITY OF SCRANTON - LACKAWANNA COUNTY, PA

REVISIONS:

DESCRIPTION:	DATE:

PROJECT NUMBER:  
DATE:  
SCALE: AS NOTED  
DRAWN BY: BEN  
CHECKED BY: EJP

FILE #:  
PROF  
  
EUGENE J. PETERS, PE-PLS  
REGISTERED ENGINEER

DRAWING TITLE:  
BASEMENT AND SECOND FLOOR PLAN

SHEET NO:  
**M-2**



UNIT VENTILATOR SCHEDULE												
SYMBOL	FAN WATTS	CFM	O.A. CFM	COIL	COOLING COIL				HEATING COIL		VOLTS/PHASE	TRANE MODEL NO.
					TOTAL MBH	SENS. MBH	FLOW RATE, GPM	WPD (FT. H2O)	TOTAL MBH			
UV-1	37	200	VARIABLES	2CH	5.38	3.91	1.10	6.79	14.6		115V/1Ø	FCJB0201___EEH?GA--
UV-2	39	260	VARIABLES	2CH	6.20	4.61	1.20	8.65	17.4		115V/1Ø	FCJB0301___EEH?GA--
UV-3	58	330	VARIABLES	2CH	7.82	6.17	1.60	3.08	21.7		115V/1Ø	FCJB0401___EEH?GA--
UV-4	79	500	VARIABLES	2CH	13.57	10.06	2.8	10.01	34.08		115V/1Ø	FCJB0601___EEH?GA--
UV-5	37	200	N/A	2CH	5.38	3.91	1.10	6.79	14.6		115V/1Ø	FCDB0201

HORIZONTAL UNIT

NOTES:

- SELECTION OF FAN COILS BASED ON TRANE.
- THE CONTRACTOR SHALL FURNISH EACH FAN COIL WITH 1" THROWAWAY MERV 13 FILTERS, AND (2) EXTRA FILTERS.
- EACH FAN COIL WITH AN OUTSIDE AIR INLET SHALL HAVE A FREEZESTAT INSTALLED ON THE COIL WHICH WILL ACTIVATE THE UNIT FAN WHEN THE TEMPERATURE REACHES 35° F.
- EACH FAN COIL INSTALLED ON AN OUTSIDE WALL SHALL HAVE AN OUTSIDE AIR INLET, RECTANGULAR WALL BOX WITH O.A. DUCT, GRILLE ON THE EXTERIOR OF THE WALL, AND A TWO POSITION, AUTOMATIC AIR DAMPER. THE DAMPER SHALL AUTOMATICALLY MODULATE TO THE OPEN POSITION WHEN THE FAN COIL IS ACTIVATED, EXCEPT WHEN THE OUTDOOR TEMPERATURE IS AT OR BELOW 32° F.
- FAN COILS ON EXTERIOR WALLS SHALL BE FURNISHED WITH A SST CONDENSATE PAN, AND SHALL HAVE A 3/8" PVC DRAIN TO THE EXTERIOR.
- UV-6 IS AN HORIZONTAL CABINET UNIT FOR THE KITCHEN. FURNISH & INSTALL ALL PIPING AND ELECTRICAL, AS WELL AS A 1"Ø CONDENSATE DRAIN FROM THE PAN TO THE EXTERIOR WALL. THE UNIT SHALL HAVE A FRONT OUTLET BAR GRILLE AND BOTTOM INLET LOUVERS.
- MULTIPLE FAN COILS IN A ROOM SHALL BE CONTROLLED FROM THE (1) ROOM THERMOSTAT.

EXHAUST FAN SCHEDULE

TAG	TYPE	ELECTRICAL	HP	CFM	SP	SONES	LOCATION	NOTES
EF-1	ROOF EXHAUSTER	115V/1Ø/60Hz	1/6	100	0.187"	8.6	JANITOR'S CLOSET	ALL NOTES
EF-2	ROOF EXHAUSTER	115V/1Ø/60Hz	1/8	250	0.25"	12.3	LADIES ROOM	ALL NOTES
EF-3	ROOF EXHAUSTER	115V/1Ø/60Hz	1/4	550	0.25"	8.5	MENS ROOM	ALL NOTES

NOTE:

- M.C. SHALL FURNISH CURB; G.C. SHALL INSTALL & FLASH ROOF. POWER WIRING BY THE E.C.. CONTROL WIRING BY THE M.C.
- M.C. SHALL FURNISH & INSTALL GRAVITY DAMPERS WITH ALL FANS.

BASEBOARD RADIATION SCHEDULE

TAG	BTUH LF	ΔT	TUBE DIA.	LENGTH	TOTAL BTUH	NOTES:
BB-2	700	20°	3/4"	2 FT.	1400	NOTES 1, 2, 3, 4, 5, 6, 7
BB-3				3 FT.	2100	NOTES 1, 2, 3, 4, 5, 6, 7
BB-4				4 FT.	2800	NOTES 1, 2, 3, 4, 5, 6, 7
BB-5				5 FT.	3500	NOTES 1, 2, 3, 4, 5, 6, 7
BB-6				6 FT.	4200	NOTES 1, 2, 3, 4, 5, 6, 7
BB-7				7 FT.	4900	NOTES 1, 2, 3, 4, 5, 6, 7
BB-8				8 FT.	5600	NOTES 1, 2, 3, 4, 5, 6, 7
BB-9				9 FT.	6300	NOTES 1, 2, 3, 4, 5, 6, 7
BB-10				10 FT.	7000	NOTES 1, 2, 3, 4, 5, 6, 7

NOTES:

- TUBE DIAMETER=3/4", ΔT=20°, FLOW=1 GPM.
- BASED ON STERLING MODEL LB-2. BASEBOARD FIN TUBE RADIATION.
- MOUNTING HEIGHT AT 10 3/4" AFF.
- FURNISH AND INSTALL WITH FULL BACKPLATE, MODULATING DAMPER ASSEMBLY WITH KNOB ACTUATOR.
- FURNISH AND INSTALL WALL TO WALL ENCLOSURES, INCLUDING END CAPS AND WALL SLEEVES.
- BASEBOARD RATING BASED ON 180° EWT, 63° EAT AND 700 BTU/LF.
- BASEBOARD ENCLOSURE COLOR TO BE SELECTED BY ARCHITECT.

EVAPORATOR CHILLER SCHEDULE

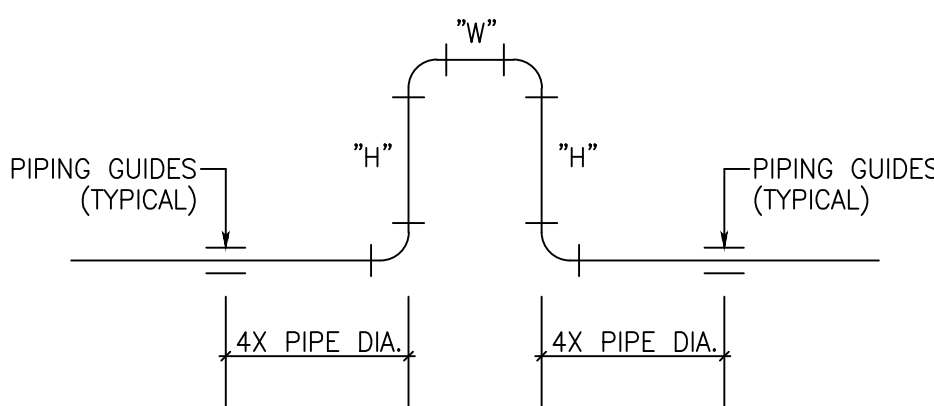
TAG	NOM TONS	REFRIG. CIRCUITS	SUCTION LINE DIA.	LIQUID LINE DIA.	H <sub>2</sub> O ΔP	GPM	EWT	LWT	REMARKS
EV-1	30	1	2-1/8"	7/8"	4.26	47.42	58°	44°	

SELECTION IS BASED ON A TRANE BRAZED PLATE HEAT EXCHANGER.

EXPANSION TANK SCHEDULE

TAG	TANK VOL.(GAL.)	MAX ACCEP.GAL.	SIZE	SERVICE	TYPE	NOTES
EX-1	44.4	22.6	24"Ø 29" H	HOT WATER HYDRONIC SYSTEM		AMTROL AX-80V OR EQUAL
EX-2	8.0	2.4	12"Ø 22" H	CHILLED WATER HYDRONIC SYSTEM		AMTROL AX-15 OR EQUAL

EXPANSION TANKS SHALL BE ASME MODELS



EXPANSION LOOP DIMENSIONS

COPPER TUBE DIAMETER	"W"	"H"
3/4"Ø	20"	20"
1"Ø	22"	22"
1-1/4"Ø	25"	25"
2"Ø	2.0'	4.0'
2 1/2"Ø	2.25'	4.5'
3"Ø	2.5'	5.0'

EXPANSION LOOP DETAIL

NO SCALE

CONDENSING UNIT SCHEDULE

TAG	SAT. SUCT. TEMP.	COMPRESSOR DATA				ELECTRICAL DATA				CONDENSER FAN DATA					CONDENSER COIL DATA				NOTES							
		TYPE	CIRCUITS	# STEPS	% STEPS	VOLTS/Ø	MIN. CIRC. AMPTRY	MAX FUSE	COMP. RLA	TOT. COMP. KW	TOT. COND. MBH	LRA	QTY	DIA	TYPE	DRIVE	# MOTORS	HP		TOT. KW	TOT. CFM	NO.	SIZE	FACE AREA	ROWS	FPF
CU-1	33°F	SCROLL	30 TON	2	100-50	230/3Ø	123	150	48.8	31.18	115.65	351	3	26	PROP	DIRECT	3	1.0	2.71	20700	2	42x71	41.4 FT	1	240	TRANE MODEL RAUJ-30 RAUJ-C30-EP_13ABDF0JC1

NOTES:

- INCLUDE LOW AMBIENT CONTROL OPTION.
- INCLUDE POWERED CONVENIENCE OUTLET AND NON-FUSED DISCONNECT SWITCH.

NEW BOILER SCHEDULE

TAG	TYPE	BURNER	BURNER CAPACITY (BTU/HR.)	GROSS IBR OUTPUT (BTU/HR.)	NET AHRI OUTPUT HOT WATER (BTU/HR.)	BOILER H.P.	FUEL	NOTES:
B-1	HOT WATER	FORCED DRAFT	639,000	515,000	455,000	15.4	NATURAL GAS	BASIS OF DESIGN IS WEIL-MCLAIN 580 WATER BOILER OR APPROVED EQUAL FURNISH & INSTALL COMPLETE BOILER PACKAGE
B-2	HOT WATER	FORCED DRAFT	639,000	515,000	455,000	15.4	NATURAL GAS	BASIS OF DESIGN IS WEIL-MCLAIN 580 WATER BOILER OR APPROVED EQUAL FURNISH & INSTALL COMPLETE BOILER PACKAGE

NOTES:

- ASME CERTIFIED FACTORY TESTED, FULLY ASSEMBLED, PACKAGED CAST IRON WITH ALL NECESSARY BOILER CONTROLS.
- FACTORY ASSEMBLED SECTIONS.
- FIRE-TESTED PACKAGE BOILER (INCLUDES LOW-WATER CUT-OFF).
- BURNER MOUNTING PLATE FOR "H" UNITS.
- FURNISH & INSTALL BOILER MANUFACTURER'S CONTROL PANEL TO CONTROL BOILER AND PUMPS. INTERFACE BOILER CONTROL PANEL WITH BUILDING CONTROL CENTER.
- BURNER BASED ON POWER-FLAME MODEL WCR1. FURNISHED & INSTALLED BY M.C.

PUMP SCHEDULE

TAG	MFGR./MODEL NO.	GPM	HEAD (ft.)	TYPE	HP	RPM	VOLTS/PHASE	USE	REMARKS
P-1	B&G/TACO	45	20 Ft	BASE MOUNTED	2.0	1750	230/3Ø/60	HEATING/COOLING CIRCUIT	
P-1A	B&G/TACO	45	20 Ft	BASE	2.0	1750	230/3Ø/60	HEATING/COOLING CIRCUIT	
P-2	B&G/TACO	6	5 Ft	IN LINE	1/6	1750	115/1Ø/60	BASEMENT BASEBOARD CIRCUIT	
P-2A	B&G/TACO	6	5 Ft	IN LINE	1/6	1750	115/1Ø/60	BASEMENT BASEBOARD CIRCUIT	
P-3	B&G/TACO	25	5 Ft	IN LINE	1/6	1750	115/1Ø/60	BOILER CIRC.	
P-3A	B&G/TACO	25	5 Ft	IN LINE	1/6	1750	115/1Ø/60	BOILER CIRC.	

NOTES:

- FURNISH & INSTALL AUTOMATIC AIR VENTS AT ALL HIGH POINTS IN HYDRONIC PIPING.
- ALL IN-LINE CIRCUITORS SHALL BE EQUIPPED WITH SHUTOFF VALVES (SEE P-2).

GRILLE, REGISTER, AND DIFFUSER SCHEDULE

TAG	CFM RANGE	SP	NECK SIZE	MAX. NC	MODULE SIZE	SERVICE	MATERIAL	REMARKS
ER-1	100	<0.01	12x12	<20	12x12	EXHAUST	STEEL	
ER-2	250	<0.01	16x16	<20	16x16	EXHAUST	STEEL	
ER-3	550	<0.01	20x20	<20	20x20	EXHAUST	STEEL	

NOTES:

- SELECTIONS BASED ON ANEMOSTAT.
- THE M.C. MUST COORDINATE THE TYPE OF MOUNTING FOR THE REGISTERS WITH THE ASSOCIATED CEILING, I.E., METAL PANEL, CONCRETE PLANK OR ACOUSTICAL TILE CEILING.

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PROJECT:  
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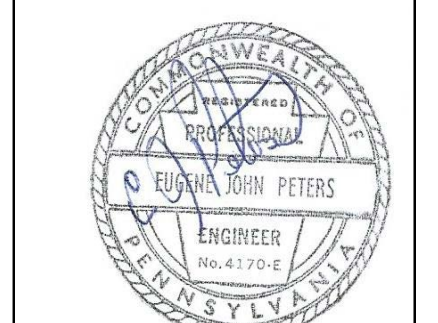
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DESCRIPTION:	DATE:

PROJECT NUMBER:

DATE:

SCALE: AS NOTED



DRAWING TITLE:

**MECH. SCHEDULES**

SHEET NO:

**M-3**



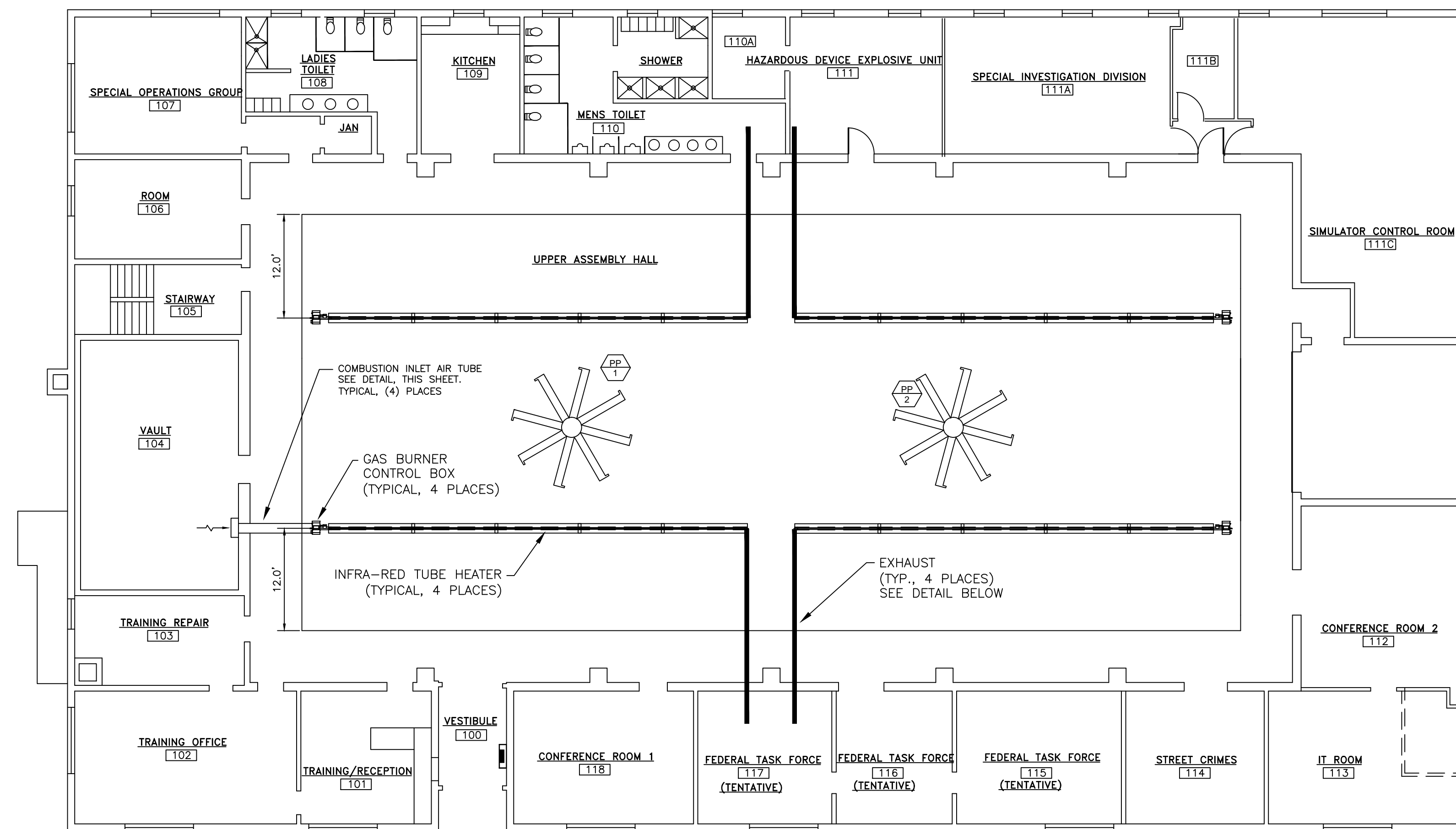
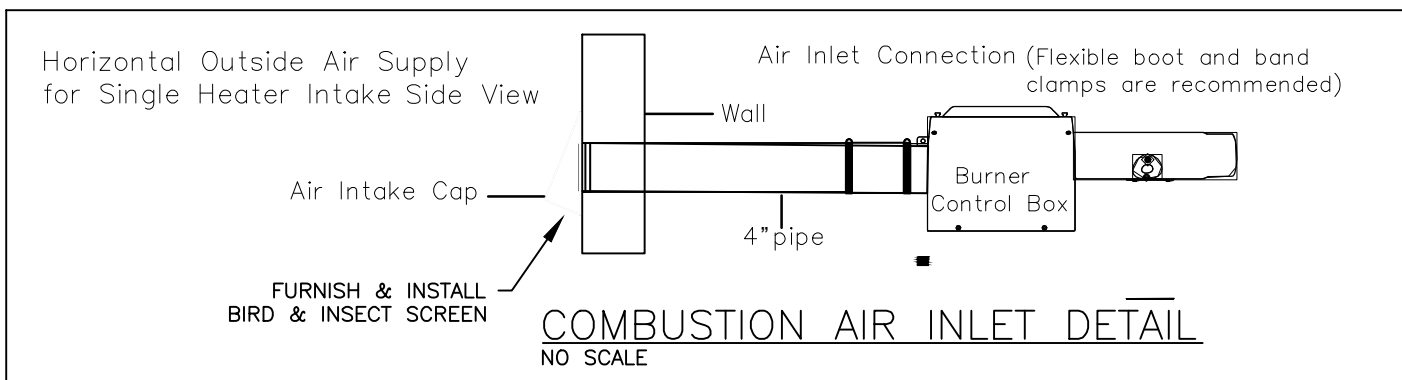






CEILING FAN SCHEDULE								
TAG	TYPE	ELECTRICAL	HP	RPM	WEIGHT	DIA.	LOCATION	MOTOR FLA
PP-1	PROPELLER FAN	115V/1Ø/60Hz	1.35	45	123#	14 FT	ASSEMBLY AREA	5.2
PP-2	PROPELLER FAN	115V/1Ø/60Hz	1.35	45	123#	14 FT	ASSEMBLY AREA	5.2

- NOTES:
1. CEILING FAN SELECTION BASED ON SKYBLADE FAN COMPANY, WARREN, MICH.
  2. MODEL NO. OF FAN: TBP-1443-XXX-1
  3. FURNISH & INSTALL "SINGLE YOKE CONTROLLER" FOR EACH FAN. VERIFY CONTROLLER LOCATION (AT FLOOR LEVEL) WITH OWNER.
  4. INSTALL FAN WITH BLADE LEVEL AT 26" BELOW CEILING..



- RADIANT HEATER NOTES:**
1. DESIGN IS BASED ON HL3 SERIES TUBE HEATERS AS MANUFACTURED BY DETROIT RADIANT PRODUCTS CO.
  2. MODEL NUMBER IS HL3-50-125, TWO STAGE, LOW INTENSITY GAS-FIRED INFRARED TUBE HEATER.
  3. HIGH FIRE = 125,000 BTU/H; LOW FIRE = 82,000 BTU/H.
  4. THE CONTRACTOR SHALL FURNISH & INSTALL ALL NECESSARY COMPONENTS FOR A COMPLETE AND OPERATIONAL INFRARED HEATING SYSTEM, INCLUDING BUT NOT LIMITED TO, PIPES, HANGERS, EXHAUST SYSTEM, HEAT SHIELDS, WIRING, PLANT & MATERIAL, ETC..
  5. FURNISH WITH 2 SIDE SHIELDS, GAS BURNER AND CONTROL, 2-STAGE, DIGITAL PROGRAMMABLE WALL-MOUNTED THERMOSTAT.
  6. CONTRACTOR SHALL FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR RADIANT HEATING SYSTEM, AND FURNISH & INSTALL ALL NECESSARY COMPONENTS, OPTIONS, PLANT & MATERIAL FOR A COMPLETE AND OPERABLE RADIANT HEATING SYSTEM.

INPUT GAS LOAD TO RADIANT HEATER SYSTEM = 500,000 BTU/H.

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**RADIANT HEATER & FAN LAYOUT**  
 SCALE: 1/8" = 1'-0"

REVISIONS:

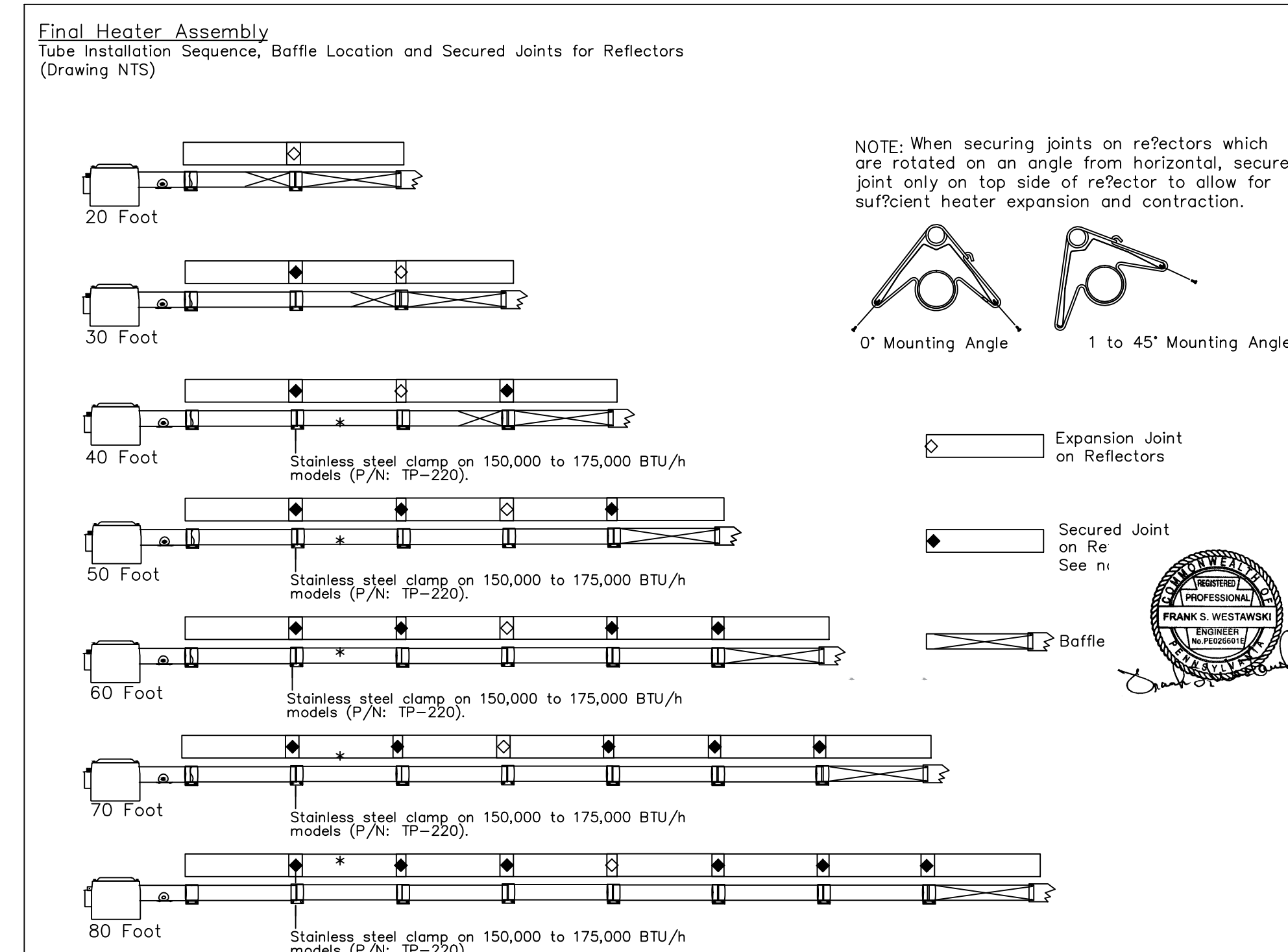
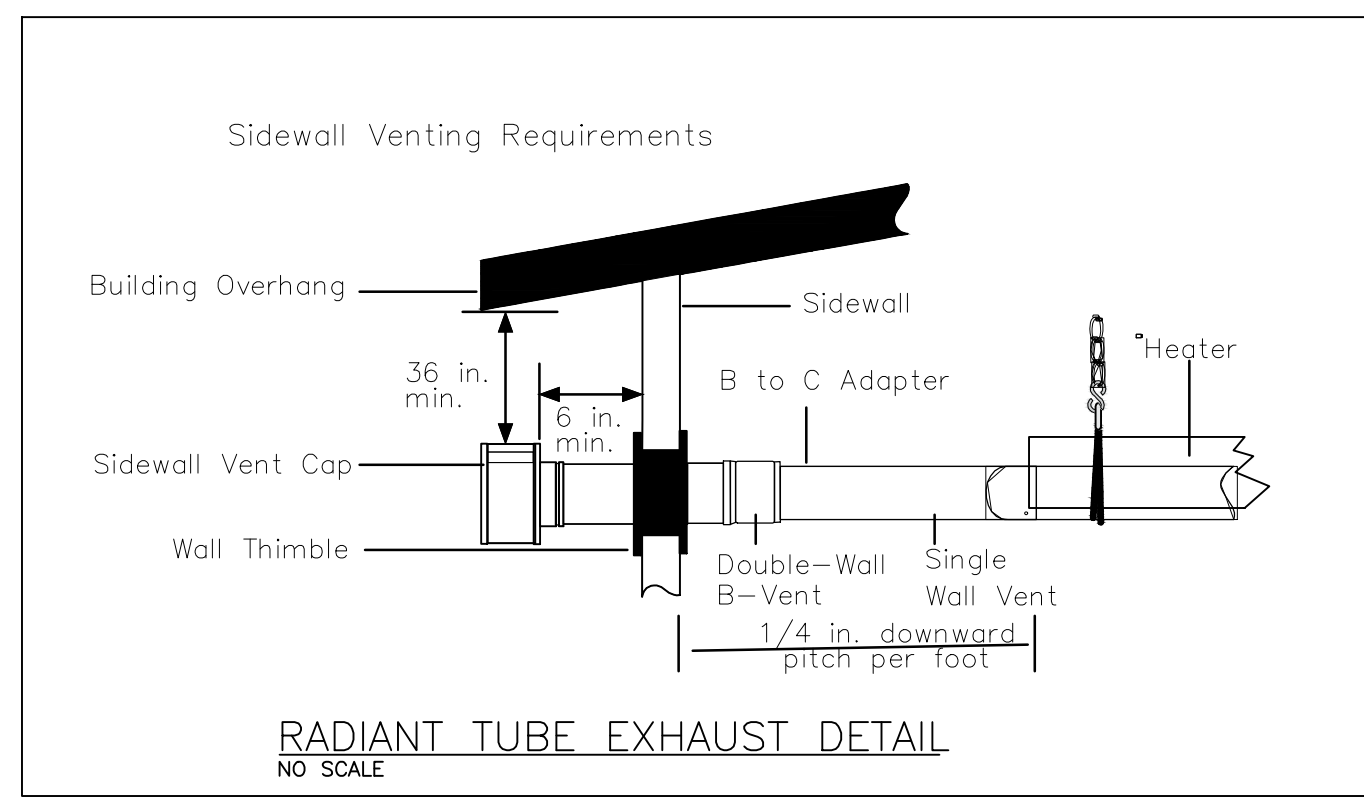
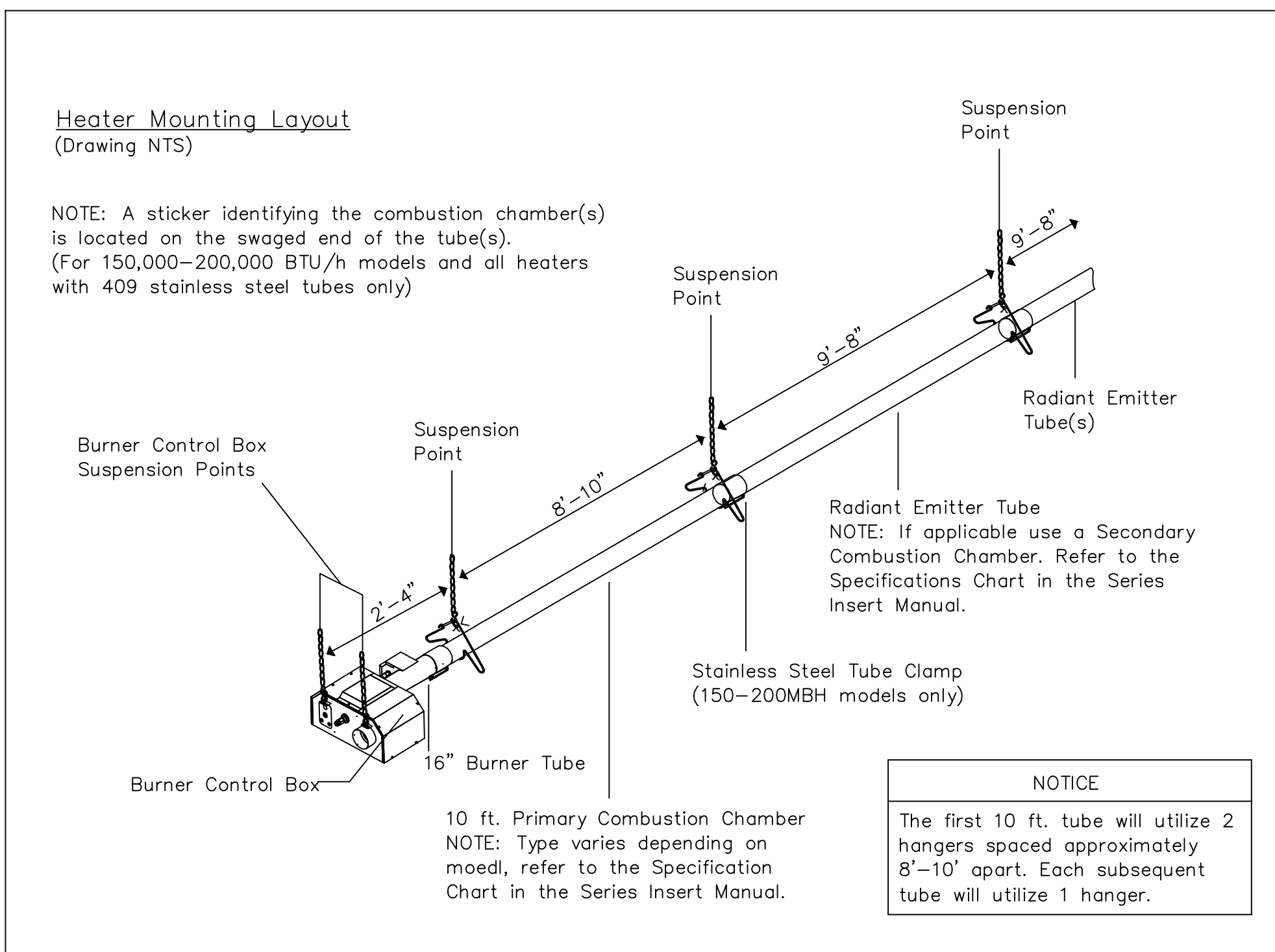
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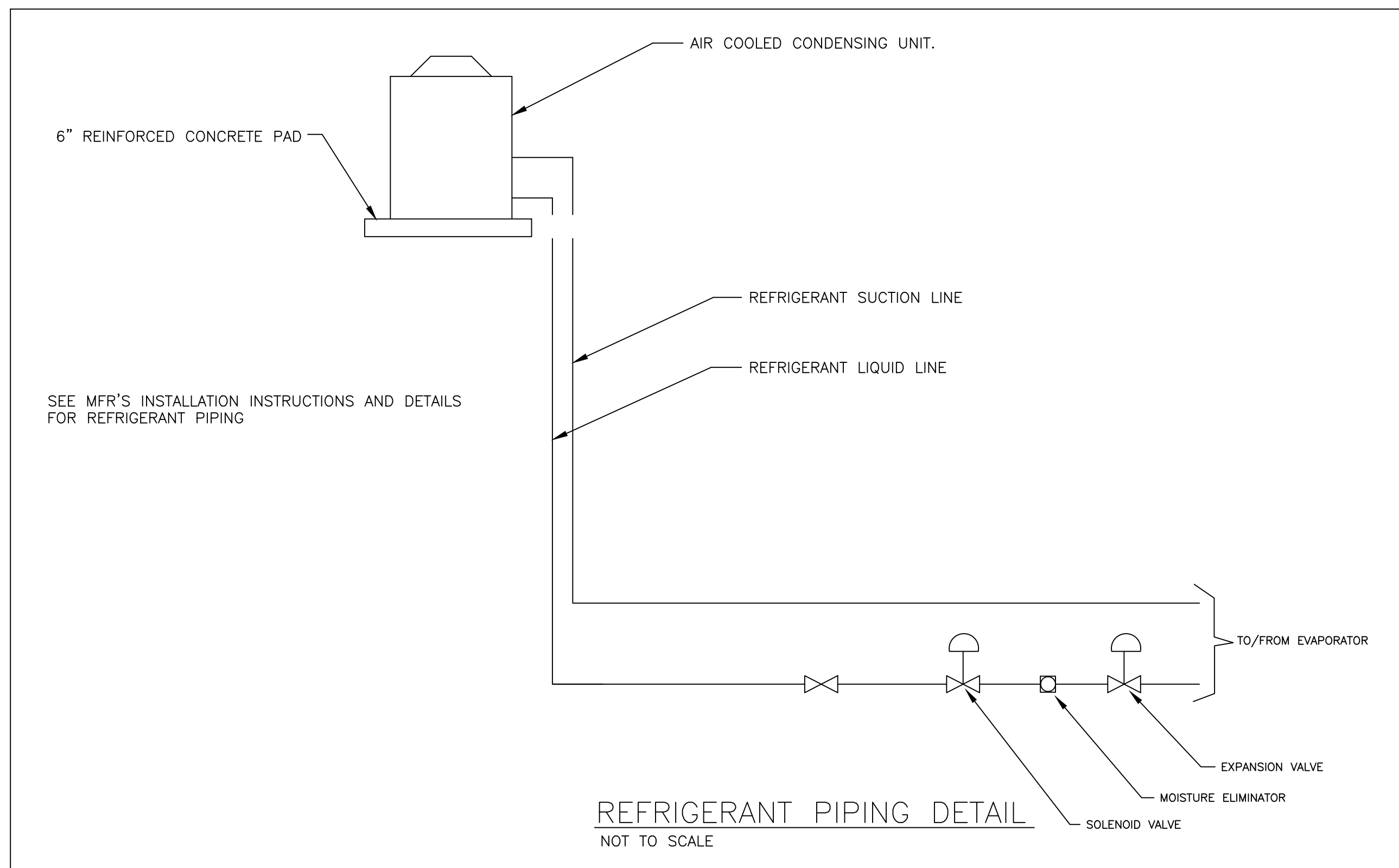


**RADIANT HEAT LAYOUT**

SHEET NO:  
**M-6**







REFRIGERANT PIPING DETAIL  
NOT TO SCALE

**Sequence of Operations: FAN COIL [QTY: 32]**

**Building Automation System Interface:**

The Building Automation System (BAS) shall send the controller Occupied Bypass, Morning Warm-up/Pre-Cool, Occupied/Unoccupied and Heat/Cool modes. If a BAS is not present, or communication is lost with the BAS the controller shall operate using default modes and setpoints

**Occupied:**

During occupied periods, the supply fan shall run continuously and the outdoor air damper shall open to maintain minimum ventilation requirements. The cooling/heating valve shall modulate to maintain the active space temperature setpoint

**Unoccupied:**

When the space temperature is below the unoccupied heating setpoint of 60.0 deg. F (adj.) and hot water is detected, the supply fan shall start, the outside air damper shall remain closed and the Heat/Cool water valve shall open. When the space temperature rises above the unoccupied heating setpoint of 60.0 deg. F (adj.) plus the unoccupied differential of 2.0 deg. F (adj.) the supply fan shall stop and the Heat/Cool water valve shall close.

**Optimal Start:**

The BAS shall monitor the scheduled occupied time, occupied space setpoints and space temperature to calculate when the optimal start occurs.

**Morning Warm-Up Mode**

During optimal start, if the space temperature is below the occupied heating setpoint a morning warm-up mode shall be activated. When morning warm-up is initiated the unit shall enable the heating and supply fan. The outside air damper shall remain closed. When the space temperature reaches the occupied heating setpoint (adj.), the unit shall transition to the occupied mode.

**Pre-Cool Mode:**

During optimal start, if the space temperature is above the occupied cooling setpoint, pre-cool mode shall be activated. When pre-cool is initiated the unit shall enable the fan and cooling or economizer. The outside air damper shall remain closed, unless economizing. When the space temperature reaches occupied cooling setpoint (adj.), the unit shall transition to the occupied mode.

**Optimal Stop:**

The BAS shall monitor the scheduled unoccupied time, occupied setpoints and space temperature to calculate when the optimal stop occurs. When the optimal stop mode is active the unit controller shall maintain the space temperature to the space temperature offset setpoint. Outside air damper shall remain enabled to provide minimum ventilation.

**Occupied Bypass:**

The BAS shall monitor the status of the ON and CANCEL buttons of the space temperature sensor. When an occupied bypass request is received from a space sensor, the unit shall transition from its current occupancy mode to occupied bypass mode and the unit shall maintain the space temperature to the occupied setpoints (adj.).

**Two Pipe Changeover Control:**

Normal heat/cool operation shall not begin until the ability to conduct the desired heating or cooling operation is verified. When the sampling function is enabled, the main hydronic valve shall be opened for 3 minutes to allow the water temperature to stabilize. If the entering water temperature is greater than 5.0 deg. F above a valid space temperature heating operation shall be enabled. If the entering water temperature is greater than 5.0 deg. F below a valid space temperature cooling operation shall be enabled.

**Space Temperature Control:**

Cascade zone control shall be used in the occupied, occupied bypass, and occupied standby modes. It maintains zone temperature by controlling the discharge air temperature to control the zone temperature while minimizing the fan speed. The space temperature shall be maintained between the occupied cooling setpoint of 74.0 deg. F (adj.) and the occupied heating setpoint of 71.0 deg. F (adj.). The unit shall transition to the cooling mode when the space temperature rises one degree above the occupied cooling setpoint of 74.0 deg. F (adj.). The unit shall transition to the heating mode when the space temperature drops one degree below the occupied heating setpoint of 71.0 deg. F (adj.).

**Economizer Control:**

Economizing shall be enabled when the outdoor air temperature is below the economizing enable setpoint of 65.0 deg. F (adj.). Economizing shall be disabled when the outdoor air temperature is greater than 5.0 deg. F above the economizer enable setpoint. When economizing is enabled the outside air damper shall modulate between the minimum damper position and 100% open to maintain the occupied cooling setpoint. If the outdoor air temperature sensor fails, economizing shall be disabled and an alarm shall annunciate at the BAS.

**Supply Fan Operation:**

The supply fan shall cycle on demand during the unoccupied mode. When the controller is in the occupied mode, the supply fan shall operate continuously at the lowest minimum speed required to maintain space temperature. The supply fan status shall be monitored by the ECM motor controller. If the supply fan fails the fan shall be commanded off and an alarm shall annunciate at the BAS. A manual reset shall be required to restart the fan.

**Condensate Overflow Monitoring:**

If the condensate level reaches the trip point, a condensate overflow diagnostic shall annunciate at the BAS. To prevent the condensate drain pan from overflowing and causing water damage to the building the fan shall be disabled and the chilled water valve shall close.

**Freeze Protection:**

A hardwired, low limit temperature switch shall be electrically interlocked with the safety circuit. If the low limit temperature switch is tripped 38.0 deg. F (adj.), the supply fan shall be commanded off, water valves shall open to 100%, outside air damper shall close, and an alarm shall annunciate at the BAS.

The controller shall automatically attempt to restart the unit after 30 minutes. If the unit restarts successfully with no low temperature condition, the diagnostic is cleared. If a second low temperature condition occurs within a 24 hour period the unit shall be locked out until manually reset.

**Filter Timer:**

The fan-run time (hrs) shall be compared to the filter maintenance timer setpoint. Once the setpoint is reached a filter timer alarm diagnostic shall annunciate at the BAS. When the diagnostic is cleared, the filter-maintenance timer is reset to zero, and the timer begins accumulating fan-run time again.

**HEATING/COOLING SEQUENCE:**

AT NO TIME SHALL THE HEATING AND COOLING BE OPERATING AT THE SAME TIME. THE CONTRACTOR SHALL FURNISH & INSTALL ISOLATION VALVES & TIMERS SO THAT THE BOILERS AND CHILLER WILL NOT OPERATE SIMULTANEOUSLY.

**Guide Specification: FAN COIL [QTY: 10]**

**1.1 APPLICATION-SPECIFIC CONTROLLERS**

**A. General Description**

1. Application Specific Controllers (ASC) shall be microprocessor-based DDC controllers which, through hardware or firmware design, control specified equipment. They are not user programmable, but are customized for operation within the confines of the equipment they are designed to serve.

2. Zone Controllers are controllers that operate equipment that control the space temperature of single zone. Examples are controllers for VAV, Fan coil, Blower Coils, Unit Ventilators, Heat Pumps, and Water Source Heat Pumps.

B. The Application Specific Controller shall be capable of operating as a stand-alone controller or as a member of a Building Automation System (BAS).

C. When the Application Specific Controller is operating as a member of a Building Automation System (BAS), the application controller shall operate as follows:

1. Application Controller will receive operation mode commands from the BAS network controller. The BAS commands shall include but not be limited to the following: Occupied Heat/Cool, Unoccupied Heat/Cool, Morning Warm-up, / Pre-cool, Occupied Bypass).

2. Application Controller will provide equipment status parameters to the BAS through BACnet communication.

3. Application Controller will operate as a stand-alone controller in the event of communication failure with the BAS.

4. In case of communications failure stand-alone operation shall use default values or last known values for remote sensors read over the network such as outdoor air temperature.

D. Stand-Alone Operation: Each piece of equipment specified in section "A" shall be controlled by a single controller and provide stand-alone control in the event that a BAS is not present.

**E. Software**

1. To meet the sequence of operation for each zone control, the controller shall use programs developed and tested by the controller manufacturer that are either factory loaded or downloaded with service tool to the controller.

2. For controlling ancillary devices and for flexibility to change the sequence of operation in the future, the controller shall be capable running custom programs written in a graphical programming language.

F. Environment: Controller hardware shall be suitable for the anticipated ambient conditions.

1. Storage: -55° to 203° F (-48° to 95° C) and 5 to 95% Rh, non-condensing.

2. Operating: -40° to 158° F (-40 to 70° C) and 5 to 95% Rh, non-condensing.

3. Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.

4. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° to 158° F [-40° to 70° C].

**G. Input/Output:**

1. For flexibility in selection and replacement of valves, the controllers shall be capable of supporting all of the following valve control types 0-10VDC, 0-5VDC, 4-20mA, 24VAC floating point, 24VAC - 2 position (Normally Open or Normally Closed).

2. For flexibility in selection and replacement of sensors, the controllers shall be capable of reading sensor input ranges of 0 to 10V, 0 to 20mA, pulse counts, and 200 to 20Kohm.

3. For flexibility in selection and replacement of binary devices, the controller shall support dry and wetted (24VAC) binary inputs.

4. For flexibility in selection and replacement devices, the controller's shall have binary output which are able to drive at least 12VA each.

5. For flexibility in selection and replacement of motors, the controller shall be capable of outputting 24VAC (binary output), DC voltage (0 to 10VDC minimum range) and PWM (in the 80 to 100 Hz range).

6. For future needs, any I/O that is unused by functionality of equipment control shall be available to be used by custom program on the controller and by another controller on the network.

7. For future expansion and flexibility, the controller shall have either on board or through expansion, 20 hardware input/output points. Expansion points must communicate with the controller via an internal communications bus. Expansion points must be capable of being mounted up to 650ft. (200 m) from the controller. Expansion points that require the BACnet network for communication with the controller are not allowed.

H. Serviceability – The controller shall provide the following in order to improve serviceability of the controller.

1. Diagnostic LEDs shall indicate correct operation or failures/fauls for all of the following: power, sensors, BACnet communications, and I/O communications bus.

2. All binary output shall have LED's indicating the output state.

3. All wiring connectors shall removable without the use of a tool.

4. Software service tool connection through the following methods: direct cable connection to the controller, connection through another controller on BACnet link.

5. For safety purposes, the controller shall be capable of being powered by a portable computer for the purposes of configuration, programming, and testing programs so that this work can be accomplished with the power off to the equipment.

6. Capabilities to temporarily override of BACnet point values with built-in time expiration in the controller.

7. BACnet MAC Address shall be set using decimal (0-9) based rotary switches.

a. Configuration change shall not be made in a programming environment, but rather by a configuration page utilizing dropdown list, check boxes, and numeric boxes.

8. For ease of troubleshooting, the Controller shall support BACnet data trend logging.

a. With a minimum of 20,000 trending points total on controller

b. Trends shall be capable of being collected at a minimum sample rate of once every second.

c. Shall be capable of trending all BACnet points used by controller

d. Trends shall be capable of being scheduled or triggered

I. Software Retention: All Zone Controller operating parameters, setpoints, BIOS, and sequence of operation code must be stored in non-volatile memory in order to maintain such information for months without power.

J. Application controller shall have met the Agency Compliance:

- 1. UL916 PAZX, Open Energy Management Equipment
- 2. UL94-5V, Flammability
- 3. FCC Part 15, Subpart B, Class B Limit
- 4. BACnet Testing Laboratory (BTL) listed as BACnet Application Specific Controller (B-ASC)

**Points List: FAN COIL [QTY: 10]**

System Point Description	Point										Alarm				
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	COMMUNICATION FAIL
CONDENSATE OVERFLOW DETECTION LOCAL	X	X										X	X		
DISCHARGE AIR TEMPERATURE DAT	X	X								X	X			X	
ENTERING WATER TEMPERATURE LOCAL	X	X								X	X			X	
HEAT / COOL VALVE H/C VLV	X		X												
LOW LIMIT CUTOFF LLT	X	X										X	X		
MIXED AIR DAMPER COMMAND MAD	X		X												
OUTDOOR AIR TEMPERATURE (COMMUNICATED) OAT	X							X							
SPACE HUMIDITY SENSOR LOCAL SPH	X	X							X				X		
SPACE TEMPERATURE LOCAL SPT	X	X							X	X			X		
SPACE TEMPERATURE SETPOINT LOCAL SPT SP	X	X													
SUPPLY FAN SPEED SAF	X		X												
SUPPLY FAN START/STOP SAF	X			X											
SUPPLY FAN STATUS LOCAL SAF	X	X													
BAS COMMUNICATION STATE BAS COM					X										X
ECONOMIZER MINIMUM POSITION SETPOINT ECON MIN POS					X										
FILTER TIMER HOURS FIL HRS					X								X	X	
MAINTENANCE REQUIRED MNT REQ					X								X		
OCCUPIED BYPASS TIMER OCC TMR					X										
OCCUPIED COOLING SETPOINT OCC CL SP	X			X											
OCCUPIED HEATING SETPOINT OCC HT SP	X			X											
OCCUPANCY STATUS OCC STS	X			X											
SPACE TEMPERATURE SETPOINT ACTIVE SPT SP ACT	X			X											
UNOCCUPIED COOLING SETPOINT UNOCC CL SP	X				X										
UNOCCUPIED HEATING SETPOINT UNOCC HT SP	X				X										

**CITY OF SCRANTON**

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**PROJECT:**

REVISIONS:	
DESCRIPTION:	DATE:

**PROJECT NUMBER:**

DATE:

SCALE: AS NOTED



**DRAWING TITLE:**

**MECHANICAL DETAILS & SEQUENCE**

SHEET NO:

**M-7**