

MECHANICAL GENERAL NOTES

1.

MECHANICAL COORDINATION: COORDINATE ALL MECHANICAL WORK W/ OTHER TRADES. MECHANICAL WORK IS NOT LIMITED TO MECHANICAL DRAWINGS AND DIVISION 20, 21, 22, 23, AND 25 SPECIFICATIONS. THERE ARE ADDITIONAL ASPECTS OF THE MECHANICAL WORK INDICATED ON OTHER DRAWINGS. CONTRACTOR SHALL REVIEW ALL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL MECHANICAL WORK.
2.

STARTERS/RELAYS: MECHANICAL EQUIPMENT 1/2 HP AND LESS SHALL HAVE ANY REQUIRED STARTER/CONTROL RELAY PROVIDED BY DIVISION 25 (EXCEPT WHERE SPECIFICALLY SHOWN OR SPECIFIED OTHERWISE).
3.

BUILDING JOINTS: SEE ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR BUILDING SEISMIC & EXPANSION JOINTS. PROVIDE FLEXIBLE CONNECTIONS IN ALL PIPING & DUCT SYSTEMS WHICH CROSS SUCH JOINTS. SIZED/CONFIGURED TO ACCOMMODATE SPECIFIED MOVEMENT (SEE SPECIFICATIONS) IN ANY DIRECTION W/O PERMANENT DAMAGE. SUBMIT DETAILS OF FLEXIBLE CONNECTIONS & LOCATIONS.
4.

FIXTURE LOCATIONS: VERIFY LOCATION OF PLUMBING FIXTURES WITH ARCHITECTURAL DRAWINGS BEFORE BEGINNING WORK. ARCHITECTURAL DRAWINGS GOVERN. PLUMBING FIXTURE HEIGHTS SHALL BE AS SHOWN ON ARCHITECTURAL DRAWINGS.
5.

TRAP PRIMERS: ALL FLOOR DRAINS, FUNNEL DRAINS, AND FLOOR RECEPTORS SHALL HAVE TRAP PRIMERS. SOME DRAINS HAVE THE TRAP PRIMER LINE AND ASSOCIATED TRAP PRIMER VALVE SHOWN ON THE PLANS SOME LOCATIONS DO NOT. LOCATIONS WHERE THIS TRAP PRIMER PIPING AND VALVE ARE NOT SHOWN STILL REQUIRE A TRAP PRIMER, BUT THE LOCATION SHALL BE SELECTED BY THE CONTRACTOR.
6.

CLEANOUTS: PROVIDE CLEANOUTS AS REQUIRED BY CODE; USE FLOOR CLEANOUTS WHERE POSSIBLE. SEE DETAILS.
7.

PIPE ROUTING: ALL PIPING SHOWN IS SCHEMATIC. CONTRACTOR SHALL PROVIDE ALL OFFSETS/ELBOWS AS REQ'D TO ALLOW ROUTING AROUND STRUCTURE, ELECTRICAL, & OTHER INTERFERENCES. ALL PIPING SHALL BE RUN CONCEALED, UNO.
8.

PIPE SIZES: UNSIZED PLUMBING PIPING SHALL MATCH THE SIZE OF THE LARGEST ADJACENT CONNECTING PIPE SIZE SHOWN, WHERE THE ADJACENT PIPE IS NOT SHOWN (OR NOT CLEAR), THE PIPE SIZE SHALL BE BASED ON THE GPM FLOWING IN THE PIPE (USE FIXTURE UNITS AND CORRESPONDING GPM PER THE UPC FOR DOMESTIC WATER SYSTEMS, USE WASTE FIXTURE UNITS & UPC TABLES FOR WASTE/VENT SYSTEM), AND A VELOCITY NO GREATER THAN 4 FEET PER SECOND. USE UPC CURVES FOR GPM/VELOCITY FOR APPROPRIATE PIPING MATERIAL INVOLVED.
9.

CONDENSATE DRAINS: PROVIDE PRIMARY CONDENSATE DRAINS FOR UNITS GENERATING CONDENSATE IN ACCORDANCE WITH CODE REQUIREMENTS.
10.

CLOSURE COLLARS: ALL DUCT PENETRATIONS THRU WALLS AND FLOORS SHALL BE PROVIDED WITH CLOSURE COLLARS (BOTH SIDES OF PENETRATION) AND BE TIGHTLY SEALED TO PREVENT THE TRANSMISSION OF NOISE.
11.

COORDINATION: CONTRACTOR SHALL CAREFULLY COORDINATE WORK W/ ALL OTHER TRADES, ESPECIALLY IN CEILING SPACES WHERE SPACE IS TIGHT. SHEET METAL CONTRACTOR SHALL HAVE PRIORITY OVER OTHER MECHANICAL TRADES IN CEILING SPACE WHERE CONFLICTS OCCUR.
12.

DUCT LAYOUT: ALL DUCTWORK SHOWN IS SCHEMATIC, CONTRACTOR SHALL PROVIDE ALL OFFSETS/ELBOWS AS REQ'D TO ALLOW ROUTING AROUND STRUCTURE, ELECTRICAL, & OTHER INTERFERENCES.
13.

FLEXIBLE DUCT: LENGTH SHALL NOT EXCEED 8 FEET, AND MAY ONLY BE USED WHERE SPECIFICALLY SHOWN ON THE PLANS.
14.

BALANCING DAMPERS: PROVIDE MANUAL VOLUME DAMPERS IN ALL BRANCH DUCTS AND SPLITS IN MAIN DUCTS AND WHERE REQUIRED BY BALANCERS; ONLY SOME OF THE REQUIRED DAMPERS ARE SHOWN ON THE PLANS.
15.

DUCT SIZES: UNSIZED DUCTS SHALL MATCH THE SIZE OF THE LARGEST ADJACENT DUCT THAT IS SIZED. WHERE THE ADJACENT DUCT SIZE IS NOT SHOWN, PROVIDE THE FOLLOWING SIZED DUCTS (OR EQUIVALENT RECTANGULAR).

CFM	DUCTS TO AIR INLETS/OUTLETS	OTHER DUCT
0 - 100	6" Ø	6" Ø
101 - 150	8" Ø	8" Ø
151 - 250	10" Ø	8" Ø
251 - 400	12" Ø	10" Ø
401 - 500	14" Ø	12" Ø
501 - 700	16" Ø	12" Ø
701 - 900	18" Ø	14" Ø
901 - 1200	20" Ø	16" Ø
1201 - 1500	----	18" Ø
1501 - 2000	----	20" Ø
2001 - 2400	----	22" Ø
>2401	SIZE BASED ON 500 FPM	SIZE BASED ON 0.08"/100' P.D.

16.

CEILING/FLOOR LOCATIONS: VERIFY LOCATIONS OF ITEMS INSTALLED IN CEILINGS & FLOORS WITH ARCHITECTURAL PLANS PRIOR TO BEGINNING WORK. NOTIFY ARCHITECT/ENGINEER OF DISCREPANCIES. SHIFT AIR INLETS/OUTLETS FROM LOCATIONS SHOWN AS REQ'D TO AVOID CONFLICTS W/STRUCTURE & OTHER ITEMS. SUCH SHIFTS SHALL MAINTAIN SYMMETRY OF AIR TERMINALS & SHALL HAVE PRIOR APPROVAL OF ARCHITECT/ENGINEER.

17.

LOUVERS: VERIFY ALL LOUVER LOCATIONS & SIZES WITH ARCHITECTURAL DRAWINGS. ARCHITECTURAL DRAWINGS GOVERN. DUCT CONNECTIONS AT LOUVERS SHALL MATCH FULL LOUVER SIZE (UNLESS NOTED OTHERWISE).

18.

BALANCING NOTES: PROVIDE AIR BALANCING OF HVAC SYSTEM, HYDRONIC SYSTEM, & BALANCING OF DOMESTIC HOT WATER SYSTEM. SEE SECTION 22 05 93 AND 23 05 93 FOR COMPLETE REQUIREMENTS.

19.

SIDE INLET CONNECTIONS: CEILING SPACE IS TIGHT IN A NUMBER OF AREAS. IN SUCH AREAS, CEILING AIR INLET/OUTLET CONN'S REQUIRE SIDE INLET PLENUM, SEE DETAIL 1 SHEET M4.1. PROVIDE WHERE REQ'D DUE TO SPACE LIMITATIONS TO PREVENT KINKS IN FLEX DUCT AND ALLOW PROPER CONN.

20.

CONCEALED: ALL DUCTWORK & PIPING SHALL BE RUN CONCEALED, UNO.

21.

ACCESS DOORS: PROVIDE DUCT ACCESS DOORS AT ALL MOTORIZED DAMPERS, ABD'S & BDD'S.

22.

BALANCER CFM'S: WHERE RETURN GRILLE CFM'S ARE NOT INDICATED, BALANCER SHALL CALCULATE & SUBMIT FOR ENGINEER REVIEW. UNIT RA=SA-OA.

23.

FLEX CONNECTORS: PROVIDE FLEX CONNECTORS IN DUCT CONNECTIONS TO ALL EQUIPMENT.

24.

GRILLE ALIGNMENT: GRILLES IN SAME ROOMS SHALL BE INSTALLED TO BE INLINE W/ EACH OTHER AND PARALLEL TO BUILDINGS WALLS (UNO).

25.

WHERE EXPOSED: VERIFY MOUNTING HEIGHTS OF ALL EXPOSED DUCTWORK & WALL GRILLES/WALL CAPS W/ ARCHITECT PRIOR TO BEGINNING WORK.

26.

EQUIPMENT TRANSITIONS: PROVIDE TRANSITIONS FROM DUCT SIZES INDICATED TO CONNECTION SIZES AT EQUIPMENT TO MATCH UNIT CONNECTIONS. WHERE THE CONNECTING DUCT IS LINED, THE TRANSITION SHALL BE LINED.

27.

DUCT PRESSURE CLASS: DUCTS SHALL BE CONSTRUCTED TO THE PRESSURE CLASS CORRESPONDING TO FAN INDICATED ESP (ROUND UP TO NEXT PRESSURE CLASS). SEAL DUCTS PER WSEC AND SPECIFICATIONS.
- LIST OF DRAWINGS
- M0.01

MECHANICAL LEGEND & NOTES

M0.02

ENERGY CODE NOTES

M0.03

MECHANICAL SCHEDULES

M0.04

MECHANICAL SCHEDULES

M0.05

MECHANICAL SPECS

M0.06

MECHANICAL SPECS

M0.07

MECHANICAL SPECS

M0.08

MECHANICAL SPECS

M2.01

FOUNDATION PLAN - PLUMBING

M3.00

BASEMENT FLOOR PLAN - PLUMBING

M3.01

FIRST FLOOR PLAN - PLUMBING

M3.02

PLUMBING DETAILS

M4.00

BASEMENT FLOOR PLAN - HVAC

M4.01

BASEMENT FLOOR PLAN - HVAC PIPING

M4.02

FIRST FLOOR PLAN - HVAC

M4.03

FIRST FLOOR PLAN - HVAC PIPING

M4.04

FIRST FLOOR ZONING PLAN - HVAC

M4.05

HVAC DETAILS

M4.06

HVAC DETAILS

M4.07

HVAC DETAILS

M4.08

HVAC DETAILS
- MECHANICAL LEGEND
- | SYMBOL | DESCRIPTION   | SYMBOL | DESCRIPTION                     |
|--------|---|--------|---------------------------------|
|        | WASTE OR SOIL (W)   | ABD    | AUTOMATIC BALANCE DAMPER        |
|        | VENT (V)  | AFF    | ABOVE FINISHED FLOOR            |
|        | COLD WATER (CW)   | AHJ    | AUTHORITY HAVING JURISDICTION   |
|        | HOT WATER (HW)  | ARCH   | ARCHITECTURAL                   |
|        | HOT WATER CIRCULATING (HWC)                                   | BDD    | BACKDRAFT DAMPER                |
|        | CONDENSATE LINE (C)   | BTU    | BRITISH THERMAL UNIT            |
|        | FIRE (F)  | BTUH   | BRITISH THERMAL UNIT/HOUR       |
|        | REFRIGERANT GAS (RG)  | BLDG   | BUILDING                        |
|        | REFRIGERANT LIQUID (RL)                                       | CAP    | CAPACITY                        |
|        | CLEANOUT  | CLG    | CEILING                         |
|        | FLOOR DRAIN   | CO     | CLEANOUT                        |
|        | ISOLATION VALVE   | COP    | COEFFICIENT OF PERFORMANCE      |
|        | CHECK VALVE   | COMP   | COMPRESSOR                      |
|        | UNION   | CONN   | CONNECTION                      |
|        | RELIEF VALVE  | CONT   | CONTINUE, CONTINUATION          |
|        | STRAINER WITH BLOW-OFF VALVE                                  | CFM    | CUBIC FEET PER MINUTE           |
|        | CONCENTRIC REDUCER  |        | COLD WATER                      |
|        | PRESSURE REDUCING VALVE                                       |        | DEGREE FAHRENHEIT               |
|        | THERMOMETER   |        | DIAMETER                        |
|        | PIPE UP   | DOAS   | DEDICATED OUTSIDE AIR SYSTEM    |
|        | PIPE DOWN   | DN     | DOWN                            |
|        | PIPE TEE IN LINE, BRANCH PIPE DOWN                            | DWG    | DRAWING                         |
|        | DUCT (FIRST FIGURE, SIDE SHOWN)                               | DB     | DRY BULB                        |
|        | RISE (R) OR DROP (D) ARROW IN DIRECTION OF FLOW               | DFU    | DRAINAGE FIXTURE UNITS          |
|        | DUCT SECTION (SUPPLY)   | DL     | DOOR LOUVER                     |
|        | DUCT SECTION (EXHAUST OR RETURN)                              | EA     | EACH                            |
|        | ROUND DUCT  | EFF    | EFFICIENCY                      |
|        | VOLUME DAMPER (MANUAL)  | ECM    | ELECTRONICALLY COMMUTATED MOTOR |
|        | MOTORIZED DAMPER  | ELEC   | ELECTRICAL, ELECTRIC            |
|        | FLEXIBLE CONNECTION   | EER    | ENERGY EFFICIENCY RATIO         |
|        | FLEXIBLE DUCT   | EAT    | ENTERING AIR TEMPERATURE        |
|        | ELBOW WITH TURNING VANES                                      | EWB    | ENTERING WET BULB               |
|        | DUCT UP (RECTANGULAR)   | EDB    | ENTERING DRY BULB               |
|        | DUCT UP (RECTANGULAR)   | EOL    | END OF LINING                   |
|        | DUCT DOWN (RECTANGULAR)                                       | EXH    | EXHAUST                         |
|        | DUCT DOWN (RECTANGULAR)                                       | ESP    | EXTERNAL STATIC PRESSURE        |
|        | DUCT UP (ROUND)   | F      | FIRE                            |
|        | DUCT DOWN (ROUND)   | FPM    | FEET PER MINUTE                 |
|        | CEILING OUTLET  | FLEX   | FLEXIBLE                        |
|        | CEILING INLET   | FCO    | FLOOR CLEAN OUT                 |
|        | WALL OUTLET (OR INLET)  | FV     | FLUSH VALVE                     |
|        | THERMOSTAT G= WITH GUARD A= AVERAGED WITH OTHER               | GAL    | GALLON                          |
|        | NITROGEN DIOXIDE / CARBON MONOXIDE SENSOR                     | HP     | HORSE POWER                     |
|        | AUTOMATIC BALANCE DAMPER                                      | HW     | HOT WATER                       |
|        | DETAIL IDENTIFICATION NUMBER SHEET ON WHICH DETAIL IS SHOWN   | HWC    | HOT WATER CIRCULATION           |
|        | SECTION IDENTIFICATION LETTER SHEET ON WHICH SECTION IS SHOWN | IN     | INCH                            |
|        |   | I.E.   | INVERT ELEVATION                |
|        |   | KW     | KILOWATT                        |
|        |   | LAT    | LEAVING AIR TEMPERATURE         |
|        |   | LDB    | LEAVING DRY BULB                |
|        |   | LWT    | LEAVING WATER TEMPERATURE       |
|        |   | LWB    | LEAVING WET BULB                |
|        |   | MAX    | MAXIMUM                         |
|        |   | MFR    | MANUFACTURER                    |
|        |   | MBH    | THOUSAND BTUH                   |
|        |   | MCA    | MINIMUM CIRCUIT AMPS            |
|        |   | MECH   | MECHANICAL                      |
|        |   | MIN    | MINIMUM                         |
|        |   | MUA    | MAKE UP AIR                     |
|        |   | NO.    | NUMBER                          |
|        |   | NTS    | NOT TO SCALE                    |
|        |   | OBD    | OPPOSED BLADE DAMPER            |
|        |   | OA     | OUTSIDE AIR                     |
|        |   | ORL    | OVERFLOW RAINLEADER             |
|        |   | PH     | PHASE                           |
|        |   | P.D.I. | PLUMBING AND DRAINAGE INSTITUTE |
|        |   | PSI    | POUNDS PER SQUARE INCH          |
|        |   | PD     | PRESSURE DROP                   |
|        |   | PW     | PUMPED WASTE                    |
|        |   | R      | RETURN                          |
|        |   | RL     | RAINLEADER, REFRIGERANT LIQUID  |
|        |   | RG     | REFRIGERANT GAS                 |
|        |   | RA     | RETURN AIR                      |
|        |   | RPM    | REVOLUTIONS PER MINUTE          |
|        |   | RM     | ROOM                            |
|        |   | S      | SUPPLY                          |
|        |   | SA     | SUPPLY AIR                      |
|        |   | SCO    | SURFACE CLEANOUT                |
|        |   | S.O.   | SCREENED OPENING                |
|        |   | SS     | STAINLESS STEEL                 |
|        |   | TEMP   | TEMPERATURE                     |
|        |   | TD     | TRANSFER DUCT                   |
|        |   | TC     | TRANSFER GRILLE                 |
|        |   | TYP    | TYPICAL                         |
|        |   | UNO    | UNLESS NOTED OTHERWISE          |
|        |   | VTR    | VENT THROUGH ROOF               |
|        |   | VERT   | VERTICAL                        |
|        |   | VG     | VOLTS, VOLTAGE, VENT            |
|        |   | WCO    | VENTILATION GRILLE              |
|        |   | W      | WALL CLEAN OUT                  |
|        |   | WA     | WASTE                           |
|        |   | WB     | WATT                            |
|        |   | WL     | WET BULB                        |
|        |   | W/     | WALL LOUVER                     |
|        |   | WSEC   | WASHINGTON STATE ENERGY CODE    |
|        |   | WSFU   | WATER SUPPLY FIXTURE UNITS      |
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- 1/29/2024
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- REVISIONS
- Description
- Date
- Rev#
- INFO
- Sheet  
Date
- Project Number
- File Name
- Plot Date
- MECHANICAL LEGEND & NOTES
- 02/01/2024 PERMIT SET
- SHEET NO.
- M0.01



ENERGY CODE NOTES

EQUIPMENT SIZING, PERFORMANCE, AND TYPE

1. LOAD CALCULATIONS, C403.1: LOAD CALCULATIONS HAVE BEEN PERFORMED IN ACCORDANCE WITH WSEC C403.1.2.
2. EQUIPMENT AND SYSTEM SIZING, C403.3: OUTPUT CAPACITIES OF HEATING AND COOLING EQUIPMENT AND SYSTEMS ARE NO GREATER THAN THE SMALLEST AVAILABLE EQUIPMENT SIZE THAT EXCEEDS THE CALCULATED LOADS.
3. HVAC EQUIPMENT PERFORMANCE, C403.3.2: EQUIPMENT SCHEDULES ARE INCLUDED WITH THESE PLANS.
4. ELECTRIC MOTOR EFFICIENCY, C405.8: ALL ELECTRIC MOTORS SHALL MEET THE MINIMUM EFFICIENCY OF WSEC TABLES.
5. FAN POWER LIMITATION: FOR ALL HVAC SYSTEMS WITH TOTAL FAN HP > 5HP, MOTOR HP OR BHP SHALL COMPLY WITH FAN POWER LIMITATIONS PER WSEC.
6. MOTOR NAMEPLATE HP: FOR EACH FAN, THE MOTOR SHALL BE NO LARGER THAN THE FIRST AVAILABLE MOTOR SIZE GREATER THAN THE BHP.
7. FAN EFFICIENCY: FANS AND FAN SYSTEMS GREATER THAN 5HP SHALL HAVE A FAN EFFICIENCY GRADE (FEG) OF 67 OR HIGHER PER AMCA 205.
8. OUTDOOR AIR, EXHAUST & RELIEF DAMPERS: PROVIDE ALL OUTSIDE AIR, EXHAUST AIR, AND RELIEF AIR OPENINGS WITH CLASS 1 (MAX LEAKAGE OF 4 CFM/SF AT 1.0" W.C.) MOTORIZED DAMPERS.

HVAC SYSTEM CONTROLS

9. THERMOSTATIC CONTROLS: WHERE ADJACENT ZONES CONNECTED BY PERMANENT OPENINGS WITH AREA GREATER THAN 10% OF EITHER ZONE SF, PROVIDE CONTROL TO PREVENT ADJACENT ZONES FROM OPERATING IN CONFLICTING MODES. WHERE A NON-PERIMETER ZONE IS ADJACENT TO A PERIMETER ZONE, PROVIDE CONTROLS TO ONLY ALLOW COOLING IN THE NON-PERIMETER ZONE WHEN IT IS 5 DEGREES HIGHER THAN THE PERIMETER ZONE.
10. DEADBAND: THERMOSTATIC CONTROLS SHALL BE CONFIGURED WITH 5°F MINIMUM DEADBAND FOR SYSTEMS THAT CONTROL BOTH HEATING AND COOLING.
11. AUTOMATIC SETBACK AND SHUTDOWN: HVAC SYSTEMS SHALL BE EQUIPPED WITH AUTOMATIC CONTROLS CAPABLE OF STARTING AND STOPPING THE SYSTEM FOR SEVEN DIFFERENT DAILY SCHEDULES, AND SHALL HAVE MANUAL OVERRIDE CONFIGURED TO OPERATE THE SYSTEM FOR 2 HOURS.
12. AUTOMATIC START: AUTOMATIC START CONTROLS SHALL BE PROVIDED FOR EACH HVAC SYSTEM, AND BE CAPABLE OF AUTOMATICALLY ADJUSTING DAILY START TIME IN ORDER TO BRING EACH SPACE TO THE DESIRED OCCUPIED TEMPERATURE IMMEDIATELY PRIOR TO SCHEDULED OCCUPANCY.
13. OUTDOOR AIR DAMPERS: OUTSIDE AIR INTAKE DAMPERS SHALL AUTOMATICALLY CLOSE WHEN SYSTEM OR SPACES SERVED ARE NOT IN USE OR DURING WARM-UP AND SET BACK.
14. VENTILATION: MECHANICAL VENTILATION AIR SYSTEMS SHALL BE CONFIGURED TO PROVIDE NOT MORE THAN 150%, BUT AT LEAST THE MINIMUM REQUIRED VOLUME OF OUTDOOR AIR TO EACH ZONE PER IMC. SEE MECHANICAL EQUIPMENT SCHEDULES FOR MINIMUM OUTSIDE AIR VALUES.

DUCTING SYSTEMS

15. DUCT CONSTRUCTION, DUCTWORK SHALL BE CONSTRUCTED AND SEALED PER IMC.
16. DUCT INSULATION: MINIMUM DUCT INSULATION PER WSEC IS AS FOLLOWS:

<u>SERVICE</u>	<u>INSULATION LEVEL</u>
OUTSIDE AIR DUCT SERVING INDIVIDUAL SUPPLY UNIT WITH LESS THAN 2,800 CFM OF SUPPLY AIR	R-7
SUPPLY & RETURN DUCTS IN UNCONDITIONED SPACES	R-6
SUPPLY DUCTS WITHIN CONDITIONED SPACE WHERE SUPPLY AIR IS < 55 DEG F. OR > 105 DEG F.	R-3.3
EXPOSED DUCTWORK WITHIN A ZONE THAT SERVES THAT ZONE	NO INSULATION REQUIRED

DEDICATED OUTDOOR AIR SYSTEMS (DOAS)

17. DEDICATED OUTDOOR AIR SYSTEMS PROVIDED FOR ALL AREAS.
18. ENERGY RECOVERY VENTILATION WITH DOAS: ALL DOAS UNITS SHALL BE PROVIDED WITH EXHAUST HEAT RECOVERY WITH RATED EFFECTIVENESS TO INCREASE OSA ENTHALPY BY 50% OR MORE BASED ON THE DELTA BETWEEN THE RETURN AIR AND THE OUTSIDE AIR ENTHALPIES AT DESIGN CONDITIONS.
19. HEATING/COOLING SYSTEM CONTROLS WITH DOAS: EQUIPMENT THAT PROVIDES ZONE LEVEL HEATING AND COOLING SHALL BE CONFIGURED WITH FANS AND/OR PUMPS THAT CYCLE OFF AND PRIMARY COOLING AIR SHALL SHUT OFF WHEN THERE IS NO CALL FOR HEATING OR COOLING IN THE ZONES THEY SERVE.

COMMISSIONING

20. SCOPE OF MECHANICAL SYSTEMS COMMISSIONING: ALL MECHANICAL SYSTEMS, EQUIPMENT AND CONTROLS SHALL BE COMMISSIONED.
21. COMMISSIONING REQUIREMENTS IN CONSTRUCTION DOCUMENTS: COMMISSIONING PLAN SHALL BE DEVELOPED BY A COMMISSIONING PROFESSIONAL AND CONSIST OF A NARRATIVE DESCRIPTION OF ACTIVITIES, ROLES & RESPONSIBILITIES OF THE COMMISSIONING TEAM, SCHEDULE OF ACTIVITIES INCLUDING TAB, FUNCTIONAL PERFORMANCE TESTING AND VERIFICATION OF PROJECT CLOSE OUT DOCUMENTATION PER C103.6, AND SUBMIT COMPLIANCE CHECKLIST TO THE BUILDING OFFICIAL UPON SUBSTANTIAL COMPLETION. A PRELIMINARY COMMISSIONING REPORT AND/OR COMMISSIONING COMPLIANCE CHECKLIST SHALL BE AVAILABLE FOR AHJ REVIEW PRIOR TO THE FINAL MECHANICAL INSPECTION.
22. AIR SYSTEM BALANCING: HVAC AIR SYSTEMS SHALL BE BALANCED IN ACCORDANCE WITH THE SPECIFICATIONS AND THESE WSEC NOTES. SEE SPECIFICATIONS FOR FLOW RATE TOLERANCES.
23. AIR SYSTEM BALANCING DEVICES: PROVIDE ALL SUPPLY AIR OUTLETS AND TERMINAL DEVICES WITH MEANS OF BALANCING AIRFLOW. BALANCE TO FIRST MINIMIZE THROTTLING LOSSES, THEN ADJUST TO MEET DESIGN AIR FLOWS.
24. FUNCTIONAL PERFORMANCE TESTING CRITERIA: FUNCTIONAL PERFORMANCE TESTING SHALL BE PERFORMED IN ACCORDANCE WITH WSEC.

EQUIPMENT SIZING, PERFORMANCE, AND TYPE

1. SWH (SERVICE WATER HEATING) EQUIPMENT TYPE & EFFICIENCY, C404.2: EQUIPMENT SCHEDULES ARE INCLUDED WITH THESE PLANS.
2. HEAT TRAPS, C404.4: WATER HEATING EQUIPMENT NOT SUPPLIED WITH INTEGRAL HEAT TRAPS SERVING NON CIRCULATED SYSTEMS SHALL BE PROVIDED WITH HEAT TRAPS ON SUPPLY AND DISCHARGE PIPING.
3. INSULATION UNDER ELECTRIC WATER HEATER, C404.5: ELECTRIC WATER HEATERS IN UNCONDITIONED SPACES OR ON CONCRETE FLOORS SHALL BE PROVIDED WITH INCOMPRESSIBLE R-10 INSULATED PAD.

PIPING SYSTEMS

4. INSULATION OF PIPING, C404.6: PROVIDE INSULATION FROM WATER HEATER TO FINAL FIXTURE, AND ON PIPING THAT IS HEAT TRACED. MINIMUM PIPE INSULATION PER WSEC IS AS FOLLOWS:

FLUID OPERATING TEMPERATURE	INSULATION THICKNESS (NOMINAL PIPE SIZE)				
	<1	1 TO <1-1/2	1-1/2 TO <4	4 TO <8	OVER 8
141-200	1.5	1.5	2.0	2.0	2.0
105-140	1.0	1.0	1.5	1.5	1.5
40-60	0.5	0.5	1.0	1.0	1.0
<40	0.5	1.0	1.0	1.0	1.5

5. EFFICIENT SWH SUPPLY PIPING, C404.3: ALL PIPING CONNECTING TO SERVICE HOT WATER SOURCE, SHALL COMPLY WITH MAXIMUM ALLOWABLE PIPE LENGTH METHOD. MAXIMUM ALLOWABLE LENGTHS ARE AS FOLLOWS:

NOMINAL PIPE SIZE (INCH)	MAXIMUM LENGTH (FEET)	
	AT PUBLIC LAVATORY	AT OTHER FIXTURES
1/2	2	43
3/4	1	21
1	0.5	13
1-1/4	0.5	8
1-1/2	0.5	6
2 OR LARGER	0.5	4

6. HEATED WATER CIRCULATING SYSTEM, C404.7.1/C404.8: CIRCULATING HOT WATER PUMPS SHALL TURN OFF AUTOMATICALLY WHEN THERE IS NO DEMAND OR DESIRED WATER TEMPERATURE IN RETURN LOOP HAS BEEN MET. CIRCULATING HOT WATER PUMPS SHALL BE EQUIPPED WITH CONTROLS TO TURN OFF DURING PERIODS OF NON-USE.

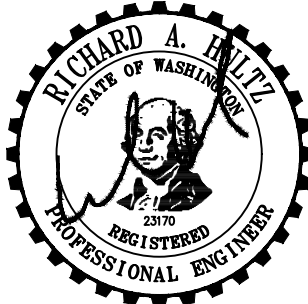
PROJECT CLOSE OUT DOCUMENTATION

7. DOCUMENTATION SUBMITTAL REQUIREMENTS: SUBMIT ALL CLOSEOUT DOCUMENTATION INCLUDING AS-BUILTS AND O&M'S TO OWNER.
8. THESE "ENERGY CODE NOTES" ARE LISTED TO SATISFY THE BUILDING DEPARTMENT'S REQUIREMENT THAT CERTAIN INFORMATION BE PLACED ON THE PLANS, BUT DO NOT DIMINISH THE FULL PROJECT REQUIREMENTS. PROVIDE ITEMS IN EXCESS OF CODE WHERE NOTED ON DRAWINGS AND IN SPECIFICATIONS.



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REVISIONS

Description

Rev#

Date

INFO

Sheet Date

Project Number

File Name

Print Date

ENERGY CODE NOTES

02/01/2024 PERMIT SET

SHEET NO.

M0.02

AIR INLET & OUTLET SCHEDULE			
SYMBOL	TYPE	MANUFACTURER AND SERIES NUMBER	REMARKS
FSG	FLOOR SUPPLY GRILLE	TITUS CT-480	ALUMINUM 1/8" THICK BARS AT 1/4" ON CENTER W/ TAF-D PLENUM
FRG	FLOOR RETURN GRILLE	TITUS CT-480	REMOVABLE CORE W/ STEEL RETAINING CLIPS, AND DEBRIS SCREEN, W/ PLENUM
FRR	FLOOR RETURN REGISTER	TITUS CT-480	REMOVABLE CORE W/ STEEL RETAINING CLIPS, INTEGRAL OBD AND DEBRIS SCREEN, W/ PLENUM
CEG	CEILING EXHAUST GRILLE	KRUEGER SERIES EGC-5	1/2"x1/2"x1/2" CUBE CORE
WTG	WALL TRANSFER GRILLE	KEES GHD40 RETURN	HORIZ. FACE BARS 1/2" O.C., 40° DEFLECTION
ABD	AUTOMATIC BALANCE DAMPER	GREENHECK ABD	ADJUST AIRFLOW BY ROTATING. USE WITH BACK DRAFT DAMPER
<div>NOTES:</div> <div><div>1. SEE LEGEND FOR TERMINOLOGY USED IN AIR TERMINAL CALL-OUTS ON DRAWINGS.</div><div>2. SEE ARCH. FINISH SCHEDULE , PROVIDE AIR TERMINALS W/ FRAME TYPE TO MATCH CONSTRUCTION.</div></div>			

AIR CONDITIONING UNIT - SPLIT SYSTEM TYPE																						
SYMBOL	BASIS OF DESIGN MANUFACTURER AND SERIES NO.	AREA SERVED	COOLING CAP *		A - INDOOR UNIT **				B - OUTDOOR UNIT **						MAX. OUTDOOR UNIT WEIGHT	MAX. INDOOR UNIT WEIGHT	UNIT TOTAL ELECTRICAL ***			PIPE SIZES ****		REMARKS
			CAP. MBH	SEER2	FAN		ELECTRICAL		COMPRESSOR		FAN		ELECTRICAL				MCA	MOP	VOLTS/PH	RG	REL	
					CFM	FLA	MCA	VOLTS/PH	QTY	RLA	QTY	FLA	MCA	VOLTS/PH								
AC-1	TRANE TPKA TRUY 24	IT ROOM	24	21	705	0.265	1	208/1	1	7	1	0.4	19	208/1	170 LBS	50 LBS	20	25	208/1	5/8"	3/8"	
AC-2	TRANE TPKA TRUY 24	ELEVATOR SHAFT	24	21	705	0.265	1	208/1	1	7	1	0.4	19	208/1	170 LBS	50 LBS	20	25	208/1	5/8"	3/8"	
* COOLING CAPACITY IS AHRI RATING: AT 80° F DB, 67° F WB INDOOR COIL EAT; AND 95° F OUTDOOR COIL EAT, & MFRS STANDARD REFRIGERANT PIPING LENGTH. REFRIGERANT TYPE R-410A.						*** INDOOR UNIT IS POWERED VIA OUTDOOR UNIT. ALL POWER WIRING/CONNECTIONS BY DIV 26.						NOTES:			1. UNITS SHALL OPERATE IN COOLING DOWN TO 0° AMBIENT.							
** ON PLANS "A" DESIGNATES INDOOR UNIT, "B" DESIGNATES OUTDOOR UNIT. (E.G. AC-1B IS AC-1 OUTDOOR UNIT)						**** PIPE SIZES ARE PRELIMINARY, VERIFY W/ MFR									2. UNIT SHALL BE ABLE TO OPERATE W/ EXTENSIVE PIPE LENGTH AS SHOWN ON PLANS.							
															3. PROVIDE W/ CONDENSATE PUMP.							

VRF OUTDOOR HEAT PUMP SCHEDULE													
SYMBOL	BASIS OF DESIGN MANUFACTURER AND SERIES NO.	AREA SERVED	COOLING CAP. *		HEATING CAP.**		OUTDOOR FAN	COMPRESSOR	MAX. WEIGHT LBS	UNIT ELECTRICAL			REMARKS
			TOTAL MBH	EFF (IEER)	MBH	EFF (COP)	QTY	QTY		MCA	MOP	VOLTS/PH	
CU-1	TRANE R2 SERIES TURV-E240	OFFICE	240	19.6	250	3.2	2	1	900	82	125	208/3	-
* COOLING CAPACITY IS AHRI RATING: AT 80°F DB; 67°F WB INDOOR COIL EAT AND 95°F OUTDOOR COIL EAT.      ** HEATING CAPACITY IS AHRI HI-TEMP RATING: AT 70°F DB INDOOR COIL EAT AND 47°F DB; 43°F WB OUTDOOR COIL EAT. UNITS SHALL BE ABLE TO PROVIDE FULL SCHEDULED HEAT OUTPUT DOWN TO -4°F.													

VRF INDOOR HEAT PUMP SCHEDULE													
SYMBOL	BASIS OF DESIGN MANUFACTURER AND SERIES NO.	TYPE	AREA SERVED	SERVED BY	CAPACITY (MBH)		CFM	ESP	FILTERS	UNIT ELECTRICAL		MAX WEIGHT	REMARKS
					COOLING	HEATING				MCA	VOLT/PH		
BC-1	TRANE R2 SERIES TCMBM108	BC CONTROLLER	INDOOR UNITS	CU-1	-	-	-	-	-	1	208/1	130	-
CC-1	TRANE TPLFY-P012	CEILING CASSETTE	CONFERENCE 113	CU-1	12	13.5	280	-	MFR STD	0.29	208/1	50	W/ ME CONTROLLER, CONDENSATE PUMP
CC-2	TRANE TPLFY-P024	CEILING CASSETTE	CONFERENCE 114	CU-1	24	27	740	-	MFR STD	0.54	208/1	70	W/ ME CONTROLLER, CONDENSATE PUMP
CC-3	TRANE TPLFY-P030	CEILING CASSETTE	CONFERENCE 112	CU-1	30	34	780	-	MFR STD	0.57	208/1	70	W/ ME CONTROLLER, CONDENSATE PUMP
FC-4	TRANE TPVFY-P024	MULTI-POSITION AIR HANDLER	WEST OFFICE 100, 101, 125, 126	CU-1	24	27	480	0.8	MFR STD	3.0	208/1	130	W/ ME CONTROLLER, CONDENSATE PUMP
FC-5	TRANE TPVFY-P030	MULTI-POSITION AIR HANDLER	NORTH OFFICE 115 - 124	CU-1	30	34	700	0.5	MFR STD	4.1	208/1	160	W/ ME CONTROLLER, CONDENSATE PUMP
FC-6	TRANE TPVFY-P054	MULTI-POSITION AIR HANDLER	CORRIDOR 102	CU-1	54	60	1350	0.5	MFR STD	5.6	208/1	190	W/ ME CONTROLLER, CONDENSATE PUMP
FC-7	TRANE TPVFY-P054	MULTI-POSITION AIR HANDLER	SOUTH OFFICE 103 - 111	CU-1	54	60	1170	0.5	MFR STD	5.6	208/1	190	W/ ME CONTROLLER, CONDENSATE PUMP
FC-8	TRANE TPVFY-P024	MULTI-POSITION AIR HANDLER	INTERIOR OFFICE 130 - 141	CU-1	24	27	540	0.8	MFR STD	3.0	208/1	130	W/ ME CONTROLLER, CONDENSATE PUMP
<div>NOTES: <div>1. SUBMIT DRAWINGS OF FINAL SYSTEM RG / RL PIPING ARRANGEMENTS.</div><div>2. PROVIDE UNITS W/ CONDENSATE PUMPS AS REQUIRED TO PROPERLY DRAIN CONDENSATE.</div></div>													

DEDICATED OUTSIDE AIR UNIT																			
SYMBOL	ITEM DESCRIPTION	BASIS OF DESIGN MANUFACTURER AND SERIES NO.	AREA SERVED	SUPPLY FAN					EXHAUST FAN					UNIT ELECTRICAL		FILTERS		MAX UNIT WEIGHT (LBS)	REMARKS
				TYPE	CFM	ESP	DRIVE	HP	TYPE	CFM	ESP	DRIVE	HP	MCA	VOLTS/PH	TYPE	MIN. SF		
DOAS-1	INDOOR HEAT RECOVERY UNIT	RENEW AIRE HE 1.5X INH	OFFICE	PLENUM	775	1.0"	DIRECT W/ ECM	1	PLENUM	775	1.0"	DIRECT W/ ECM	1	10.4	208/3	2"PTA MERV 8	1.5	500	-
NOTES: 1. ENERGY RECOVERY EFFICIENCY SHALL COMPLY WITH WSEC REQUIREMNTS																			



FAN SCHEDULE														
SYMBOL	BASIS OF DESIGN MANUFACTURER AND SERIES NO.	TYPE	AREA SERVED	CFM	ESP	MAX RPM	MIN EFF	BRAKE HP	ELECTRICAL		DRIVE	CONTROL	MAX WEIGHT LBS	REMARKS
									HP	VOLTS / PH				
EF-1	GREENHECK AER-20-03-0605-VG	WALL PROPELLER	GARAGE EXHAUST	750	0.5	1278	-	0.15	0.25	120/1	DIRECT	CO & NO2 SENSORS	80	W/ HOUSING
NOTES:    1.    PROVIDE WITH EC MOTORS AND MANUAL SPEED CONTROL (MOTOR MOUNTED)														
2.    PROVIDE WITH DISCONNECT.														
3.    PROVIDE FANS WITH MOTORIZED DAMPERS TO BE INTERLOCKED WITH FANS; LOCATE AS SHOWN ON PLANS.														

ELECTRIC HEATER SCHEDULE								
SYMBOL	BASIS OF DESIGN MANUFACTURER AND SERIES NO.	TYPE	AREA / UNIT SERVED	CFM	NOMINAL SIZE	ELECTRICAL		REMARKS
						AMPS	VOLTS/PH	
EH-1	QMARK CWH-3000	WALL	ELEV. LOBBY	-	2 KW	8.3	208/1	W/ INTERNAL THERMOSTAT SET AT 60°F
EH-2	QMARK CWH-3000	WALL	STORAGE	-	2 KW	8.3	208/1	FREEZE PROTECTION W/ INTERNAL THERMOSTAT SET AT 55°F
EH-3	QMARK CWH-3000	WALL	WAITING	-	2 KW	8.3	208/1	W/ INTERNAL THERMOSTAT SET AT 70°F; W/ NIGHT SET-BACK RELAY
DH-1	INDEECO QUA	DUCT	DOAS-1 CONFERENCE	340	4 KW	-	208/3	W/ SCR CONTROLLER

PLUMBING FIXTURE SCHEDULE						
SYMBOL	DESCRIPTION	W	V	CW	HW	REMARKS
P-1A	WATER CLOSET	4"	2"	1"	-	FLOOR MOUNT - ADA ACCESSIBLE - FLUSH VALVE TYPE
P-1B	WATER CLOSET	4"	2"	1"	-	FLOOR MOUNT - FLUSH VALVE TYPE
P-2A	URINAL	2"	1-1/2"	3/4"	-	WALL MOUNT - ADA ACCESSIBLE
P-3A	LAVATORY	2"	1-1/2"	1/2"	1/2"	WALL MOUNT, ADA ACCESSIBLE
P-5A	SINK	2"	1-1/2"	1/2"	1/2"	STAINLESS STEEL - SINGLE BOWL
P-6A	SERVICE SINK	3"	2"	1/2"	1/2"	FLOOR MOUNT
P-8A	DRINKING FOUNTAIN	2"	2"	1/2"	-	BI-LEVEL WALL MOUNT, COOLED, ADA ACCESSIBLE, 120V/1PH
P-10A	HOSE BIBB	-	-	3/4"	-	FREEZE PROOF
P-11A	FLOOR DRAIN	*	2"	-	-	W/ TRAP PRIMER
P-11B	FUNNEL FLOOR DRAIN	2"	2"	-	-	W/ TRAP PRIMER
P-12A	REFRIGERATOR FITTING	-	-	1/2"	-	-
* SEE PLANS FOR WASTE PIPE SIZING. PLUMBING STOPS: QUARTER TURN BALL VALVE; BRASSCRAFT. P-TRAPS: 17 GAUGE SEAMLESS CHROME PLATED BRASS, WITH MINIMUM 2-INCH SEAL; SIZE PER UPC. RISERS: FLEXIBLE BRAIDED STEEL TYPE; RATED FOR 125 PSIG. PROVIDE ALL ACCESSORIES REQUIRED FOR ADA FIXTURES TO BE CODE COMPLIANT.						

WATER HEATER SCHEDULE											
SYMBOL	BASIS OF DESIGN MANUFACTURER AND SERIES NO.	TYPE	AREA SERVED	INPUT RATING	STORAGE (GAL)	DOMESTIC HW			ELECTRICAL		REMARKS
						GPH	EWT	LWT	FLA	VOLTS/PH	
WH-1	A.O. SMITH DRE-52	ELECTRIC TANK TYPE	BUILDING HW	9 KW	50	26.2	50	120	25	208/3	-

PUMP SCHEDULE								
SYMBOL	BASIS OF DESIGN MANUFACTURER AND SERIES NO.	TYPE	SERVICE	GPM	HEAD FT. H2O	ELECTRICAL		REMARKS
						POWER	VOLTS/PH	
CP-1	BELL & GOSSETT NBF	DOMESTIC CIRCULATOR	DOMESTIC HWC	2	15	90 WATTS	115/1	W/ AQUASTAT
SP-1	STANCOR SE-50	SUMP PUMP	ELEVATOR	50	30	1/2 HP	115/1	W/ OIL SWITCH & LIQUID SMART SENSOR

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PROFESSIONAL ENGINEER

1/29/2024

PROJECT

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REVISIONS

Description

Date

Rev#

INFO

Sheet Date

Project Number

File Name

Print Date

MECHANICAL SCHEDULES

02/01/2024 PERMIT SET

SHEET NO.

M0.04



MECHANICAL SPECIFICATIONS

20 05 00 - MECHANICAL COMMON WORK RESULTS

1. CODE COMPLIANCE: ALL WORK SHALL COMPLY WITH ALL LOCAL CODES AND ORDINANCES. WORKERS ASSIGNED TO THIS PROJECT SHALL BE FAMILIAR AND KNOWLEDGEABLE OF ALL APPLICABLE CODES; BY VIRTUE OF BIDDING THE PROJECT THE CONTRACTOR REPRESENTS THAT WORKERS HAVE SUCH KNOWLEDGE. THROUGHOUT THE PROJECT DOCUMENTS, ITEMS ARE SHOWN OR SPECIFIED IN EXCESS OF CODE REQUIREMENTS; IN ALL SUCH CASES, THE WORK SHALL BE DONE SO THAT CODE REQUIREMENTS ARE EXCEEDED AS INDICATED.
2. DRAWINGS: DRAWINGS ARE DIAGRAMMATIC AND SHOW THE GENERAL ARRANGEMENT OF THE CONSTRUCTION, AND THEREFORE DO NOT SHOW ALL NECESSARY OFFSETS, FITTINGS, AND ACCESSORIES WHICH ARE REQUIRED TO FORM COMPLETE AND OPERABLE SYSTEMS.
3. FIELD VERIFICATION: CHECK FIELD CONDITIONS AND VERIFY ALL MEASUREMENTS AND RELATIONSHIPS INDICATED ON THE DRAWINGS BEFORE SUBMITTING BIDS AND AGAIN BEFORE PROCEEDING WITH THE WORK.
4. PERMITS, FEES AND INSPECTIONS: OBTAIN AND PAY FOR ALL PERMITS, LICENSES, FEES AND INSPECTIONS AS REQUIRED BY THE AHJ AND UTILITIES. COORDINATE WITH AHJ AND ARRANGE SYSTEM INSPECTIONS. MAINTAIN RECORDS OF ALL SYSTEM TESTS AND AHJ INSPECTIONS.
6. QUALITY ASSURANCE CHECKS: PRIOR TO PROVIDING SUBMITTALS VERIFY THAT PROPOSED PRODUCT MEETS PROJECT REQUIREMENTS; INCLUDING: LEAD/DELIVERY TIMES COMPATIBLE WITH SCHEDULE, PROPER VOLT/PHASE, WEIGHT DOES NOT EXCEED THAT ALLOWED, SPACE VERIFICATION HAS BEEN DONE, PRODUCT IS SUITABLE FOR CONDITIONS, MANUFACTURER IS ACCEPTABLE, SPECIFIED FEATURES ARE PROVIDED, EQUIPMENT EFFICIENCIES COMPLY WITH CODE.
7. SUBMITTALS - PRODUCT DATA: SHALL SUBMIT MANUFACTURERS PRODUCT DATA FOR ALL PRODUCTS PROPOSED TO BE USED FOR REVIEW. PRODUCTS SHALL NOT BE USED UNTIL APPROVED BY THE OWNER OR HIS REPRESENTATIVE. SUBMITTALS MAY BE ELECTRONIC TYPE IN "PDF" FORMAT; SUBMIT WITH TABLE OF CONTENTS.
8. SUBMITTALS - SHOP DRAWINGS: SUBMIT SHOP DRAWINGS FOR INDICATED SYSTEMS FOR REVIEW. PRODUCTS SHALL NOT BE ORDERED OR INSTALLED UNTIL SHOP DRAWINGS HAVE BEEN APPROVED. SEE INDIVIDUAL SPECIFICATION SECTIONS AND DRAWING NOTES FOR SYSTEMS AND AREAS REQUIRING SHOP DRAWINGS. SHOP DRAWINGS SHALL BE CONTRACTOR PREPARED DRAWINGS SHOWING THE DETAILS OF THE INSTALLATION. SUBMIT PDF OR ACAD FILES WITH A TRANSMITTAL.
9. RECORD DRAWINGS: MAINTAIN A SET OF CONTRACT PLANS AT THE PROJECT SITE UPON WHICH ALL CHANGES FROM THE AS-BID PLANS ARE NOTED. AT THE COMPLETION OF THE PROJECT DELIVER TO THE OWNER ONE COMPLETE SET OF THESE RECORD DRAWINGS.
10. PROTECTION AND DAMAGE: PROTECT ALL ITEMS FROM DAMAGE OF ANY KIND (INCLUDES WATER, CORROSION, FREEZING, DIRT/DUST, CONDENSATION, PHYSICAL DAMAGE, ETC.) BOTH IN STORAGE AND WHEN INSTALLED, UNTIL FINAL PROJECT ACCEPTANCE. PROTECT BUILDING AND SITE AREAS FROM DAMAGE. RESTORE ALL EXISTING ITEMS THAT ARE DAMAGED TO PRE-CONSTRUCTION CONDITIONS (OR BETTER). REPLACE ALL NEW ITEMS THAT ARE DAMAGED WITH NEW, EXCEPT WHERE CLEANING OR REPAIR CAN RESTORE THE ITEM TO A NEW CONDITION, SATISFACTORY TO THE OWNER.
11. COORDINATION: COORDINATE ALL CONSTRUCTION ACTIVITIES WITH OTHER TRADES, INCLUDING THE RELATIVE LOCATION OF ITEMS, SCHEDULING THE WORK, AND INTERCONNECTIONS OF SYSTEMS. COORDINATE WITH THE OWNER AND COOPERATE FULLY SO AS TO MINIMIZE CONFLICTS AND TO ALLOW FULL OWNER USAGE (UNO) OF INDICATED AREAS DURING CONSTRUCTION.
12. FINAL INSPECTION: PRIOR TO ACCEPTANCE OF THE WORK, PUT ALL SYSTEMS INTO OPERATION FOR A PERIOD OF NOT LESS THAN 5 WORKING DAYS SO THAT THEY MAY BE INSPECTED BY THE OWNER.
13. INSTRUCTION: PROVIDE INSTRUCTIONS AND DEMONSTRATIONS FOR THE OWNER'S REPRESENTATIVES ON THE OPERATION AND MAINTENANCE OF ALL EQUIPMENT.
14. O&M MANUALS: PROVIDE O&M MANUALS FOR ALL EQUIPMENT, INDICATING REQUIRED MAINTENANCE. INCLUDE: SIZE OF ALL FILTERS, BELTS, AND SIMILAR ITEMS REQUIRING ROUTINE REPLACEMENT; LIST OF CONTACTS FOR SERVICE AND PARTS FOR EQUIPMENT.;
15. WARRANTY: ALL WORK AND EQUIPMENT SHALL BE WARRANTED TO BE FREE FROM DEFECTS AND CAPABLE OF PROVIDING SATISFACTORY OPERATION FOR A PERIOD OF ONE YEAR AFTER PROJECT FINAL ACCEPTANCE.
16. COMPLETE SYSTEMS: NOT ALL NECESSARY MATERIALS TO PERFORM THE WORK REQUIRED ARE SPECIFIED OR SHOWN. CONTRACTOR SHALL PROVIDE ALL ITEMS NEEDED TO HAVE COMPLETED PROPERLY OPERATING SYSTEMS; ITEMS PROVIDED SHALL BE OF COMMERCIAL/INSTITUTIONAL QUALITY, CONSISTENT WITH THE QUALITY OF RELATED ITEMS PROVIDED ON THE PROJECT.
17. IDENTIFICATION:
- A. PIPING: LABEL ON 20 FOOT CENTERS WITH SELF-STICKING COLORED MARKERS, LETTERED TO IDENTIFY THE PIPE CONTENTS. AND BANDED AT EACH END WITH ARROW TAPE INDICATING THE DIRECTION OF FLOW. MARKERS SHALL BE SIMILAR AND EQUAL TO BRADY "SYSTEM 1." LETTERING AND COLORS SHALL COMPLY WITH ANSI A13.1. IN ADDITION, PIPING SHALL BE PAINTED, COLORS AS SELECTED BY OWNER.
- B. VALVES: LABEL WITH IDENTIFICATION TAGS MADE OF ENGRAVED PHENOLIC MATERIAL, WITH 1/8" HIGH WHITE LETTERING ON A BLACK BACKGROUND, ENGRAVED WITH ABBREVIATION OF SYSTEM SERVED, AND INDICATION OF THE FUNCTION OF THE VALVE. CHAIN TAG TO VALVE.
- C. EQUIPMENT: LABEL WITH IDENTIFICATION TAGS MADE OF ENGRAVED PHENOLIC MATERIAL, WITH 1/4" HIGH WHITE LETTERING ON A BLACK BACKGROUND, ENGRAVED WITH EQUIPMENT I.D. (SAME AS USED ON PLANS) AND AREA SERVED. PRE-DRILL AND ANCHOR TO EQUIPMENT WITH TWO SCREWS.
- D. CONTROLS: LABEL CONTROL COMPONENTS WITH IDENTIFICATION TAGS MADE OF ENGRAVED PHENOLIC MATERIAL, WITH 1/8" HIGH WHITE LETTERING ON A BLACK BACKGROUND, ENGRAVED WITH ITEM IDENTIFIER MATCHING THAT USED ON CONTROL SHOP DRAWINGS. EXCEPT THAT ROOM THERMOSTATS AND CO2 SENSORS DO NOT REQUIRE LABELS; ROOM EXHAUST FAN SWITCHES SHALL BE LABELED IN A GENERIC FASHION TO BE UNDERSTOOD BY ROOM USER.
- E. FIRE/SMOKE DAMPERS: FACTORY PRE-PRINTED LABEL WITH MINIMUM 1" HIGH LETTERS IDENTIFYING ITEM, APPLY LABEL TO DUCT ACCESS DOORS.
18. TESTING: ALL PIPING AND DUCT SYSTEMS SHALL BE TESTED PER CODE REQUIREMENTS. PRESSURIZED PIPING SYSTEMS SHALL BE PRESSURE TESTED TO AT LEAST 1.5 TIMES THE SYSTEMS OPERATING PRESSURE.
19. CONTRACTOR LAY-OUT: THE CONTRACTOR IS REQUIRED TO DO FURTHER DESIGN AND LAYOUT TO FINALIZE THE DESIGN SHOWN ON THE PROJECT DRAWINGS. SUCH

WORK INCLUDES LAYOUT SKETCHES TO VERIFY RISES AND DROPS IN PIPING AND DUCTWORK, COORDINATION, OF ELEVATIONS WITH OTHER TRADES, AND NOTIFYING OTHER TRADES OF ITEMS TO BE RELOCATED, ETC.

20. SEISMIC: ALL PIPING, DUCTWORK, AND EQUIPMENT SHALL BE INSTALLED AND BRACED FOR THE SEISMIC CATEGORY FOR THIS PROJECT PER CODE.

20 05 19 - PIPING SPECIALTIES

1. THERMOMETERS: ADJUSTABLE ANGLE TYPE, BRASS CONSTRUCTION, 7-INCH SCALE, ALUMINUM CASE, RED READING MERCURY, WHITE FACE WITH BLACK NUMERALS, AND MARKINGS IN DEGREES F, PROVIDE SOCKETS WITH EXTENSION NECKS WHERE INSTALLED ON INSULATED PIPING. THERMOMETER TEMPERATURE RANGES SHALL BE APPROXIMATELY 30 DEG F HIGHER AND LOWER THAN NORMAL SYSTEM SETPOINT (OR OPERATING RANGE).
2. PRESSURE GAUGES: 3-1/2 INCH DIAL, STEM MOUNTING, ALUMINUM OR STAINLESS STEEL CASE, WHITE FACE WITH BLACK NUMERALS, PHOSPHOR BRONZE BOURDON TUBE, 1/4 INCH NPT BOTTOM CONNECTION. PROVIDE A SHUT-OFF COCK FOR ALL GAUGES, COIL SYPHON FOR ALL STEAM GAUGES. PRESSURE GAUGE RANGE SHALL EXTEND TO APPROXIMATELY 1.5 TIMES SYSTEM OPERATING PRESSURE, WITH NUMERAL INTERVALS 10% OF FULL RANGE.
3. WATER STRAINERS: "Y" TYPE, SAME SIZE AS THE PIPE IN WHICH INSTALLED, RATED FOR 125 PSI WORKING PRESSURE, AND WITH REMOVABLE PLUG AND SEDIMENT SCREEN. BASKET SCREEN SHALL BE STAINLESS STEEL OR MONEL, 20 MESH, WITH A NET FREE AREA OF AT LEAST 3 TIMES THAT OF THE ENTERING PIPE. PROVIDE WITH BLOWDOWN VALVE.
4. UNIONS: RATED AT MINIMUM 125 PSIG AT 200 DEGREES F; PROVIDE UNIONS AT THREADED CONNECTIONS TO ALL EQUIPMENT AND ITEMS WHICH MAY REQUIRE REPLACEMENT. PROVIDE DIELECTRIC CONNECTORS WHERE DISSIMILAR METALS JOIN; DIELECTRIC UNIONS SHALL NOT BE USED.
5. ACCESS DOORS: LOCKABLE, STEEL ACCESS DOOR, FOR MOUNTING ON FACE OF WALL, WITH MINIMUM 16 GAUGE FRAME AND 16 GAUGE DOOR, WITH CONCEALED HINGE, CAM AND CYLINDER LOCK. NO.4 STAINLESS STEEL FINISH WHERE USED IN RESTROOMS, LOCKER ROOMS, KITCHENS, AND SIMILAR "WET" AREAS.
6. PIPING FLEXIBLE CONNECTORS: CORRUGATED HOSE TYPE WITH OUTER BRAIDED WIRE SHEATH COVERING. MINIMUM WORKING PRESSURE OF 250 PSIG, MINIMUM LENGTH OF 12 INCHES (OR 12 TIMES THE CONNECTOR'S NOMINAL DIAMETER, WHICHEVER IS MORE), AND SCREWED OR FLANGED END CONNECTIONS. METAL FOR HOSE SHALL BE BRONZE OR STAINLESS STEEL; BRAIDED SHEATH SHALL BE STAINLESS STEEL.

20 05 29 - HANGERS, SUPPORTS, SLEEVES AND SEALS

1. PIPE HANGERS AND SUPPORTS:
- A. GENERAL: SHALL CONFORM TO MSS SP-58 AND MSS SP-69 AND SHALL BE COPPER PLATED WHERE IN CONTACT WITH COPPER PIPE OR BE PROVIDED WITH FACTORY MADE ISOLATORS TO PREVENT CONTACT OF DISSIMILAR MATERIALS.
- B. REFRIGERANT PIPE: PROVIDE VIBRATION DAMPENING CUSHION CLAMPS CONSTRUCTED OF THERMOPLASTIC ELASTOMER WITH NYLON INSERT LOCK-NUTS ON REFRIGERANT PIPE AND PIPE SUBJECT TO VIBRATION.
- C. HANGERS: SHALL PERMIT ADEQUATE ADJUSTMENT AFTER ERECTION WHILE STILL SUPPORTING THE LOAD. PIPE GUIDES AND ANCHORS SHALL BE INSTALLED TO KEEP PIPES IN ACCURATE ALIGNMENT, TO DIRECT EXPANSION MOVEMENT, AND TO PREVENT BUCKLING, SWAYING, AND UNDUE STRAIN.
- D. SPACING: SHALL BE SPACED AS REQUIRED BY THE MORE STRINGENT OF MSS SP-69, CODE, PIPING MANUFACTURER, OR NOTES ON PLANS (LIMITING LOADS). CAST IRON DRAINAGE PIPE SHALL HAVE SUPPORTS INSTALLED NOT OVER 1' FROM EACH PIPE FITTING JOINT AND AT EACH CHANGE IN DIRECTION OF THE PIPING (FOR PIPING 2" AND LARGER).
- E. INSULATION: SHALL BE CONTINUOUS THROUGH ALL SUPPORTS FOR PIPING 1-1/2 INCH AND LARGER. PROVIDE WITH RIGID INSULATION INSERT AND METAL SHIELD AT SUPPORT POINT.
2. PIPING SEISMIC RESTRAINTS: PROVIDE SEISMIC BRACING FOR ALL NATURAL GAS PIPING. PROVIDE SEISMIC SUPPORTS FOR ALL OTHER PIPING 2-INCH AND LARGER LOCATED MORE THAN 12-INCHES OR MORE BELOW THE BUILDING SUPPORTING MEMBER (UNO). PROVIDE TRANSVERSE BRACING ON 20' INTERVALS, LONGITUDINAL BRACING ON 40' INTERVALS.
3. PIPE SLEEVES AND SEALS: SLEEVES SHALL BE FABRICATED OF 20 GAUGE SHEETMETAL AND SHALL ALLOW 1/2" SPACE AROUND INNER PIPE AND SHALL EXTEND AT LEAST 1" BEYOND PENETRATED ELEMENT SURFACES. PROVIDE SLEEVES AT ALL WALL, FLOOR, AND CEILING PENETRATIONS (EXCEPT WHERE COMPLETELY SOLID INTERIOR ELEMENTS SUCH AS CONCRETE SLABS ARE PENETRATED). SEAL BETWEEN SLEEVE AND PIPE WITH UL APPROVED FIRE SEALANT SYSTEM (EXCEPT WHERE INDICATED OTHERWISE). SEAL BETWEEN SLEEVE AND ELEMENT PENETRATED WITH SAME MATERIAL ELEMENT IS CONSTRUCTED OF (I.E., CONCRETE, PLASTER, ETC.). ALL SEALING SHALL BE PROVIDED SO AS TO MAINTAIN THE FIRE RATING OF THE ELEMENT BEING PENETRATED. SEALS IN EXTERIOR OR BELOW GRADE WALLS OR SLABS SHALL BE INTERLOCKING SYNTHETIC RUBBER LINK TYPE; THUNDERLINE "LINK-SEAL". SUBMIT SHOP DRAWING OR PROPOSED UL FIRE SEAL SYSTEM.
4. DUCT SUPPORTS: SHALL BE SPACED ON MAXIMUM 8 FOOT CENTERS EXCEPT WHERE THE DUCT SIZE IS LARGER THAN 24" DIAMETER (OR RECTANGULAR EQUIVALENT, E.G. 24X20) HANGERS SHALL BE ON MAXIMUM 6 FOOT CENTERS. COMPLY WITH SMACNA STANDARDS AND CODE.
5. DUCT SEISMIC RESTRAINTS: PROVIDE SEISMIC BRACING FOR ALL DUCTWORK LARGER THAN 24" DIAMETER (OR RECTANGULAR EQUIVALENT, E.G. 24X20) AND ALL DUCTWORK LOCATED 24-INCHES OR MORE BELOW THE BUILDING SUPPORTING MEMBER. PROVIDE TRANSVERSE BRACING ON 20' INTERVALS, LONGITUDINAL BRACING ON 40' INTERVALS.
6. DUCT SLEEVES AND SEALS: PROVIDE DUCT CLOSURE COLLARS FABRICATED OF GALVANIZED STEEL ANGLE, MINIMUM 1-1/2X1-1/2" 24 GAUGE, SIZED TO SEAL OFF OPENINGS BETWEEN THE DUCT AND ELEMENT PENETRATED. PROVIDE CLOSURE COLLARS AT ALL WALL, FLOOR, AND CEILING PENETRATIONS AT MECHANICAL ROOMS. SEAL BETWEEN DUCT AND ELEMENT PENETRATED WITH UL APPROVED FIRE SEALANT (EXCEPT WHERE INDICATED OTHERWISE); PROVIDE GALVANIZE STEEL SLEEVE THROUGH ELEMENT WHERE REQUIRED AS PART OF SEAL SYSTEM. SEAL BETWEEN SLEEVE AND ELEMENT PENETRATED WITH SAME MATERIAL. ELEMENT IS CONSTRUCTED OF (I.E., CONCRETE, PLASTER, ETC.). ALL SEALING SHALL BE PROVIDED SO AS TO MAINTAIN THE FIRE RATING OF THE ELEMENT BEING PENETRATED. SUBMIT SHOP DRAWING OR PROPOSED UL FIRE SEAL SYSTEM.

20 05 93 - BALANCING

1. GENERAL: SHALL BE BY A COMPANY SPECIALIZING IN THIS WORK.
2. COORDINATION: COORDINATE AND ASSIST WITH BALANCER TO ALLOW FOR ACCESS TO ALL ITEMS. PROVIDE ADDED BALANCING DEVICES AS THE BALANCER MAY REQUIRE.

3. BALANCE: BALANCE SYSTEM TO VALUES SHOWN ON DRAWINGS, PROVIDE WRITTEN REPORT DOCUMENTING UNIT DATA AND ALL BALANCING WORK. MARK FINAL DAMPER POSITIONS WITH PERMANENT MARKER. PROVIDE SHEAVES CHANGES AS DIRECTED BY THE BALANCER OR ENGINEER.

20 07 00 - MECHANICAL SYSTEMS INSULATION

1. PIPING INSULATION: RIGID MOLDED FIBERGLASS INSULATION, SIZED TO MATCH PIPE APPLIED TO, THERMAL CONDUCTIVITY SHALL NOT EXCEED 0.24 BTU-INCH/HR-SF-DEGREES F AT 75 DEGREES F, WITH JACKET CONSISTING OF HIGH DENSITY WHITE KRAFT BONDED TO ALUMINUM FOIL AND HAVING A PRESSURE SENSITIVE ADHESIVE CLOSURE SYSTEM, INTEGRAL VAPOR BARRIER WITH MAXIMUM 0.02 PERM RATING. FITTINGS SHALL USE FIBERGLASS INSULATION PACKED INSIDE MINIMUM 20 MIL WHITE PVC FITTING COVERS, SIZED/SHAPED TO MATCH FITTING AND ADJACENT PIPE.
2. HANGER INSERTS: EXPANDED PERLITE OR CALCIUM SILICATE INSULATION; WITH NO MORE THAN 5% DEFORMATION AT 100 PSI; AND MAXIMUM CONDUCTIVITY OF 0.32 BTU-IN/HR-SF-DEGREES F; WITH MINIMUM 18 GAUGE GALVANIZED STEEL SHIELDS. PROVIDE 360 DEGREE TYPE INSERT WHERE PIPE IS CLAMPED FOR SUPPORT.
3. REFRIGERANT PIPING INSULATION: FLEXIBLE CELLULAR ELASTOMERIC INSULATION, SIZED TO MATCH PIPE APPLIED TO, THERMAL CONDUCTIVITY SHALL NOT EXCEED 0.27 BTU-INCH/HR-SF-DEGREES F AT 75 DEGREES F WITH LONGITUDINAL ADHESIVE SEALED JOINT, AND MAXIMUM 0.08 PERM RATING. FITTINGS SHALL USE MITERED/FORMED INSULATION SEALED/ATTACHED WITH ADHESIVE GLUED IN PLACE.
4. METAL JACKET: ALUMINUM ROLL JACKETING, FABRICATED OF TYPE 3003 OR 5005 ALUMINUM, MINIMUM 0.020 INCH THICK, WITH INTEGRAL 1 MIL HEAT BONDED POLYETHYLENE MOISTURE BARRIER.
5. DUCTWORK: BLANKET FIBERGLASS INSULATION, 0.75 LB PER CUBIC FOOT MINIMUM DENSITY, THERMAL CONDUCTIVITY NO GREATER THAN 0.25 BTU-IN/HR-SQ.FT-DEGREES F. AT 75 DEGREES F WITH FACTORY APPLIED VAPOR PROOF JACKET CONSISTING OF ALUMINUM FOIL COVER WITH OPEN MESH FIBERGLASS REINFORCEMENT, LAMINATED TO UL RATED KRAFT, VAPOR TRANSMISSION RATE SHALL NOT EXCEED 0.05 PERMS.
6. PIPING AND EQUIPMENT INSULATION INSTALLATION:
- A. PROVIDE INSULATION ON THE SURFACES OF ALL ENERGY CONVEYING, ENERGY CONSUMING, OR ENERGY STORAGE DEVICES (I.E. PIPES, EQUIPMENT, VALVES, FITTINGS, ACCESSORIES, ETC.) INSTALLED AS PART OF THIS PROJECT EXCEPT WHERE SPECIFICALLY EXCLUDED.
- B. PROVIDE INSULATION CONTINUOUS THROUGH ALL SUPPORTS ON PIPING 1-1/2 INCH AND LARGER USING INSERTS.
- C. INSULATE ALL PIPING WITH INSULATION THICKNESSES AS REQUIRED BY CODE, AND NO LESS THAN AS FOLLOWS THICKNESS:

FLUID TEMP	COND*	MRT**	PIPE SIZE (INCHES)			
			<1	1 TO < 1.5	1.5 TO <4	4 TO <=8
> 350	0.32 - 0.34	250	4.5	5.0	5.0	5.0
251 - 350	0.29 - 0.32	200	3.0	4.0	4.5	4.5
201 - 250	0.27 - 0.30	150	2.5	2.5	2.5	3.0
141 - 200	0.25 - 0.29	125	1.5	1.5	2.0	2.0
105 - 140	0.21 - 0.28	100	1.0	1.0	1.5	1.5
40 - 60	0.21 - 0.27	75	0.5	0.5	1.0	1.0
< 40	0.20 - 0.26	75	0.5	1.0	1.0	1.0

\*CONDUCTIVITY (BTU-IN/HR-SF-DEG F)

\*\*MEAN RATING TEMPERATURE (DEG F)

7. DUCT INSULATION INSTALLATION:
- A. ALL DUCTS SHALL BE INSULATED EXCEPT AS NOTED BELOW.
- B. INSULATION THICKNESSES SHALL PROVIDE THE R-VALUES AS REQUIRED BY CODE, AND EXCEED CODE AS INDICATED. MINIMUM INSULATION:
- 1) SUPPLY AIR DUCT:
- A) UNLINED WITHIN CONDITIONED AREA: 1.0 INCH THICK.
- B) LINED WITHIN CONDITIONED AREA: NO INSULATION REQUIRED.
- C) UNLINED OUTSIDE CONDITIONED AREA: 2.0 INCH THICK.
- D) LINED OUTSIDE CONDITIONED AREA: 1.0 INCH THICK (EXCEPT WHERE 2-INCH LINING USED NO INSULATION REQUIRED).
- 2) RETURN AIR DUCTS:
- A) UNLINED WITHIN CONDITIONED AREA: NO INSULATION REQUIRED.
- B) LINED WITHIN CONDITIONED AREA: NO INSULATION REQUIRED.
- C) UNLINED OUTSIDE CONDITIONED AREA: 2.0 INCH THICK.
- D) LINED OUTSIDE CONDITIONED AREA: 1.0 INCH THICK (EXCEPT WHERE 2-INCH LINING USED NO INSULATION REQUIRED).
- 3) EXHAUST/RELIEF AIR DUCTS:
- A) WITHIN CONDITIONED AREA, FROM AUTOMATIC DAMPER TO EXTERIOR: 4.0 INCH THICK.
- B) WITHIN CONDITIONED AREA, FROM AUTOMATIC DAMPER TO INTERIOR: NO INSULATION REQUIRED.
- C) OUTSIDE CONDITIONED AREA: NO INSULATION REQUIRED WHERE CONDENSATION CANNOT OCCUR; OTHERWISE 2.0 INCH.
- 4) OUTSIDE AIR DUCTS:
- A) WITHIN CONDITIONED AREA, FROM AUTOMATIC DAMPER TO EXTERIOR: 4.0 INCH THICK.
- B) WITHIN CONDITIONED AREA, FROM AUTOMATIC DAMPER TO INTERIOR: 2.0 INCH THICK.
- C) OUTSIDE CONDITIONED AREA: NO INSULATION REQUIRED.

22 05 10 - PIPE AND PIPE FITTINGS

1. COPPER PIPE AND FITTINGS: TYPE L OR K COPPER, HARD TEMPER, PER ASTM B88. WROUGHT COPPER AND BRONZE FITTINGS PER ANSI B16.22, CAST ALLOY FITTINGS PER B16.18, AND CAST BRONZE THREADED FITTINGS PER ASME B16.15. CAST FITTINGS SHALL NOT BE USED FOR BRAZED JOINTS.
2. CAST IRON PIPE AND FITTINGS: SERVICE WEIGHT NO-HUB CAST IRON PIPE PER CISPI-301 AND ASTM A888 FOR USE WITH MECHANICAL NO-HUB COUPLINGS AND CAST IRON DRAINAGE PATTERN FITTINGS. STAINLESS STEEL MECHANICAL COUPLINGS AND NEOPRENE GASKETS PER CISPI-310, ASTM C1277, AND ASTM C564.

3. GALVANIZED STEEL DWV PIPE AND FITTINGS: GALVANIZ3ED STEEL PIPE PER ASTM A53 GRADE B, TYPE 5, SCHEDULE 40. CAST-IRON THREADED DRAINAGE FITTINGS PER ASTM B16.12 AND CAST IRON SCREWED FITTINGS PER ASME B16.4.
4. PVC DWV PIPE AND FITTINGS: PVC DRAIN PIPE PER ASTM D1785, ASTM D2665, WITH SOLVENT CEMENT JOINTS. FOAM CORE PIPE NOT ALLOWED. PVC DRAINAGE FITTINGS PER ASTM D2665, ASTM F1866. SOLVENT CEMENT PER ASTM D2564.
5. ABS DWV PIPE AND FITTINGS: ABS DRAIN PIPE PER ASTM D2861, WITH SOLVENT CEMENT JOINTS. FOAM CORE PIPE NOT ALLOWED. ABS DRAINAGE FITTINGS PER ASTM D2861 OR ASTM D3311. SOLVENT CEMENT PER ASTM D2235.
6. PVC PIPE AND FITTINGS: PVC PRESSURE PIPE PER ASTM D1785, SCHEDULE 40, WITH SOLVENT CEMENT JOINTS. FOAM CORE PIPE NOT ALLOWED. PVC SOCKET TYPE FITTINGS PER ASTM D2466. SOLVENT CEMENT PER ASTM D2564.
7. PIPE, PIPE FITTING, AND JOINT APPLICATION:

SYSTEM	PIPE SIZE	PIPING	FITTING/JOINT
COLD AND HOT WATER ABOVEGROUND	ALL	TYPE L COPPER	SOLDER JOINTS

COLD AND HOT WATER UNDERGROUND	ALL	TYPE K COPPER	SOLDER JOINTS
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WASTE & VENT ABOVEGROUND	ALL	GALV STEEL	DWV, THREADED
		OR	
		CAST IRON	DWV CAST IRON, NO-HUB
		OR	
		COPPER DWV	DWV COPPER, SOLDERED
		OR	
		PVC DWV	DWV PVC, SOLVENT
		OR	
		ABS DWV	DWV ABS, SOLVENT

WASTE & VENT UNDERGROUND	ALL	NO-HUB	CAST IRON
		OR	
		PVC DWV	DWV PVC, SOLVENT
		OR	
		ABS DWV	DWV ABS, SOLVENT

HVAC CONDENSATE	ALL	PVC DWV PVC PIPE	DWV PVC, SOLVENT
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8. INSTALLATION:
- A. INSTALL PIPING CONCEALED UNLESS SPECIFICALLY NOTED OTHERWISE. COORDINATE WITH OTHER TRADES AND ALL EXISTING CONDITIONS. INSTALL TO ALLOW MAXIMUM ACCESS TO COMPONENTS INSTALLED IN PIPING SYSTEM.
- B. FOLLOW ESTABLISHED PROFESSIONAL PRACTICES FOR JOINING OF PIPING AND SO AS TO SUIT THE SYSTEM PRESSURES AND TEMPERATURES INVOLVED.
- C. PROVIDE ALL PIPING AS INDICATED AND AS REQUIRED TO ALLOW SUPPLY CONNECTIONS TO EACH FIXTURE AND EQUIPMENT ITEM REQUIRING WATER SUPPLY. PROVIDE OFFSETS AS REQUIRED TO ACCOMMODATE BUILDING CONSTRUCTION AND ACCESS REQUIREMENTS PER SECTION 20 05 00.

22 11 00 - FACILITY WATER DISTRIBUTION

1. BALL VALVES:

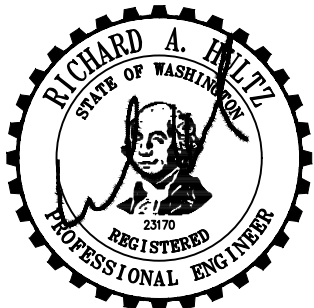
- A. 2 INCHES AND SMALLER: 600 PSI NON-SHOCK COLD WORKING PRESSURE, 100 PSI AT 300 DEG F, BRONZE BODY, FULL PORT, 2 PIECE CONSTRUCTION, ANTI-BLOWOUT STEM, REINFORCED PTFE SEATS, STAINLESS STEEL OR CHROME PLATED BRASS OR SILICON BRONZE BALL, LEVER HANDLE. SOLDER OR THREADED CONNECTIONS. PROVIDE WITH EXTENDED LEVER HANDLE WHERE VALVE IS INSTALLED IN SYSTEMS WITH INSULATION THICKNESS GREATER THAN 0.5 INCH. NIBCO S-585-80-LF, T-585-80-LF (OR APPROVED).
- B. 2-1/2 INCHES AND LARGER:
- 1) COPPER ALLOY: 400 PSI NON-SHOCK COLD WORKING PRESSURE COPPER ALLOY BODY, FULL PORT, ANTI-BLOWOUT STEM, PTFE SEATS, STAINLESS STEEL OR CHROME PLATED BRASS BALL, PLATED STEEL LEVER HANDLE. NIBCO T-FP-600A-LF (OR APPROVED).
- 2) STAINLESS: CLASS 150 STAINLESS STEEL BODY, SPLIT-BODY FULL BORE DESIGN, ANTI-BLOWOUT STEM, CARBON FILLED TFE SEATS, STAINLESS STEEL BALL, STAINLESS STEEL TRIM, PLATED STEEL LEVER HANDLE. NIBCO F-515-S6-F-66-FS (OR APPROVED).
- 3) CAST IRON: CLASS 125 PSI-SWP, CAST IRON BODY, SPLIT-BODY FULL PORT, ANTI-BLOWOUT STEM, PTFE SEATS, STAINLESS STEEL BALL AND STEM. CONBRACO/APOLLO 6P SERIES (OR APPROVED).

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SIGNED

1/29/2024

PROJECT

CONSEJO COUNSELING & REFERRAL SERVICES  
**CONSEJO GRAHAM OFFICES**  
21120 MERIDIAN AVE E, GRAHAM, WA

REVISIONS

Description

Date

Rev#

INFO

Sheet Number

Project Number

File Name

Plot Date

MECHANICAL SPECS

02/01/2024 PERMIT SET

SHEET NO.

M0.05



MECHANICAL SPECIFICATIONS

2. CHECK VALVES:
- A. 2 INCHES AND SMALLER:
- 1) HORIZONTAL: 125 PSI-SWP BRONZE BODY HORIZONTAL SWING CHECK VALVE, REGARDING TYPE, Y-PATTERN, RENEWABLE SEAT AND DISC, SOLDER OR THREADED CONNECTION. NIBCO S-413-LF OR T-413-LF (OR APPROVED).
- 2) VERTICAL: 125 PSI-SWP BRONZE BODY VERTICAL INLINE CHECK VALVE, STAINLESS STEEL OR BRONZE DISK HOLDER, BUNA-N DISK, STAINLESS STEEL SPRING ACTUATED, SOLDER OR THREADED CONNECTION. NIBCO S-480-LF OR T-480-LF (OR APPROVED).
- B. 2-1/2 INCHES AND LARGER:
- 1) HORIZONTAL: 125 PSI-SWP IRON BODY VERTICAL INLINE "SILENT" CHECK VALVE, WAFER OR FLANGED STYLE, RENEWABLE SEAT AND DISK, STAINLESS SPRING ACTUATED, BRONZE DISK. NIBCO W-910 (OR APPROVED).
- 2) VERTICAL: 125 PSI-SWP IRON BODY VERTICAL INLINE "SILENT" CHECK VALVE, WAFER OR FLANGED STYLE, RENEWABLE SEAT AND DISK, STAINLESS SPRING ACTUATED, BRONZE DISK. NIBCO W-910, F-910 (OR APPROVED).
3. DRAIN VALVES: BRONZE BALL VALVE, MINIMUM 125 PSI-SWP, ANTI-BLOWOUT STEM, STAINLESS STEEL OR CHROME PLATED BRASS BALL, REINFORCED TFE SEAT, SOLDER OR THREADED INLET CONNECTION, MALE 3/4 INCH HOSE THREAD OUTLET CONNECTION, WITH BRASS CAP AND CHAIN. NIBCO S-585-70-HC, T-585-70-HC (OR APPROVED).
4. ACCESSORIES:
- A. WATER HAMMER ARRESTORS: ALL METAL, FACTORY PRE-CHARGED WITH INERT GAS, SEALED INTERNAL BELLOW; 125 PSI WORKING PRESSURE. ALL WETTED PARTS SHALL BE TYPE 300 STAINLESS STEEL, BRASS OR COPPER. PDI (PLUMBING AND DRAINAGE INSTITUTE) SIZES AS INDICATED. WHERE NOT SIZED, PROVIDE SIZES IN ACCORDANCE WITH PDI STANDARDS. ZURN "SHOKTROL", WADE "SHOKSTOP", OR J. R. SMITH "HYDROTROL".
- B. TRAP PRIMER VALVE: ACTIVATED BY DROP-IN WATER PRESSURE. CONSTRUCTED OF CORROSION RESISTANT BRASS WITH INTEGRAL BACKFLOW PREVENTER, VACUUM BREAKER PORTS, DISTRIBUTION MANIFOLD TO SUIT NUMBER OF DRAINS SERVED, ADJUSTABLE TO LINE PRESSURE FOR WATER DELIVERY. PRECISION PLUMBING PRODUCTS MODEL P-1 AND P-2 (OR APPROVED).
8. BACKFLOW PREVENTERS:
- A. REDUCED PRESSURE TYPE:
- 1) GENERAL: WASHINGTON STATE APPROVED, WITH AIR GAP DRAIN FITTING AND RESILIENT SEATED FULL FLOW SHUTOFF VALVES AND TEST COCKS. SAME SIZE AS CONNECTING PIPE. CONFIGURATION TO SUIT APPLICATION. CONFORMING TO AWWA C 511.
- 2) 2 INCHES AND SMALLER: BRONZE BODY, STAINLESS STEEL SPRINGS, BRONZE BALL VALVES, 175 PSI WORKING PRESSURE, THREADED END CONNECTIONS.
- 3) 2-1/2 INCHES AND LARGER: DUCTILE IRON BODY, INTERNAL AND EXTERNAL EPOXY COATING PER AWWA C 550, OS & Y GATE ISOLATION VALVES, BRONZE TRIM, STAINLESS STEEL SPRINGS, 175 WORKING PRESSURE, CLASS 125 FLANGED END CONNECTIONS.
9. DOMESTIC WATER EXPANSION TANK:
- A. TYPE: DIAPHRAGM THERMAL EXPANSION ABSORBER. AMTROL "ST" SERIES (OR APPROVED).
- B. CONSTRUCTION: WELDED STEEL CONSTRUCTION, WITH POLYPROPYLENE LINER, BUTYL/EPDM DIAPHRAGM, STAINLESS STEEL AIR CHARGING VALVE, 175 PSIG WORKING PRESSURE, CONFIGURATION/CONNECTIONS TO SUIT INSTALLATION, NSF 61 APPROVED, AND ASME CERTIFIED.
- C. CAPACITY: AS INDICATED ON PLANS; WHERE NOT INDICATED PROVIDE 4.0 GALLON TANK VOLUME (MINIMUM).
- D. PROVIDE ISOLATION VALVE FOR SERVICING EXPANSION TANK. ALL ISOLATION VALVES BETWEEN EXPANSION TANK AND WATER HEATER SHALL BE LABELED, "EXPANSION TANK SERVICE VALVE: MUST BE OPEN WHEN SYSTEM IS OPERATING."
10. INSTALLATION: INSTALL VALVES SO AS TO BE EASILY ACCESSIBLE AND ORIENTED TO PERMIT EASE OF OPERATION. PROVIDE ACCESS DOORS FOR VALVES NOT OTHERWISE ACCESSIBLE.
11. HOT WATER ADJUSTMENT: ADJUST THE HOT WATER CIRCULATION SYSTEM FOR UNIFORM CIRCULATION THROUGHOUT THE SYSTEM; PROVIDE BALANCING OF SYSTEM WHERE HOT WATER CIRCULATION SYSTEM HAS MULTIPLE BRANCHES WITH BALANCING VALVES (SEE BALANCING SPECIFICATION SECTION). INSTALL, SET, AND ADJUST AND ALL SYSTEM COMPONENTS FOR PROPER OPERATION.
12. FLUSHING AND DISINFECTION: FLUSH AND DISINFECT THE SYSTEM PER CODE. PROVIDE WATER QUALITY TESTS TO CONFIRM CLEANLINESS.

22 13 00 - SANITARY SEWER SYSTEM

1. CLEANOUTS-GENERAL: ALL CLEANOUTS SHALL HAVE CAST IRON BODIES WITH BRONZE COUNTERSUNK RECTANGULAR SLOTTED PLUGS, LUBRICATED WITH A NON-HARDENING TEFLON BASE THREAD LUBRICANT AND HAVING A GASKET SEAL. CLEANOUTS LOCATED IN WATERPROOF MEMBRANE FLOORS SHALL BE PROVIDED WITH AN INTEGRAL CAST FLANGE AND FLASHING DEVICE. ALL CLEANOUTS SHALL BE THE SAME SIZE AS THE PIPE WHICH THEY ARE INTENDED TO SERVE (BUT NOT LARGER THAN 4-INCH).
2. FLOOR CLEANOUTS: AREAS WITH BARE CONCRETE FLOORS: J. R. SMITH NO. 4100 SERIES ADJUSTABLE FLOOR CLEANOUT WITH ROUND HEAVY DUTY NICKEL BRONZE TOP. AREAS WITH TERRAZZO (AND SIMILAR POURED FLOORS): J. R. SMITH NO. 4180 SERIES ADJUSTABLE FLOOR LEVEL CLEANOUT WITH ROUND HEAVY DUTY NICKEL BRONZE TOP WITH TERRAZZO RECESS. AREAS WITH CARPET: J. R. SMITH 4020-X SERIES ADJUSTABLE FLOOR LEVEL CLEANOUT WITH ROUND HEAVY DUTY NICKEL BRONZE TOP AND CARPET CLAMP.
3. WALL CLEANOUTS: CAST IRON FERRULE WITH CAST BRONZE TAPER THREADED PLUG, WITH PLUG TAPPED 1/4-INCH, 20 THREAD, TO ACCEPT ACCESS COVER SCREW; WITH STAINLESS STEEL ACCESS COVER AND VANDAL PROOF SCREW.
4. OUTSIDE CLEANOUTS: HEAVY DUTY, ROUND, CAST IRON, DOUBLE-FLANGED HOUSING, HAVING SCORIATED CAST IRON COVER WITH LIFTING DEVICE, FERRULE AND BRONZE CLOSURE PLUG. HOUSING AND LID SHALL BE GALVANIZED AND HAVE VANDAL RESISTANT SCREWS. J. R. SMITH NO. 4251 OR 4256 SERIES.
5. VENT FLASHING:
- A. GENERAL: STYLE AND TYPE TO SUIT ROOFING SYSTEM, MATCH VENT PIPE SIZE, AND PROVIDE WATERPROOF BUILDING PENETRATION. PROVIDE WITH ADEQUATE

BASE SIZE FOR PROPER FLASHING INTO ROOF SYSTEM.

- B. EPDM OR COMPRESSION MOLDED RUBBER; SUITABLE FOR TEMPERATURES FROM -60 DEG F TO 270 DEG F; RESISTANT TO OZONE AND UV LIGHT. FLASHING SHALL HAVE ALUMINUM OR GALVANIZED STEEL BASE FOR FLASHING OR ATTACHMENT TO ROOF (STYLE TO SUIT ROOF TYPE). PROVIDE STAINLESS STEEL CLAMP.
- C. 2.5 LB SHEET LEAD, EXTENDING AS A SLEEVE ALL AROUND VENT PIPE WITH BASE EXTENDED OUT MINIMUM 10 INCHES ALL AROUND; TOP COUNTER-FLASHING OVERLAP 2" AND TURNED DOWN INSIDE VENT PIPE.
6. INSTALLATION: PROVIDE ALL PIPING AS INDICATED AND AS REQUIRED TO ALLOW COMPLETE AND PROPER WASTE, DRAIN, AND VENT CONNECTIONS TO EACH FIXTURE AND EQUIPMENT ITEM REQUIRING CONNECTION. PROVIDE OFFSETS AS REQUIRED TO ACCOMMODATE BUILDING CONSTRUCTION AND ACCESS REQUIREMENTS PER SECTION 20 05 00. FOR MULTISTORY BUILDINGS INCLUDE COSTS TO OFFSET VERTICAL PIPING THROUGH EACH FLOOR LEVEL SINCE STRUCTURAL MEMBER LOCATIONS WILL NOT BE THE SAME ON EACH FLOOR. VERIFY POINTS OF CONNECTION, INVERT ELEVATIONS, AND GRADE REQUIREMENTS BEFORE BEGINNING INSTALLATION OR ORDERING MATERIALS. VENTS EXTENDING THROUGH ROOF SHALL TERMINATE AT LEAST 10 INCHES ABOVE ROOFING; AND NOT LESS THAN 10 FEET FROM AND 3 FEET ABOVE ANY BUILDING OPENING. PROVIDE VENT FLASHING AT EACH VENT THROUGH ROOF; UTILIZE WATER-PROOF METHOD AS REQUIRED TO BEST SUIT ROOFING MATERIAL AND ROOFING SYSTEM MANUFACTURER.
7. MISCELLANEOUS DRAINS: PROVIDE DRAIN PIPING FOR ALL DRIP PANS, UNIT CONDENSATE DRAINS, UNIT P-TRAPS, ETC. RUN PIPING TO NEAREST POINT OF DRAINAGE, OR AS SHOWN ON DRAWINGS. WHERE ROUTING IS NOT SHOWN, ROUTE TO NEAREST POINT OF PROPER DRAINAGE.
8. SLOPE: INSTALL ALL HORIZONTAL SOIL OR WASTE LINES WITH A SLOPE OF 1/4-INCH PER FOOT UNLESS NOTED OTHERWISE. COORDINATE WITH AHJ IF WRITTEN APPROVAL IS REQUIRED FOR EXCEPTIONS TO 1/4-INCH PER FOOT SLOPE.

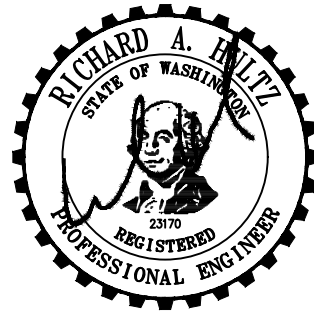
22 40 00 - PLUMBING FIXTURES

1. GENERAL:
- A. PROVIDE NEW FIXTURES AND FITTINGS, APPROVED, FREE FROM FLAWS AND BLEMISHES WITH FINISHED SURFACES CLEAR, SMOOTH AND BRIGHT. VISIBLE PARTS OF FIXTURE BRASS AND ACCESSORIES, AND ALL ITEMS LOCATED IN ACCESSIBLE CABINET SPACES, SHALL BE HEAVILY CHROME PLATED. ALL STOPS, P-TRAPS AND ITEMS EXPOSED TO VIEW SHALL BE CHROME PLATED (EXCEPT WHERE SPECIFICALLY NOTED OTHERWISE). ALL PRODUCTS AND CONNECTIONS SHALL BE IN COMPLIANCE WITH CODE, LOCAL UTILITIES DEPARTMENT STANDARDS, AND HEALTH DEPARTMENT REQUIREMENTS.
- B. TYPES: VERIFY SPECIFIED FIXTURE TYPES WITH THE ARCHITECTURAL AND PLUMBING DRAWINGS TO CONFIRM THE REQUIREMENTS ARE CONSISTENT (E.G. FIXTURES ARE WALL MOUNTED VERSUS FLOOR MOUNTED TYPE, LOCATIONS OF ADA FIXTURES MATCH, ETC.). WHERE CONFLICTS OCCUR CLEARLY IDENTIFY THE ISSUE ON THE FIXTURE SUBMITTAL ALONG WITH A PROPOSED RESOLUTION; OR RESOLVE PRIOR TO MAKING THE SUBMITTAL BY THE PROJECT RFI PROCESS.
- C. SPACE VERIFICATION: PRIOR TO ORDERING ANY FIXTURES OR MAKING SUBMITTALS, CONTRACTOR SHALL CHECK THE DRAWINGS AND VERIFY THAT ALL FIXTURES WILL FIT THE SPACE AVAILABLE (I.E. FIXTURES FIT ANY CABINETS FIXTURES ARE TO BE INSTALLED IN; FIXTURES HAVE ADEQUATE ACCESS CLEARANCES FOR PROPER USE; ETC.).
- D. LEAD-FREE REQUIREMENT: ALL ITEMS IN CONTACT WITH POTABLE WATER SHALL BE LEAD FREE. FIXTURES USED TO DISPENSE POTABLE WATER FOR DRINKING SHALL MEET THE REQUIREMENTS OF NSF/ANSI 61.
- E. ALL VITREOUS CHINA AND ENAMELED CAST IRON FIXTURES SHALL BE FINISHED WHITE UNLESS SPECIFICALLY NOTED OTHERWISE.
- F. ALL STAINLESS STEEL SINKS SHALL BE SOUND DEADENED, AND SHALL HAVE FAUCET LEDGE (EXCEPT WHERE NOTED SPECIFICALLY WITHOUT LEDGE).
- G. IN INTERESTS OF OWNER'S STANDARDIZATION, FIXTURES OF SIMILAR TYPE SHALL BE PRODUCT OF ONE MANUFACTURER; TRIM OF SIMILAR TYPE SHALL BE PRODUCT OF ONE MANUFACTURER.
2. CARRIERS: TYPE TO SUIT FIXTURE AND BUILDING CONSTRUCTION, WITH ADDED ANCHORS, BRACING, WALL BACKING AND ACCESSORIES TO COMPLY WITH MAXIMUM SPECIFIED FIXTURE MOVEMENT. CONCEALED IN WALL. PROVIDE WITH ALL HARDWARE AND ACCESSORIES FOR PROPER FIXTURE SUPPORT TO SUIT THE APPLICATION.
3. SPECIALTIES:
- A. GENERAL: UNLESS INDICATED OTHERWISE, THE FOLLOWING FITTINGS AND MATERIALS (I.E. SPECIALTIES) SHALL BE USED.
- B. FIXTURE TRAPS: 17 GAGE SEAMLESS CHROME PLATED CAST BRASS TUBING, WITH 2 INCH MINIMUM SEAL, AND CLEANOUT, SIZE AS REQUIRED BY UNIFORM PLUMBING CODE (UNLESS A LARGER SIZE IS INDICATED), AND CONFIGURED TO SUIT THE APPLICATION.
- C. EXPOSED PIPING AND FITTINGS: IN FINISHED AREAS AND IN ACCESSIBLE CABINETS, PROVIDE PIPING WITH CHROME PLATING OR SLEEVED WITH CHROMED SLEEVES OR OF STAINLESS STEEL CONSTRUCTION/FINISH; ALL CHROME TO HAVE A BRIGHT POLISHED FINISH. NO EXPOSED COPPER ALLOWED (INCLUDES ACCESSIBLE CABINET AREAS).
- D. STOPS: QUARTER TURN BALL VALVE WITH LOOSE KEY, SIZE AS REQUIRED.
- E. RISERS: FLEXIBLE BRAIDED STEEL TYPE; RATED FOR 125 PSIG.
- F. ESCUTCHEONS: CHROME PLATED, LOW PROFILE.
- G. REFRIGERATOR WALL BOX: 20 GAUGE HOT DIPPED GALVANIZED STEEL BOX WITH 18 GAUGE FACE PLATE, 1/2" INLET X 1/4" OUTLET COMPRESSION ANGLE VALVE. GUY GRAY MODEL BIM875.
- H. HOT WATER TEMPERATURE LIMITING VALVE: THERMOSTATIC WATER TEMPERATURE MIXING VALVE WITH INTEGRAL CHECKS, COMPLYING WITH ASSE 1070 AND UPC CHAPTER 4. BRASS BODY WITH BRASS AND STAINLESS STEEL INTERNAL COMPONENTS. LEONARD "ECO-MIX" 270 / SYMMONS "MAXLINE" MODEL 5-210.
4. INSTALLATION OF FIXTURES:
- A. GENERAL: ALL FIXTURES SHALL BE COMPLETELY CONNECTED TO PIPING AS NEEDED TO MAKE A COMPLETE AND OPERABLE INSTALLATION.
- B. FIXTURE LOCATIONS: MOUNTING HEIGHTS AND LOCATIONS OF FIXTURES SHALL BE AS SHOWN ON THE ARCHITECTURAL DRAWINGS AND IN ACCORDANCE WITH CONTRACT DOCUMENT REQUIREMENTS. LOCATIONS SHALL BE VERIFIED AND COORDINATED WITH THE VARIOUS TRADES AFFECTED BY THE INSTALLATION OF THESE FIXTURES. WHEN NO INDICATED OR SHOWN, OBTAIN MOUNTING LOCATION AND HEIGHTS FROM THE ARCHITECT/ENGINEER PRIOR TO INSTALLATION.

- C. ROUGH-IN: DETERMINE ROUGH-IN LOCATION OF FIXTURE UTILITIES TO SUIT FIXTURE LOCATION, FIXTURE DIMENSIONS, ELEMENTS OF CONSTRUCTION (I.E. BEAMS, STUDS, ELECTRICAL, DUCTS, ETC.), ACCESS REQUIREMENTS, CASEWORK DIMENSIONS, ITEMS WHICH MAY DRAIN/CONNECT TO FIXTURE, USE OF FIXTURE, AND RELATED CONSIDERATIONS. THE FIXTURE ROUGH-IN LOCATIONS INDICATED ON THE PLANS IS SCHEMATIC, AND IS NOT TO BE USED FOR FINAL ROUGH-IN PURPOSES.
- D. OFFSETS: PROVIDE OFFSETS IN PIPING TO FIXTURES TO ACCOMMODATE BUILDING SYSTEMS. SUCH OFFSETS SHALL INCLUDE OFF-SETTING WASTE PIPING INTO CABINET BASES (IN KICK SPACE WHERE POSSIBLE) TO ACCOMMODATE BEAMS LOCATED DIRECTLY BELOW WALLS BEHIND FIXTURES.
- E. CARRIERS: ALL OFF-THE-FLOOR (I.E. WALL) MOUNTED FIXTURES SHALL BE INSTALLED WITH SUPPORTING CARRIERS AND ADDITIONAL ANCHORS, BRACING AND SUPPORTS TO TRANSMIT FIXTURE LOADS TO THE FLOOR AND BUILDING STRUCTURE WITHOUT EXCEEDING THE MAXIMUM SPECIFIED FIXTURE MOVEMENT. PRIOR TO CONCEALING CARRIER AND ASSOCIATED SUPPORTS REVIEW ADEQUACY OF SUPPORT SYSTEM WITH ARCHITECT/ENGINEER.
- F. FIXTURE SEALANT: WHERE FIXTURES ABUT TO WALLS, FLOORS, AND CABINETS SEAL ALL JOINTS WITH A UNIFORM FILLET BEAD OF SEALANT. PROVIDE AT OTHER LOCATIONS AS RECOMMENDED BY FIXTURE MANUFACTURER.
- G. ESCUTCHEONS: PROVIDE ESCUTCHEONS AT EACH POINT WHERE AN EXPOSED PIPE OR OTHER FITTING PASSES THROUGH WALLS, FLOORS, BACKS OF CABINETS, OR CEILINGS.
- H. HOT WATER TEMPERATURE LIMITING VALVE: INSTALL ON ALL LAVATORIES, AND AS FIXTURES REQUIRED BY CODE.
- I. CLEANING: AFTER COMPLETION OF INSTALLATION REMOVE ALL LABELS AND THOROUGHLY CLEAN ALL FIXTURES, TRIM AND FITTINGS.



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SIGNED

1/29/2024

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**REVISIONS**

Rev#	Date	Description
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**INFO**

Sheet Date	Project Number	File Name	Plot Date
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**MECHANICAL SPECS**

02/01/2024 PERMIT SET

SHEET NO.

M0.06

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MECHANICAL SPECIFICATIONS

23 09 33 - ELECTRONIC CONTROLS FOR HVAC

1. DESIGN AND INSTALLATION: THE ENTIRE CONTROL SYSTEM SHALL BE DESIGNED AND INSTALLED BY SKILLED CONTROL SYSTEM DESIGNERS, ELECTRICIANS AND MECHANICS, ALL OF WHOM ARE PROPERLY TRAINED AND QUALIFIED FOR CONTROL SYSTEM DESIGN AND INSTALLATION.
2. CARBON MONOXIDE DETECTOR AND NITROGEN DIOXIDE DETECTOR: INDUSTRIAL QUALITY, CONTINUOUS AMBIENT AIR SENSING CARBON MONOXIDE AND NITROGEN DIOXIDE DETECTOR, ELECTROCHEMICAL TYPE, BRASCH GSE, BRASCH "ON GUARD", MICROPROCESSOR BASED UNIT WHICH CONTINUOUSLY DETECTS, MONITORS, AND DISPLAYS CONCENTRATIONS OF CARBON MONOXIDE AND NITROGEN DIOXIDE. UNIT SHALL PROVIDE A 4-20 mA OUTPUT IN DIRECT PROPORTION TO CO LEVEL SENSED. UNIT SHALL HAVE DRY CONTACT CLOSURE FOR EACH ALARM LEVEL. UNIT SHALL HAVE 120/1 POWER, ADJUSTABLE LOW AND HIGH ALERT LEVELS, WITH TIME DELAY BETWEEN. INITIAL CO SETTINGS TO BE 35 PPM, 100 PPM; NO2 SETTINGS TO BE 1PPM, 5PPM.
3. CONTROL DAMPERS: PARALLEL BLADE OR OPPOSED BLADE TYPE, AS SELECTED BY CONTRACTOR TO BEST SUIT APPLICATION (UNLESS A SPECIFIC TYPE IS INDICATED). CLASS 1A LEAKAGE RATED.
4. ACTUATORS: BRUSHLESS DC MOTOR TYPE CONTROLLED BY A MICROPROCESSOR WITH MANUAL POSITIONING MECHANISM AND CONTROL DIRECTION OF ROTATION SWITCH ACCESSIBLE ON ITS COVER, COMPATIBLE WITH CONTROL DEVICES USED WITH. ACTUATOR SHALL BE PROPORTIONAL OR TWO POSITION TYPE, AS REQUIRED FOR APPLICATION. ALL ACTUATORS SHALL SPRING RETURN UPON POWER INTERRUPTION.
5. ELECTRICAL:

- A. GENERAL: PROVIDE ALL ELECTRICAL WIRING AND DEVICES IN ACCORDANCE WITH APPLICABLE CODES AND DIVISION 26 REQUIREMENTS. IT SHALL BE THE RESPONSIBILITY OF THE CONTROL CONTRACTOR TO PROVIDE POWER FOR ALL CONTROL DEVICES REQUIRING POWER. COORDINATE WITH THE DIVISION 26 CONTRACTOR TO ARRANGE FOR NECESSARY POWER CIRCUITS. ALL CONTROL DEVICES SHALL OBTAIN POWER FROM CIRCUITS DEDICATED TO CONTROL POWER.
- B. WIRING AND CONDUIT: ALL WIRING SHALL BE INSTALLED IN CONDUIT AND IN ACCORDANCE WITH DIVISION 26 SPECIFICATIONS, EXCEPT THAT LOW VOLTAGE WIRING WITHIN CEILING PLENUM SPACES, MECHANICAL MEZZANINES, AND ATTICS MAY BE INSTALLED WITHOUT CONDUIT. WIRING IN WALLS SHALL BE IN CONDUIT, WIRING SHALL BE IN ACCORDANCE WITH MANUFACTURERS DIRECTIONS FOR CONTROL DEVICES, AND BE COLOR CODED.
- C. MOTOR STARTERS/RELAYS: SHALL BE BY DIVISION 26; EXCEPT FOR LOADS 1/2 HP AND LESS WHICH SHALL BE RELAYS, PROVIDED BY THIS SECTION.
6. MISCELLANEOUS WIRING: PROVIDE ALL NECESSARY CONTROL WIRING AND INTERLOCKS BETWEEN UNITS AND ACCESSORIES TO ALLOW FOR PROPER OPERATION.
7. CONTROL CABINET: WALL MOUNTED, NEMA CONSTRUCTION TYPE TO SUIT APPLICATION, MINIMUM 14 GAUGE SHEET METAL, HINGED FRONT DOOR WITH LATCH, SIZE AS REQUIRED TO HOUSE CONTROLS. ALL ELECTRICAL DEVICES, RELAYS, AND COMPONENTS SHALL BE INSTALLED IN CONTROL CABINETS.
8. CONDENSATE OVERFLOW SWITCH: OVERFLOW SWITCH TO DETECT HIGH CONDENSATE LEVEL TO STOP UNIT OPERATION AND INDICATE AN ALARM, LOW VOLTAGE, PVC OR ABS CONSTRUCTION, WITH SWITCH RATED FOR VOLTAGE/AMPERAGE USED WITH. STYLE TO BEST SUIT APPLICATION (I.E. IN DRAIN PAN TYPE, IN DRAIN LINE TYPE, OR TYPE THAT INSTALLS IN UNIT AUXILIARY DRAIN OUTLET); SELECTED BY CONTRACTOR SUBJECT TO ENGINEER REVIEW. LITTLE GIANT NOS. ACS-2, -3, -4, OR -5 (OR APPROVED EQUAL).
9. MISCELLANEOUS COMPONENTS/SENSORS/TRANSMITTERS/TRANSFORMERS: SHALL BE MANUFACTURER'S STANDARD, DESIGNED FOR APPLICATION IN COMMERCIAL BUILDING HVAC CONTROL SYSTEMS, COMPATIBLE WITH OTHER COMPONENTS SO AS TO PROVIDE SEQUENCE OF OPERATION SPECIFIED.

23 09 93 - HVAC SEQUENCE OF OPERATION

1. GENERAL: PROVIDE COMPLETE SYSTEM WITH SEQUENCES OF OPERATION AS SPECIFIED HEREIN. PROVIDE COMPLETE CONTROL SYSTEM SHOP DRAWINGS INDICATING ALL CONTROL DEVICES AND WIRING CONNECTIONS. ALL TEMPERATURE SETPOINTS AND TIME CONTROL SETTINGS SHALL BE ADJUSTABLE. VARIOUS THERMOSTATS ARE NOT SHOWN ON THE DRAWINGS BUT ARE REQUIRED PER THE SEQUENCE OF OPERATION SPECIFIED. COORDINATE WITH ENGINEER FOR LOCATION OF ALL SUCH THERMOSTATS PRIOR TO INSTALLING. SEE PLANS FOR UNITS WITH MOTORIZED DAMPERS IN THE DUCTS AND MISCELLANEOUS OTHER ITEMS REQUIRING CONTROL.
2. TIME CONTROL: CONTROL SYSTEM SHALL PROVIDE TIME SCHEDULE CONTROL (I.E. OCCUPIED/UNOCCUPIED/ WARM-UP MODES SWITCHING) FOR ALL HVAC AND EXHAUST EQUIPMENT. PROVIDE INDEPENDENT OCCUPIED/UNOCCUPIED SCHEDULES AND OPTIMUM START (I.E. WARM-UP) CYCLE FOR EACH HVAC UNIT (UNLESS NOTED OTHERWISE).
2. ELECTRIC WALL HEATERS:
- A. WALL HEATERS: SHALL BE CONTROLLED BY THEIR INTEGRAL THERMOSTAT, HEATER SHALL BE ON ONCE SPACE TEMPERATURE HAS FALLEN BELOW SETPOINT (INITIALLY SET AT 45 DEGREES F), AND SHALL BE OFF ONCE TEMPERATURE HAS RISEN 2 DEG F OR MORE ABOVE SETPOINT
6. DOMESTIC HW CIRCULATION PUMPS: PUMP SHALL BE ENABLED TO OPERATE BY TIME CLOCK SCHEDULE. WHEN ENABLED, PUMP SHALL BE CONTROLLED IN CONJUNCTION WITH A SENSOR IN THE HOT WATER RECIRCULATION LINE. WHEN HWC FALLS TO 5 DEGREES F BELOW SETPOINT, THE PUMP SHALL RUN; WHEN TEMPERATURE RETURNS TO SETPOINT, PUMP SHALL BE OFF. SETPOINT AND DIFFERENTIAL SHALL BE ADJUSTABLE. INITIAL SETPOINT SHALL BE 5 DEGREES LESS THAN DOMESTIC HOT WATER SETTING FOR SYSTEM USED ON.
7. DOAS HEAT RECOVERY UNITS/DUCT HEATERS:
- A. DOAS: INTERLOCK WITH VRF SYSTEM SO THAT DOAS IS IN THE OCCUPIED MODE WHEN ANY AREA OF THE VRF SYSTEM IS IN THE OCCUPIED MODE. IN THE OCCUPIED MODE DOAS FANS SHALL BE ON AND ANY OUTDOOR AIR (OA) OR EXHAUST AIR (EA) DAMPERS SHALL BE OPEN. IN THE UNOCCUPIED MODE, DOAS FANS SHALL BE OFF AND OA AND EA DAMPERS CLOSED.
- B. DUCT HEATER: HEATER SHALL BE CONTROLLED BY THE SUPPLY AIR (SA) TEMPERATURE SENSOR AND OA TEMPERATURE SENSOR. HEATER SHALL BE VARIED TO SATISFY THE SA SETPOINT (INITIALLY SET AT 70 DEG F). HEATER SHALL BE LOCKED OUT WHEN THE OA TEMPERATURE SENSOR RISES ABOVE THE "OA OFF" SET POINT (INITIALLY SET AT 65 DEG F).

8. MISCELLANEOUS CONTROLS:
- A. WATER HEATERS: SHALL BE CONTROLLED BY INTEGRAL THERMOSTAT PROVIDED WITH UNIT. SET FOR TEMPERATURE AS NOTED IN WATER HEATER SCHEDULE.
- B. AC UNIT: CONNECT THERMOSTAT (FURNISHED WITH UNIT) TO INDOOR SECTION, PROVIDE CONTROL INTERCONNECTIONS FROM INDOOR SECTION TO OUTDOOR SECTION. SET AND ADJUST FOR PROPER OPERATION.
- C. MISCELLANEOUS ITEMS: SEE PLANS FOR UNITS WITH MOTORIZED DAMPERS IN THE DUCTS AND MISCELLANEOUS OTHER ITEMS REQUIRING CONTROL.
- D. FIRE ALARM SYSTEM SHUTDOWN:
- 4) PROVIDE NECESSARY CONDUIT, WIRING, AND ACCESSORIES TO SHUTDOWN EACH UNIT UPON ACTIVATION OF THAT UNIT'S SMOKE DETECTORS (SMOKE DETECTORS ARE BY DIVISION 23 UNLESS SPECIFICALLY SHOWN ON THE ELECTRICAL PLANS AND DIVISION 26 SPECIFICATIONS). CONNECTIONS SHALL BE HARDWIRED, INDEPENDENT OF ANY CONTROL SYSTEM LOGIC, SO THAT FAILURE OF CONTROL SYSTEM OR LOSS OF CONTROL SYSTEM WILL IN NO WAY PREVENT THE FIRE ALARM SHUTDOWN OF THE SYSTEM. IN ADDITION TO SHUTTING DOWN THE UNIT WITH THE ALARMED SMOKE DETECTOR, ALL EQUIPMENT INTERLOCKED OR SERVED BY THAT UNIT SHALL BE OFF. OTHER UNITS SHALL ALSO SHUT-OFF AS REQUIRED TO AVOID BUILDING PRESSURE DIFFERENTIALS AND SIMILAR UNDESIRABLE EFFECTS. UPON RESET OF ALARMED DEVICE, SYSTEM SHALL AUTOMATICALLY RETURN TO NORMAL, PROVIDE TIME DELAY START OF EQUIPMENT TO PREVENT EXCESS LOAD STARTING AT THE SAME TIME.
- 5) IN ADDITION TO THE ABOVE SPECIFIED HARDWIRED FIRE ALARM SHUT-DOWN (WHICH PERTAINS TO EQUIPMENT WITH SMOKE DETECTORS), PROVIDE THE FOLLOWING: SHUT-DOWN ALL AIR HANDLING EQUIPMENT WHEN THE BUILDING FIRE ALARM SYSTEM GOES INTO ALARM. ZONE CONTACTS IN THE FIRE ALARM SYSTEM ARE AVAILABLE FOR THIS PURPOSE. THIS ADDED SHUT-DOWN MAY BE ACCOMPLISHED BY USE OF CONTROL LOGIC AND IS NOT REQUIRED TO BE HARDWIRED BUT SHALL BE OF A FAIL-SAFE NATURE SO AS TO PROVIDE THE NECESSARY SHUT-DOWN IN CASE OF CONTROL FAILURE. RESET SHALL BE SAME AS THAT SPECIFIED FOR HARD-WIRED UNIT SMOKE-DETECTOR SHUT-DOWN.

23 31 00 - DUCTWORK SYSTEMS

1. GENERAL: FABRICATE AND INSTALL DUCTWORK IN ACCORDANCE WITH SMACNA DUCT CONSTRUCTION STANDARDS, ASHRAE HANDBOOKS, AND CODE.
2. DUCT SIZES: ALL DUCT SIZES ARE INSIDE CLEAR DIMENSIONS. WHERE INSIDE DUCT LINING IS SHOWN, DUCT DIMENSIONS ARE TO THE INSIDE FACE OF LINING.
3. DUCT PRESSURE CLASS: CONSTRUCT TO NEXT HIGHER PRESSURE CLASS ACCORDING TO THE FAN STATIC PRESSURE WHICH SERVES THE DUCT SYSTEM (PLUS OR MINUS AS APPROPRIATE).
4. DUCTS: CONSTRUCT OF GALVANIZED SHEET STEEL, SUITABLE FOR LOCK FORMING WITHOUT FLAKING OR CRACKING, CONFORMING TO ASTM A653 AND A924, HAVING A ZINC COATING OF 0.90 OUNCES TOTAL PER SQUARE FOOT FOR BOTH SIDES OF A SHEET, CORRESPONDING TO COATING DESIGNATION G90. DUCT GAUGE, REINFORCEMENT, JOINTS, SEAMS AND CONNECTIONS SHALL BE AS SHOWN IN SMACNA HVAC DUCT CONSTRUCTION STANDARDS ACCORDING TO THE PRESSURE CLASS OF THE SYSTEM AND THE DUCT DIMENSIONS. SELECT HEAVIER GAUGE DUCT WITHOUT (OR WITH SMALLER) REINFORCEMENT TO SUIT SPACE AVAILABLE.
5. DUCT LINING:
- A. LINING MATERIAL: FLEXIBLE, INORGANIC GLASS FIBER MATERIAL, MAXIMUM THERMAL CONDUCTIVITY OF 0.26 BTU-INCH/HR-SQ.FT.-DEGREES F AT 75 DEGREES F, COATED TO PREVENT EROSION, AND CONFORMING TO SMACNA DUCT LINER APPLICATION STANDARD. LINING SHALL BE 1-INCH THICK (UNO). ADHESIVE, FASTENERS, AND INSTALLATION SHALL BE IN ACCORDANCE WITH SMACNA APPLICABLE STANDARDS.
- B. RECTANGULAR DUCTS: CONTRACTOR FABRICATED WITH INTERIOR DUCT LINING MATERIAL.
- C. ROUND/OVAL DUCTS: SHALL CONSIST OF 1-INCH (UNO) ACOUSTIC INSULATION IN-BETWEEN A PERFORATED INTERIOR DUCT LINER AND SOLID EXTERIOR DUCT, CONSTRUCTED TO MAINTAIN POSITIVE CONCENTRICITY OF LINER WITH DUCT. INSULATION SHALL HAVE A MAXIMUM THERMAL CONDUCTIVITY OF 0.28 BTU-INCH/HR-SQ. FT.-DEGREES F AT 75 DEGREES F. UNITED-MCGILL UNITED SHEET METAL "ACOUSTI-K27" OR APPROVED.
6. SPIN-IN FITTINGS: FACTORY FABRICATED OF GALVANIZED STEEL WITH DIE-FORMED MOUNTING GROOVE AND DAMPER WITH RAISED DAMPER QUADRANT WHERE DUCTS ARE TO BE INSULATED. COLLAR LENGTH FOR FLEXIBLE DUCT ATTACHMENT SHALL BE AT LEAST 2" LONG.
7. AIR-TIGHT TAKE-OFF FITTINGS (ATTO): FACTORY FABRICATED BRANCH DUCT CONNECTOR, OF GALVANIZED STEEL. FLANGE SHALL BE 1-1/2" WIDE WITH 1/8" SELF-ADHESIVE GASKET AND PRE-DRILLED FASTENER HOLES. COLLAR LENGTH FOR FLEXIBLE DUCT ATTACHMENT SHALL BE AT LEAST 2" LONG. WHERE USED ON ROUND DUCT MAINS, SHALL BE SADDLE TYPE APPROPRIATELY SIZED FOR MAIN DUCT DIAMETER.
8. MANUAL DAMPERS: SHALL BE FABRICATED OF GALVANIZED STEEL, TWO GAUGES HEAVIER THAN DUCT IN WHICH INSTALLED. REGULATOR SETS SHALL HAVE QUADRANT DIAL REGULATOR WITH LOCKING NUT, SQUARE END BEARING ONE SIDE, AND SPRING OR ROUND END BEARING OTHER SIDE.
9. DUCT ACCESS DOORS: DOUBLE WALL, MINIMUM 14 GAUGE, HINGED OR CAMLOCK ACCESS DOOR. DOORS IN INSULATED DUCT SHALL BE INSULATED TYPE.
10. DUCT INSTALLATION: INSTALL ALL DUCTWORK IN SIZES AND LOCATIONS AS SHOWN ON THE DRAWINGS AND AS BUILDING CONSTRUCTION ALLOWS. PROVIDE ALL ACCESSORIES AND CONNECTIONS TO PROVIDE COMPLETE AND OPERABLE HEATING, VENTILATING, AIR CONDITIONING, AND EXHAUST SYSTEMS. DUCT SHALL BE INSTALLED LEVEL AND IN NEAT LINES WITH THE BUILDING CONSTRUCTION. ALL DUCTS ARE TO BE INSTALLED CONCEALED UNLESS INDICATED OTHERWISE.
11. DUCT SEALING: SEAL ALL JOINTS IN ACCORDANCE WITH SEAL CLASSIFICATION AS SHOWN IN SMACNA HVAC DUCT CONSTRUCTION STANDARDS AND PER CODE.
12. FLEXIBLE DUCT: FACTORY INSULATED FULLY LINED FLEXIBLE DUCT: DUCT SHALL HAVE FULL INTERNAL LINER, REINFORCED WITH ZINC COATED STEEL HELIX, LINER BONDED TO 1-INCH THICK FIBERGLASS INSULATION, WITH MAXIMUM CONDUCTIVITY OF 0.26 BTU-INCH/HR-SQ.FT.-DEGREE F AT 75 DEGREES AND HAVING A POLYETHYLENE OUTER VAPOR BARRIER. PROVIDE ENDS WITH COMPRESSION CLAMPS FOR POSITIVE CONNECTION TO OVAL OR ROUND FITTINGS. SHALL COMPLY WITH NFPA 90A AND 90B AND SHALL BE UL LISTED AND LABELED AS A CLASS 1 CONNECTOR PER UL STANDARD 181. FLEXIBLE DUCT SHALL ONLY BE USED AT DIFFUSER CONNECTION, AND SHALL NOT EXCEED 2 FEET IN LENGTH, IN STRAIGHT RUNS ONLY (UNLESS SPECIFICALLY SHOWN OTHERWISE ON PLANS). DUCT PRESSURE RATING SHALL MATCH PRESSURE CLASS OF DUCT SYSTEM INSTALLED ON.

13. DRAIN PANS: GALVANIZED STEEL DRAIN PAN, FULLY WELDED TO BE WATERTIGHT WITH 3/4-INCH DRAIN CONNECTION. SIZE TO FULLY CAPTURE LEAKAGE OF ITEM SERVED.
2. INSTALLATION: PROVIDE FLEXIBLE CONNECTIONS IN DUCTWORK CONNECTIONS TO ALL FANS WHERE SHOWN ON DRAWINGS. INSTALL ALL FANS WITH VIBRATION ISOLATORS SO THAT NO EXCESSIVE VIBRATION IS TRANSMITTED TO THE STRUCTURE. PRIOR TO AIR BALANCING, CHECK FOR CORRECT ROTATION, TIGHTEN BELTS TO PROPER TENSION AND LUBRICATE BEARINGS PER MANUFACTURER'S RECOMMENDATIONS.

23 37 00 - AIR INLETS AND OUTLETS

1. GENERAL: STEEL OR ALUMINUM CONSTRUCTION, PROVIDE WITH FRAME FOR MOUNTING IN 2X2 T-BAR CEILING SYSTEM EXCEPT WHERE A DIFFERENT CEILING TYPE IS NOTED ON THE ARCHITECTURAL DRAWINGS (I.E. GWB IN RESTROOM, ETC.). PROVIDE WITH OPPOSED BLADE DAMPERS WHERE NOTED AND WHERE A DAMPER WOULD NOT BE ACCESSIBLE. GRILLES SHALL HAVE BAKED ON OFF-WHITE FACTORY FINISH.
2. INSTALLATION: INSTALL DIFFUSERS AS SHOWN ON DRAWING; PROVIDE WITH TRANSITION TO ALLOW FOR CONNECTION FROM DUCT TO DIFFUSER. FLEXIBLE DUCT MAY BE USED FOR CONNECTING FROM DUCT TO DIFFUSER.

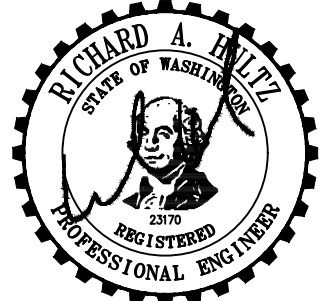
23 81 00 - HVAC EQUIPMENT

1. GENERAL:
- A. GENERAL REQUIREMENTS: UNITS SHALL BE UL LISTED AND LABELED. UNITS SHALL BE MANUFACTURERS STANDARD UNITS. UNITS COOLING AND HEATING PERFORMANCE SHALL BE RATED IN ACCORDANCE WITH ANSI/AHRI 210/240. UNIT EFFICIENCY SHALL COMPLY WITH CODE (AND EXCEED CODE AS INDICATED). UNITS SHALL BE FOR USE WITH POWER OF VOLTAGE AND PHASE AS SCHEDULED ON THE DRAWINGS; COORDINATE REQUIREMENTS AND CONFIRM VOLTAGES WITH ELECTRICAL CONTRACTOR PRIOR TO ORDERING EQUIPMENT.
- B. FACTORY ASSEMBLED: UNITS SHALL BE FULLY FACTORY ASSEMBLED AND SHALL BE COMPLETE WITH CASING, COILS, FANS, COMPRESSOR(S), WIRING, CONTROLS, AND ALL OTHER ACCESSORIES REQUIRED TO BE READY FOR FIELD CONNECTIONS OF CONDENSATE DRAINS, DUCTWORK, POWER AND CONTROLS.
- C. CAPACITY: UNITS SHALL HAVE MINIMUM CAPACITIES AS SCHEDULED ON THE DRAWINGS AT THE CONDITIONS SHOWN; RATED IN ACCORDANCE WITH AHRI STANDARDS.
- D. EXTENDED WARRANTIES: UNIT COMPRESSORS SHALL BE WARRANTED BY THE MANUFACTURER FOR FIVE YEARS. ALL LABOR AND MATERIALS ASSOCIATED WITH COMPRESSOR REPLACEMENT (OR REPAIR) SHALL BE WARRANTED.
2. VRF SYSTEM - OUTDOOR UNIT:
- A. GENERAL: VRF AIR-TO-AIR HEAT PUMP, OUTDOOR SECTION, FOR SERVING MULTIPLE INDOOR UNITS. UNIT SHALL BE CAPABLE OF OPERATING IN THE COOLING MODE FROM 30 TO 125 DEGREES F AMBIENT, AND IN HEATING MODE FROM 0 TO 65 DEGREES F AMBIENT.
- B. REFRIGERANT CIRCUIT: COMPRESSOR(S) SHALL BE HIGH PERFORMANCE, INVERTER DRIVEN, MODULATING CAPACITY SCROLL TYPE WITH INTERNAL OVERCURRENT PROTECTION AND THERMAL OVERLOAD PROTECTION, HIGH PRESSURE SAFETY SWITCH, AND CRANKCASE HEATERS. UNITS SHALL BE FOR USE WITH REFRIGERANT R-410A AND SHALL BE FULLY CHARGED AT THE FACTORY FOR THE PIPING AND INDOOR UNITS USED WITH. UNIT SHALL INCLUDE AN ACCUMULATOR WITH REFRIGERANT LEVEL SENSORS AND CONTROLS.
- C. FAN: SHALL BE DIRECT DRIVE, VARIABLE SPEED PROPELLER TYPE WITH A RAISED GUARD TO PREVENT CONTACT WITH MOVING PARTS. FAN MOTOR SHALL HAVE PERMANENTLY LUBRICATED BEARINGS AND INHERENT OVERCURRENT PROTECTION.
- D. ELECTRICAL AND CONTROLS: UNITS SHALL BE FOR USE WITH POWER OF VOLTAGE AND PHASE AS SCHEDULED ON THE DRAWINGS. SHALL HAVE OVER-CURRENT PROTECTION AND DC BUS PROTECTION AND SHALL INCLUDE ALL CONTROLS FOR UNITS COMPONENTS, INTERCONNECTION TO OTHER SYSTEM COMPONENTS FOR AUTOMATIC OPERATION, SAFETIES TO PREVENT UNSAFE OPERATION, TO ACCOMMODATE SYSTEM DEFROST, AND TO ALLOW FOR 8 STAGES OF OPERATION. UNIT CONTROLS SHALL BE 24 VOLT.
- E. SOUND: UNIT SHALL HAVE A SOUND RATING NOT HIGHER THAN 60 DB(A) INDIVIDUALLY, AND 64 DB(A) WHERE TWINNED. IN "NIGHT MODE" UNIT SHALL HAVE A SOUND RATING NOT HIGHER THAN 50 DB(A) INDIVIDUALLY, AND 53 DB(A) WHERE TWINNED.
3. VRF SYSTEM - INDOOR UNITS - CEILING CASSETTE:
- A. GENERAL: INDOOR VRF HEAT PUMP FOR OVERHEAD SUSPENDED INSTALLATION IN A CEILING (OR AT CEILING HEIGHT). UNIT SHALL BE COMPLETE WITH FAN, FOUR-WAY DISCHARGE OUTLET, EVAPORATOR COIL, REFRIGERANT METERING DEVICE, HEAVY GAUGE STEEL CHASSIS, REFRIGERANT PIPING CONTROLS, CONDENSATE PAN, DRAIN CONNECTION, AND RELATED ACCESSORIES TO OPERATE PROPERLY WITH VRF SYSTEM.
- B. UNIT CASING: FABRICATED OF GALVANIZED STEEL, WITH SUPPORT PROVISIONS FOR HANGING FROM BUILDING STRUCTURE. UNIT SHALL HAVE BOTTOM DISCHARGE GRILLE, ADJUSTABLE FOR TWO, THREE, OR FOUR-WAY DISCHARGE. GRILLE VANE ANGLES SHALL BE ADJUSTABLE VIA ROOM WALL THERMOSTAT. EXPOSED PORTION OF UNIT SHALL HAVE FINISHED PAINT, MANUFACTURE'S STANDARD COLOR.
- C. REFRIGERANT CIRCUIT: SHALL BE FULLY FACTORY PIPED AND SHALL INCLUDE AN ELECTRONIC LINEAR THERMOSTATIC EXPANSION DEVICE TO ALLOW FOR BOTH HEATING AND COOLING OPERATION. UNITS SHALL BE FACTORY CHARGED WITH DEHYDRATED AIR (OR AN INERT GAS).
- D. FAN: DIRECT DRIVE, MULTI-SPEED TYPE, STATICALLY AND DYNAMICALLY BALANCED, WITH PERMANENTLY LUBRICATED MOTOR, MANUALLY ADJUSTABLE GUIDE VANES FOR SIDE TO SIDE DISCHARGE, AND A MOTORIZED DISCHARGE LOUVER DIRECTING AIR UP AND DOWN AUTOMATICALLY. FAN SPEED SHALL BE ADJUSTABLE VIA ROOM WALL THERMOSTAT TO A SET LEVEL, OR BE ABLE TO BE SET TO VARY ACCORDING TO HEATING OR COOLING DEMAND.
- E. FILTER: UNIT SHALL HAVE AN INTEGRAL WASHABLE FILTER, EASILY REMOVABLE.
- F. ELECTRICAL AND CONTROLS: UNIT SHALL BE FOR USE WITH POWER OF VOLTAGE AND PHASE AS SCHEDULED ON THE DRAWINGS. UNIT SHALL INCLUDE ALL CONTROLS FOR UNIT'S COMPONENTS, INTERCONNECTION TO OTHER SYSTEM COMPONENTS, AND TO PROVIDE THE SPECIFIED SEQUENCE OF AUTOMATIC OPERATION. UNIT SHALL INCLUDE CONTROLS PROVIDING SELF-DIAGNOSTIC CHECKS, AUTO RESTART (ON POWER OUTAGE OR LOSS OF CONTROL COMMUNICATION), TEST RUN SWITCH, AUXILIARY CONTACTS FOR CONTROL OF AN EXTERNAL HEAT SOURCE, FOUR DIGITAL INPUTS FOR CUSTOM CONTROL APPLICATIONS, AND THREE DIGITAL OUTPUTS FOR CUSTOM CONTROL APPLICATIONS.

- G. CONDENSATE PUMP: PROVIDE UNIT WITH CONDENSATE PUMP. WHERE NOT AVAILABLE INTERNAL TO UNIT, OR WHERE INTERNAL PUMP DOESN'T MEET THE PUMPING CAPACITY REQUIRED, PROVIDE EXTERNAL TYPE, WITH CONTROLS, AND GPM CAPACITY TO SUIT UNIT MAXIMUM CONDENSATE RATE, AT 10 FEET OF HEAD. PROVIDE MOUNTING ASSEMBLY, ACCESSORIES FOR COMPLETE CONNECTIONS, AND AN ARCHITECTURAL COVER TO MATCH THE FINISH OF THE UNIT TO MINIMIZE VISIBILITY.
4. VRF SYSTEM CONTROLS:
- A. GENERAL: SYSTEM SHALL COME WITH VRF MANUFACTURER'S CONTROLS TO CONTROL ALL SPACE INDOOR UNITS, HEAT RECOVERY UNIT, AND OUTDOOR UNIT, AS A UNIFIED SYSTEM. SYSTEM SHALL PROVIDE THE SEQUENCE OF OPERATION SPECIFIED.
- B. ROOM THERMOSTATS: SHALL PROVIDE SPACE TEMPERATURE CONTROL FOR INDOOR UNITS, COMPLETELY INDEPENDENT OF OTHER INDOOR UNITS. THERMOSTATS SHALL INCLUDE: OCCUPANT SETPOINT ADJUSTMENT OF PLUS OR MINUS 3 DEG F, ROOM TEMPERATURE DISPLAY, ROOM SETPOINT DISPLAY, FAN SPEED ADJUST, INDOOR UNIT DIAGNOSTICS, AND DISCHARGE VANE/LOUVER ADJUST (WHERE APPLICABLE).
5. MASTER CONTROLLER:
- A. GENERAL: SHALL PROVIDE TIME SCHEDULE, WARM-UP, OPTIMUM START, NIGHT SETBACK AND OTHER CONTROL FUNCTIONS FOR THE SYSTEM AND TO SERVE AS THE USERS INTERFACE FOR SYSTEM PROGRAMMING AND SETUP. SHALL BE WALL MOUNTED, WITH VISUAL DISPLAY OF ALL SETTINGS, AND SYSTEM DIAGNOSTICS.
- B. SCHEDULING:
- a. TIME SCHEDULES: THE CONTROL SYSTEM SHALL PROVIDE TIME CLOCK SCHEDULE WITH AT LEAST 20 TIME SCHEDULES. EACH SCHEDULE TO BE 8-DAY TYPE, 6 ENTRIES PER DAY. ALL ENTRIES TO BE IN 12 HOUR AM/PM FORMAT. THE COMPLETE SCHEDULE SHALL BE DISPLAYED AT ONE TIME ON THE OPERATOR WORKSTATION FOR EASY EDITING. EACH TIME PROGRAM SHALL BE ABLE TO INCLUDE ON/OFF, HIGH/LOW SPEED OR DUTY CYCLE COMMANDS, OR ANALOG CONTROL VALUES AS APPLICABLE FOR THE APPLICATION. EQUIPMENT MAY BE ASSIGNED TO NAMED SCHEDULES, WITH MASTER REVISIONS TO THE SCHEDULE REVISING ALL ASSIGNED EQUIPMENT.
- b. HOLIDAY SCHEDULES: A MINIMUM OF 24 HOLIDAY TIME SCHEDULES SHALL BE AVAILABLE AND SHALL BE ASSIGNED TO ANY NUMBER OF AVAILABLE POINTS.
- c. HOLIDAY SCHEDULE SHALL DISPLAY ENTIRE YEAR AND SHALL ALSO ALLOW FOR AN INTERVAL HOLIDAY TIME, PROGRAM SHOWING HOLIDAY START DATE TO END DATE (EXAMPLE: DECEMBER 24 TO JANUARY 2).
- C. WARM-UP MODE: CONTROL SYSTEM SHALL HAVE WARM-UP MODE PRIOR TO OCCUPIED MODE ON HEATING TO PRE-WARM BUILDING PRIOR TO OCCUPANCY. TIME OF BEGINNING WARM-UP CYCLE SHALL BE DETERMINED BY AN OPTIMUM START/STOP PROGRAM.
- D. OPTIMUM START/STOP: CONTROL SYSTEM SHALL HAVE OPTIMUM START/STOP PROGRAM TO REDUCE RUN TIME OF HVAC EQUIPMENT. OPTIMUM START/STOP PROGRAM SHALL CONSIDER BUILDING MASS, BUILDING TEMPERATURES, OUTDOOR AIR TEMPERATURES, AND OTHER SYSTEM FACTORS IN DETERMINING TIME OF SYSTEM START-UP OR SHUT-DOWN. PROGRAM SHALL RECORD PREVIOUS WARM-UP TIMES VERSUS ACTUAL WARM-UP TIMES AND SHALL ADJUST THE PROGRAM ALGORITHM SO THAT PROGRAM CALCULATED WARM-UP TIME CORRESPONDS TO ACTUAL.



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MECHANICAL SPECIFICATIONS

4. VRF SYSTEM - INDOOR UNITS - AHU:

- A. GENERAL: SUSPENDED INDOOR VRF HEAT PUMP, DUCTED, FAN COIL. UNIT SHALL BE COMPLETE WITH FAN, MOTOR, EVAPORATOR COIL, REFRIGERANT METERING DEVICE, HEAVY GAUGE STEEL CHASSIS, REFRIGERANT PIPING CONTROLS, CONDENSATE PAN, DRAIN CONNECTION, AND RELATED ACCESSORIES TO OPERATE PROPERLY WITH VRF SYSTEM.

B. UNIT CASING: FABRICATED OF GALVANIZED STEEL, WITH PROVISIONS FOR HANGING FROM ABOVE. PROVIDE WITH ACCESS DOORS FOR SIDE ACCESS.

C. REFRIGERANT CIRCUIT: SHALL BE FULLY FACTORY PIPED AND SHALL INCLUDE AN ELECTRONIC LINEAR THERMOSTATIC EXPANSION DEVICE TO ALLOW FOR BOTH HEATING AND COOLING OPERATION. UNITS SHALL BE FACTORY CHARGED WITH DEHYDRATED AIR (OR AN INERT GAS).

D. FAN: DIRECT DRIVE, MULTI-SPEED TYPE, STATICALLY AND DYNAMICALLY BALANCED, WITH PERMANENTLY LUBRICATED MOTOR. AIR SPEED SHALL BE ADJUSTABLE VIA ROOM WALL THERMOSTAT TO A SET LEVEL, OR SET TO VARY ACCORDING TO HEATING OR COOLING DEMAND.

E. ELECTRICAL AND CONTROLS: UNIT SHALL BE FOR USE WITH POWER OF VOLTAGE AND PHASE AS SCHEDULED ON THE DRAWINGS. UNIT SHALL INCLUDE ALL CONTROLS FOR UNIT'S COMPONENTS, INTERCONNECTION TO OTHER SYSTEM COMPONENTS, AND TO PROVIDE THE SPECIFIED SEQUENCE OF AUTOMATIC OPERATION. UNIT SHALL INCLUDE CONTROLS PROVIDING SELF-DIAGNOSTIC CHECKS, AUTO RESTART (ON POWER OUTAGE OR LOSS OF CONTROL COMMUNICATION), TEST RUN SWITCH, AUXILIARY CONTACTS FOR CONTROL OF AN EXTERNAL HEAT SOURCE, FOUR DIGITAL INPUTS FOR CUSTOM CONTROL APPLICATIONS, AND THREE DIGITAL OUTPUTS FOR CUSTOM CONTROL APPLICATIONS.

F. CONDENSATE PUMP: PROVIDE UNIT WITH CONDENSATE PUMP. WHERE NOT AVAILABLE INTERNAL TO UNIT, OR WHERE INTERNAL PUMP DOESN'T MEET THE PUMPING CAPACITY REQUIRED, PROVIDE EXTERNAL TYPE, WITH CONTROLS, AND GPM CAPACITY TO SUIT UNIT MAXIMUM CONDENSATE RATE, AT 10 FEET OF HEAD, PROVIDE MOUNTING ASSEMBLY, ACCESSORIES FOR COMPLETE CONNECTIONS, AND AN ARCHITECTURAL COVER TO MATCH THE FINISH OF THE UNIT TO MINIMIZE VISIBILITY.

E. VRF HEAT PUMPS - SEQUENCE OF OPERATION

1) GENERAL: VRF CONTROLS SHALL PROVIDE TIME SCHEDULE CONTROL AND HEATING/COOLING/FAN OPERATION OF INDOOR UNITS, WITH BC AND OUTDOOR UNITS AUTOMATICALLY OPERATING IN RESPONSE TO SYSTEM LOADS AND NEEDS USING THEIR INTEGRAL CONTROLS.

2) OCCUPIED MODE:

a. FAN: INDOOR FAN SHALL RUN CONTINUOUSLY WHEN HEATING OR COOLING IS REQUIRED; FAN SHALL CYCLE TO LOW SPEED (OR AS AN OPTION CYCLE OFF) WHEN NO HEATING OR COOLING IS REQUIRED.

b. HEATING: INDOOR HEAT PUMP SECTION SHALL OPERATE IN HEATING AS REQUIRED TO SATISFY THE SPACE SETPOINT. AIRFLOW SHALL VARY FROM MINIMUM TO MAXIMUM DEPENDING ON LOAD, AND SHALL BE PROGRAMMABLE TO REMAIN AT A FIXED VALUE INSTEAD OF VARYING

c. COOLING: INDOOR HEAT PUMP SECTION SHALL OPERATE IN THE COOLING MODE AS REQUIRED TO SATISFY THE SPACE SETPOINT. AIRFLOW SHALL VARY FROM MINIMUM TO MAXIMUM DEPENDING ON LOAD, AND SHALL BE PROGRAMMABLE TO REMAIN AT A FIXED VALUE INSTEAD OF VARYING.

3) UNOCCUPIED MODE: INDOOR FAN AND INDOOR HEAT PUMP HEATING/COOLING SHALL CYCLE ON AND OFF AS REQUIRED TO MAINTAIN UNOCCUPIED SETPOINTS.

4) MODE CONTROL: UNITS' MODE OF OPERATION SHALL BE DETERMINED BY TIME SCHEDULE AND TIME SCHEDULE OVERRIDE; WARM-UP MODE SHALL BE INITIATED BY OPTIMUM START CONTROLS.

6. REFRIGERANT PIPING

- A. PIPING AND FITTINGS: RATED FOR SYSTEM PRESSURES PER VRF SYSTEM MANUFACTURER. HARD DRAWN ACR COPPER TUBING PER ASTM B280, TYPE L, WITH SILVER BRAZED JOINTS AND WROUGHT COPPER FITTINGS PER ASME B16.22. USE ONLY LONG RADIUS ELBOWS, FLARED FITTINGS (AT EQUIPMENT CONNECTIONS ONLY) SHALL COMPLY WITH ASME B16.26. SOFT COPPER TUBING MAY ONLY BE USED ON RUNS LESS THAN 50-FEET OR WHERE NECESSARY (I.E. WHEN ROUTING THROUGH SLEEVES, OR SIMILAR POOR ACCESS AREAS) AND WHERE ACCEPTABLE TO VRF SYSTEM MANUFACTURER.

B. ISOLATION VALVES: BRASS BALL VALVE, FULL PORT, RATED FOR SYSTEM PRESSURES AND TEMPERATURES, BUT NO LESS THAN 700 PSIG AND -40 DEG F TO 300 DEG F. COMPATIBLE WITH REFRIGERANT USED WITH, UL LISTED, WITH RUPTURE PROOF ENCAPSULATED STEM, EXTENDED COPPER CONNECTIONS FOR EASE IN BRAZING. PROVIDE IN CONFIGURATION (I.E. ANGLE, STRAIGHT, WITH ACCESS PORT) AS REQUIRED TO SUIT APPLICATION.
7. REFRIGERANT PIPING: HARD DRAWN ACR COPPER TUBING PER ASTM B280, TYPE L, WITH SILVER BRAZED JOINTS AND WROUGHT COPPER FITTINGS PER ASME B16.22. USE ONLY LONG RADIUS ELBOWS. FLARED FITTINGS (AT EQUIPMENT CONNECTIONS ONLY) SHALL COMPLY WITH ASME B16.26. SOFT COPPER TUBING MAY ONLY BE USED ON RUNS LESS THAN 50-FEET OR WHERE NECESSARY (I.E. WHEN ROUTING THROUGH SLEEVES, OR SIMILAR POOR ACCESS AREAS).
8. CONDENSATE PUMP: AUTOMATIC CONDENSATE PUMP WITH INTEGRAL TANK. PUMP SHALL BE RATED TO PUMP MINIMUM OF 1.4 GALLONS PER HOUR PER TON OF UNIT COOLING CAPACITY SERVED AT 15 FEET OF HEAD AND TANK SHALL BE 1/2 GALLON CAPACITY (UNLESS INDICATED OTHERWISE). TANK BODY AND PUMP SHALL BE CONSTRUCTED OF OIL RESISTANT POLYPROPYLENE OR ABS, WITH DISCHARGE CHECK VALVE, AND FLOAT FOR PUMP ON/OFF CONTROL, FACTORY WIRED. PROVIDE WITH OVERFLOW SAFETY SWITCH FOR WIRING TO LOW VOLTAGE CONTROLS TO STOP HVAC UNIT ON HIGH CONDENSATE (OR TO INDICATE AN ALARM). LITTLE GIANT VCMA, VCMX OR VCL SERIES (OR APPROVED).
9. CONDENSATE SAFETY SWITCH: CODE COMPLIANT SAFETY SWITCH FOR STOPPING UNIT OPERATION AT HIGH CONDENSATE LEVEL. PVC OR POLYMER BODY, WITH CORROSION RESISTANT MECHANICAL FLOAT OR REED SWITCH, NORMALLY CLOSED CONTACTS, MINIMUM 2.5 AMP CAPACITY AT 24 VAC, AND 6 FEET 18 GAUGE WIRE LEADS LITTLE GIANT ACS-5 (OR APPROVED EQUAL).
10. INSTALLATION:
- A. GENERAL: INSTALL ALL EQUIPMENT AT LOCATIONS AND AS SHOWN ON THE DRAWINGS AND SO AS TO ALLOW MAXIMUM ACCESS TO UNITS. PRIOR TO SELECTING UNIT FINAL LOCATION, CONFIRM THAT: PROPER UNIT CLEARANCES AND ACCESS WILL BE PROVIDED; NO ADVERSE AIRFLOW CONDITIONS ARE PRESENT; CONFIRM LOCATION AND INSTALLATION DETAILS WITH OTHER TRADES.

UNITS SHALL BE LEVEL AND ALIGNED WITH BUILDING WALLS. SET OUTDOOR UNIT ON CONCRETE PAD.

- B. REFRIGERANT PIPING: SHALL BE SILVER BRAZED. BLEED DRY NITROGEN THROUGH PIPING DURING BRAZING TO MINIMIZE OXIDATION. KEEP ALL OPEN ENDS OF PIPING CAPPED WHEN NOT BEING WORKED. PIPING SHALL BE ROUTED CONCEALED, EXCEPT WHERE ROUTED OUTDOORS AND WHERE NOTED. PIPING SHALL BE RAN PLUMB AND SQUARE TO BUILDING WALLS, AND IN A NEAT PROFESSIONAL MANNER.

C. REFRIGERANT CHARGE: UNITS SHALL BE CHECKED FOR PROPER REFRIGERANT CHARGE AND OIL LEVEL AND CHARGED TO PROPER LEVELS AFTER ALL LEAK TESTING AND EVACUATION WORK HAS BEEN COMPLETED.
11. LEAK TESTING AND EVACUATION: DISCONNECT AND ISOLATE FROM THE SYSTEM ANY CONTROLS, RELIEF VALVES, OR OTHER COMPONENTS THAT MAY BE DAMAGED BY THE TEST PRESSURE. PROVIDE 1 PRESSURE TEST, AND SYSTEM EVACUATION PER STANDARD PROFESSIONAL REFRIGERATION PRACTICE. LET VACUUM STAND FOR A MINIMUM OF 24 HOURS BEFORE CHARGING SYSTEM.
12. START-UP: PROVIDE START-UP IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. CHECK UNIT FOR PROPER OPERATION IN RESPONSE TO THERMOSTAT SETTINGS INCLUDING: PROPER FAN ROTATION, NO EXCESSIVE VIBRATION, NO UNUSUAL NOISES, PROPER UNIT CYCLING IN RESPONSE TO ROOM TEMPERATURE, NO EXCESSIVE ROOM TEMPERATURE SWINGS, NO SAFETIES OR ELECTRICAL DEVICES TRIPPING OUT. SUBMIT WRITTEN REPORT DETAILING ALL START-UP PROCEDURES AND FINDINGS.

23 82.40 - ELECTRIC HEATERS

1. DUCT HEATERS:
- A. TYPE: OPEN COIL TYPE ELECTRIC DUCT HEATERS; UL LISTED FOR ZERO CLEARANCE TO COMBUSTIBLES, HEATING COILS SHALL BE MADE OF 80% NICKEL AND 20% CHROMIUM COILED RESISTANCE WIRE, SUPPORTED IN AN ALUMINIZED STEEL FRAME AND INSULATED BY FLOATING CERAMIC BUSHINGS.

B. ACCESSORIES: PROVIDE WITH THE FOLLOWING SAFETIES & ACCESSORIES:

1) PRIMARY AND SECONDARY OVER-TEMPERATURE SAFETY DEVICES.

2) FUSES SHALL FOR OVERCURRENT PROTECTION; FUSE CAPACITIES SHALL BE RATED FOR AT LEAST 125% OF THE CIRCUIT AMPERAGE.

3) DIFFERENTIAL AIR PRESSURE DEVICE AND SENSING TUBE (OR SAIL FLOW SWITCH), INTERLOCKED WITH THE HEATER TO PREVENT HEATER OPERATION IN CASE OF INSUFFICIENT AIRFLOW.

4) BUILT-IN POWER DISCONNECT SWITCH WITH TERMINAL DOOR INTERLOCK.

5) 24 VOLT CONTROL TRANSFORMER WITH FUSING.

6) SOLID STATE PROPORTIONAL POWER CONTROLLER (SCR) ALLOWING MODULATION OF HEATER CAPACITY FROM 0 TO 100% OF FULL CAPACITY.
2. WALL ELECTRIC HEATERS
- A. TYPE: FAN FORCED COMMERCIAL DUTY WALL MOUNTED ELECTRIC HEATER. HEATING COILS SHALL BE MADE OF 80% NICKEL AND 20% CHROMIUM RESISTANCE WIRE ENCLOSED IN A STEEL SHEATH WITH BRAZED STEEL PLATE FINS. ELEMENT SHALL COVER THE ENTIRE DISCHARGE AREA TO PROVIDE UNIFORM HEATING OF ALL DISCHARGE AIR.

B. CONSTRUCTION: UNIT BACK BOX SHALL BE CONSTRUCTED OF MINIMUM 20 GAUGE GALVANIZED STEEL, WITH INNER FRAME ASSEMBLY AND HEAVY GAUGE STEEL LOUVERED FRONT COVER. INNER FRAME ASSEMBLY SHALL BE A HEAVY GAUGE STEEL PANEL UPON WHICH ARE UPON WHICH ARE MOUNTED ALL HEATER OPERATIONAL PARTS, FACTORY PRE-WIRED. UNIT BACK BOX SHALL CONTAIN KNOCK OUTS THROUGH WHICH FIELD WIRING LEADS CAN ENTER. ALL EXPOSED PORTIONS OF UNIT SHALL HAVE BAKED-ON ENAMEL (OR POWDER COAT) WHITE FINISH.

C. FAN AND MOTOR: FAN SHALL BE LOW PROFILE MULTI-BLADE PROPELLER TYPE, DIRECT CONNECTED TO MOTOR. MOTOR SHALL BE TOTALLY ENCLOSED, IMPEDANCE PROTECTED, PERMANENTLY LUBRICATED TYPE.

D. ELECTRICAL AND CONTROLS: FAN SHALL BE CONTROLLED BY BI-METALLIC, SNAP-ACTION CONTROLLER, WHICH SHALL START FAN ONCE ELEMENT IS UP TO TEMPERATURE AND STOP FAN AFTER ALL HEAT HAS BEEN DISSIPATED. OVER TEMPERATURE PROTECTION SHALL BE BY A BI-METALLIC, SNAP-ACTION, AUTOMATIC RESET TYPE TO SHUT OFF HEATER IN THE EVENT OF OVERHEATING. PROVIDE WITH ELECTRICAL DISCONNECT PER NEC REQUIREMENTS.



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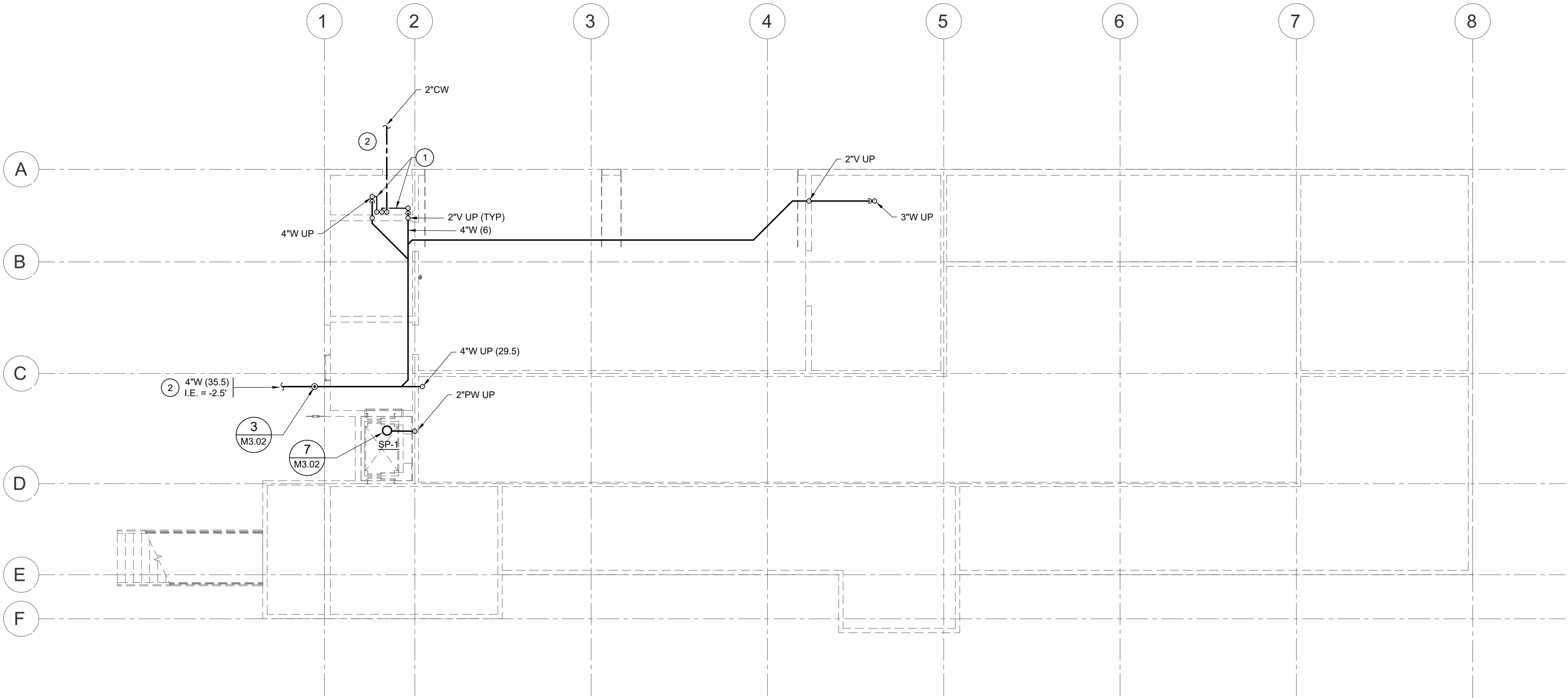
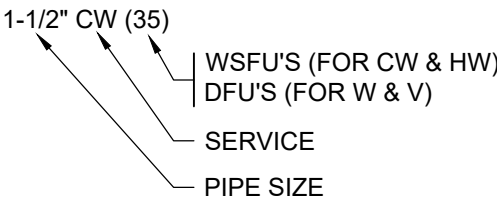
GENERAL NOTES:

1. SEE GENERAL NOTES SHEET M0.01.

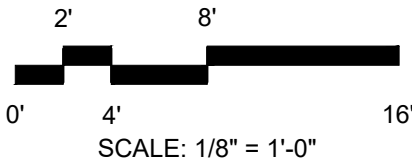
KEYED NOTES:

- 1 1/2" CW TRAP PRIMER LINE TO FLOOR DRAIN.  
SEE DETAIL 5/M3.02.
- 2 CONNECT TO SITE PIPING. COORDINATE & VERIFY  
SIZE/LOCATION W/ SITE CONTRACTOR.  
REFERENCE CIVIL DRAWINGS.

PIPE SIZING LEGEND:



1 FOUNDATION PLAN - PLUMBING  
1/8" = 1'-0"

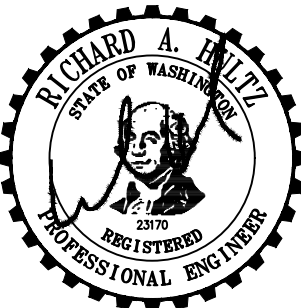


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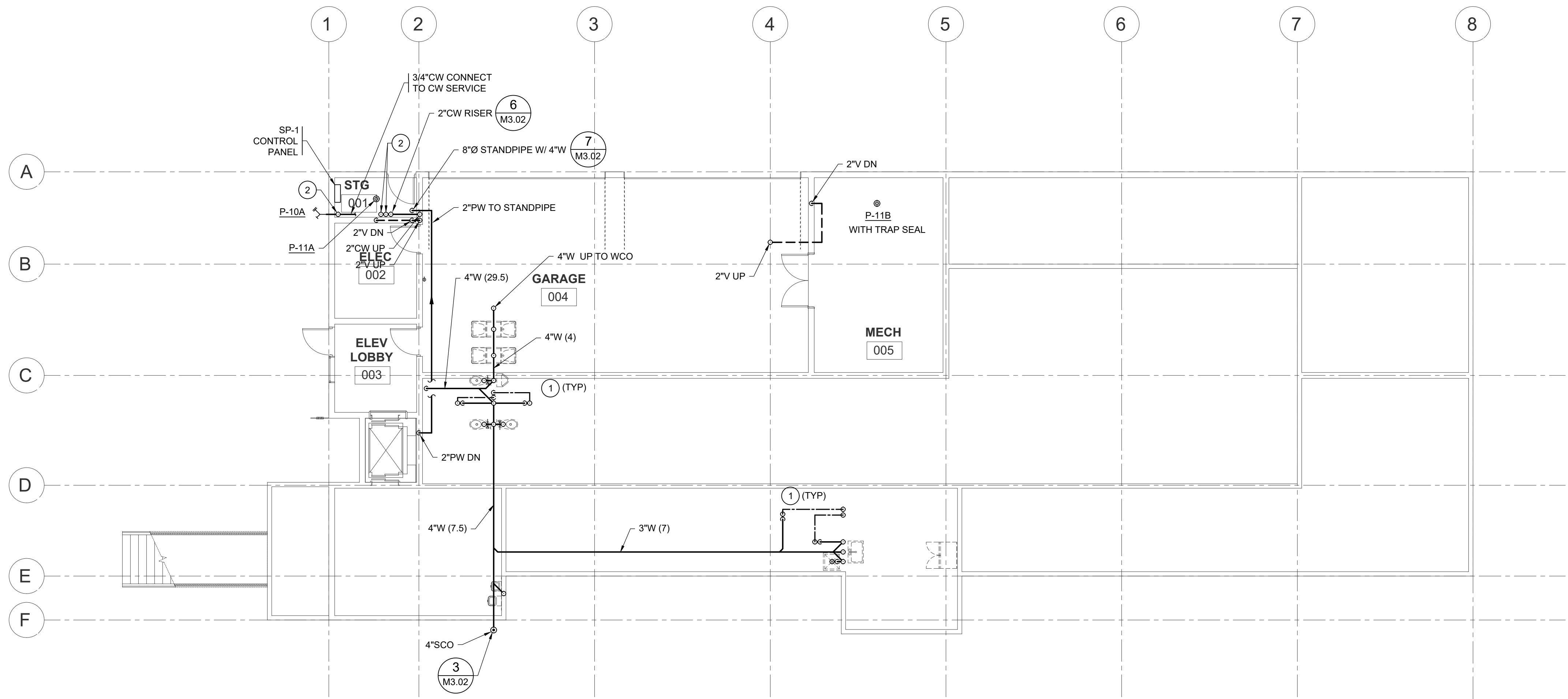
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FOUNDATION PLAN - PLUMBING

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M2.01



1 BASEMENT FLOOR PLAN - PLUMBING  
1/8" = 1'-0"



#### GENERAL NOTES:

- SEE GENERAL NOTES SHEET M0.01.

#### KEYED NOTES:

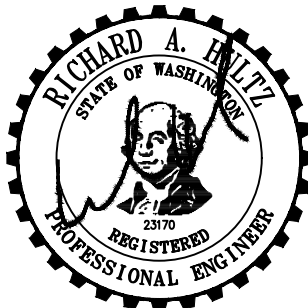
- 1/2" CW TRAP PRIMER LINE TO FLOOR DRAIN. SEE DETAIL 5/M3.02.
- PROVIDE VALVE IN VERTICAL
- 3/4" CW TO TRAP PRIMER VALVE.

#### PIPE SIZING LEGEND:

- 1-1/2" CW (35)
- WSFU'S (FOR CW & HW)
- DFU'S (FOR W & V)
- SERVICE
- PIPE SIZE



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BASEMENT FLOOR PLAN - PLUMBING  
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FIRST FLOOR PLAN - PLUMBING

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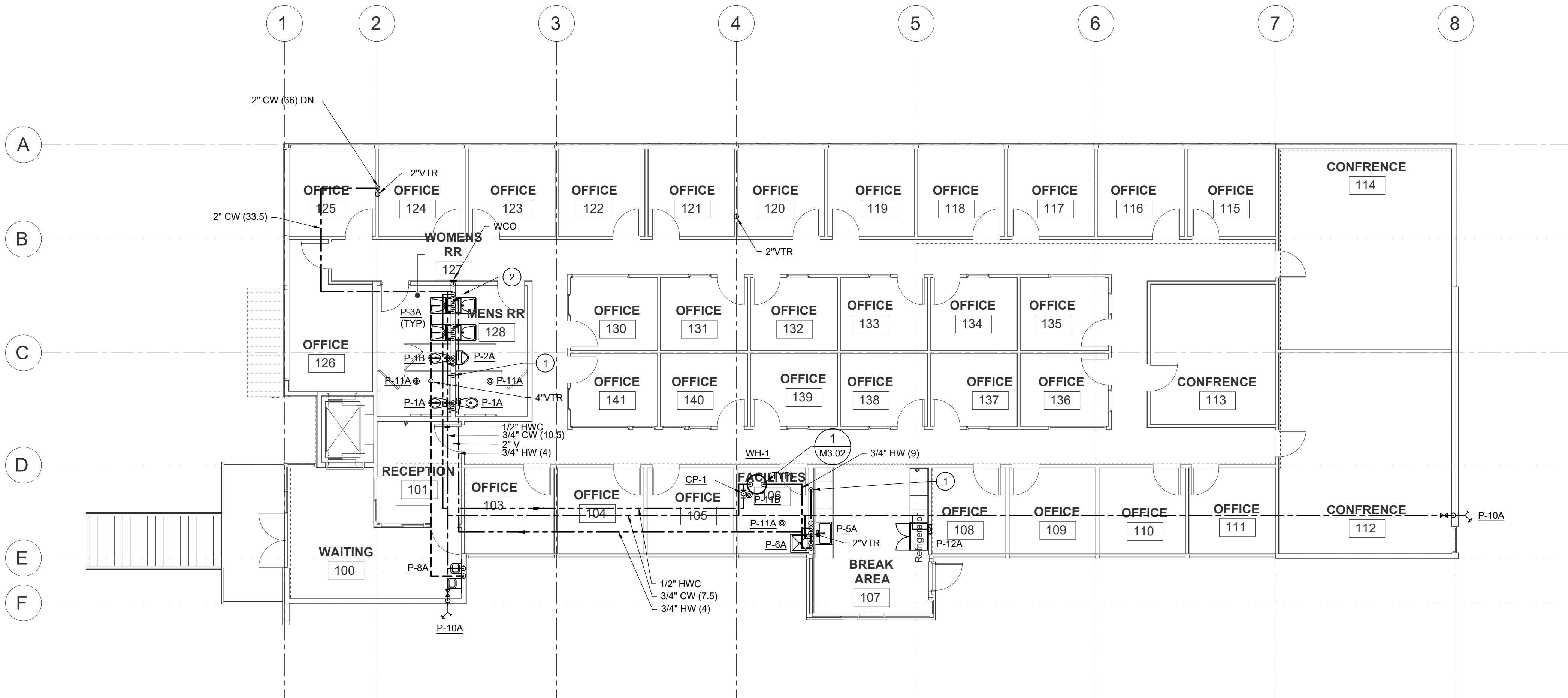
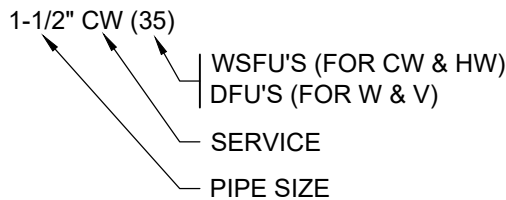
**GENERAL NOTES:**

- SEE GENERAL NOTES SHEET M0.01.
- PROVIDE CLEANOUTS IN WASTE PIPING AT ALL SINKS, URINALS, AND AS REQUIRED BY CODE.

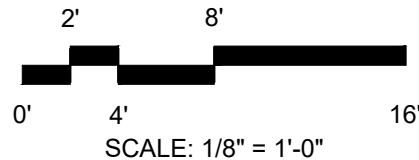
**KEYED NOTES:**

- 1/2" CW TRAP PRIMER LINE TO FLOOR DRAIN.
- LOOP HW DN IN WALL TO WITHIN 6" OF STOP VALVE AT LAVATORIES.

**PIPE SIZING LEGEND:**

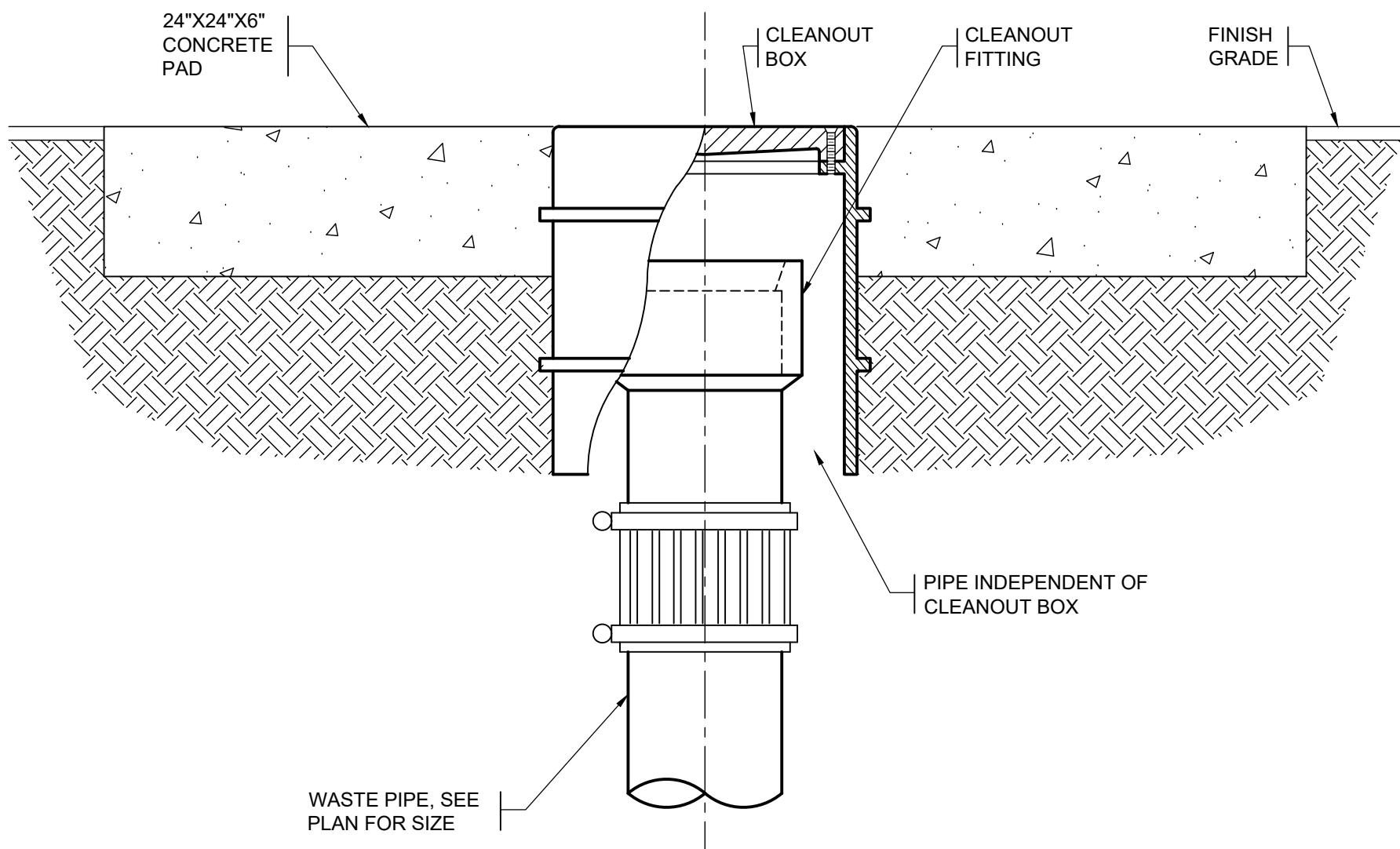


**1 FIRST FLOOR PLAN - PLUMBING**  
1/8" = 1'-0"



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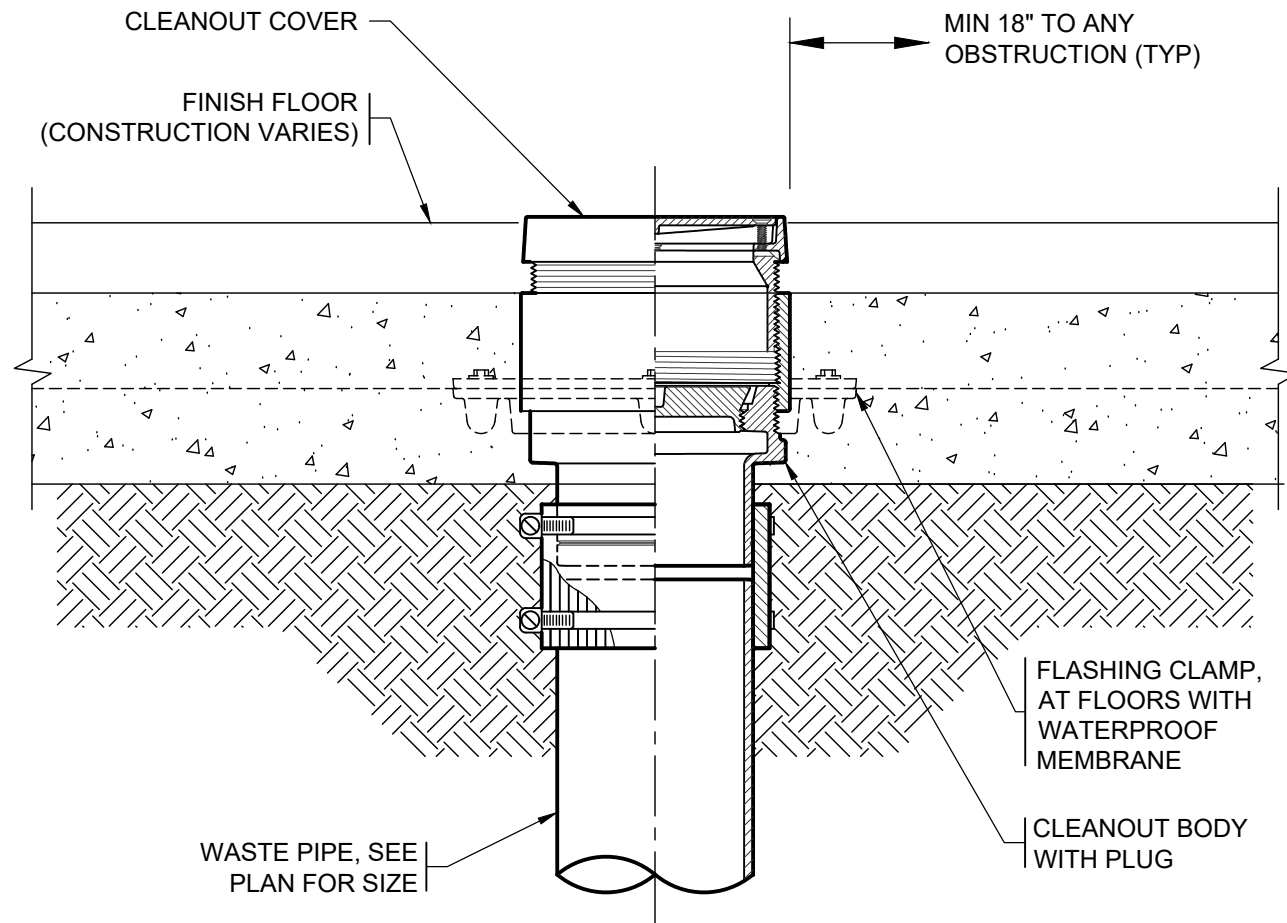


**SURFACE CLEANOUT DETAIL**

NTS

**3**

M3.02

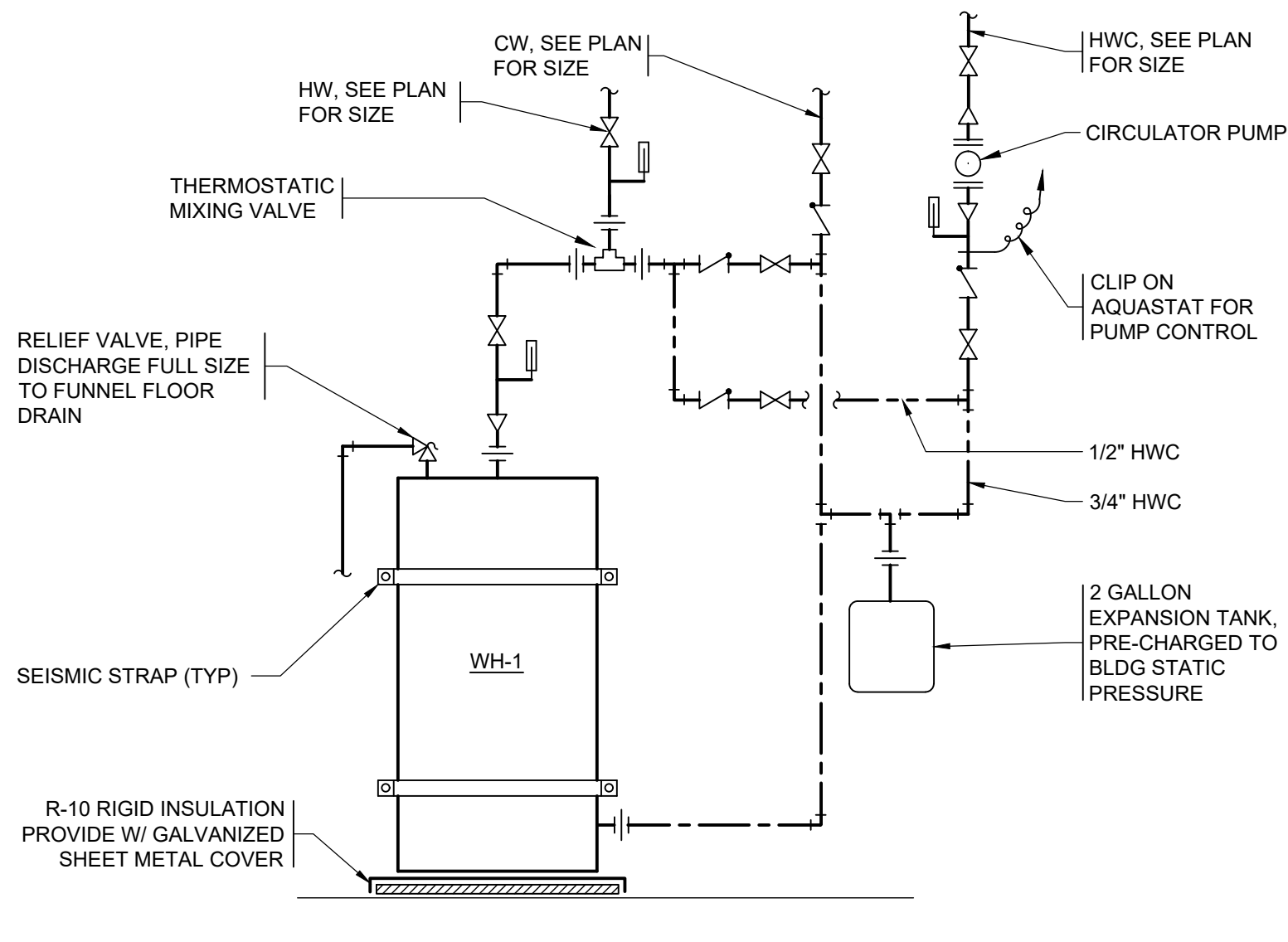


**FLOOR CLEANOUT DETAIL**

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**2**

M3.02

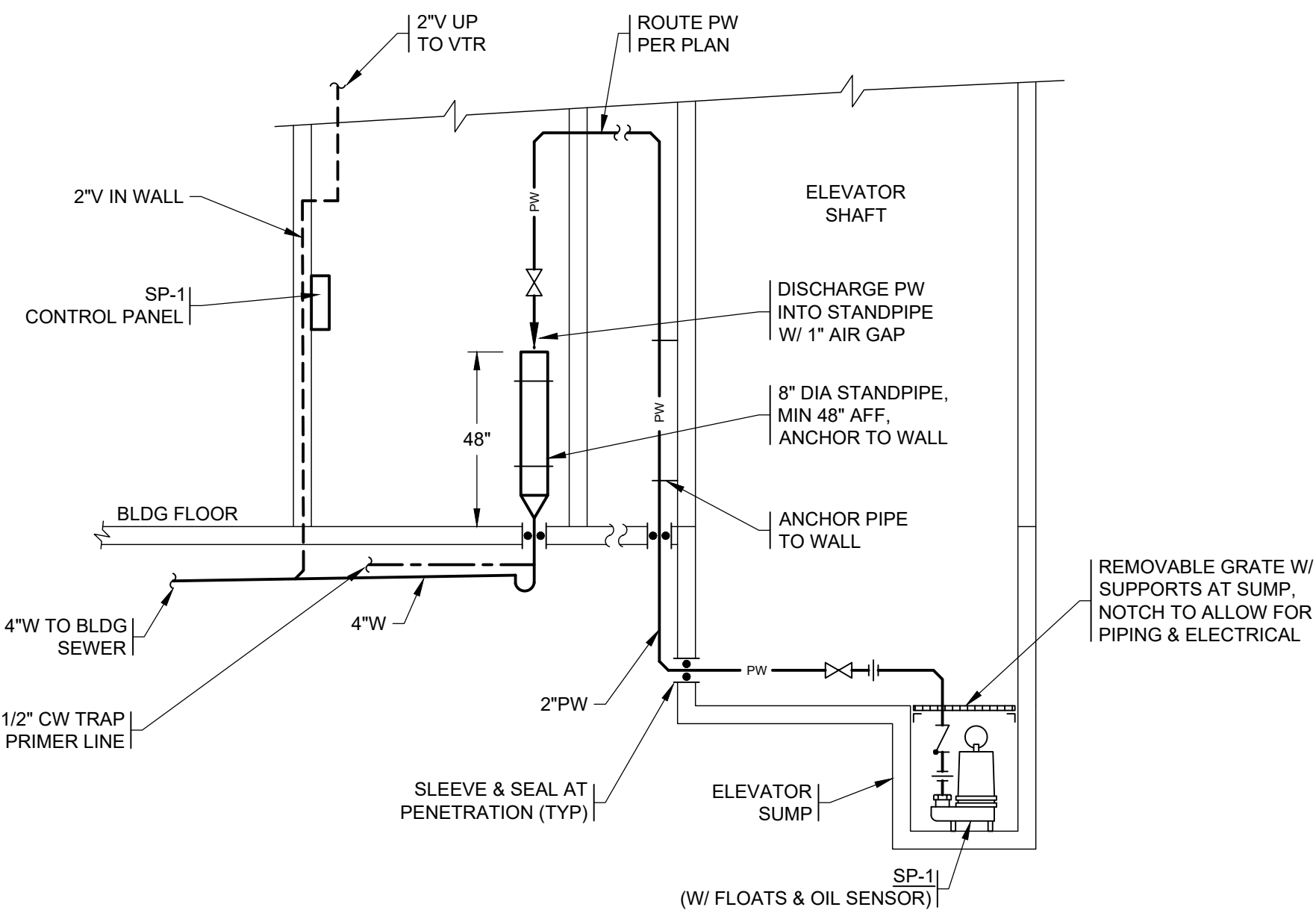


**WATER HEATER DETAIL**

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**1**

M3.02



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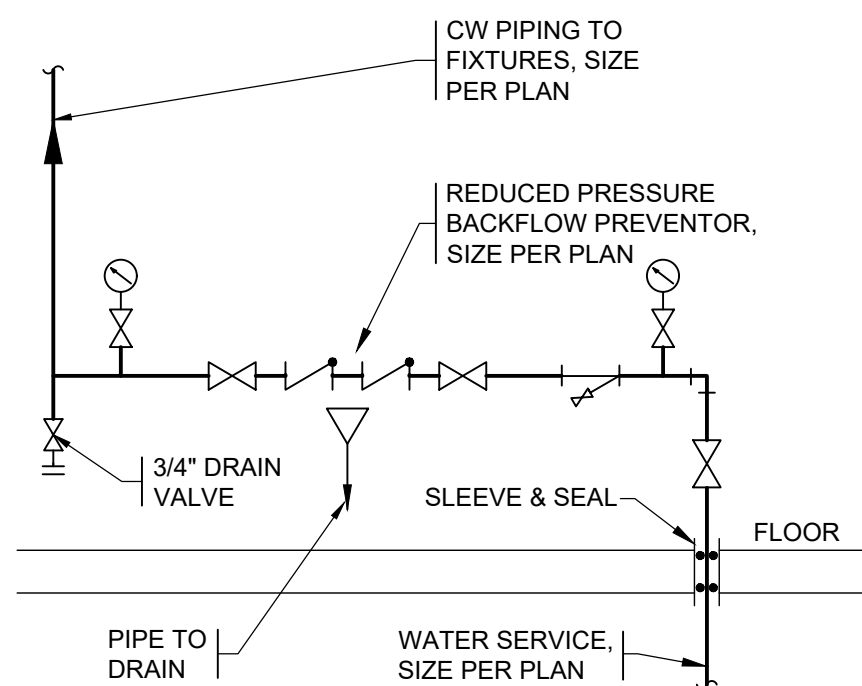
- COORDINATE LOCATION OF PIPING & SUMP IN ELEVATOR SHAFT W/ ELEVATOR SUPPLIER.
- PUMP POWER & OIL SENSOR CONTROLS ARE FED FROM THE PUMP CONTROL PANEL. WIRING IS BY DIV 26.
- SEE PLANS FOR LOCATIONS OF COMPONENTS, THIS IS SCHEMATIC.

**ELEVATOR SUMP PUMP**

NTS

**7**

M3.02

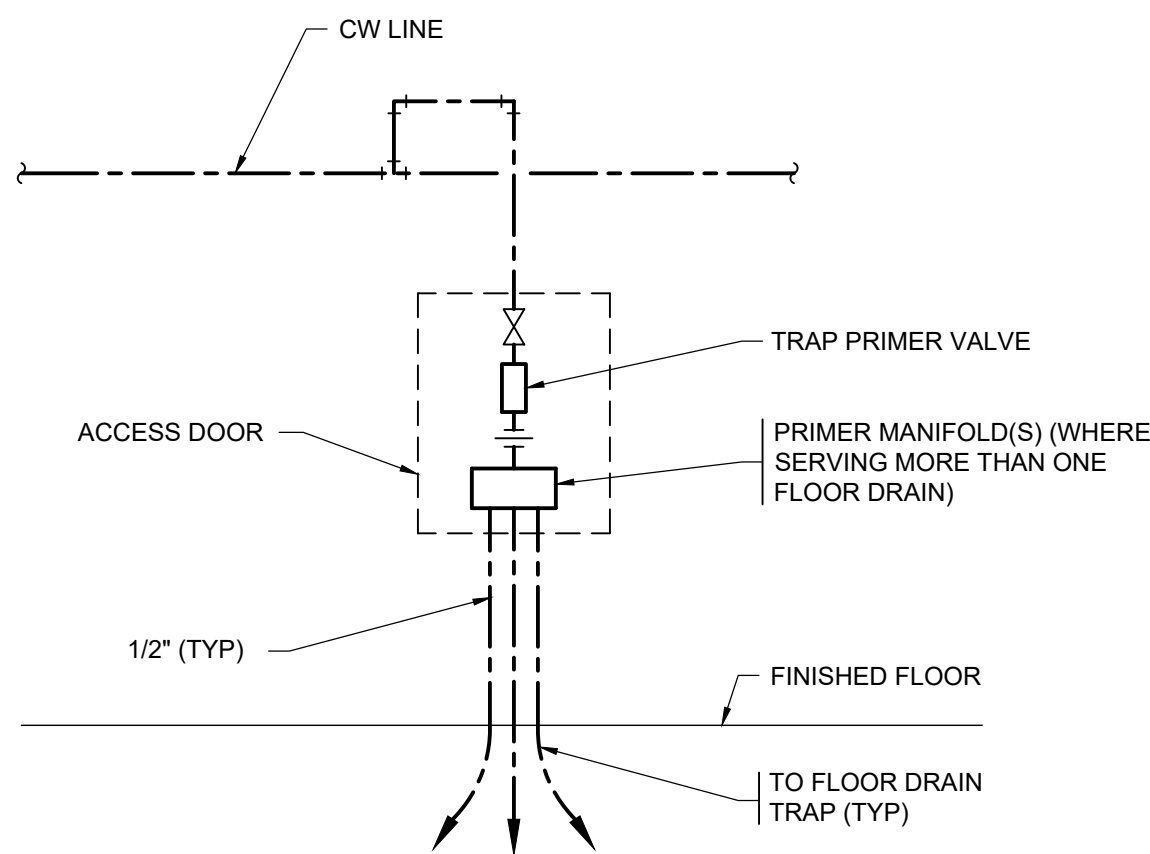


**CW RISER**

NTS

**6**

M3.02

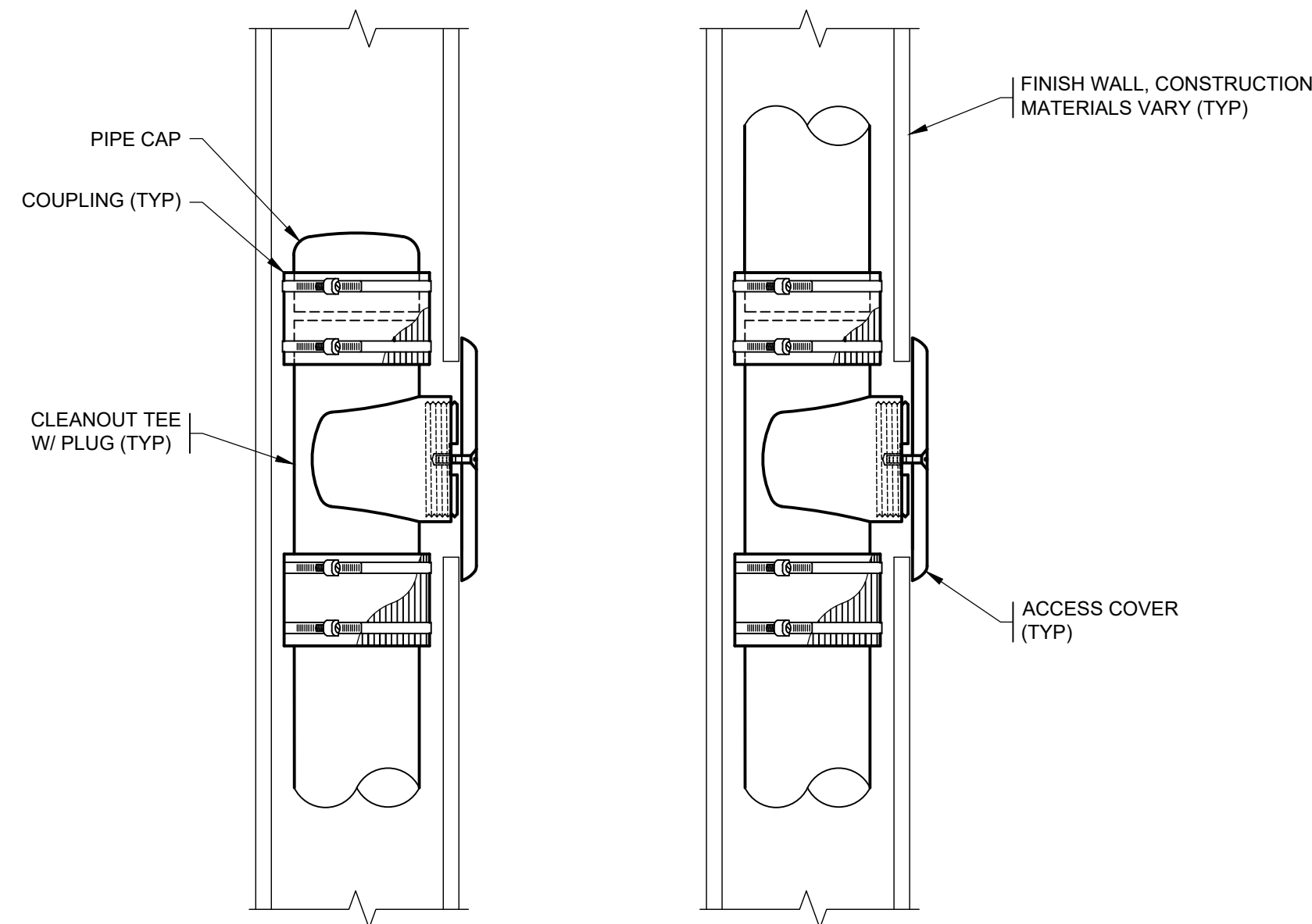


**TRAP PRIMER DETAIL**

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**5**

M3.02



**WALL CLEANOUT-IN WALL**

NTS

**4**

M3.02

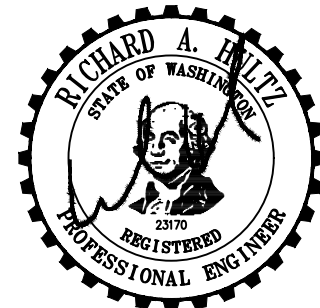
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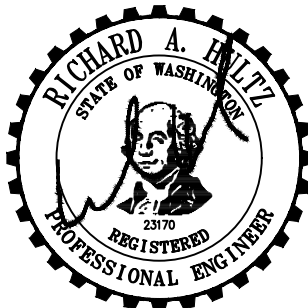


GENERAL NOTES:

- SEE GENERAL NOTES SHEET M0.01.
- COORDINATE ROUTING OF DUCT W/ PLUMBING AND OTHER TRADES.



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INFO

Sheet

Date

Project Number

File Name

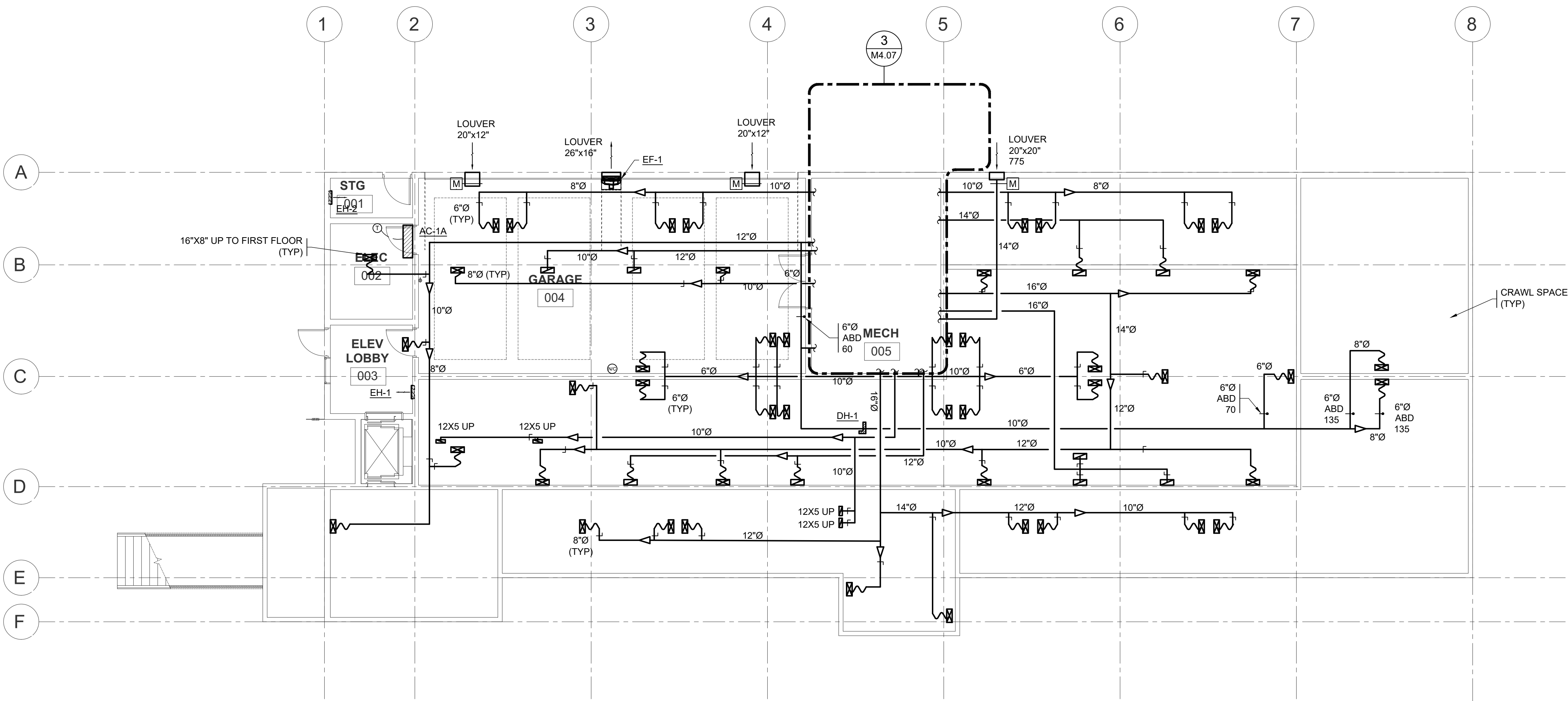
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BASEMENT FLOOR PLAN - HVAC

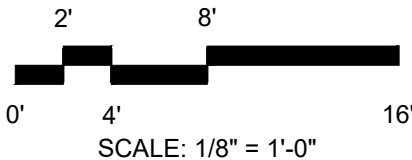
02/01/2024 PERMIT SET

SHEET NO.

M4.00

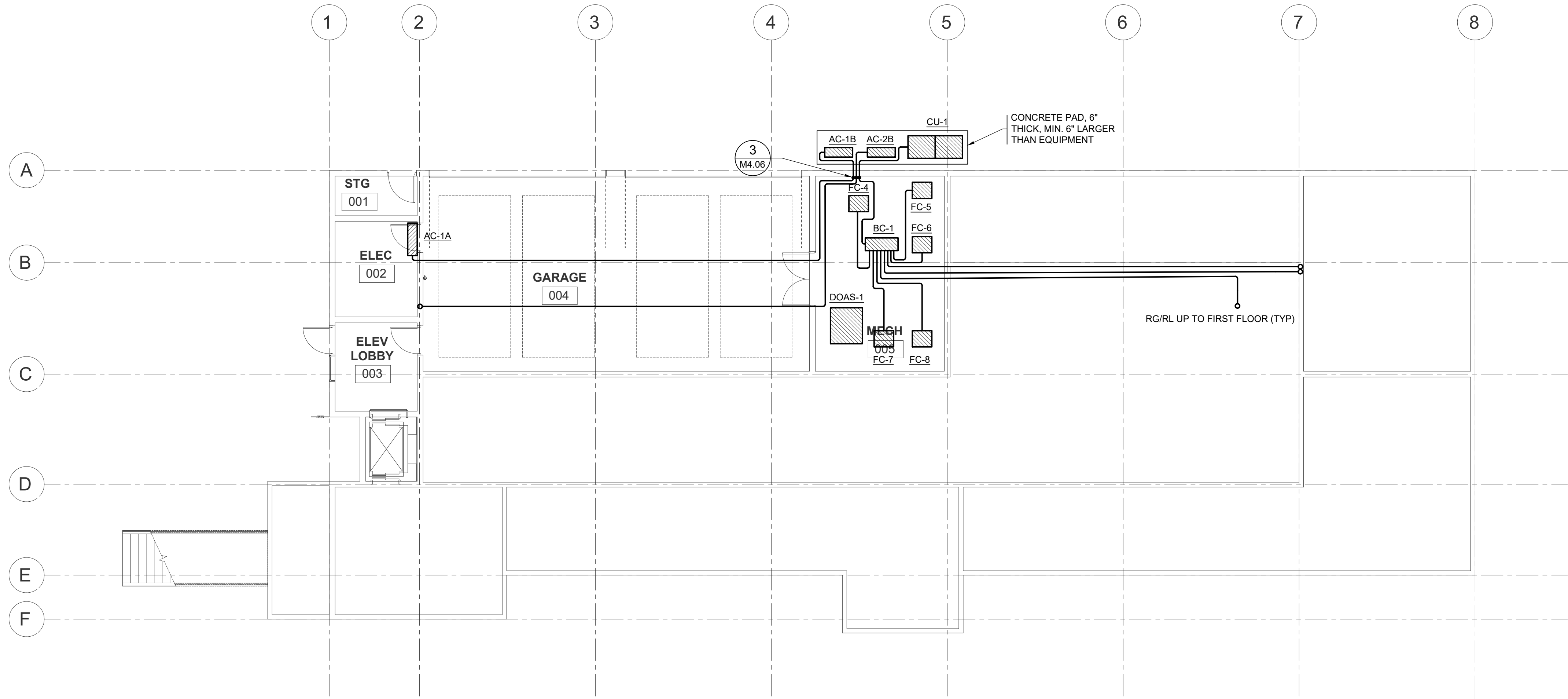


**1 BASEMENT FLOOR PLAN - HVAC**  
1/8" = 1'-0"



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engineers inc  
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Phone: (253) 383-3257 Fax: (253) 383-3283  
general@hultzbhu.com Job Number: 23-170





1 BASEMENT FLOOR PLAN - HVAC PIPING  
1/8" = 1'-0"

NORTH

0' 2' 4' 8' 16'  
SCALE: 1/8" = 1'-0"

GENERAL NOTES:

- SEE GENERAL NOTES SHEET M0.01.
- ROUTE MIN. 3/4" CONDENSATE DRAIN LINE TO NEAREST INDIRECT DRAIN.



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1/29/2024

PROJECT

CONSEJO COUNSELING & REFERRAL SERVICES  
**CONSEJO GRAHAM OFFICES**  
2120 MERIDIAN AVE E, GRAHAM, WA

REVISIONS

Description

Rev#

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Date  
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BASEMENT FLOOR PLAN - HVAC

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M4.01

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general@hultzbhu.com Job Number: 23-170



GENERAL NOTES:

1. SEE GENERAL NOTES SHEET M0.01.

LEGEND:

- 16x8 FSG  
16x8 FRG, UNO  
14x8 WTG SEE DETAIL 5 / M4.06



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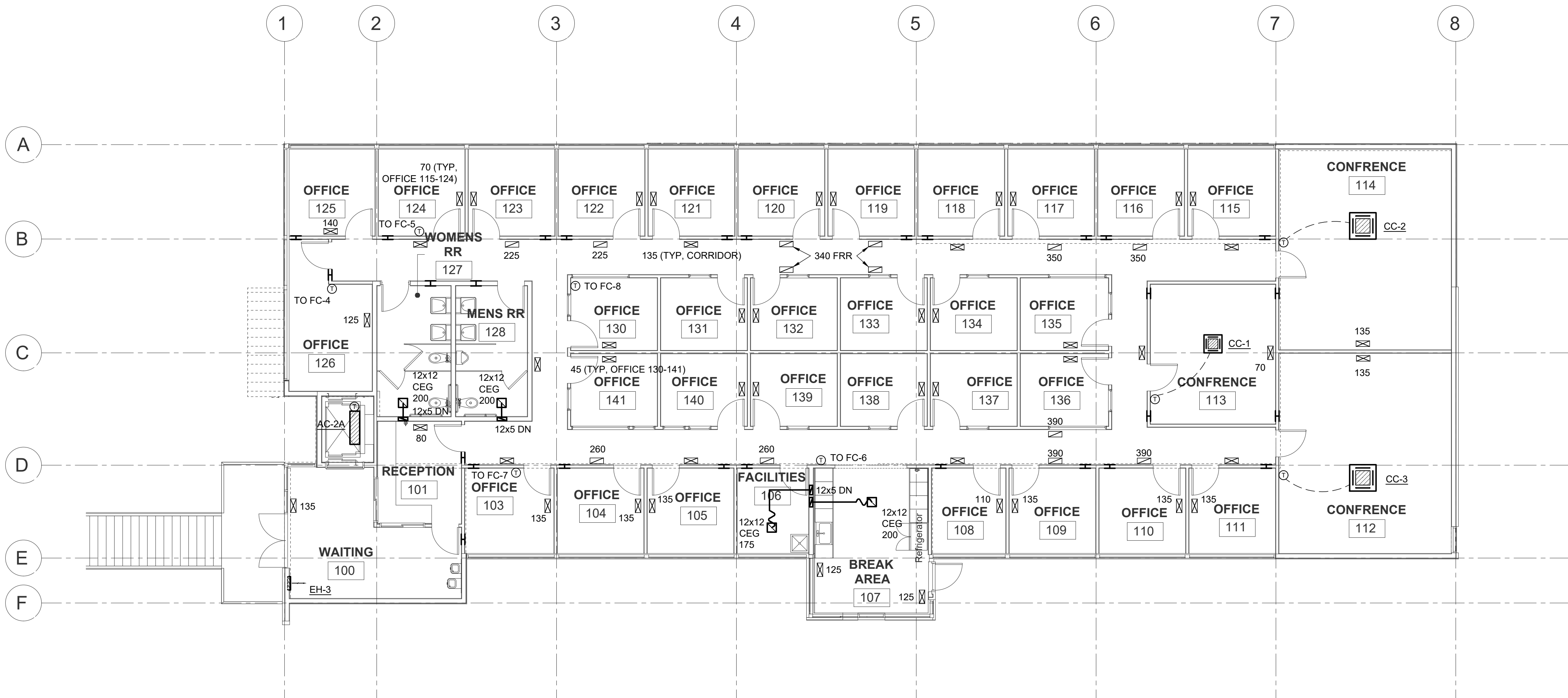
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Project Number  
File Name  
Plot Date

FIRST FLOOR PLAN - HVAC

02/01/2024 PERMIT SET

SHEET NO.

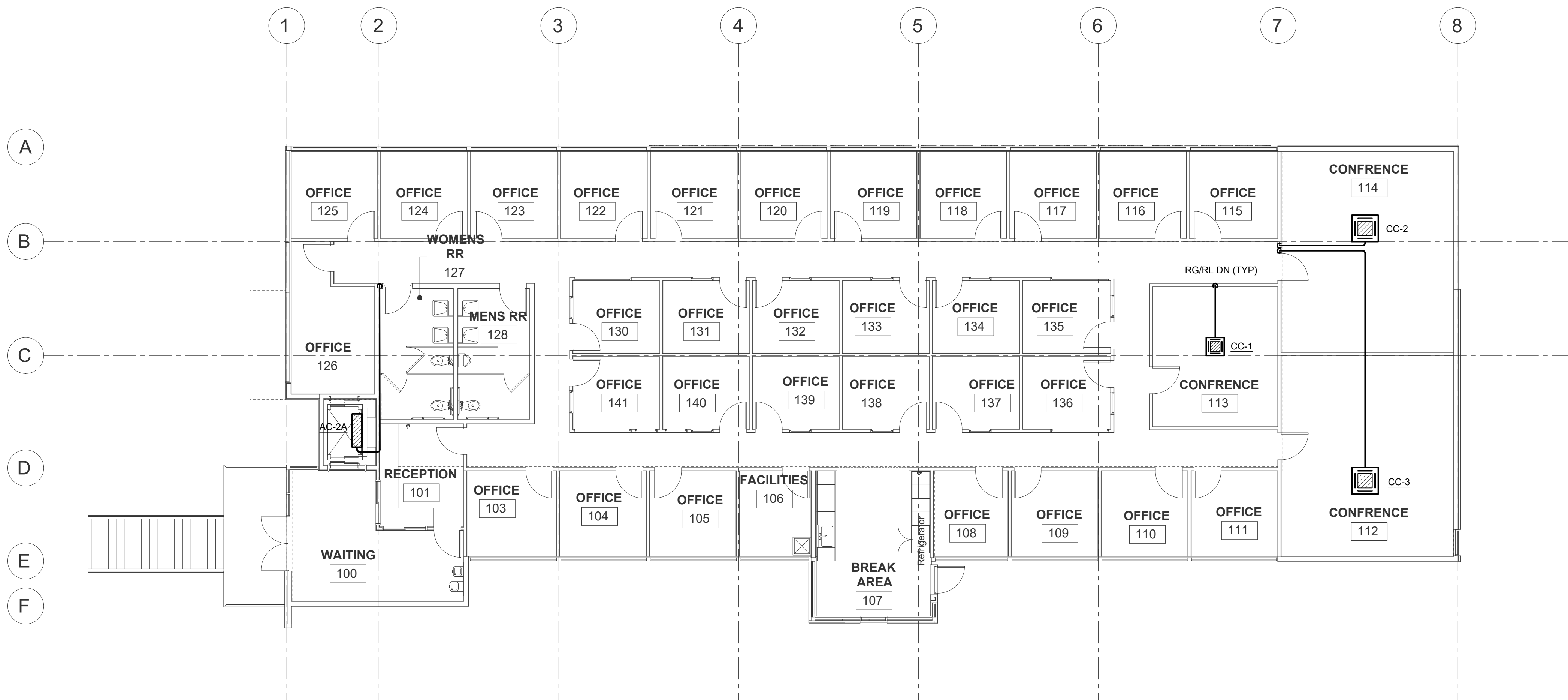
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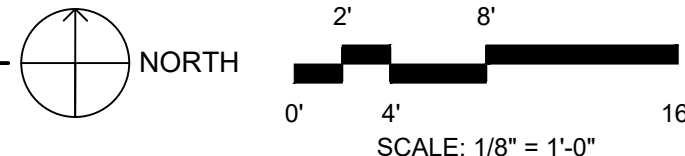
1 FIRST FLOOR PLAN - HVAC  
1/8" = 1'-0"







1 FIRST FLOOR PLAN - HVAC PIPING  
1/8" = 1'-0"



GENERAL NOTES:

- SEE GENERAL NOTES SHEET M0.01.
- ROUTE MIN. 3/4" CONDENSATE DRAIN LINE TO NEAREST INDIRECT DRAIN.



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Plot Date:

FIRST FLOOR PLAN - HVAC PIPING  
02/01/2024 PERMIT SET

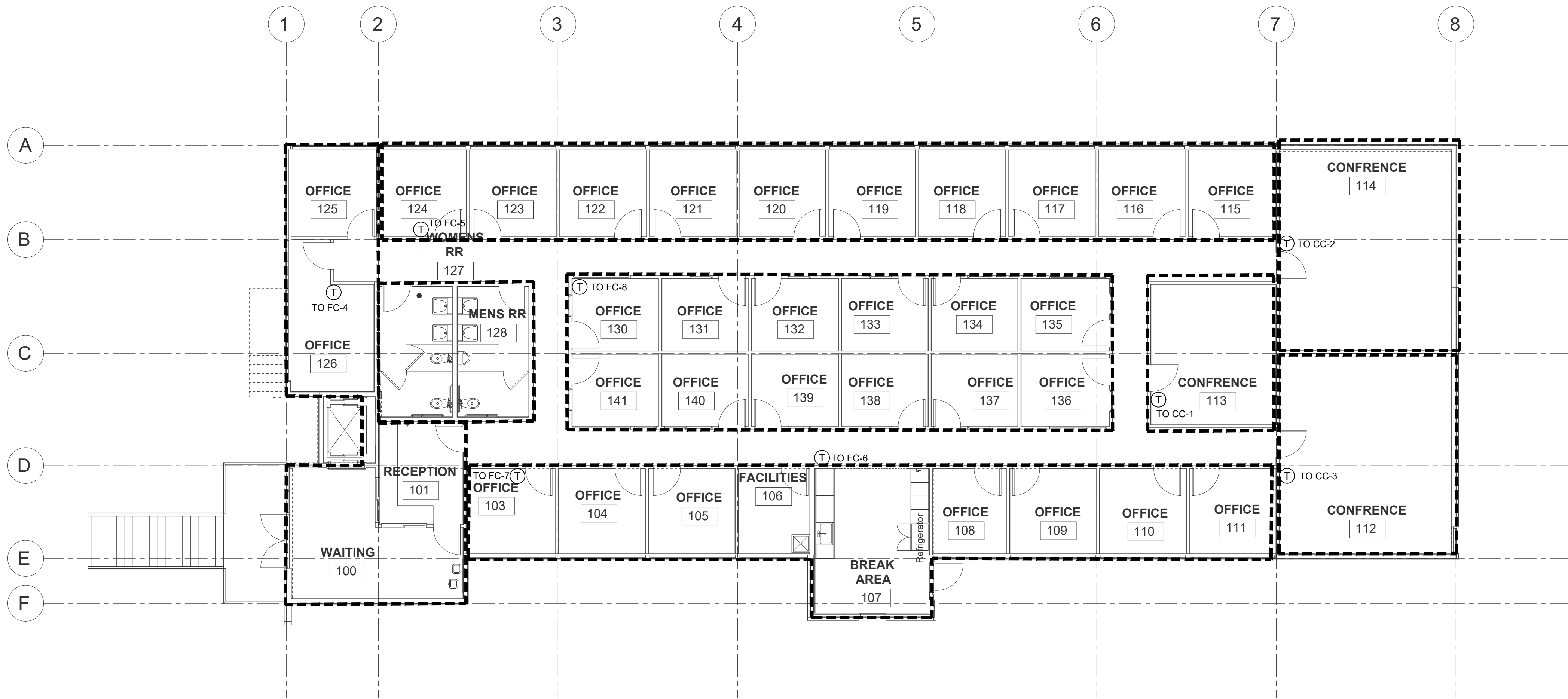
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M4.03

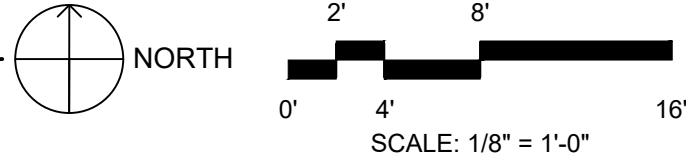
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general@hultzbhu.com Job Number: 23-170





1 FIRST FLOOR ZONING PLAN - HVAC  
1/8" = 1'-0"



LEGEND:

- INDIVIDUAL ZONE SERVED BY FAN COIL.
- T THERMOSTAT

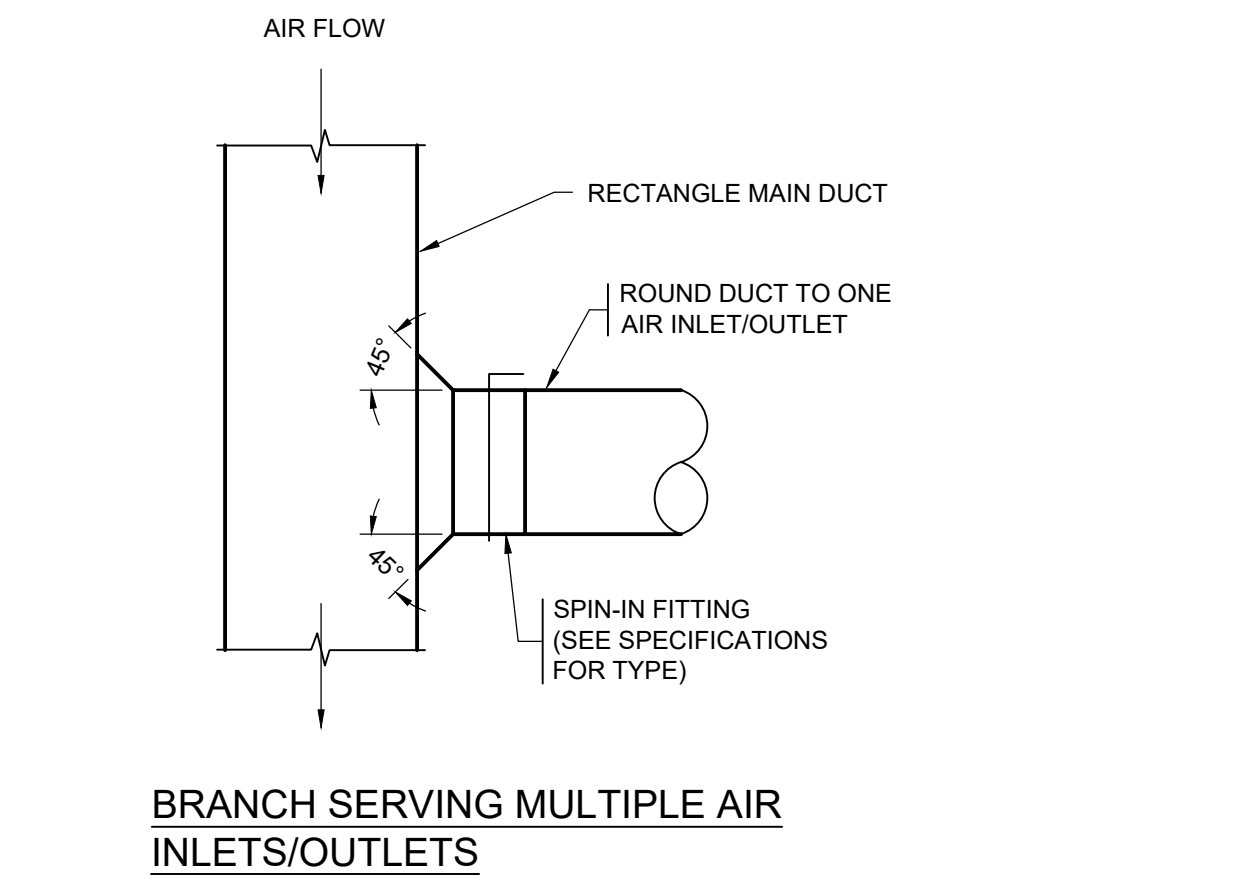


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	CONSEJO GRAHAM OFFICES	
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	Rev# Date	
INFO	Sheet Number	
	Project Number	
FIRST FLOOR ZONING PLAN - HVAC	File Name	
	Plot Date	02/01/2024 PERMIT SET
SHEET NO.		M4.04





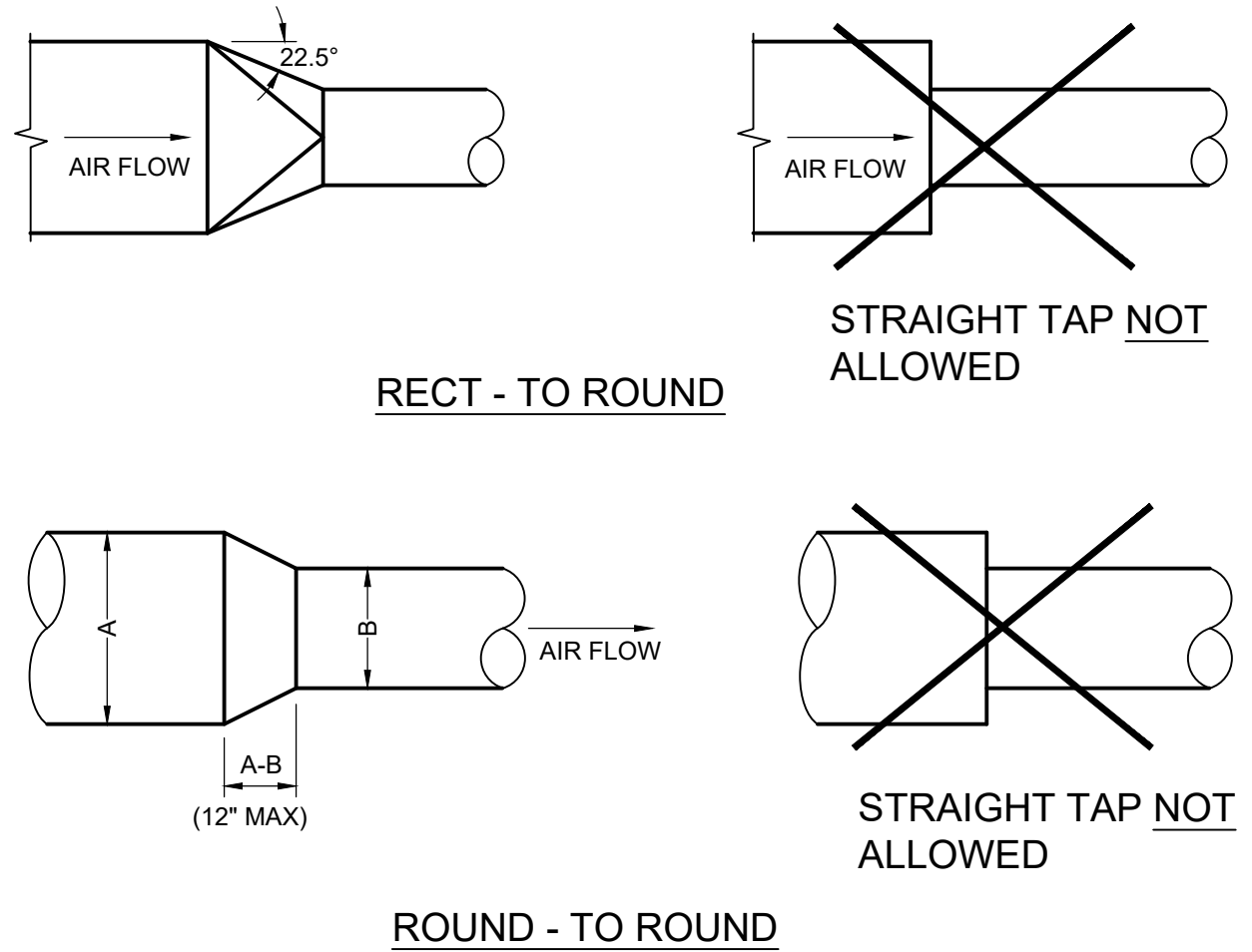
NOTE:  
WHERE MAIN DUCT DOES NOT HAVE ADEQUATE HEIGHT TO ACCEPT ROUND DUCT, PROVIDE RECTANGULAR CONNECTION, WITH SAME FREE AREA AS ROUND DUCT, AND TRANSITION TO ROUND

### RECT-TO-ROUND BRANCH DUCT CONNECTION

NTS

3

M4.05

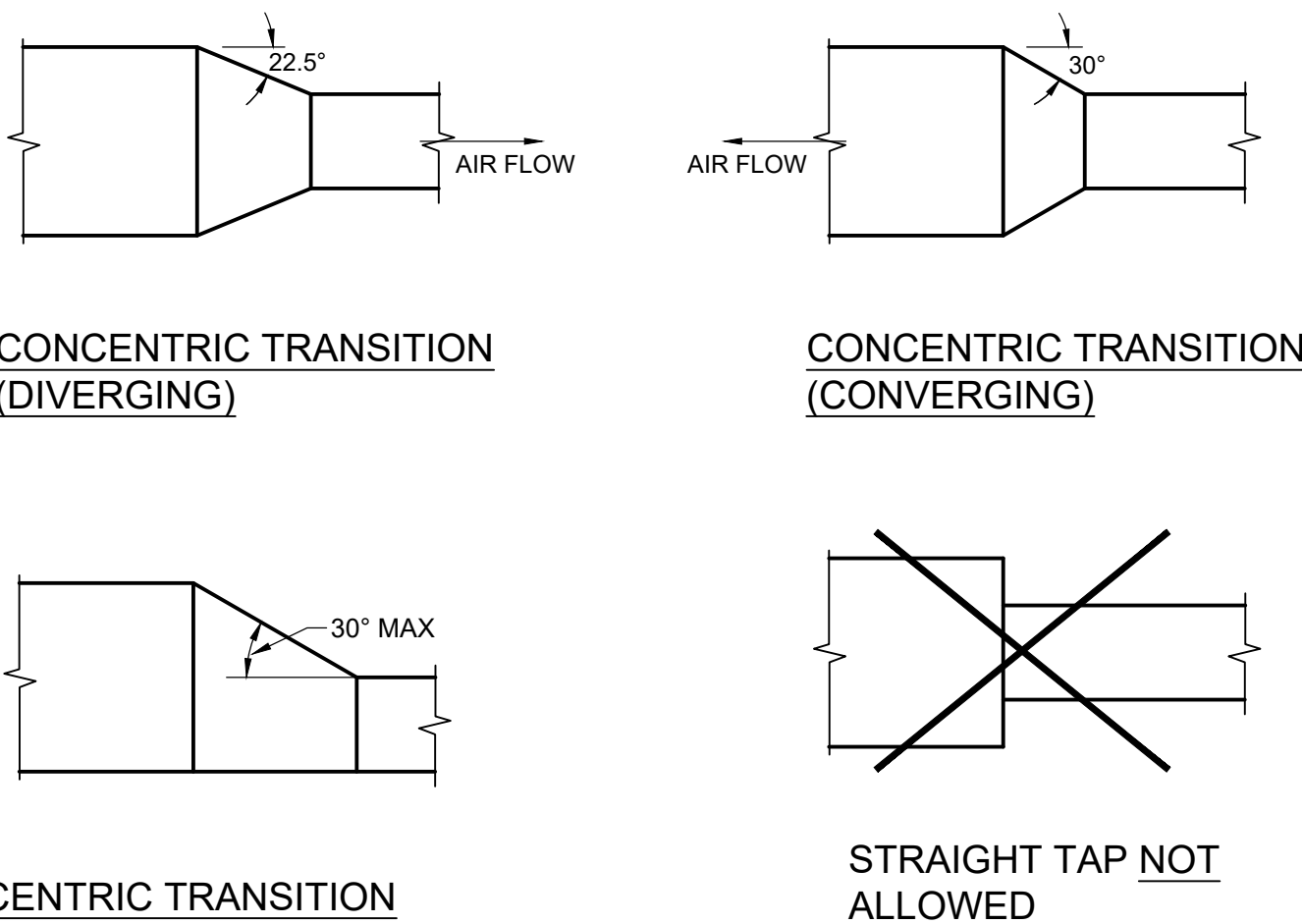


### ROUND TRANSITIONS

NTS

6

M4.05



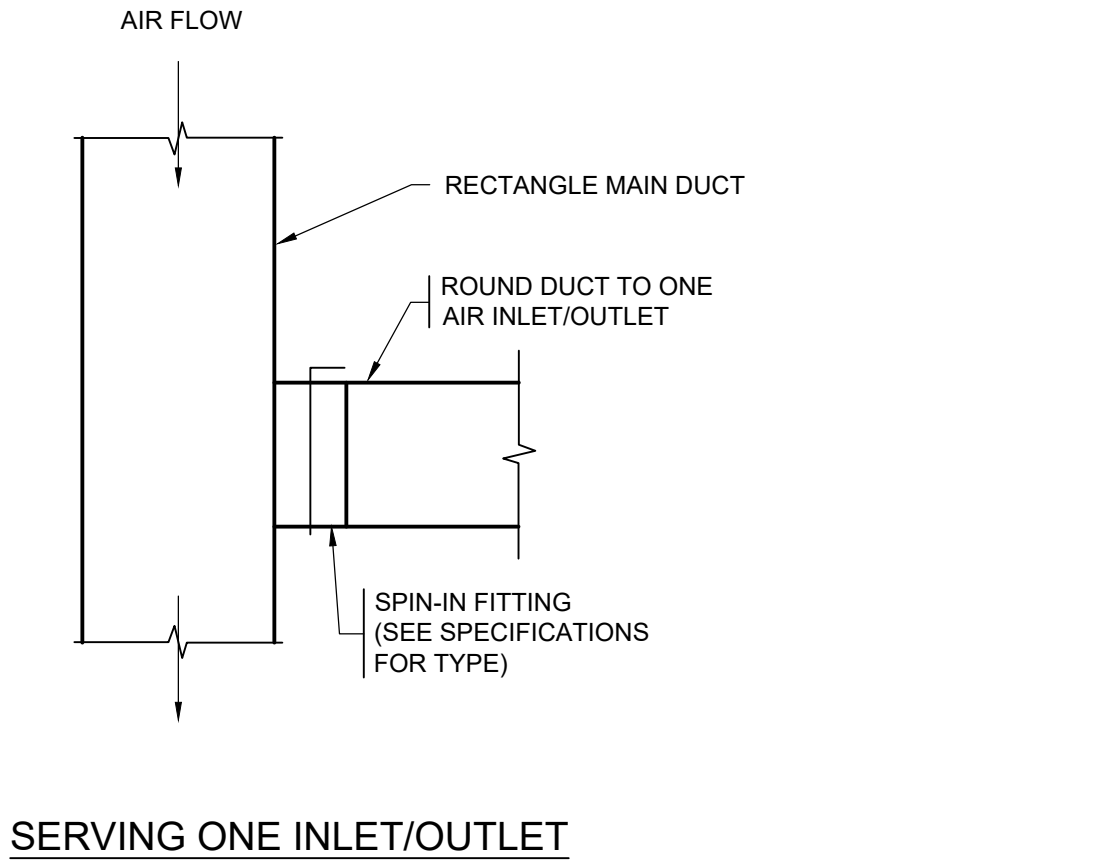
ECCENTRIC TRANSITION

### RECT-TO-RECT TRANSITIONS

NTS

8

M4.05



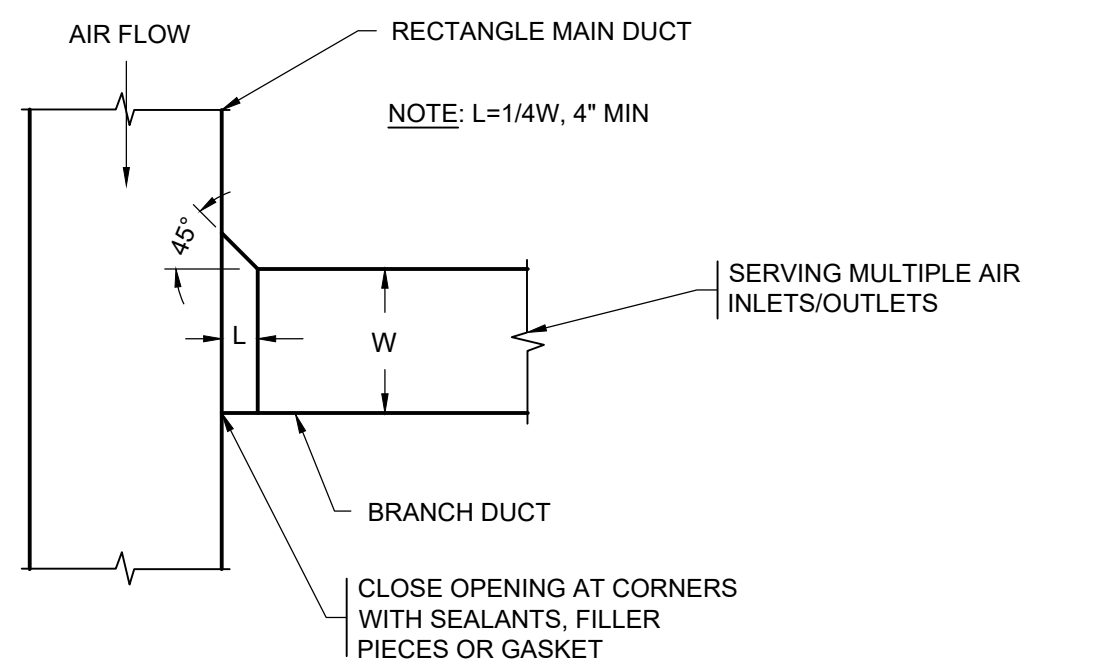
NOTE:  
WHERE MAIN DUCT DOES NOT HAVE ADEQUATE HEIGHT TO ACCEPT ROUND DUCT, PROVIDE RECTANGULAR CONNECTION, WITH SAME FREE AREA AS ROUND DUCT, AND TRANSITION TO ROUND

### RECT-TO-RECT BRANCH DUCT CONNECTION

NTS

2

M4.05

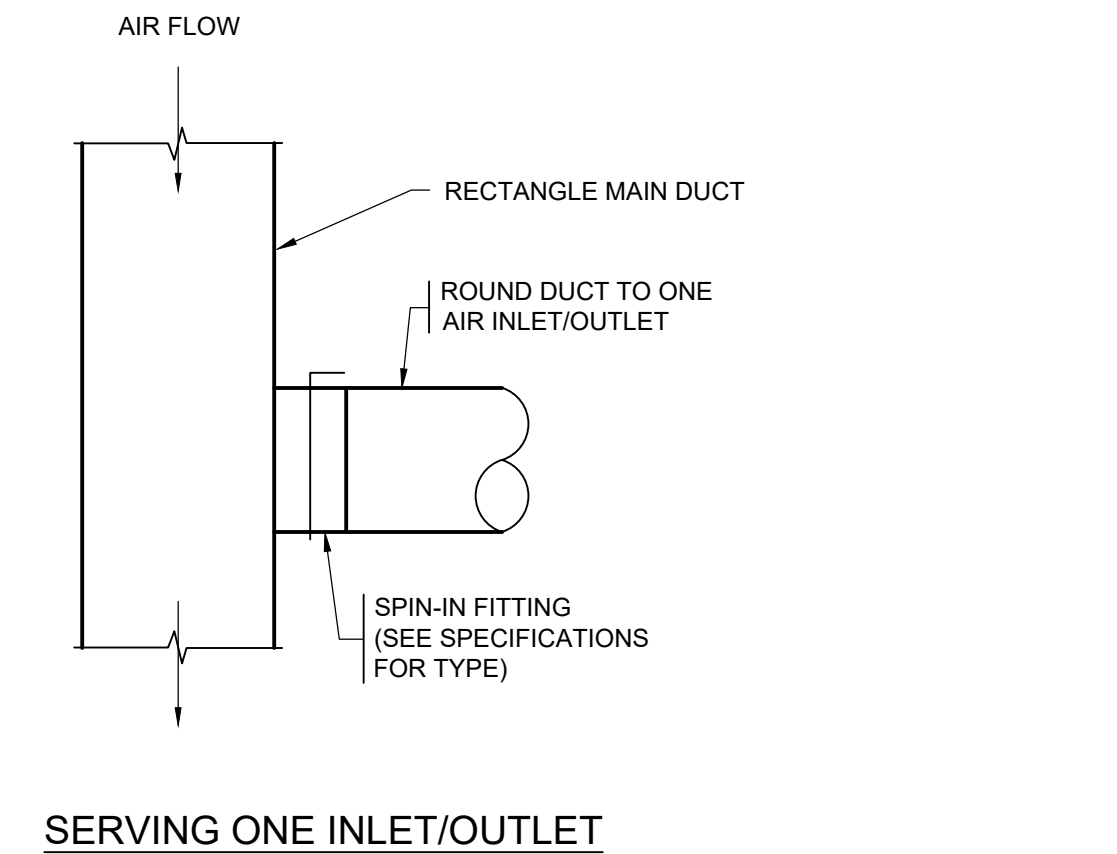


### RECT-TO-RECT BRANCH DUCT CONNECTION

NTS

5

M4.05



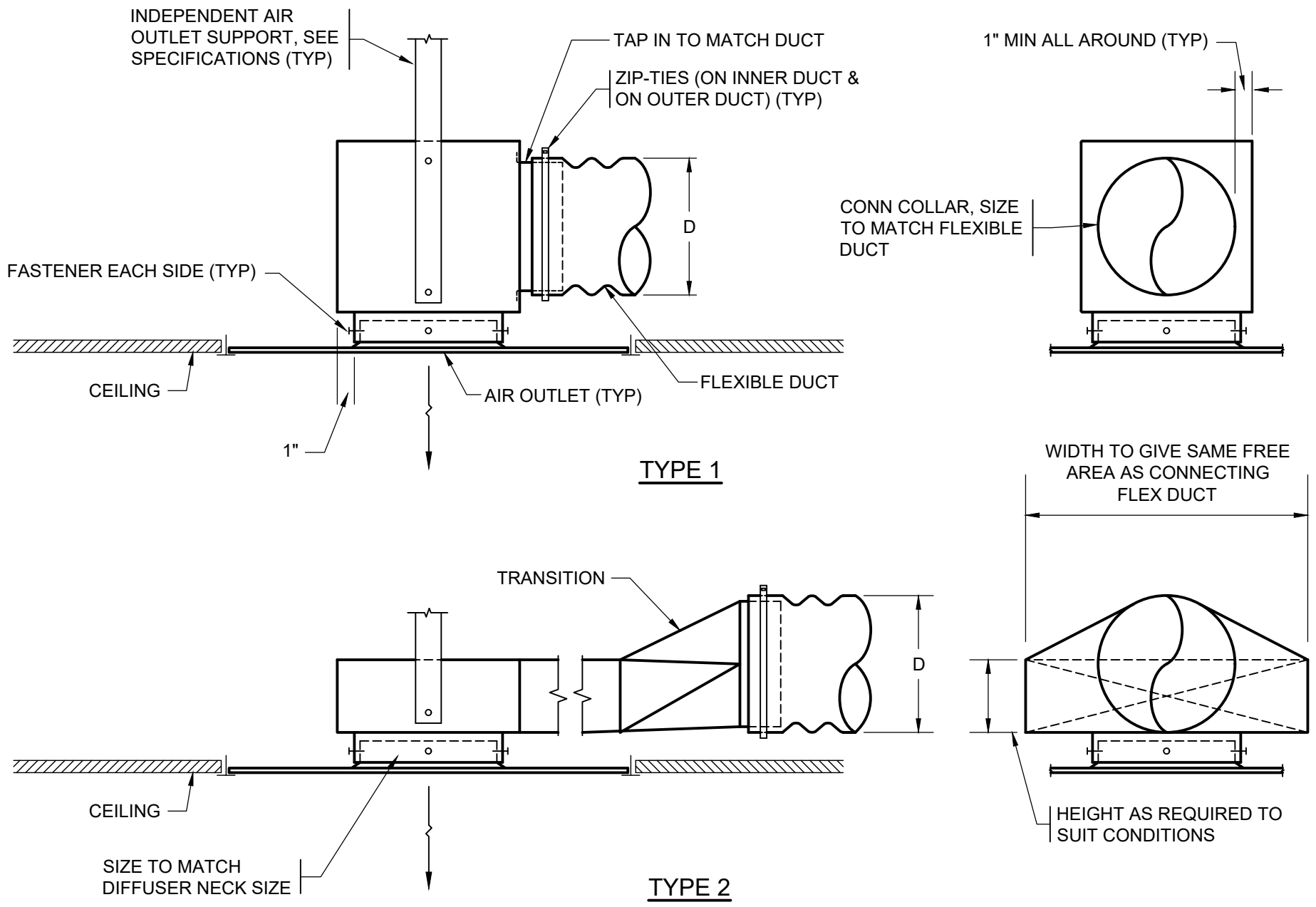
NOTE:  
WHERE MAIN DUCT DOES NOT HAVE ADEQUATE HEIGHT TO ACCEPT ROUND DUCT, PROVIDE RECTANGULAR CONNECTION, WITH SAME FREE AREA AS ROUND DUCT, AND TRANSITION TO ROUND

### RECT-TO-ROUND BRANCH DUCT CONNECTION

NTS

7

M4.05



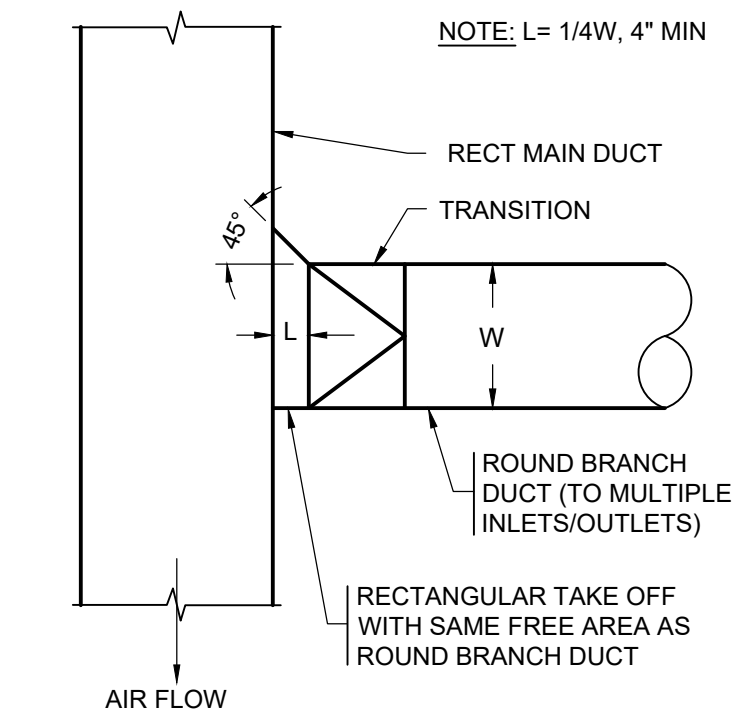
- NOTES:
1. PROVIDE TYPE 1 UNLESS BUILDING CONDITIONS REQUIRE LOWER PROFILE - THEN USE TYPE 2.
  2. CONSTRUCT PLENUM BOXES OF MIN. 26 GA. GALV. STEEL.
  3. NOT ALLOWED AT TRANSFER DUCTS.
  4. LINE PLENUM & DUCT TO AIR OUTLET WHERE SO NOTED ON PLANS OR IN SPECIFICATIONS.
  5. CEILING TYPE & AIR OUTLET FRAME STYLE MAY VARY FROM THAT DEPICTED.
  6. NOT ALL SUPPORTS ARE SHOWN FOR CLARITY.
  7. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

### TIGHT CONDITION - FLEX DUCT AIR OUTLET CONNECTION

NTS

1

M4.05



SERVING MULTIPLE INLET/OUTLET

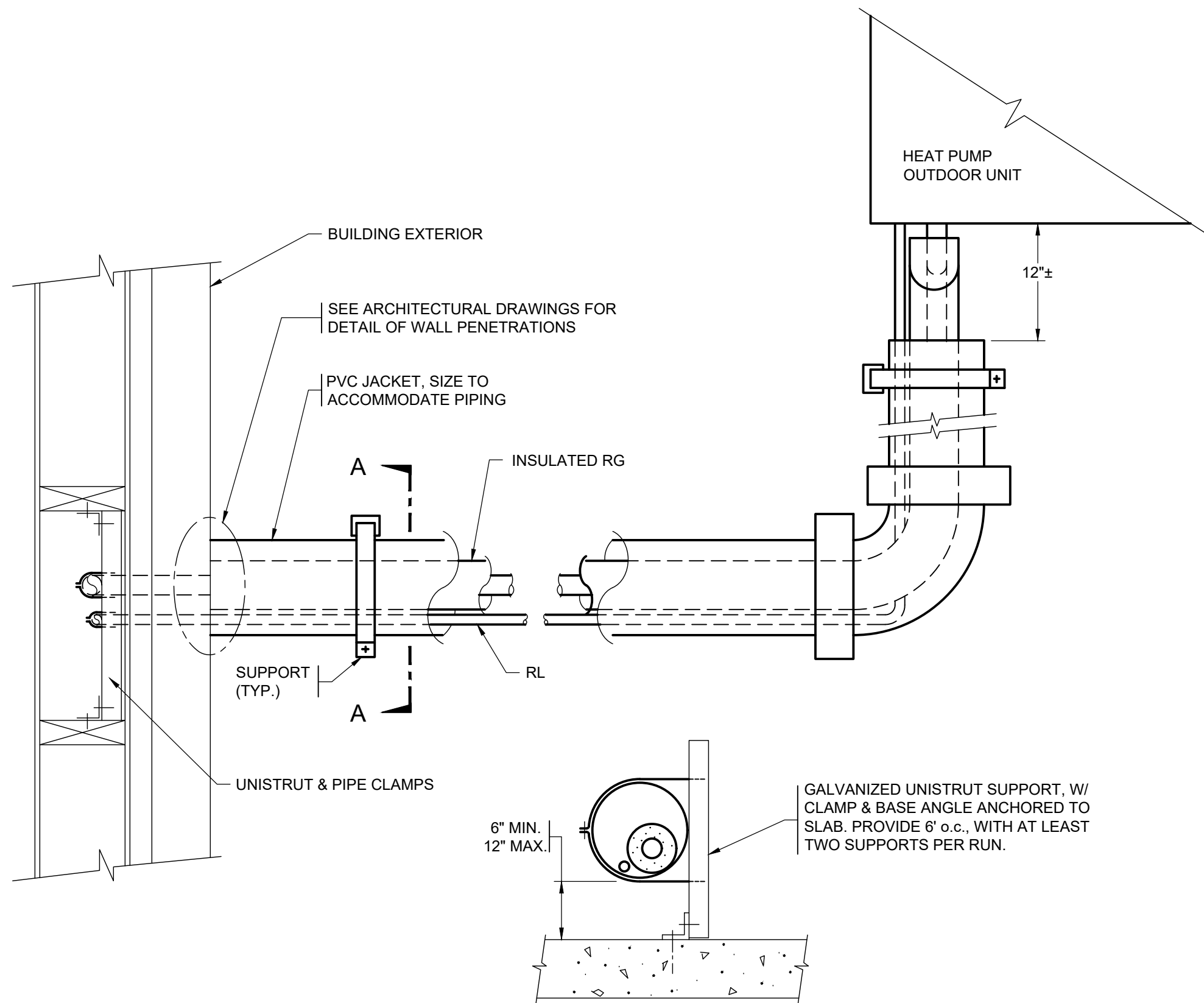
### RECT-TO-ROUND BRANCH DUCT CONNECTION

NTS

4

M4.05





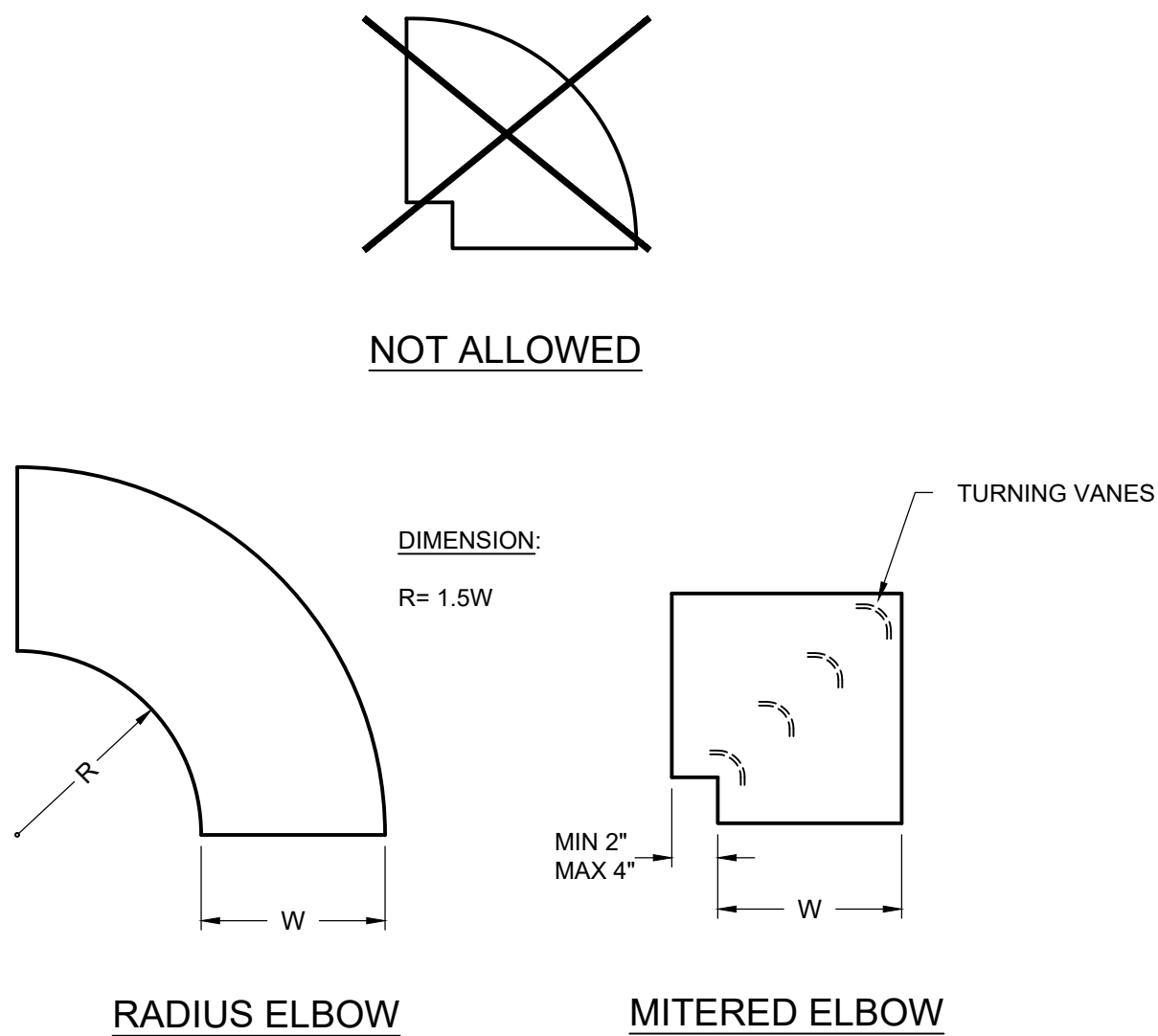
SECTION A - A

**REFRIGERANT PIPING JACKET**

NTS

3

M4.06

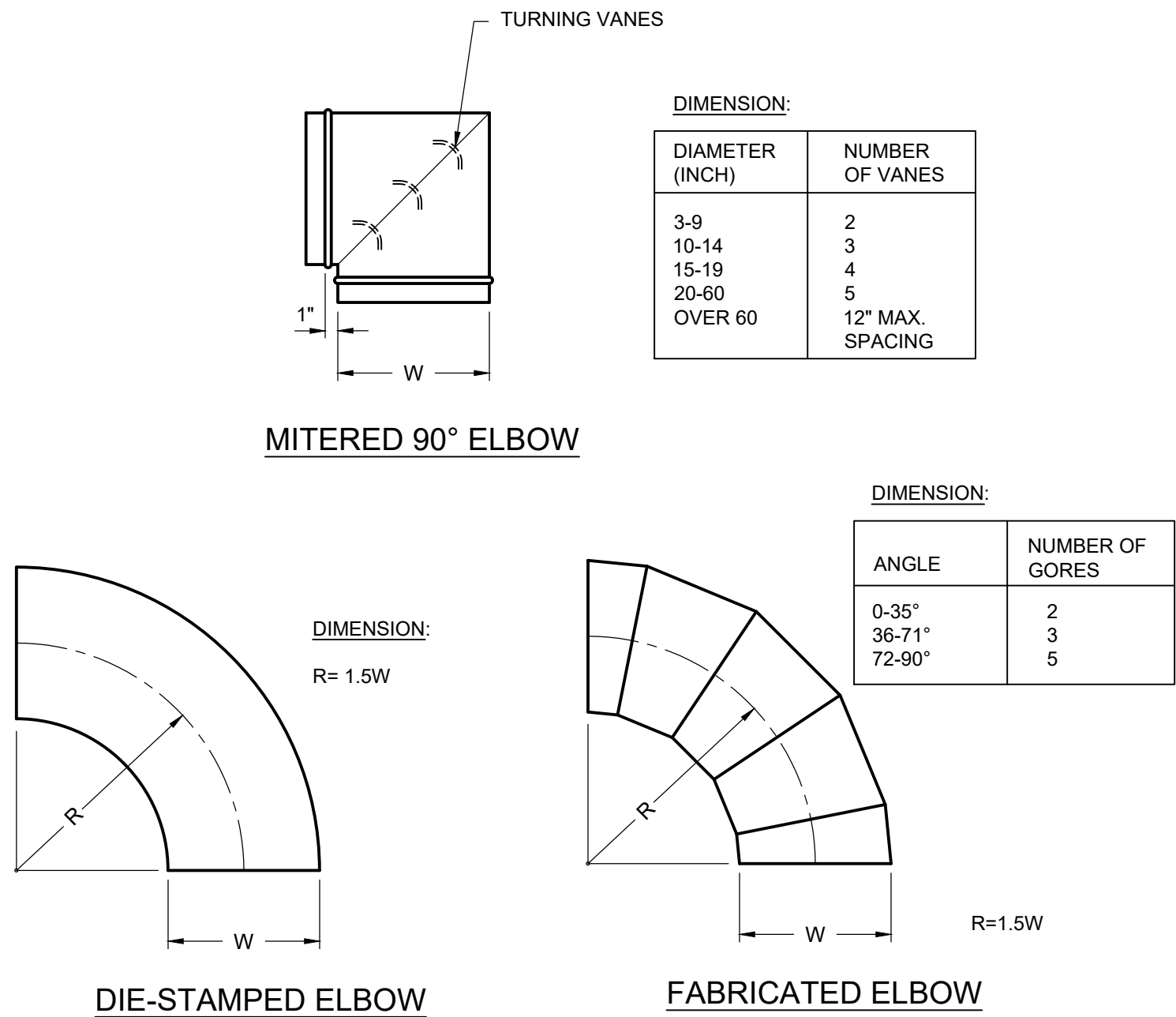


**ELBOWS - RECTANGULAR**

NTS

2

M4.06

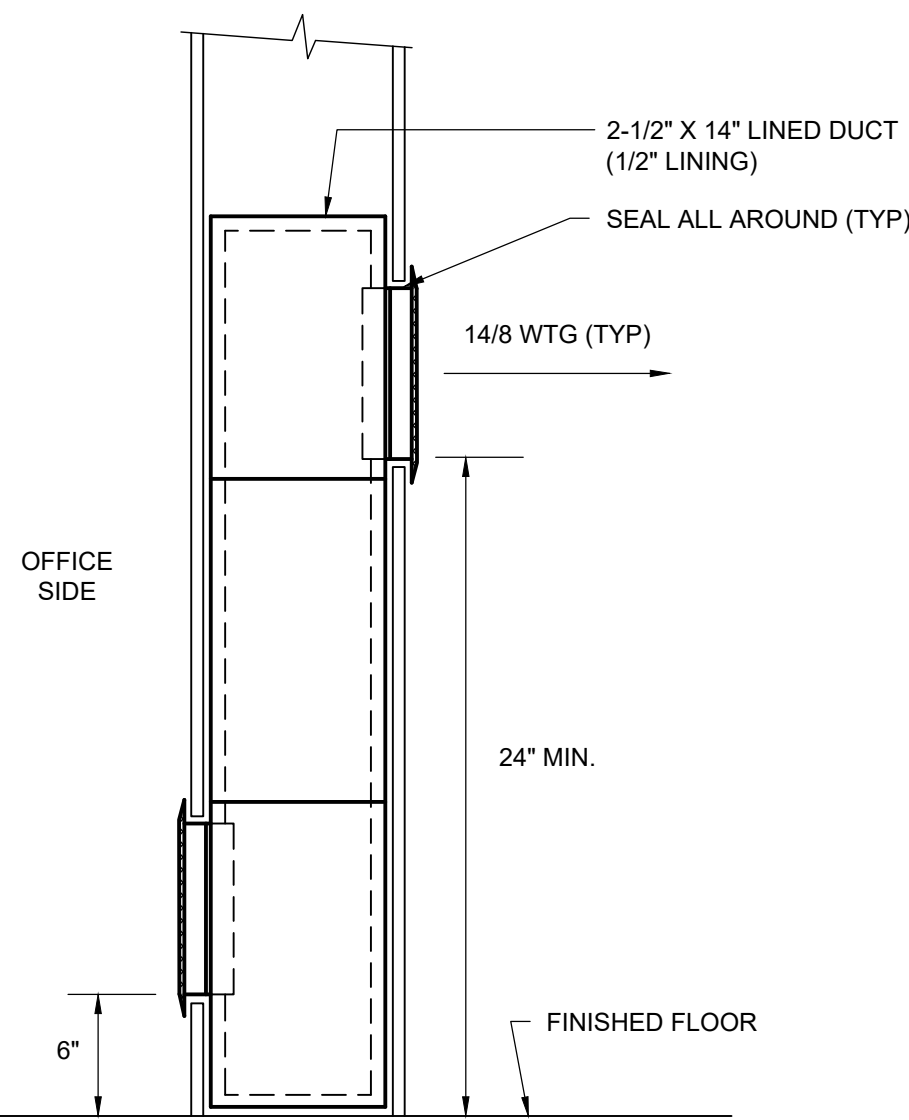


**ELBOWS - ROUND**

NTS

1

M4.06

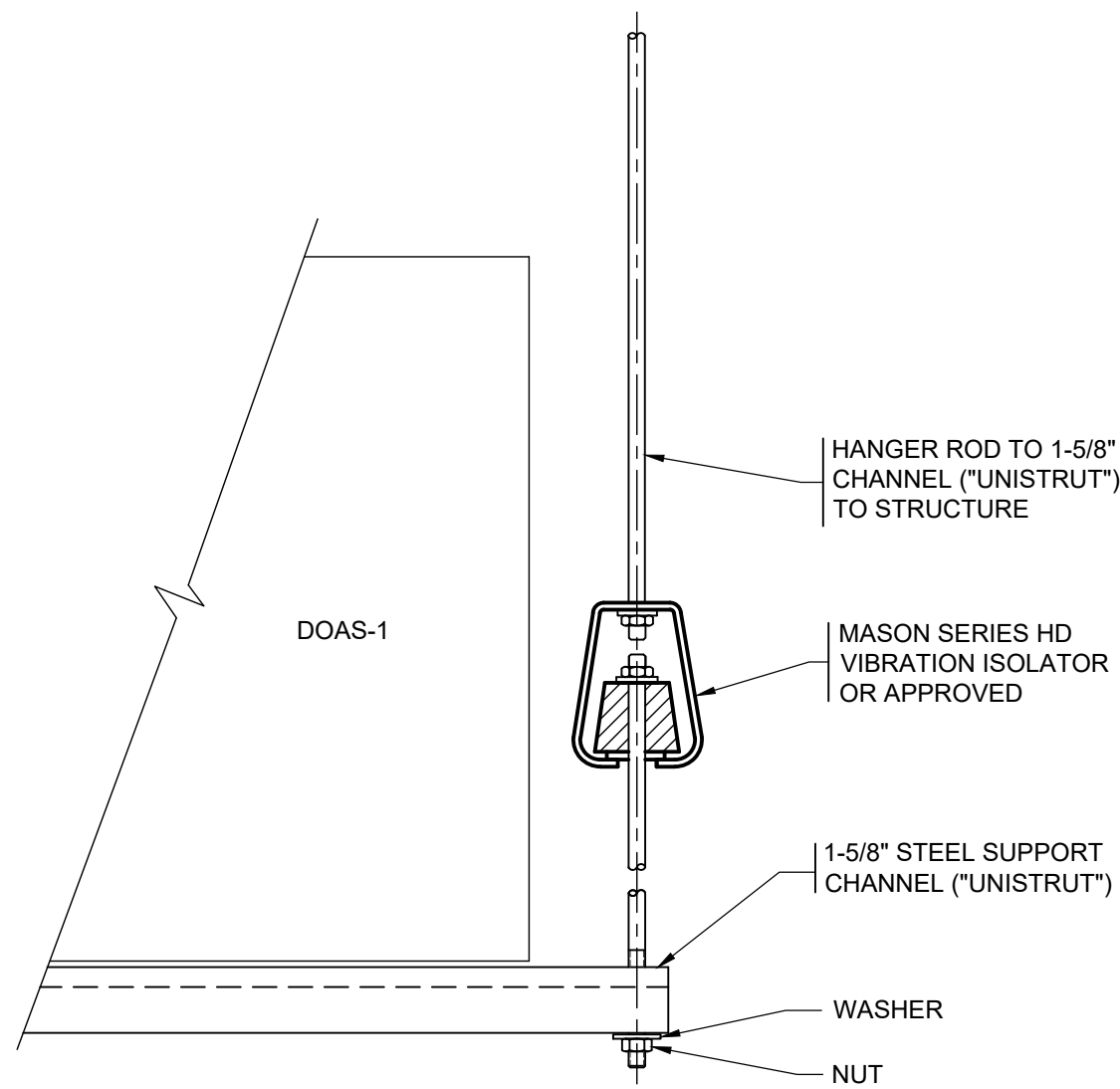


**LOW WALL TRANSFER DETAIL**

NTS

5

M4.06



- NOTES:
- SEE STRUCTURAL & SPECIFICATIONS FOR ATTACHMENT TO STRUCTURE & OTHER ANCHORING REQUIREMENTS.
  - LAYOUT SUPPORT SUCH THAT HANGER ROD DOES NOT BLOCK ACCESS TO ANY UNIT ACCESS DOOR OR OTHER COMPONENTS WHICH REQUIRE MAINTENANCE.

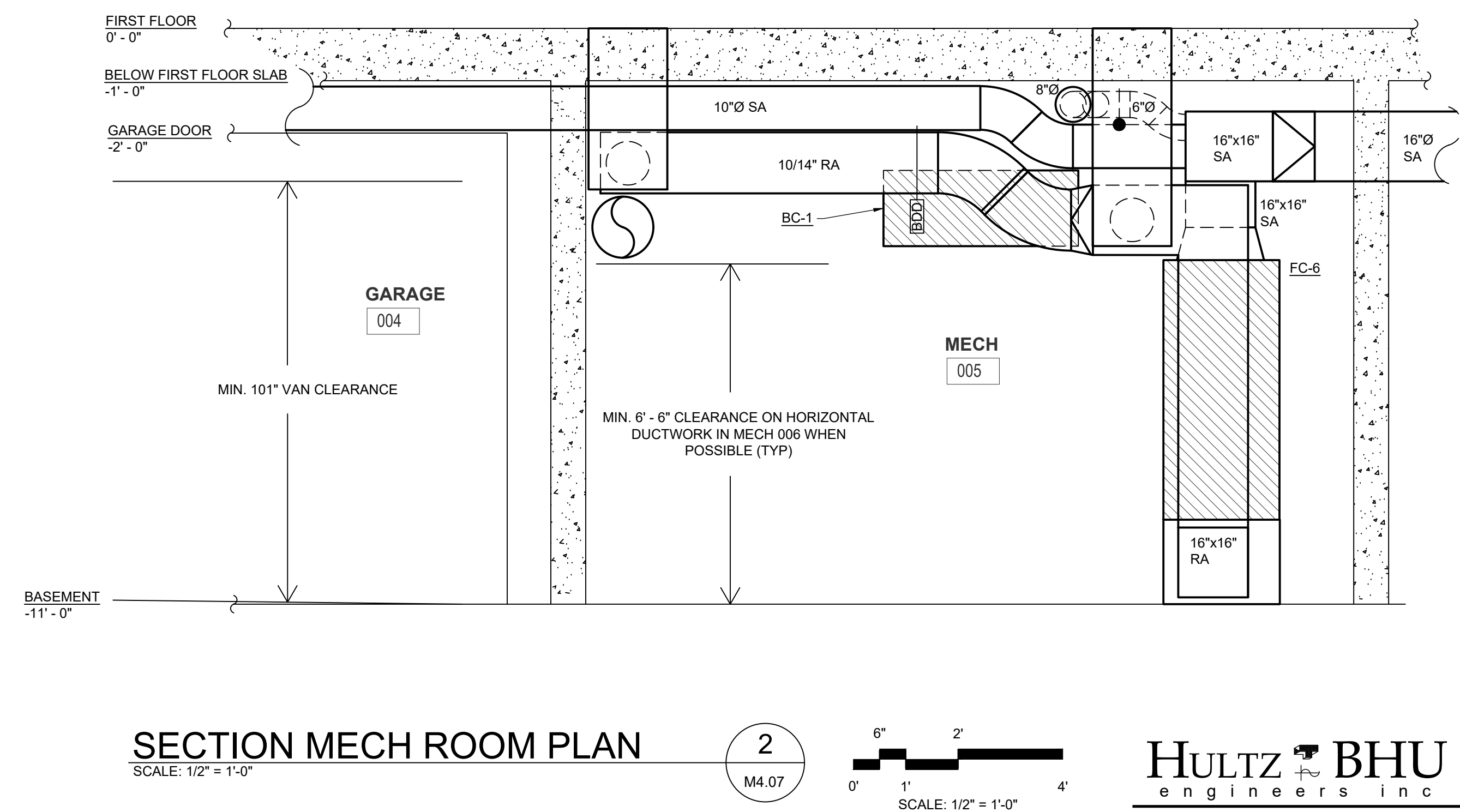
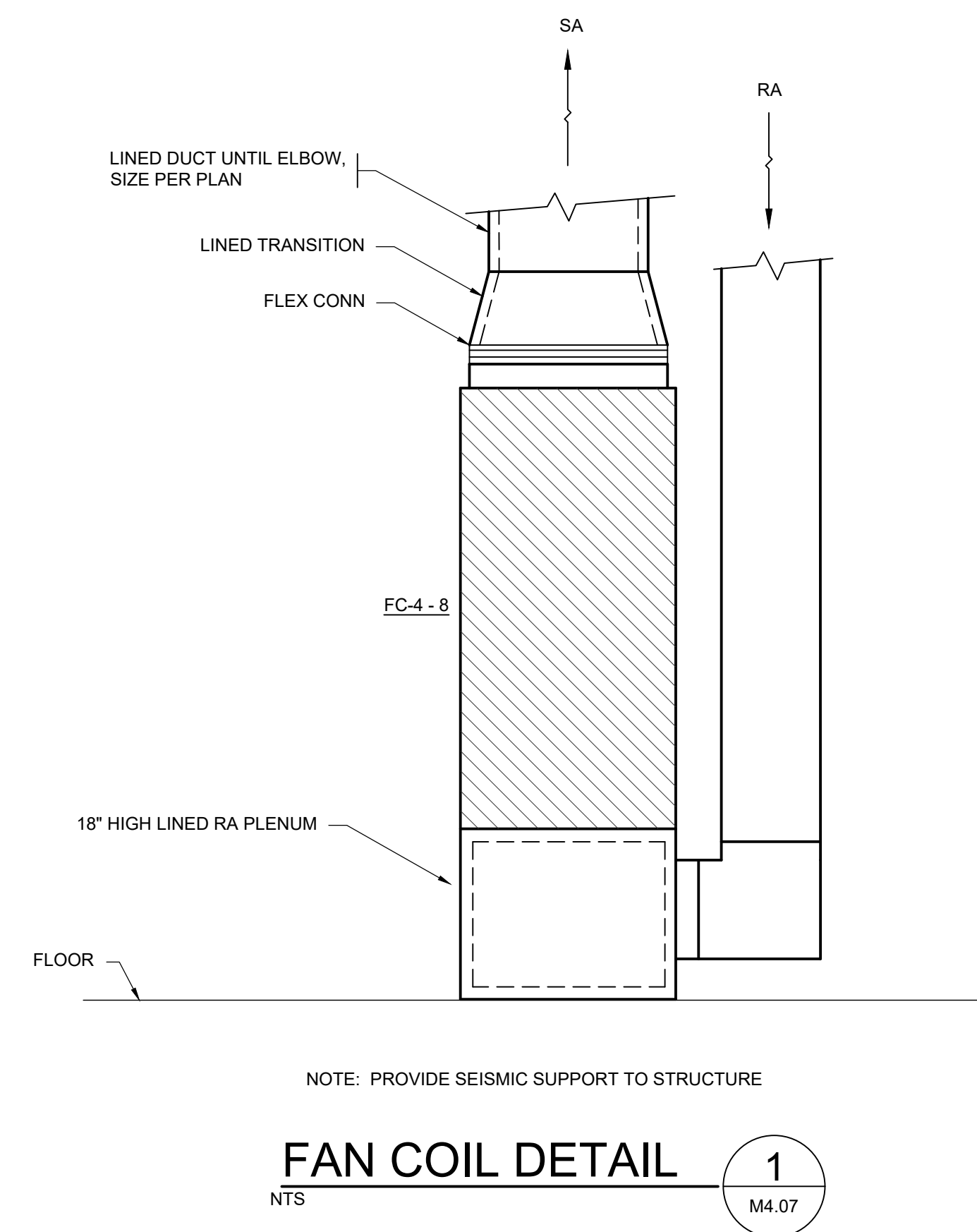
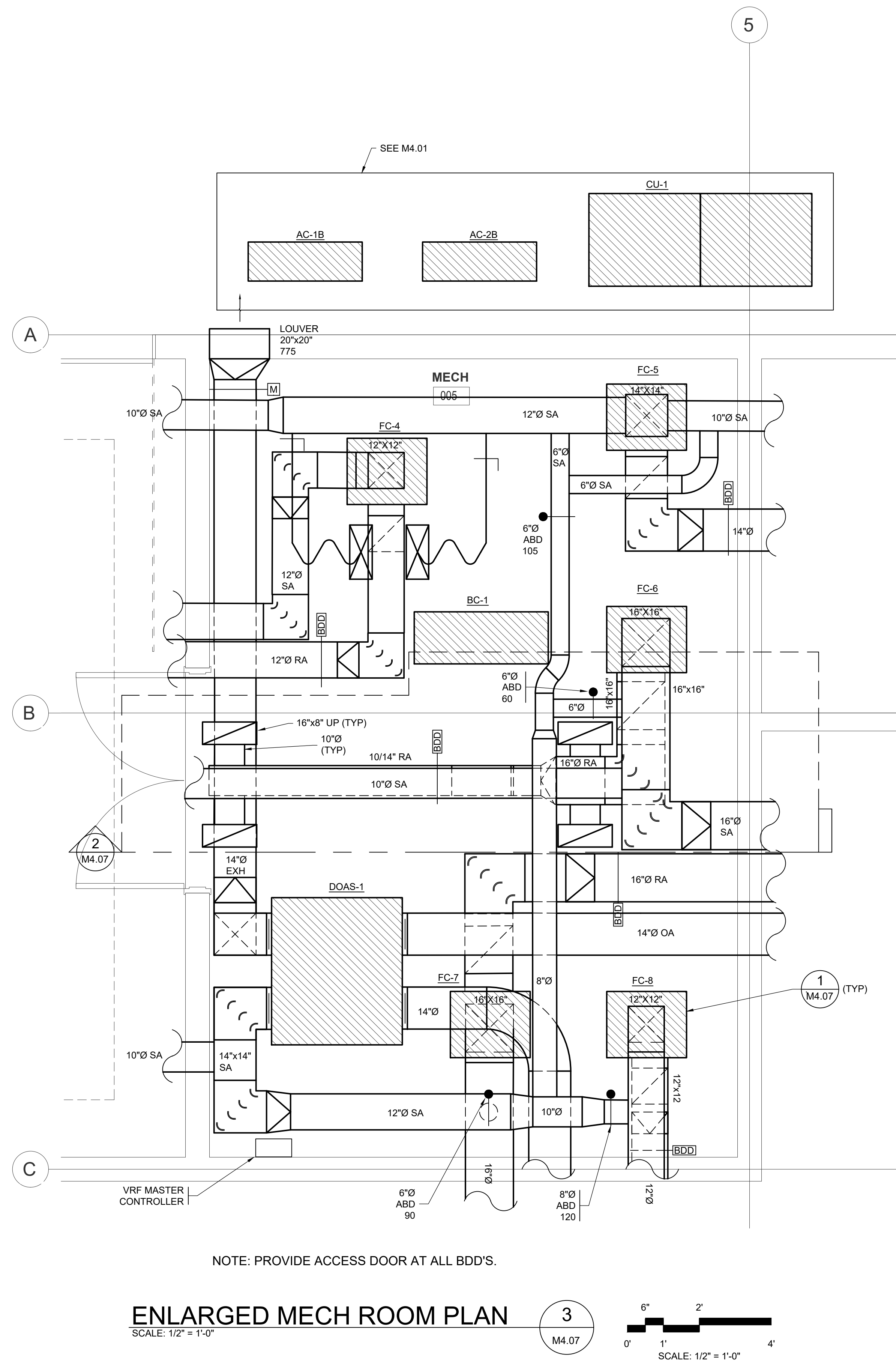
**DOAS-1 SUPPORT**

NTS

4

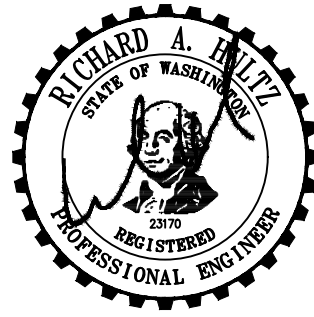
M4.06







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HVAC DETAILS  
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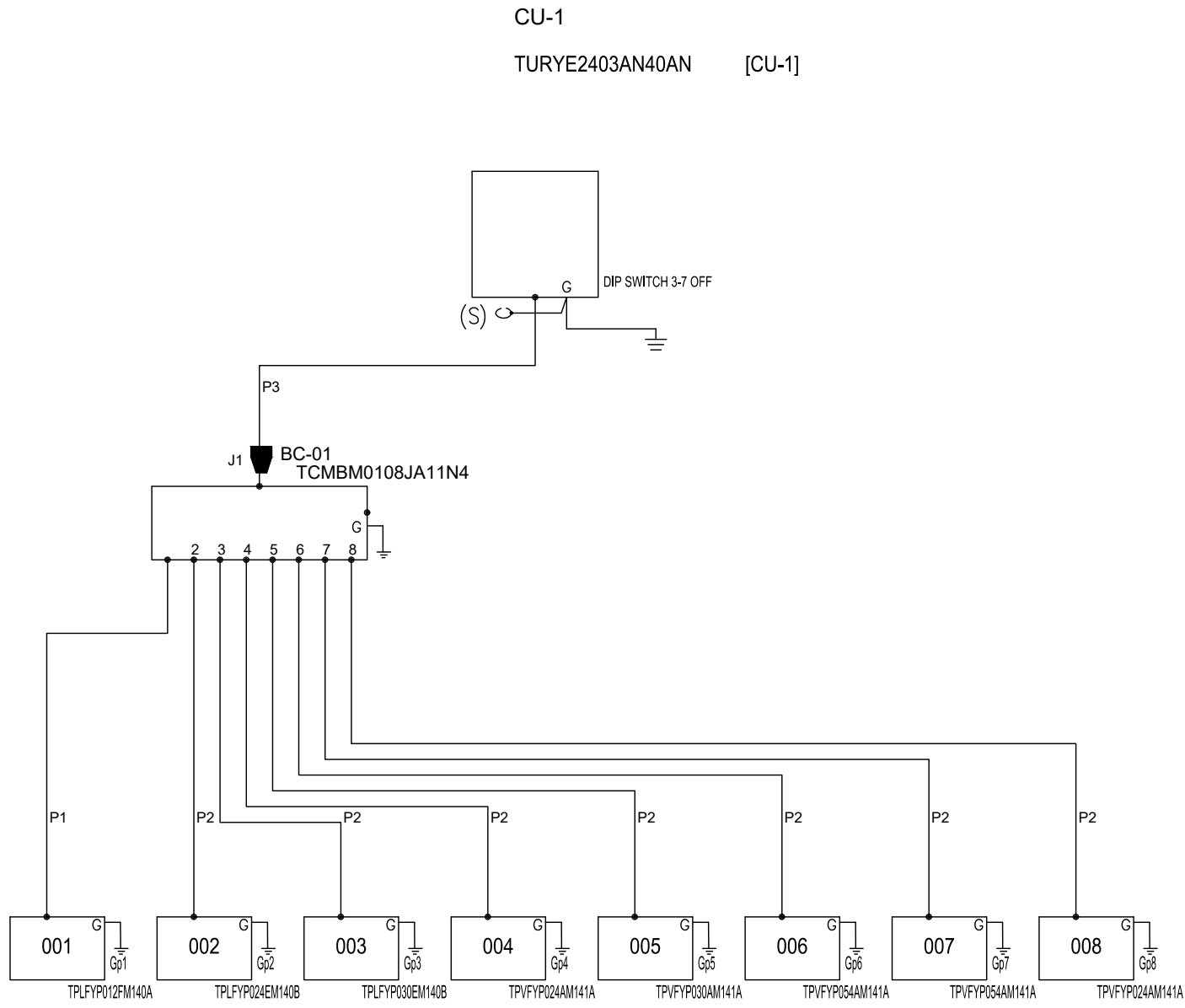
SHEET NO.  
M4.08

DIAGRAM	SYMBOL	LEGEND	[CONT.No]	PAGE
---	///	POWER WIRE		
---	---	CONTROL WIRE		
---	---	REF. PIPE		

PIPING AND CONTROLS
SYMBOL BRANCH PIPE MODEL NAME
J1 - ONLY R302S-G1
SYMBOL LIQUID PIPE GAS PIPE SIZE
P1 - 1/4 1/2
P2 - 3/8 1/8
P3 - 7/8 1/8
SYMBOL MODEL NUMBER
UA - TAR-AMAU

CITY MULTI  
SYSTEM SCHEMATIC DWG.

This drawing is schematic in nature. Final routing of piping & wiring shall be determined by the installing contractor and/or designer of record. Additional refrigerant charge is needed depending on the size and length of extended piping. Please refer the amount of pre-charge and the formula of calculation which is mentioned on the data book.  
1.25mm<sup>3</sup>(16 AWG) : 1.25mm<sup>3</sup>(16 AWG) or more. 0.75mm<sup>3</sup>(20 AWG) : between 0.5mm<sup>3</sup>(24 AWG) and 0.75mm<sup>3</sup>(20 AWG).



CC-1 CC-2 CC-3 FC-4 FC-5 FC-6 FC-7 FC-8

REFRIGERANT PIPING DIAGRAM  
NTS

1  
M4.07

NOTE:  
THIS DIAGRAM HAS BEEN PROVIDED BY THE VRF MFR AND IS PRELIMINARY & APPROXIMATE ONLY. IT DOES NOT SHOW ALL REQ'D CONTROL DEVICES NOR ALL CONNECTIONS, NOR A DESIGN FOR OTHER MFR'S. OBTAIN FROM VRF MFR UPDATED DIAGRAM WITH ALL PIPING SIZES, CONTROLS, WIRING, AND RELATED REQUIREMENTS. SUBMIT SHOP DRAWINGS AS SPECIFIED.