

MECHANICAL SYMBOLS		ABBREVIATIONS	
THIS IS A MASTER LEGEND AND NOT ALL SYMBOLS OR ABBREVIATIONS ARE USED.		V2.00	
HVAC EQUIPMENT & DUCTWORK			
NOTE: ALL DUCT DIMENSIONS SHOWN ON DRAWINGS ARE INSIDE DIMENSIONS. SEE DUCTWORK SECTION OF THE SPECIFICATION FOR DUCTWORK TO RECEIVE INSULATION OR LINER.			
	DUCTWORK/EQUIPMENT TO BE REMOVED OR RELOCATED	ACC	AIR COOLED CHILLER
	EXISTING DUCTWORK/EQUIPMENT TO REMAIN	ACCU	AIR COOLED CONDENSING UNIT
	LINEAR SLOT DIFFUSER	AD	ACCESS DOOR
	INSULATED FLEXIBLE DUCT (MAX. 5'-0" LONG)	AF	ABOVE FINISHED CEILING
	BRANCH DUCT WITH 45° RECTANGLE ROUND BRANCH FITTING AND MANUAL VOLUME DAMPER	AFB	ABOVE FINISHED FLOOR
	ELBOW WITH TURNING VANES	AFG	ABOVE FINISHED GRADE
	BRANCH DUCT WITH BELL-MOUTH FITTING & MANUAL VOLUME CONTROL DAMPER	AHJ	AUTHORITY HAVING JURISDICTION
	RETURN, EXHAUST, OR OUTSIDE AIR DUCT UP	AHJ	AIR HANDLING UNIT
	RETURN, EXHAUST, OR OUTSIDE AIR DUCT DOWN	AI	ANALOG INPUT
	SUPPLY AIR DUCT UP	AO	ANALOG OUTPUT
	SUPPLY AIR DUCT DOWN	AP	ACCESS PANEL
	EQUIPMENT WITH FLEXIBLE DUCT CONNECTION	AWG	AMERICAN WIRE GAUGE
	10" CSO-1 300 CFM NECK SIZE, TYPE, CFM OF SUPPLY DIFFUSER OR REGISTER	B	BOILER
	24x24 CEQ-1 800 CFM SIZE, TYPE, CFM OF EXHAUST GRILLE	BA	BUILDING AUTOMATION SYSTEM
	MANUAL VOLUME DAMPER	BB	BACKBONE
	SQUARE TO ROUND TRANSITION	BD	BACKDRAFT DAMPER
	DUCT MOUNTED SMOKE DETECTOR (SD=SUPPLY/RETURN)	BD	BLOWDOWN
	RISER IDENTIFICATION	BFC	BELOW FINISHED CEILING
	FIRE DAMPER	BFF	BELOW FINISHED FLOOR
	FIRE SMOKE DAMPER	BFG	BELOW FINISHED GRADE AROUND EQUIPMENT
	SMOKE DAMPER	BFP	BLOWN THROUGH PUMP
	VOLUME DAMPER	BI	BINARY INPUT
	MOTORIZED DAMPER	BO	BINARY OUTPUT
	BACKDRAFT DAMPER	BOB	BOTTOM OF DUCT
	HUMIDISTAT	BOS	BOTTOM OF STRUCTURE
	THERMOSTAT	BTU	BRITISH THERMAL UNIT
PIPING LINETYPES AND SYMBOLS			
	REFRIGERANT LIQUID (RL)	CH	CHILLER
	REFRIGERANT DISCHARGE (HOT GAS) (RD)	CFM	CUBIC FEET PER MINUTE
	REFRIGERANT SUCTION (RS)	CR	CONTROL POWER
	REFRIGERANT DISCHARGE BYPASS (RDB)	CT	CONTROL TRANSFORMER
	REFRIGERANT VENT (RV)	CRAC	COMPUTER ROOM AIR CONDITIONING UNIT
	ELBOW UP	CRU	COMPUTER ROOM UNIT
	ELBOW DOWN	CW	CONTROL VALVE
ANNOTATION			
	MECHANICAL OR FIRE PROTECTION PLAN CALLOUT	CW	CONDENSER WATER PUMP
	MECHANICAL EQUIPMENT DESIGNATION (CONTRACTOR FURNISHED AND INSTALLED UNLESS NOTED OTHERWISE)	CU	CONDENSING UNIT
	CONNECTION POINT OF NEW WORK TO EXISTING	CHWP	CHILLED WATER PUMP
	DETAIL REFERENCE (UPPER NUMBER INDICATES DETAIL NUMBER, LOWER NUMBER INDICATES SHEET NUMBER)	DB	DECIBELS
	SECTION CUT DESIGNATION	DBA	DECIBELS AVERAGE
STANDARD MOUNTING HEIGHTS			
MECHANICAL (AFF, AFG, UNLESS NOTED OTHERWISE)			
THERMOSTATS (USER ADJUSTABLE/BOTTOM OF DEVICE)			
48" AFF OFFICE AREA, 84" AFF STORAGE AREA			
CONTROLS (TOP OF DEVICE) 84" AFF, STORAGE AREA			

GENERAL NOTES:

- PRIOR TO SUBMITTING BID, VISIT THE JOB SITE AND BECOME FULLY ACQUAINTED WITH THE EXISTING CONDITIONS OF THE PROJECT. REVIEW THE GENERAL NOTES, SPECIFICATIONS AND OTHER DRAWINGS FOR ADDITIONAL REQUIREMENTS WHICH MAY NOT BE SPECIFICALLY CALLED OUT IN THIS PORTION OF THE CONSTRUCTION DOCUMENTS. NOTIFY ARCHITECT, ENGINEER AND/OR OWNER OF CONFLICTS OR DISCREPANCIES PRIOR TO SUBMISSION OF BID.
- COORDINATE THE INSTALLATION OF THE MECHANICAL SYSTEMS WITH OTHER TRADES TO ENSURE A NEAT AND ORDERLY INSTALLATION. INSTALL DUCTWORK AND PIPING AS TIGHT TO STRUCTURE AS POSSIBLE. COORDINATE WITH OTHER TRADES TO AVOID CONFLICTS. COORDINATE INSTALLATION OF DUCTWORK AND PIPING TO AVOID CONFLICTS WITH ELECTRICAL PANELS, LIGHTING FIXTURES, ETC. ANY MODIFICATIONS REQUIRED DUE TO LACK OF COORDINATION WILL BE THE RESPONSIBILITY OF THE CONTRACTOR AT NO EXTRA COST TO THE OWNER.
- ALL MECHANICAL EQUIPMENT SHOWN ON THE MECHANICAL PLANS SHALL BE PROVIDED BY DIVISION 23 UNLESS OTHERWISE NOTED.
- NEW MECHANICAL EQUIPMENT, DUCTWORK AND PIPING ARE SHOWN AT APPROXIMATE LOCATIONS. FIELD MEASURE FINAL DUCTWORK AND PIPING LOCATIONS PRIOR TO FABRICATION AND MAKE ADJUSTMENTS AS REQUIRED TO FIT THE DUCTWORK AND PIPING WITHIN THE AVAILABLE SPACE. VERIFY THAT FINAL EQUIPMENT LOCATIONS MEET MANUFACTURER'S RECOMMENDATIONS REGARDING SERVICE CLEARANCE AND PROPER AIRFLOW CLEARANCE AROUND EQUIPMENT.
- REFER TO ARCHITECTURAL DRAWINGS FOR RELATED CONSTRUCTION DETAILS AS APPLICABLE TO THE HVAC SYSTEM. VERIFY CHASES AND PENETRATIONS SHOWN ON ARCHITECTURAL DRAWINGS THAT ARE INTENDED FOR DUCTWORK AND PIPING MEET REQUIREMENTS.
- COORDINATE LOCATION OF ROOF MOUNTED HVAC EQUIPMENT AND ROOF PENETRATIONS WITH THE ARCHITECTURAL AND STRUCTURAL DRAWINGS.
- INDOOR AIR QUALITY MEASURES: PROTECT INSIDE OF (INSTALLED AND DELIVERED) DUCTWORK AND HVAC UNITS FROM EXPOSURE TO DUST, DIRT, PAINT AND MOISTURE. REPLACE INSULATION THAT HAS BECOME WET AT ANY TIME DURING CONSTRUCTION. DRYING THE INSULATION IS NOT ACCEPTABLE. SEAL ANY TEARS OR JOINTS OF INTERNAL FIBERGLASS INSULATION. REMOVE DEBRIS FROM CEILING/RETURN AIR PLenums INCLUDING DUST. AN INDEPENDENT, PROFESSIONAL DUCT CLEANING COMPANY SHALL VACUUM CLEAN ANY DUCTWORK CONNECTED TO HVAC UNITS THAT WERE OPERATED DURING THE CONSTRUCTION PERIOD AFTER NEW FILTERS ARE INSTALLED AND PRIOR TO TURNING SYSTEM OVER TO THE OWNER. THE INTERNAL SURFACES AND ASSOCIATED COILS OF ANY HVAC UNITS THAT WERE OPERATED SHALL ALSO BE CLEANED.
- INSTALL DUCTWORK AND PIPING PARALLEL TO BUILDING COLUMN LINES UNLESS OTHERWISE SHOWN OR NOTED.
- OVERHEAD HANGERS AND SUPPORTS FOR EQUIPMENT, DUCTWORK AND PIPING SHALL BE FASTENED TO BUILDING JOISTS OR BEAMS. DO NOT ATTACH HANGERS AND SUPPORTS TO THE ABOVE FLOOR SLAB OR ROOF EXCEPT WHERE CONCRETE INSERTS IN CONCRETE SLABS ARE ALLOWED BY THE SPECIFICATIONS.

- COORDINATE LOCATION OF EQUIPMENT SUPPORTS WITH LOCATION OF EQUIPMENT ACCESS PANELS/DOORS TO ENABLE SERVICE OF EQUIPMENT AND/OR FILTER REPLACEMENT.
- SEAL PENETRATIONS THROUGH THE BUILDING COMPONENTS IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS. FIREPROOF PENETRATIONS THROUGH FIRE RATED COMPONENTS IN ACCORDANCE WITH U.L. REQUIREMENTS.
- COORDINATE THE EXACT MOUNTING SIZE AND FRAME TYPE OF DIFFUSERS, REGISTERS AND GRILLES WITH THE SUPPLIER TO MEET THE CEILING, WALL AND DUCT INSTALLATION REQUIREMENTS.
- ADJUST LOCATION OF CEILING DIFFUSERS, REGISTERS AND GRILLES AS REQUIRED TO ACCOMMODATE FINAL CEILING GRID AND LIGHTING LOCATIONS.
- PAINT PORTIONS OF DUCTWORK AND INSULATION THAT ARE EXPOSED TO VIEW BY THE INSTALLATION OF DIFFUSERS, REGISTERS, AND GRILLES IN CEILINGS OR WALLS FLAT BLACK. PORTIONS INCLUDE BOTH THE INTERIOR OF UNLINED DUCTWORK AND THE EXTERIOR OF DUCTWORK AND INSULATION.
- DUCTWORK CROSSING FIRE RATED WALLS OR OTHER FIRE RATED ASSEMBLIES SHALL BE MINIMUM 26 GAUGE SHEET METAL.
- PROVIDE WALL OR DUCT ACCESS PANELS OR DOORS FOR ACCESS TO FIRE AND FIRE-SMOKE DAMPERS. ACCESS PANEL OR DOOR SHALL BE MINIMUM SIZE OF 10" BY 10" AND SHALL BE INSTALLED WITHIN 12" OF DAMPER. PROVIDE A REMOVABLE DUCT SECTION WHERE DUCT SIZE IS TOO SMALL FOR A 10" BY 10" ACCESS DOOR.
- LOCATE AND SET THERMOSTATS AND HUMIDISTATS AT LOCATIONS SHOWN ON PLANS. VERIFY EXACT LOCATIONS WITH ARCHITECT PRIOR TO INSTALLATION. INSTALL DEVICES WITH BOTTOM OF DEVICE AT 48" AFF IN OFFICE TO MEET ADA REQUIREMENTS AND 80" AFF IN STORAGE AREAS. PROVIDE INSULATED BACKING FOR THERMOSTATS MOUNTED ON EXTERIOR BUILDING WALLS. INSTALL WIRING IN CONDUIT PROVIDED BY DIVISION 26. AT A MINIMUM, PROVIDE CONDUIT IN THE WALL FROM THE JUNCTION BOX TO 6" ABOVE THE CEILING.
- COORDINATE THE LOCATION AND ELEVATION OF WALL-MOUNTED DEVICES WITH PRESENTATION BOARDS, DISPLAY CABINETS, SHELVES OR OTHER COMPONENTS SHOWN ON THE ARCHITECTURAL DRAWINGS THAT ARE TO BE INSTALLED UNDER OTHER DIVISIONS. CONTRACTOR WILL NOT BE REIMBURSED FOR RELOCATION OF WALL-MOUNTED DEVICES CAUSED BY A LACK OF COORDINATION.
- PROVIDE A MANUAL BALANCING DAMPER IN EACH DUCT TAKEOFF FROM SUPPLY, RETURN, OUTDOOR AND EXHAUST AIR DUCTS.
- PROVIDE A PREFABRICATED 45 DEGREE, HIGH EFFICIENCY, RECTANGULAR ROUND BRANCH DUCT TAKEOFF FITTING FOR BRANCH DUCT CONNECTIONS AND TAKE-OFFS TO INDIVIDUAL DIFFUSERS, REGISTERS AND GRILLES. PROVIDE WITH INTEGRAL MANUAL BALANCING DAMPER AND LOCKING QUADRANT WHERE INDICATED ON PLANS.
- BRANCH DUCTWORK TO AIR OUTLETS SHALL BE SAME SIZE AS OUTLET NECK SIZE UNLESS OTHERWISE NOTED.
- REFER TO SPECIFICATIONS FOR DUCTWORK AND PIPING INSULATION REQUIREMENTS. DUCT SIZES ON MECHANICAL

- PLANS INDICATE CLEAR INSIDE AIRFLOW DIMENSIONS. INCREASE SHEET METAL SIZES ACCORDINGLY TO ACCOUNT FOR THICKNESS OF DUCT LINER.
23. FLEXIBLE DUCTWORK SHALL NOT EXCEED 5'-0" IN LENGTH AND SHALL BE INSTALLED AND SUPPORTED TO AVOID SHARP BENDS AND SAGGING. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
24. PROVIDE WALL MOUNTED LOUVERS AND DAMPERS WITH SUITABLE MOUNTING FRAME TO MATCH WALL CONSTRUCTION. COORDINATE WITH ARCHITECTURAL DRAWINGS.
25. PROVIDE A NEW SET OF AIR FILTERS IN UNITS PRIOR TO TESTING, ADJUSTING AND BALANCING AND BEFORE TURNING SYSTEM(S) OVER TO OWNER.



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PROJECT DESIGN CONDITIONS																															
CLIMATE CONDITIONS				WEATHER STATION				REFERENCE				BUILDING OPERATING HOURS:																			
WEATHER STATION:				NE PHILADELPHIA, PA				2021 ASHRAE				MONDAY - FRIDAY				TBD BY OWNER															
CLIMATE ZONE:				4A				12.8 °F DB				SATURDAY				TBD BY OWNER															
ASHRAE HEATING:				99.6% 12.8 °F DB								SUNDAY				TBD BY OWNER															
DESIGN HEATING CONDITIONS:				99.6% 12.8 °F DB								HOLIDAY				TBD BY OWNER															
HUMIDIFICATION:				99.6% -4.8 °F DP 4.3 gr/lb 15.4 °F DB																											
ASHRAE COOLING:				0.4% 93.3 °F DB 75.0 °F WB																											
DESIGN COOLING CONDITIONS:				93.3 °F DB 75.0 °F WB																											
DEHUMIDIFICATION:				0.4% 75.0 °F DP 131.8 gr/lb 82.8 °F DB																											
SPACE / UNIT DESCRIPTION																															
SPACE / UNIT DESCRIPTION		COOLING / DE-HUMIDIFICATION								HEATING				ZONE VENTILATION RESET				NOTES													
		OCC		UNOCC		MAX		MIN		OCC		UNOCC		MIN		MAX			CONTROL		BASE		MAXIMUM								
		°F		°F		RH %		RH %		°F		°F		RH %		RH %		METHOD		PPM		PPM		M/F		SAT		SUN		A/C	
STORAGE		85		85		55%		NA		55		55		NA		NA		NA		NA		NA		TBD		TBD		TBD		A-C	
OFFICE		75		80		50%		NA		70		60		NA		NA		NA		NA		NA		TBD		TBD		TBD		A-C	

- NOTES:
- A. ZONE LEVEL SET POINT CONDITIONS SHALL BE AS SCHEDULED UNLESS OTHERWISE SCHEDULED OR NOTED ON THE DRAWINGS FOR ROOM SPECIFIC SPACE CONDITIONS.
- B. ZONE LEVEL OCCUPANCY HOUR SCHEDULE SHALL BE PER BUILDING OPERATING HOURS UNLESS OTHERWISE SCHEDULED.
- C. ZONE LEVEL CONTROLS SHALL BE CAPABLE OF OPERATING WITH INDEPENDENT OCCUPANCY SCHEDULES.

OUTSIDE AIR REQUIREMENTS, IMC-2021 (IP)																	
SYSTEM DESIGNATION	SYSTEM TAB NAME OR LIST SINGLE	SINGLE-ZONE SYSTEMS ONLY				MULTI-ZONE SYSTEMS ONLY				FLOOR AREA SERVED BY SYSTEM [A _s] (SF)	SYSTEM AVERAGED AREA-BASED OUTDOOR AIR RATE (CFM/SF)	SYSTEM POPULATION (PEOPLE)	SYSTEM AVERAGED PEOPLE-BASED OUTDOOR AIR RATE (CFM/PEOPLE)	REQUIRED OA INTAKE FLOW [A _o] (CFM)	REQUIRED DCV OA INTAKE FLOW [A _o] (CFM)	DESIGN OA INTAKE FLOW [A _o] (CFM)	NOTES
		SINGLE ZONE SYSTEM ASSOCIATED VENTILATION ZONE	SINGLE ZONE WORST CASE ZONE AIR DISTRIBUTION EFFECTIVENESS [ε _d]	SYSTEM VENTILATION EFFICIENCY [ε _v]	SYSTEM VENTILATION EFFICIENCY [ε _v]	MIN	MAX	MIN	MAX								
AHU-1	SINGLE ZONE	FIRST FLOOR STORAGE	0.80	-	-	3,430	0.060	0	10.00	257	N/A	480					
AHU-1-4	MULTIZONE (AHU-1-4)	-	-	1.00	842	0.060	4.21	5.00	72	N/A	120						
AHU-2	SINGLE ZONE	SECOND FLOOR STORAGE	0.80	-	-	5,888	0.060	0	10.00	442	N/A	640					
AHU-3	SINGLE ZONE	THIRD FLOOR STORAGE	0.80	-	-	6,484	0.060	0	10.00	480	N/A	640					
AHU-4	SINGLE ZONE	FOURTH FLOOR STORAGE	0.80	-	-	6,332	0.060	0	10.00	475	N/A	640					
TOTALS												1,726	0	2,520			

GENERAL NOTES:

- VENTILATION CALCULATIONS BASED ON IMC-2021.
- SYSTEM POPULATIONS BASED ON CODE MAXIMUM VALUES IN OCCUPIED CORRIDORS. STORAGE UNITS ARE NON-OCCUPIED.
- SINGLE ZONE SYSTEMS (V_{h1} = V_{h2}): SYSTEM VENTILATION EFFICIENCY CALCULATION IS NOT REQUIRED FOR SINGLE ZONE SYSTEMS. WORST CASE AIR DISTRIBUTION EFFECTIVENESS BETWEEN HEATING AND COOLING MODES OF OPERATION IS SHOWN IN TABLE.
- MULTI-ZONE RECIRCULATING SYSTEMS: CALCULATOR USED TO DETERMINE VENTILATION AIRFLOW IN COMPLIANCE WITH IMC-2021 VRP AND ASHRAE 62.1-2019 APPENDIX A. VENTILATION RATE SHOWN IS ACTUAL CALCULATED WITH CORRECTION FACTORS INCLUDED. EACH ZONE IS CALCULATED WITH ITS WORST CASE ZONE AIR DISTRIBUTION EFFECTIVENESS (HEATING/COOLING) AS PART OF CALCULATIONS TO FIND ε_v.

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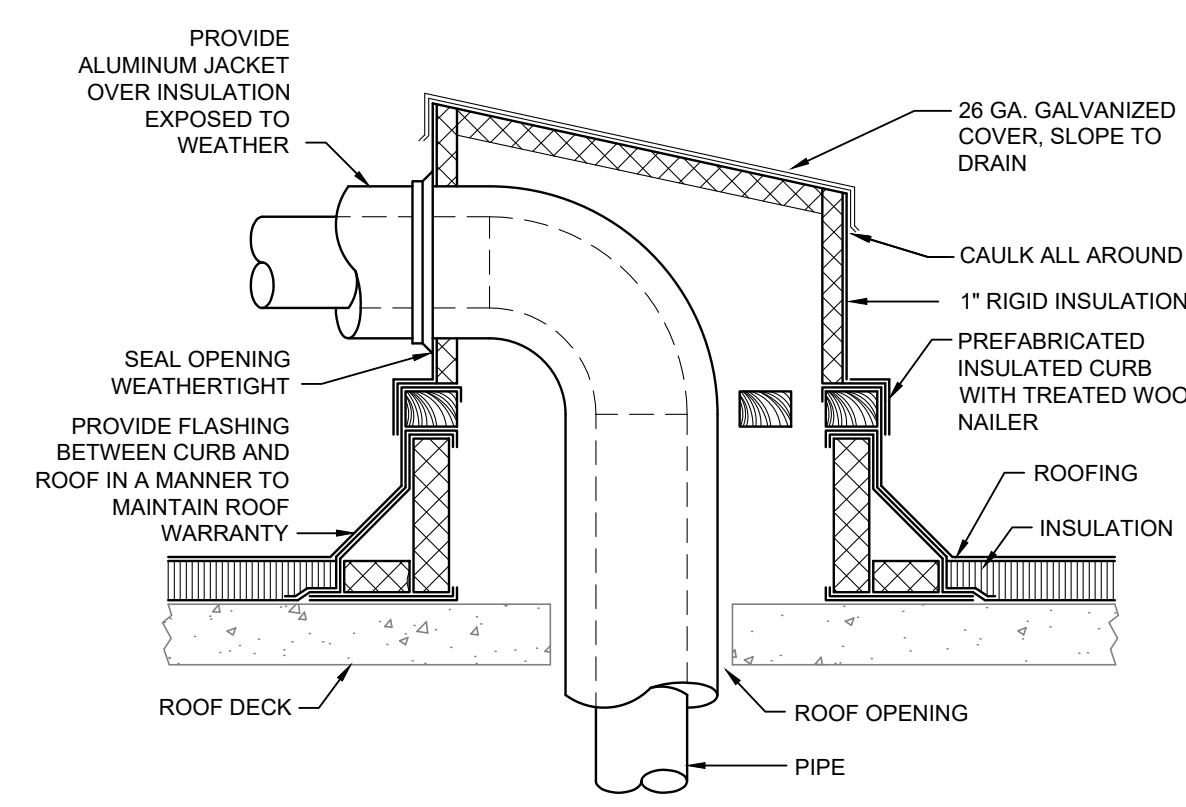
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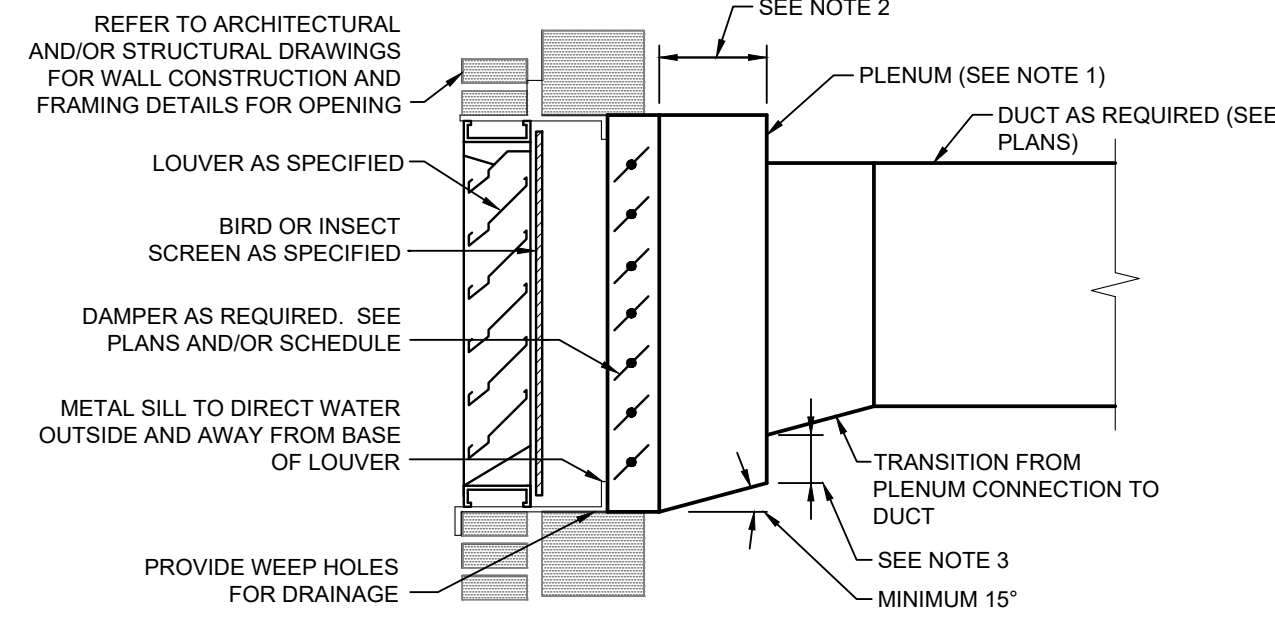
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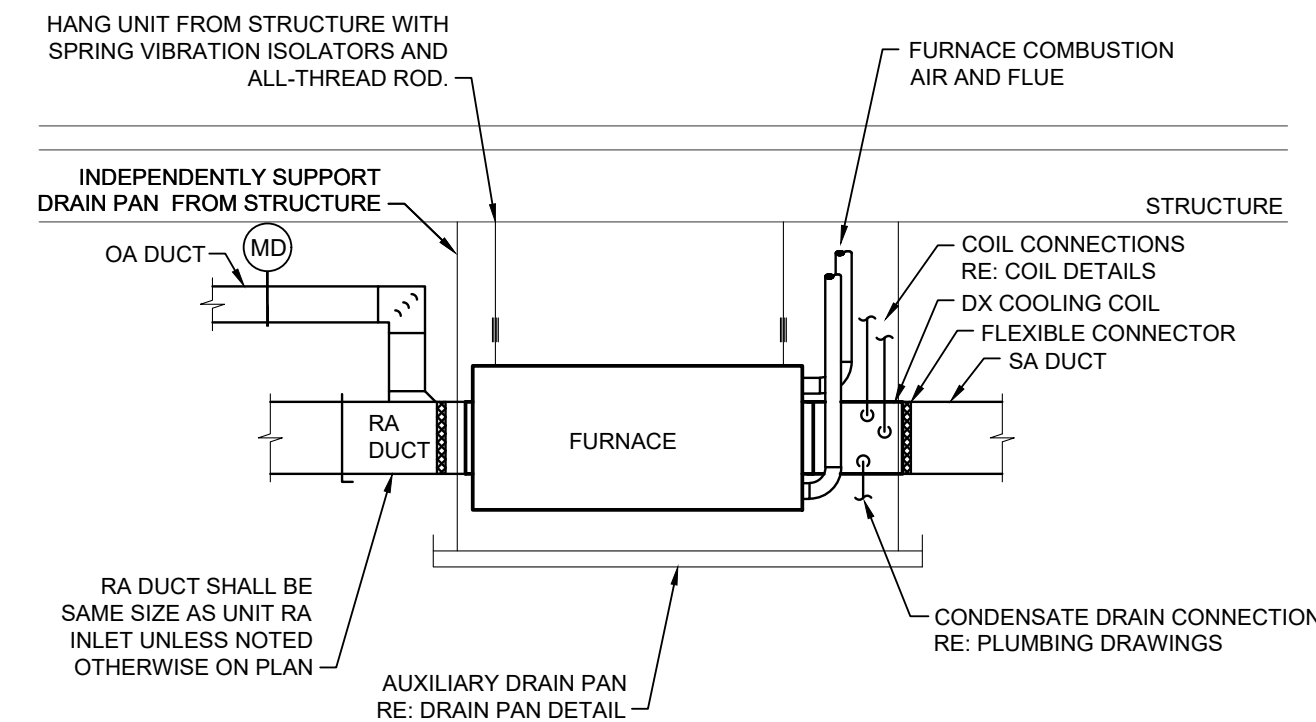
NOTES:
1. FOR MULTIPLE PIPES, PROVIDE ONE ENCLOSURE, WHERE FEASIBLE.

1 PIPE ROOF PENETRATION ENCLOSURE DETAIL
NO SCALE



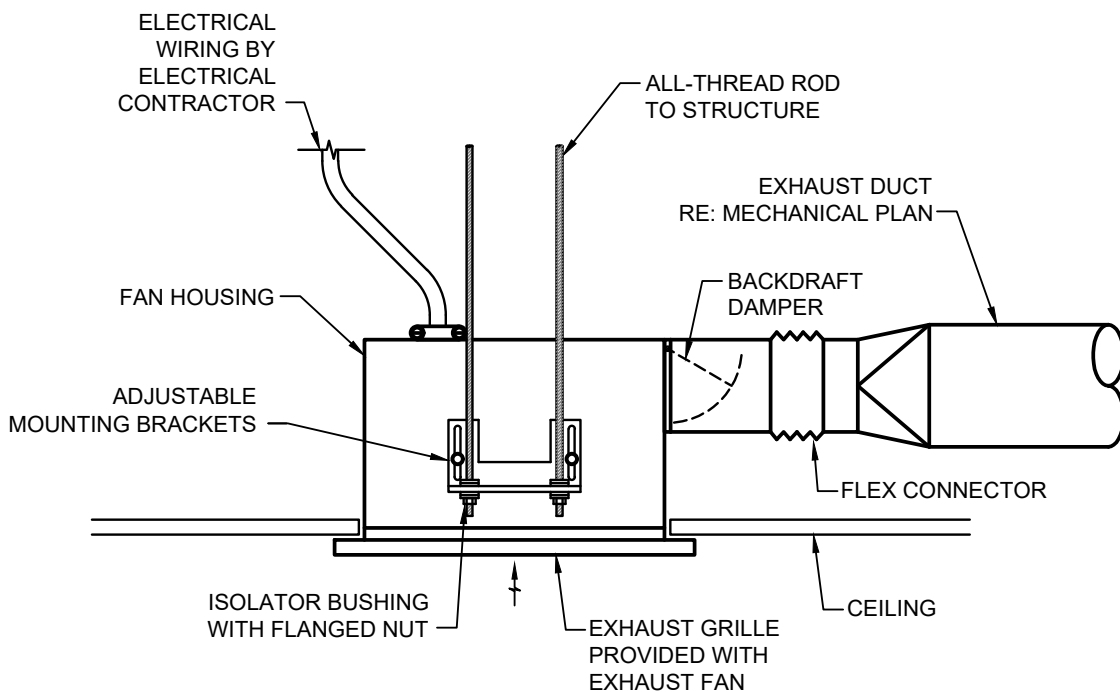
NOTES:
1. SEAL ALL JOINTS AND SEAMS OF PLENUM AND DUCT TO PROVIDE WATER TIGHT CONSTRUCTION. PROVIDE INSULATION FOR PLENUM AND DUCT PER SPECIFICATIONS.
2. MINIMUM DEPTH OF PLENUM SHALL BE 24\"/>

5 LOUVER INSTALLATION DETAIL
NO SCALE

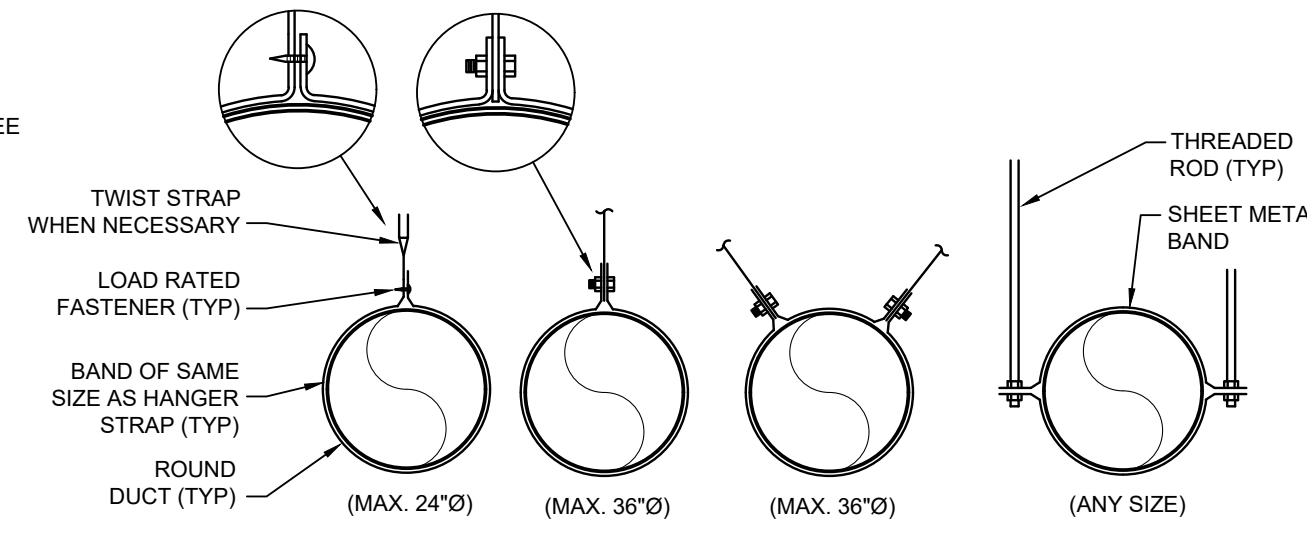
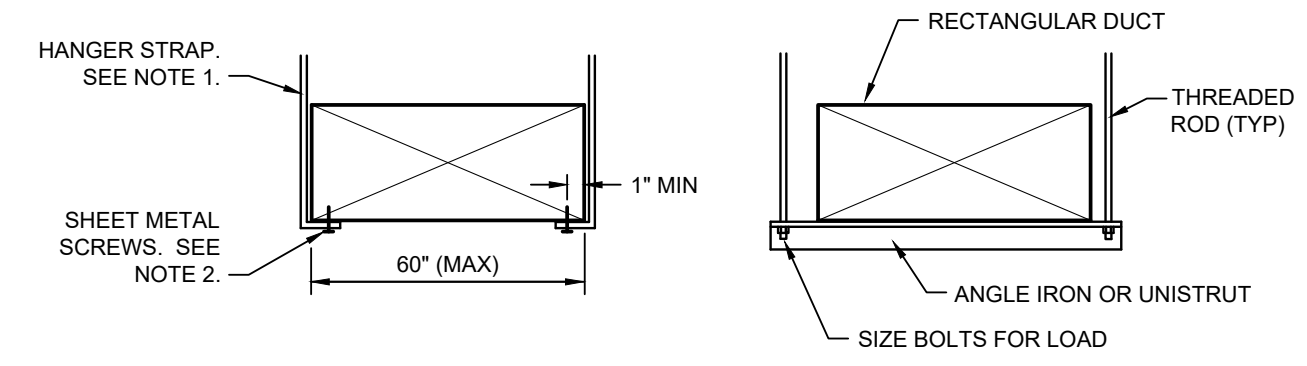


NOTES:
1. ARRANGEMENT SHOWN IS SCHEMATIC. ADJUST TO SUIT FIELD CONDITIONS AND MEET LOCAL CODE REQUIREMENTS.

9 HORIZONTAL FURNACE DETAIL
NO SCALE

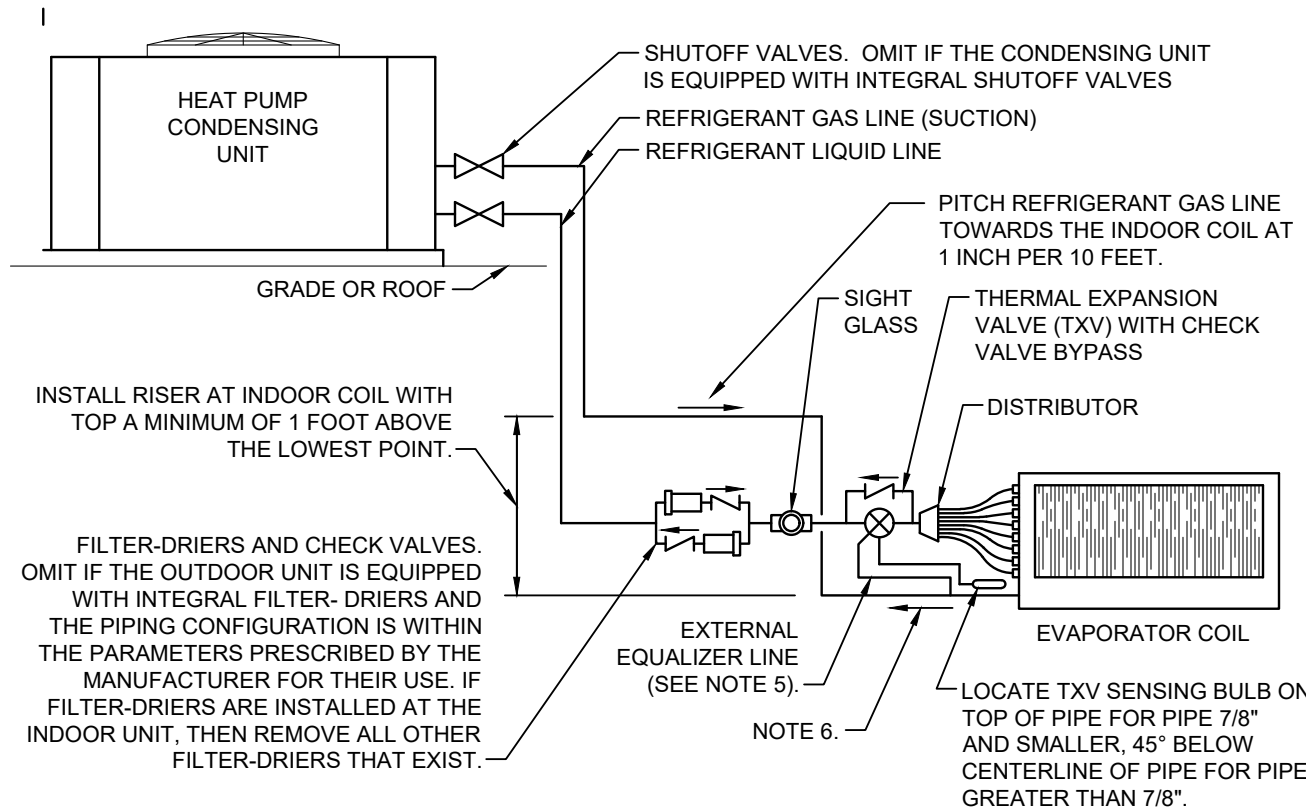


2 CEILING MOUNTED EXHAUST FAN
NO SCALE



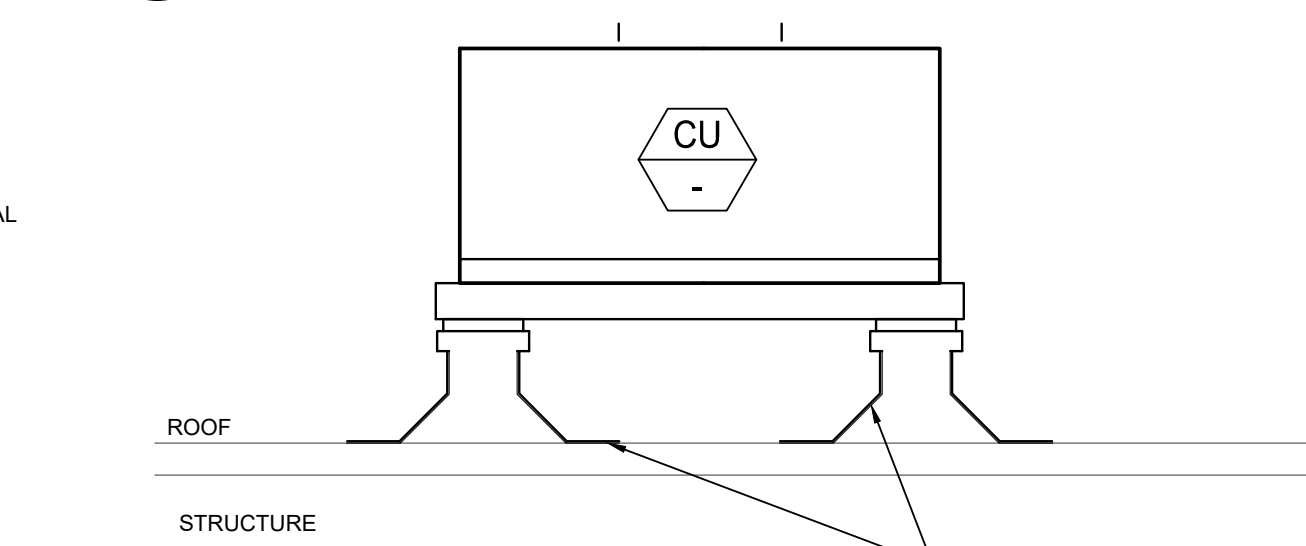
NOTES:
1. USE THREADED ROD FOR RECTANGULAR DUCTS LARGER THAN 60\"/>

6 DUCT HANGER LOWER ATTACHMENT DETAILS
NO SCALE



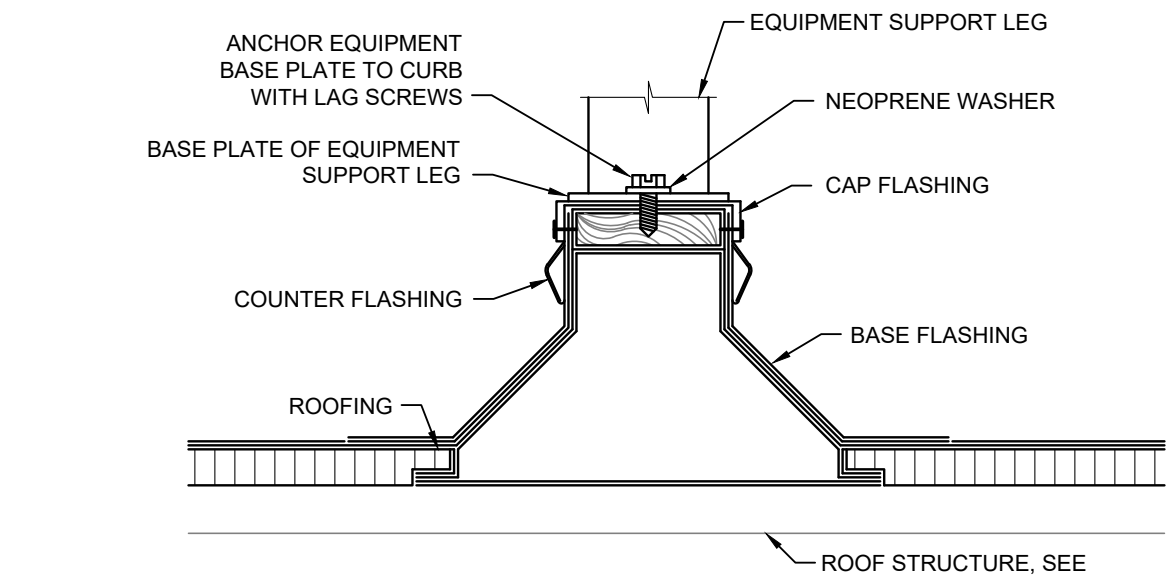
NOTES:
1. INSTALL REFRIGERANT PIPING AND COMPONENTS IN STRICT CONFORMANCE WITH ALL MANUFACTURER'S RECOMMENDATIONS AND REQUIREMENTS, WHICH SHALL TAKE PRECEDENT OVER INFORMATION PRESENTED IN THIS DETAIL.
2. ALL COMPONENTS INSTALLED SHALL BE THE EXACT MODEL RECOMMENDED BY THE MANUFACTURER.
3. CONSULT THE MANUFACTURER REGARDING THE NEED TO INSTALL A SOLENOID VALVE IN THE LIQUID LINE BETWEEN THE FILTER-DRIER AND SITE GLASS.
4. INSTALL REFRIGERATION PIPE SIZES RECOMMENDED BY THE MANUFACTURER AND CONSULT THE MANUFACTURER REGARDING THE NEED FOR INTERMEDIATE TRAPS BASED ON THE RECOMMENDED PIPE SIZES AND PIPING CONFIGURATION.
5. INSTALL THERMAL EXPANSION VALVE WITH BALANCED PORT CONSTRUCTION AND EXTERNAL EQUALIZER LINES FOR ALL EVAPORATOR COILS EQUIPPED WITH A REFRIGERANT DISTRIBUTOR.
6. PITCH REFRIGERANT GAS LINE AWAY FROM INDOOR COIL AT 1 INCH PER 10 FEET.
7. FILTER-DRIER MAY BE OMITTED IF NOT REQUIRED BY MANUFACTURER AND SYSTEM IS LESS THAN 5 TONS.
8. SIGHT GLASS MAY BE OMITTED IF NOT REQUIRED BY MANUFACTURER AND SYSTEM IS LESS THAN 5 TONS.

3 SPLIT SYSTEM PIPING DETAIL
NO SCALE

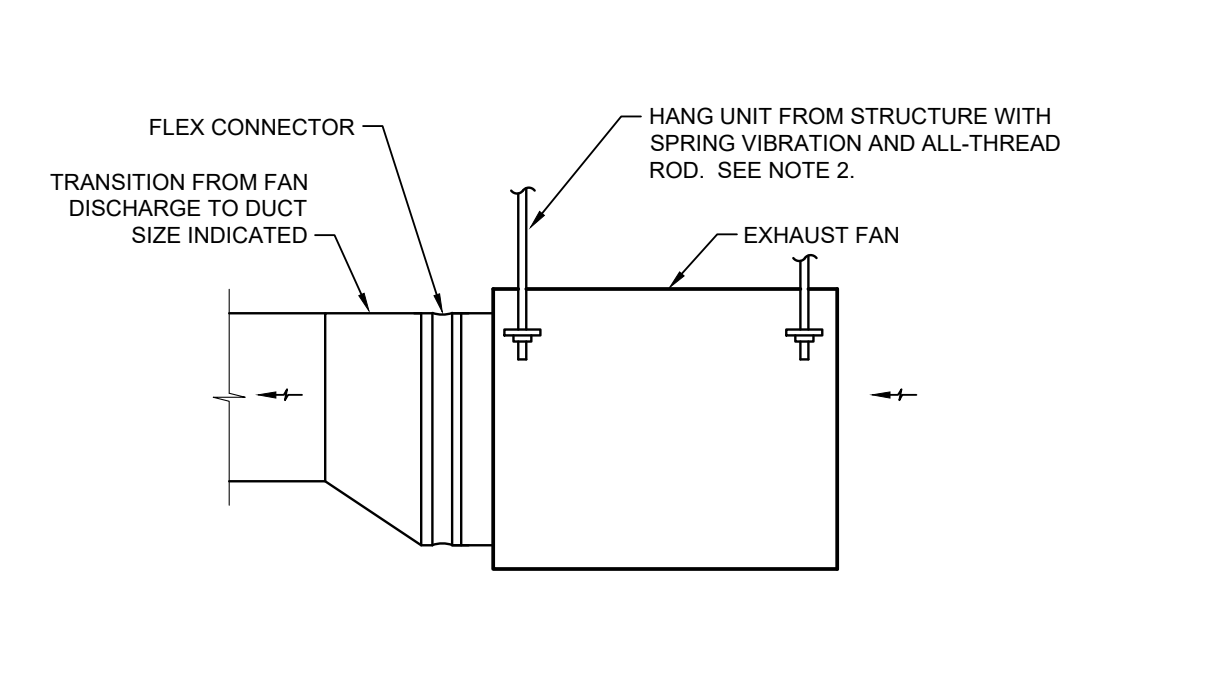


NOTES:
1. SUPPORT OUTDOOR UNITS ON MECHANICAL EQUIPMENT RAIL PER SUPPORT MANUFACTURER'S INSTALLATION DETAILS IN COMPLIANCE WITH LOCAL SEISMIC AND WIND RESTRAINT REQUIREMENTS.
2. SEE TYPICAL EQUIPMENT SUPPORT RAIL AND SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

7 CONDENSING UNIT ROOF MOUNTED SUPPORT
NO SCALE

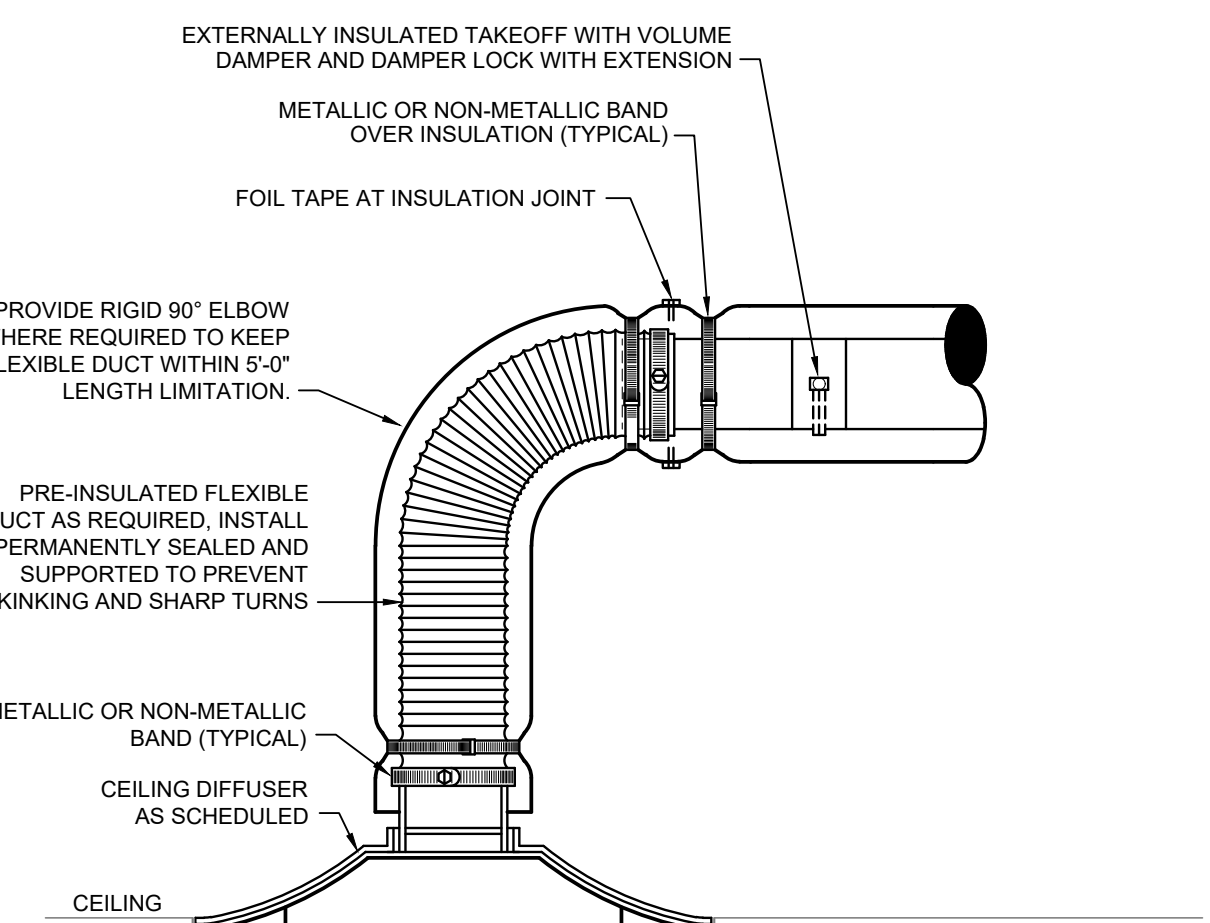


10 ROOF EQUIPMENT SUPPORT RAIL DETAIL
NO SCALE



NOTES:
1. ARRANGEMENT SHOWN IS SCHEMATIC. ADJUST TO SUIT FIELD CONDITIONS AND MEET LOCAL CODE REQUIREMENTS.
2. FOR FANS 1 HP AND LESS, PROVIDE NEOPRENE RUBBER MOUNT HANGER (NR). FOR FANS LARGER THAN 1 HP, PROVIDE SPRING VIBRATION ISOLATION HANGER (SPNH).

4 IN-LINE FAN DETAIL
NO SCALE



NOTES:
1. FLEXIBLE DUCT LENGTH MAY NOT EXCEED 5'-0\"/>

8 CEILING DIFFUSER DETAIL
NO SCALE



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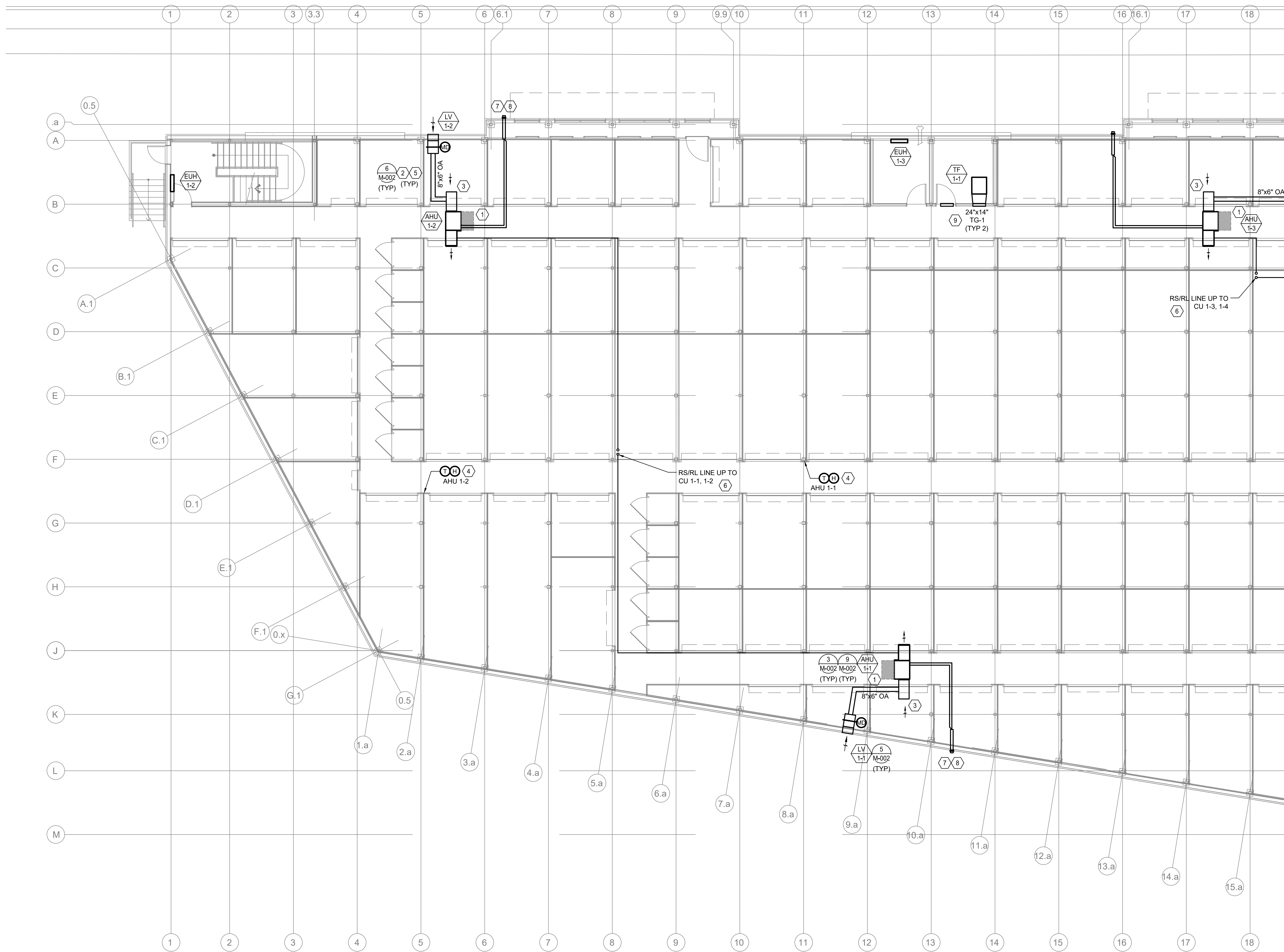
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- SHEET KEY NOTES**
1. ACCESS TO HVAC EQUIPMENT SHALL BE FROM UNFINISHED AREA OR PLAN COORDINATE FINAL METELED LOCATION SUCH THAT THE HVAC EQUIPMENT REMAINS ACCESSIBLE. VERIFY THIS COORDINATE WITH ELECTRICAL, CIVIL, STRUCTURAL, AND/OR ARCHITECTURE AS NECESSARY.
 2. COORDINATE ROUTE OF DUCTWORK WITH STRUCTURAL BEARING SYSTEM, POWER AND LIGHTING, STORAGE UNITS, AIRWAYS, ETC.
 3. COOLING RETURN AIR OPENINGS WITH WIRE MESH SCREEN.
 4. MOUNT THERMOSTATS AT 5' AFF. PROVIDE WITH GRADE, TAMPER-RESISTANT LOCKABLE THERMOSTAT GUARD. ARCHITECT TO VERIFY THERMOSTAT LOCATION PRIOR TO FINISH AND INSULATION.
 5. PROVIDE DELTA FOR OUTSIDE AIR DUCT FROM CONNECTION AT FAN COIL UNIT TO AND INCLUDING INSULATED PURSUE ROOM AS LATEST PER SPECIFICATIONS.
 6. LINE REPRESENTS BOTH REFRIGERANT LIQUID LINE AND SUCTION LINE PIPING FOR UNIT AT SUGGESTED ROUTE.
 7. FLEET TERMINATION TO BE LOCATED MINIMUM 10' AWAY FROM OUTSIDE AIR INTAKE.
 8. ROUTE OF COMBUSTION AIR INTAKE AND EXHAUST DUCT TO LOCATION INDICATED. SLOPE EXHAUST VENT A MINIMUM OF 1/4" PER LINEAR FOOT. COORDINATE ROUTE OF COMBUSTION EXHAUST VENT WITH GENERAL CONTRACTOR. ELECTRICAL CONTRACTOR SHALL COORDINATE AND PROVIDE CONNECTION OF EXHAUST WIRE FROM EXHAUST VENT TO GENERAL CONTRACTOR. PROVIDE CONNECTION TO ALL NEW TYPICAL MECHANICAL FLOOR PLAN. PROVIDE CONNECTION TO TERMINAL KIT FOR COMBUSTION INTAKE AND EXHAUST PIPING. MAINTAIN MINIMUM 12" OF CLEARANCE FROM ALL OUTSIDE AIR INTAKES.
 9. MOUNT THERMOSTAT SHALL AT 5' AFF.



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COGENT CAPITAL GROUP

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 WILMETTE, ILLINOIS 60091

SELF STORAGE
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DRAWING NAME + NUMBER
 FIRST FLOOR MECHANICAL PLAN - A

1 MECHANICAL FLOOR PLAN - FIRST FLOOR - A
 M-201 SCALE: 1/8" = 1'-0"

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 NJ REG.# 24GE05484200

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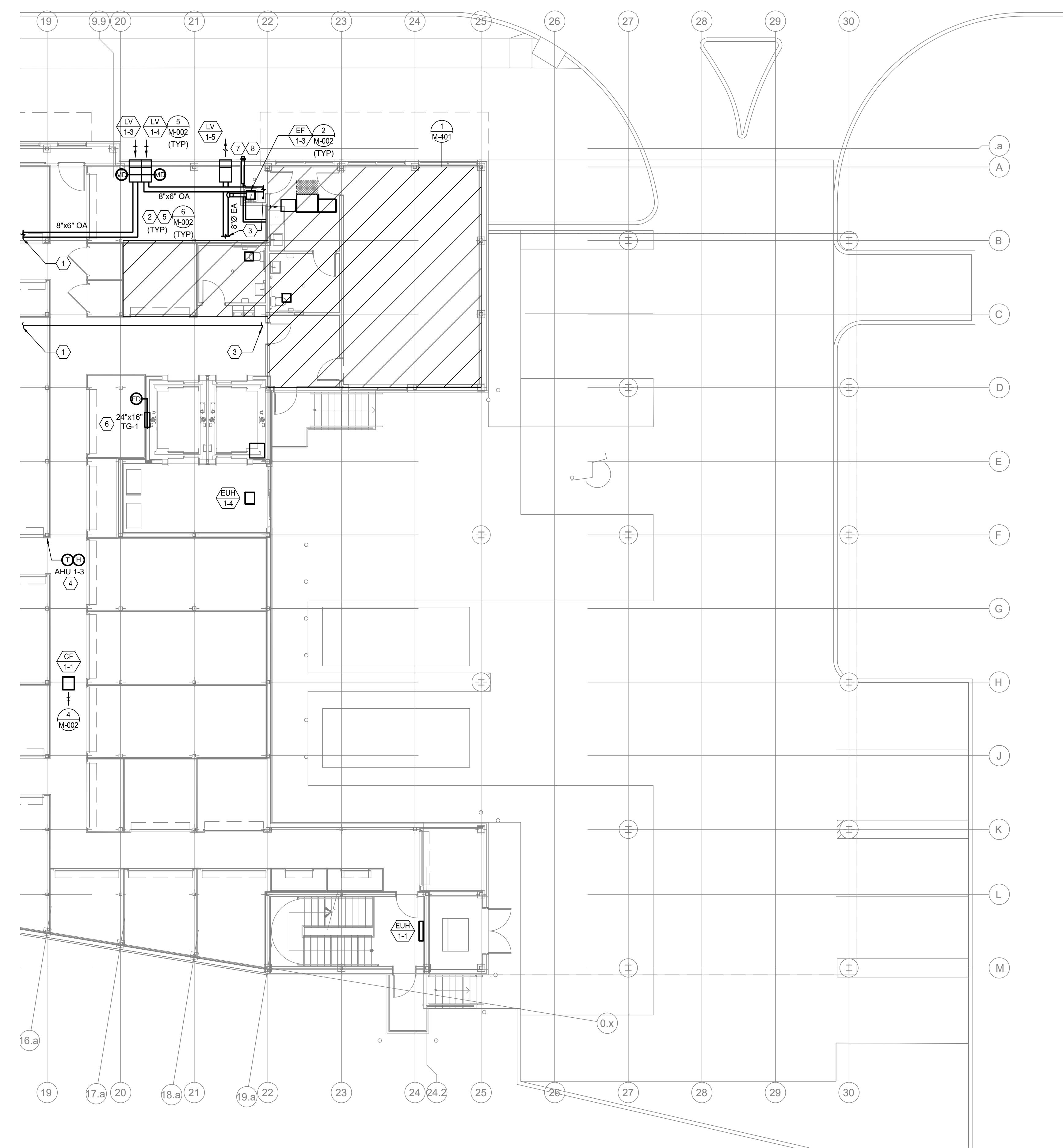
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DRAWING NAME + NUMBER
FIRST FLOOR MECHANICAL PLAN - B



SHEET KEY NOTES

- SEE SHEET MD-1 FOR CONTINUATION.
- COORDINATE HEIGHT OF EQUIPMENT WITH STRUCTURAL BEARING SYSTEM POWER AND LIGHTING STORAGE UNITS.
- SEE SHEET MD-1 FOR CONTINUATION.
- SEE SHEET MD-1 FOR CONTINUATION.
- RELAY TERMINALS SHALL BE AT 6'0" AFF. PROVIDE WITH SINGLE TAMPER RESISTANT LOCKABLE TERMINAL SQUARE ARCHITECT TO VERIFY TERMINALS LOCATION FROM TO STRUCTURE AND INSULATION.
- PROVIDE INSULATION FOR OUTSIDE AIR DUCT FROM CONNECTION AT THE COIL UNIT TO AND INCLUDING INSULATED FLEXIBLE BOSS AT LOUVER FIF SPECIFICATIONS.
- INSTALL TAMPER RESISTANT LOCK AT 6'0" AFF.
- FLUE TERMINATION TO BE LOCATED MINIMUM 10' AWAY FROM OUTSIDE AIR INTAKES.
- ROUTE OF CONDENSATION AIR INTAKE AND EXHAUST VENT TO LOCATION INDICATED. EXHAUST SHALL NOT BE A MINIMUM OF 10' FROM ANY OTHER CONDENSATION SOURCE. CONDENSATE SHALL BE COLLECTED AND DISPOSED OF AS REQUIRED. REFER TO MANUFACTURER INSTALLATION REQUIREMENTS FOR ADDITIONAL INFORMATION. PROVIDE CONDENSATE VENT TERMINATION AND FLOOR CONNECTIONS AND THROUGH PENETRATION MINIMUM 10' CLEARANCE FROM ALL OUTSIDE AIR INTAKES.

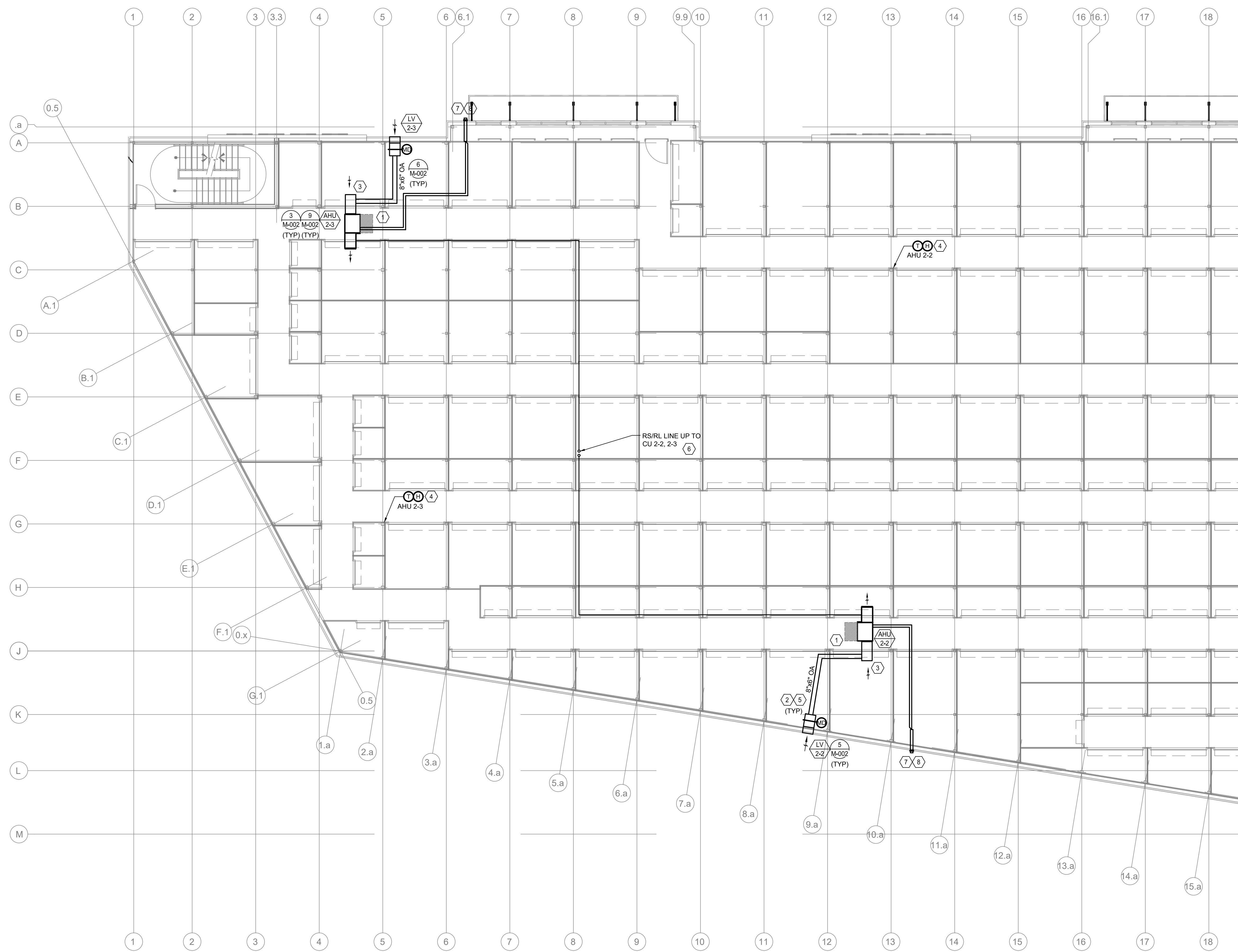
1 MECHANICAL FLOOR PLAN - FIRST FLOOR - B
M-202 SCALE: 1/8" = 1'-0"

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- SHEET KEY NOTES**
1. ACCESS TO HVAC EQUIPMENT SHALL BE FROM UNOCCUPIED AREAS. COORDINATE FINAL METALLIC LOCATIONS WITH THE GENERAL CONTRACTOR'S ACCESSIBILITY. VERIFY THE LOCATION WITH ELECTRICAL, CIVIL, STRUCTURAL, AND/OR MECHANICAL CONTRACTORS PRIOR TO CONSTRUCTION.
 2. COORDINATE ROUTE OF DUCTWORK WITH STRUCTURAL, BEARING SYSTEM, POWER AND LIGHTING, STORAGE UNITS, ELEVATORS, ETC.
 3. COORDINATE RETURN AIR OPENINGS WITH WIRE MESH SCREEN.
 4. MOUNT THERMOSTATS AT 5' AFF. PROVIDE WITH GRADE, TAMPER-RESISTANT LOCKABLE THERMOSTAT GUARD. ARCHITECT TO VERIFY THERMOSTAT LOCATION PRIOR TO FINISH AND INSTALLATION.
 5. PROVIDE ISOLATION FOR OUTSIDE AIR DUCT FROM CONNECTION AT FAN COIL UNIT TO AVOID INCLUDING ISOLATED FURNACE ROOM AT UNIT.
 6. LINE REPRESENTS BOTH REFRIGERANT LIQUID LINE AND SUCTION LINE PIPING FOR UNIT AT SUGGESTED ROUTE.
 7. FUEL TERMINATION TO BE LOCATED MINIMUM 10' AWAY FROM OUTSIDE AIR INTAKE.
 8. ROUTE OF COMBUSTION AIR PIPING AND EXHAUST MUST BE LOCATED MINIMUM 10' AWAY FROM EXHAUST AIR INTAKE. FOR LINEAR FOOT COORDINATE ROUTE OF COMBUSTION EXHAUST WITH GENERAL CONTRACTOR. ELECTRICAL CONTRACTOR SHALL VERIFY LOCATION AND PROVIDE COORDINATION OF ALL WIRING FROM EXHAUST ROUTE. REFER TO APPLICABLE NATIONAL REQUIREMENTS FOR ALL WIRING. VERIFY CLEARANCE FROM ALL OUTSIDE AIR INTAKES. KIT FOR COMBUSTION INTAKE AND EXHAUST PIPING MANTION MINIMUM 10' CLEARANCE FROM ALL OUTSIDE AIR INTAKES.

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SECOND FLOOR
MECHANICAL FLOOR - A

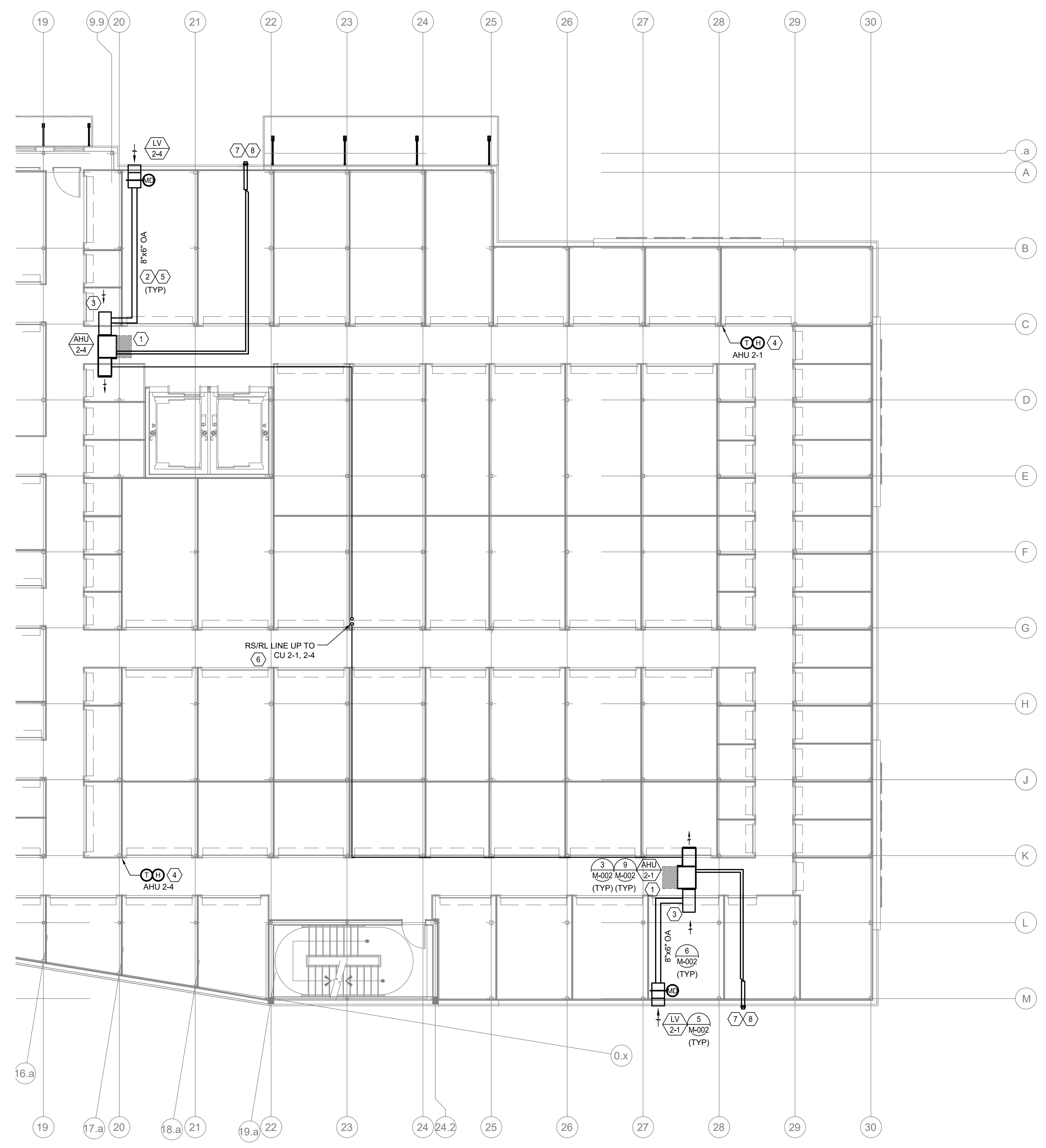
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M-203 **MECHANICAL FLOOR PLAN - SECOND FLOOR - A**
SCALE: 1/8" = 1'-0"

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- SHEET KEY NOTES**
1. ACCESS TO HVAC EQUIPMENT SHALL BE FROM HATCHED AREA ON PLAN. COORDINATE FINAL METELED LOCATION WITH THAT OF THE ELECTRICAL SYSTEM. PROVIDE ACCESSIBLE AND SAFE TO ALL. PROVIDE ELECTRICAL, MECHANICAL, STRUCTURAL, AND/OR OTHER SYSTEMS ACCESS AS MAY BE REQUIRED. COORDINATE WITH ALL OTHER SYSTEMS.
 2. COORDINATE ROUTE OF DUCTWORK WITH STRUCTURAL, BEARING SYSTEM, POWER AND LIGHTING, STORAGE UNITS, AIRHANDLERS, ETC.
 3. COOLING RETURN AIR OPENINGS WITH WIRE MESH SCREEN.
 4. MOUNT THERMOSTATS AT 5' 0" AFF. PROVIDE WITH GRADE, TAMPER RESISTANT LOCKABLE THERMOSTAT GUARD. ARCHITECT TO VERIFY THERMOSTAT LOCATION PRIOR TO FLOORING AND INSULATION.
 5. PROVIDE INSULATION FOR OUTSIDE AIR DUCT FROM CONNECTOR AT FAH COIL UNIT TO AND INCLUDING INSULATED PLUMB ROOM IF APPLICABLE.
 6. LINE REPRESENTS BOTH REFRIGERANT LIQUID LINE AND SUCTION LINE PIPING FOR UNIT AT SUGGESTED ROUTE.
 7. FLUE TERMINATION TO BE LOCATED MINIMUM 10' AWAY FROM OUTSIDE AIR INTAKE.
 8. ROUTE OF COMBUSTION AIR PIPING AND EXHAUST DUCT TO LOCATION INDICATED. SLOPE EXHAUST VENT A MINIMUM OF 1/4" PER LINEAR FOOT. COORDINATE ROUTE OF COMBUSTION EXHAUST VENT WITH GENERAL CONTRACTOR. ELECTRICAL CONTRACTOR SHALL VERIFY LOCATION AND PROVIDE PROTECTION OF ALL UTILITIES PRIOR TO INSTALLATION. PROVIDE CLEARANCE FROM ALL UTILITIES. PROVIDE CLEARANCE FROM ALL UTILITIES. PROVIDE CLEARANCE FROM ALL UTILITIES. PROVIDE CLEARANCE FROM ALL UTILITIES.



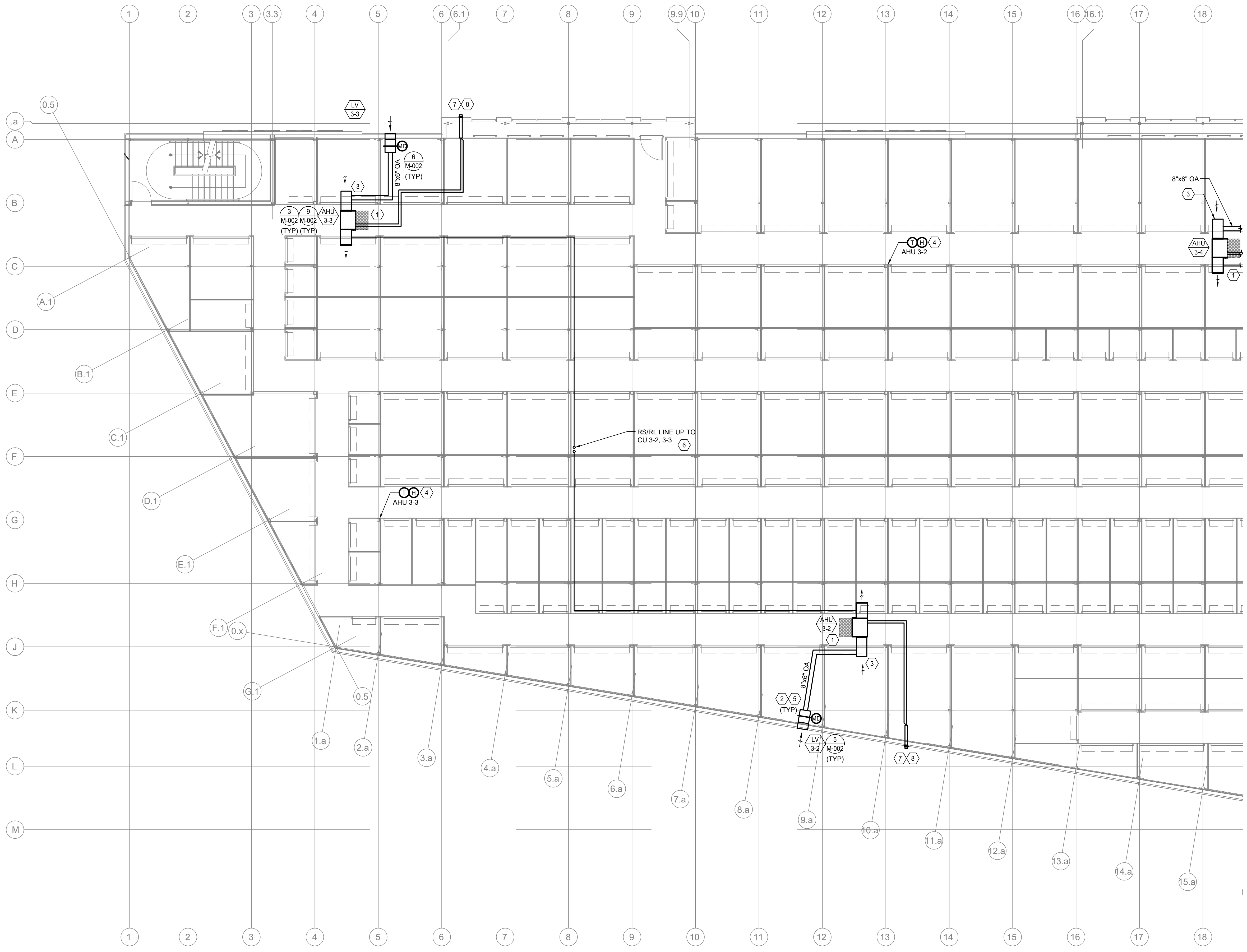
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M-204
MECHANICAL FLOOR PLAN - SECOND FLOOR - B
SCALE: 1/8" = 1'-0"

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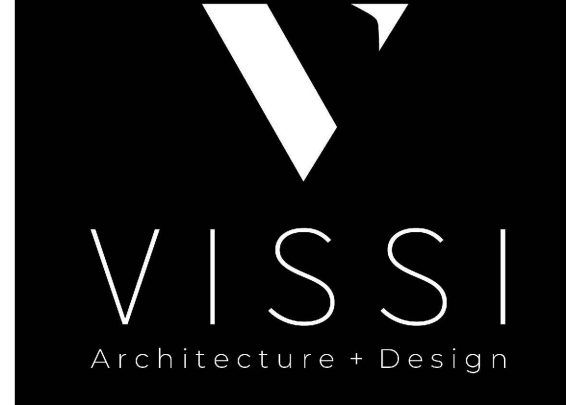
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- SHEET KEY NOTES**
1. ACCESS TO HVAC EQUIPMENT SHALL BE FROM UNOCCUPIED AREAS OR PLANS. COORDINATE FINAL INSTALLED LOCATIONS WITH THE ARCHITECTURE, ELECTRICAL, MECHANICAL, AND STRUCTURAL CONTRACTORS. PROVIDE ACCESS TO ALL HVAC EQUIPMENT FROM UNOCCUPIED AREAS OR PLANS.
 2. COORDINATE ROUTE OF DUCTWORK WITH STRUCTURAL BEARING SYSTEM AND LIGHTING, STORAGE UNITS, SINKS, ETC.
 3. COORDINATE RETURN AIR GRilles WITH WIRE SCREENS.
 4. MOUNT THERMOSTATS AT 5' AFF. PROVIDE WITH GRADE TAMPERS RESISTANT LOCKABLE THERMOSTAT GUARD ARCHITECT TO VERIFY THERMOSTAT LOCATION PRIOR TO FINISH AND INSTALLATION.
 5. PROVIDE ISOLATION FOR OUTSIDE AIR DUCT FROM CONNECTION AT FAULT COL UNIT TO AVOID INCLUDING IMBILATED PURSUE ROOM AT UNIT.
 6. LINE REPRESENTS BOTH REFRIGERANT LIQUID LINE AND SUCTION LINE PIPING FOR UNIT AT SUGGESTED ROUTE.
 7. FUEL TERMINATION TO BE LOCATED MINIMUM 10' AWAY FROM OUTSIDE AIR INTAKE.
 8. ROUTE OF COMBUSTION AIR PIPING AND EXHAUST VENT TO LOCATION INDICATED. SLOPE EXHAUST VENT A MINIMUM OF 1/4" PER LINEAR FOOT. COORDINATE ROUTE OF COMBUSTION EXHAUST VENT WITH GENERAL CONTRACTOR, ELECTRICAL CONTRACTOR, FIRE ALARM CONTRACTOR, AND OTHERS AS NECESSARY. PROVIDE CLEARANCE FROM ALL OUTSIDE AIR INTAKES. PROVIDE CLEARANCE FROM ALL OUTSIDE AIR INTAKES.



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1 MECHANICAL FLOOR PLAN - THIRD FLOOR - A
 M-205 SCALE: 1/8" = 1'-0"

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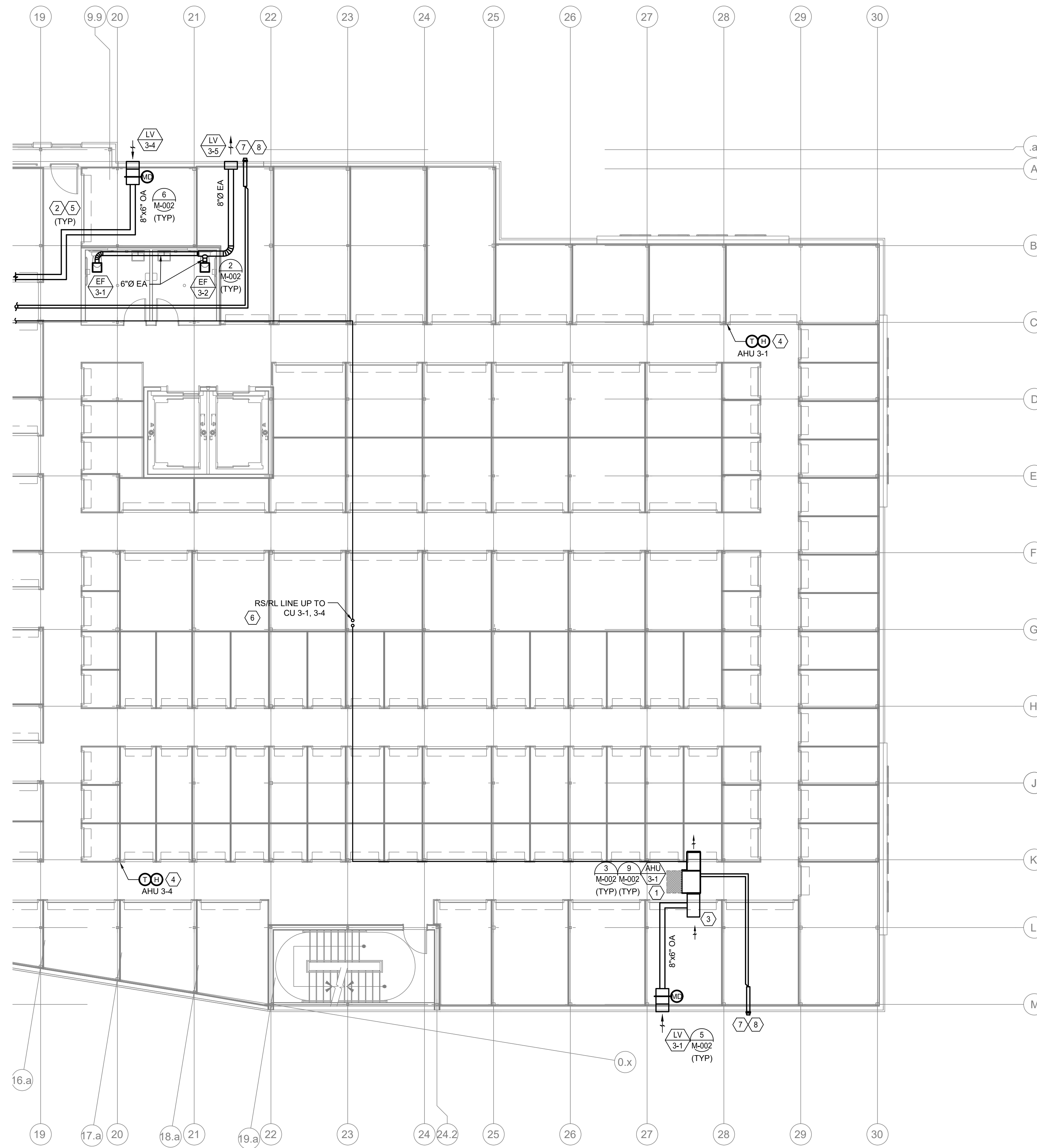
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 THIRD FLOOR - A
 MECHANICAL PLAN - A

M-205
 A&E Construction Co.
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 2. COORDINATE ROUTE OF DUCTWORK WITH STRUCTURAL, BEARING SYSTEM, POWER AND LIGHTING, STORAGE UNITS, AIRWAYS, ETC.
 3. COOLING RETURN AIR DRAINAGE WITH WIRE MESH SCREEN.
 4. MOUNT THERMOSTATS AT 5' AFF. PROVIDE WITH GRADE, TAMPER RESISTANT LOCKABLE THERMOSTAT GUARD. ARCHITECT TO VERIFY THERMOSTAT LOCATION PRIOR TO FLOORING INSTALLATION.
 5. PROVIDE ISOLATION FOR OUTSIDE AIR DUCT FROM CONNECTION AT FAN COIL UNIT TO AVOID INCLUDING UNBLENDED FRESH AIR INTO ROOMS.
 6. LINE REPRESENTS BOTH REFRIGERANT LIQUID LINE AND SUCTION LINE PIPING FOR UNIT AT SUGGESTED ROUTE.
 7. FLEX TERMINATION TO BE LOCATED MINIMUM 10' AWAY FROM OUTSIDE AIR INTAKE.
 8. ROUTE OF COMBUSTION AIR INTAKE AND EXHAUST DUCT TO LOCATION INDICATED. SLOPE EXHAUST VENT A MINIMUM OF 1/4" PER LINEAR FOOT. COORDINATE ROUTE OF COMBUSTION EXHAUST VENT WITH GENERAL CONTRACTOR, ELECTRICAL CONTRACTOR, FIRE PROTECTION CONTRACTOR, AND OTHERS AS NECESSARY. VERIFY WITH GENERAL CONTRACTOR THAT ALL NECESSARY PERMITS AND APPROVALS ARE OBTAINED PRIOR TO CONSTRUCTION. PROVIDE CLEARANCE TO ALL EXHAUST TERMINATION KIT FOR COMBUSTION INTAKE AND EXHAUST PIPING. MAINTAIN MINIMUM 18" OF CLEARANCE FROM ALL OUTSIDE AIR INTAKES.



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1 MECHANICAL FLOOR PLAN - THIRD FLOOR - B
 M-206 SCALE: 1/8" = 1'-0"

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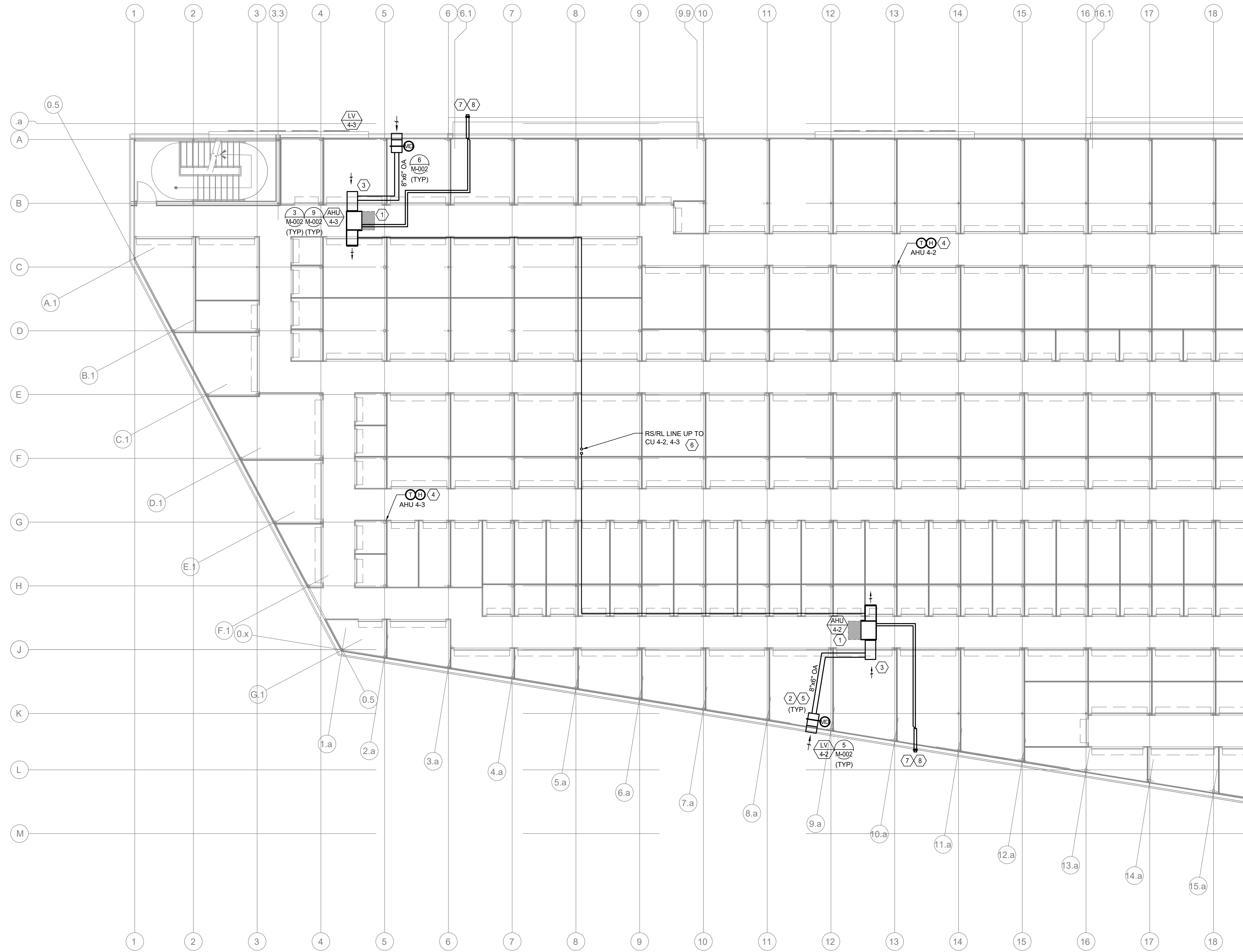
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DRAWING NAME + NUMBER
 THIRD FLOOR PLAN - B

M-206
 A&E Construction Co.
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DATE:



- SHEET NOTES**
1. ACCESS TO HVAC EQUIPMENT SHALL BE FROM UNOCCUPIED AREAS OR FROM COORDINATE PANEL, BATTLED, LOCATION SUCH THAT THE HVAC EQUIPMENT REMAINS ACCESSIBLE. VERIFY THIS LOCATION WITH ELECTRICAL, CIVIL, STRUCTURAL, AND/OR ARCHITECTURE BEFORE ACCESS. VERIFY THIS COORDINATE INSTALLATION WITH EQUIPMENT DETAIL.
 2. COORDINATE ROUTE OF DUCTWORK WITH STRUCTURAL BEARING SYSTEM, POWER AND LIGHTING, STORAGE UNITS, SHOWERHEADS, ETC.
 3. COOL RETURN AIR OPENINGS WITH WIRE MESH SCREEN.
 4. MOUNT THERMOSTATS AT 5' AFF. PROVIDE WITH GRADE, TAMPER-RESISTANT LOCKABLE THERMOSTAT GUARD. ARCHITECT TO VERIFY THERMOSTAT LOCATION PRIOR TO FINISH INSTALLATION.
 5. PROVIDE INSULATION FOR OUTSIDE AIR DUCT FROM CONNECTION AT FAH COIL UNIT TO AND INCLUDING INSULATED PURSUE ROOM AT UNIT.
 6. LINE REPRESENTS BOTH REFRIGERANT LIQUID LINE AND SUCTION LINE PIPING FOR UNIT AT SUGGESTED ROUTE.
 7. FLEX TERMINATION TO BE LOCATED WITHIN 10' OF AWAY FROM OUTSIDE AIR INTAKE.
 8. ROUTE OF COMBUSTION AIR PIPING AND EXHAUST DUCT TO LOCATION INDICATED. SLOPE EXHAUST VENT A MINIMUM OF 1/4" PER LINEAR FOOT. COORDINATE ROUTE OF COMBUSTION EXHAUST VENT WITH GENERAL CONTRACTOR. ELECTRICAL CONTRACTOR SHALL PROVIDE COORDINATE ROUTE OF EXHAUST PIPING FROM UNIT TO EXHAUST VENT. REFER TO ARCHITECTURE FOR VENTILATION REQUIREMENTS FOR ALL ROOMS. VERIFY CLEARANCE FROM ALL OUTSIDE AIR INTAKES. KIT FOR COMBUSTION INTAKE AND EXHAUST PIPING. MAINTAIN MINIMUM 18" OF CLEARANCE FROM ALL OUTSIDE AIR INTAKES.

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1 MECHANICAL FLOOR PLAN - FOURTH FLOOR - A
M-207 SCALE: 1/8" = 1'-0"

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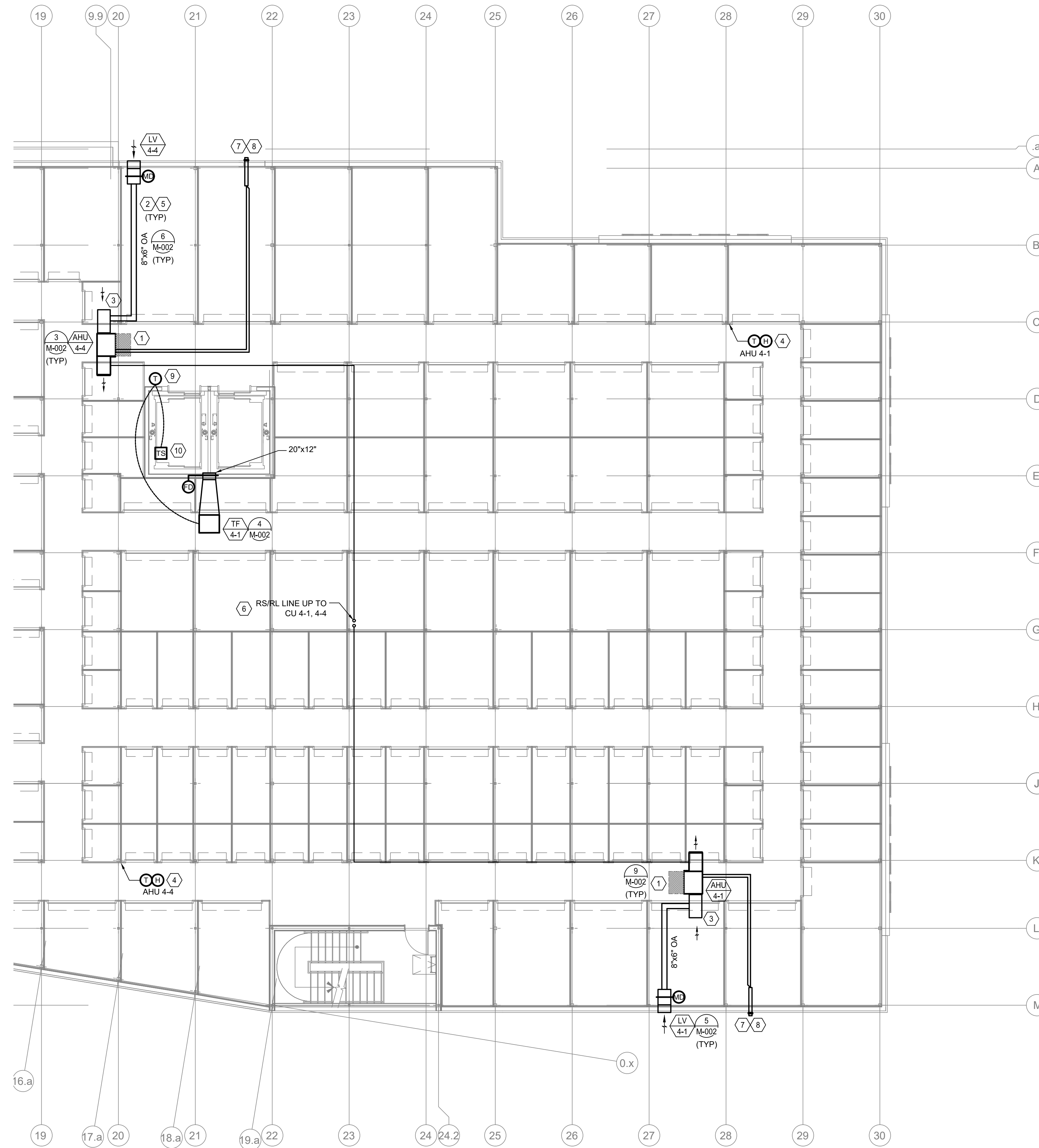
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FOURTH FLOOR - A
MECHANICAL PLAN - A

M-207

DATE:



- SHEET KEY NOTES**
- ACCESS TO ALL MECHANICAL EQUIPMENT SHALL BE FROM UNOCCUPIED AREAS ON PLAN. COORDINATE FINAL INSTALLED LOCATION SUCH THAT THE MECHANICAL EQUIPMENT IS ACCESSIBLE. VERIFY THIS INCLUDING WITH ELECTRICAL, CIVIL, STRUCTURAL, AND/OR ARCHITECTURAL AS NECESSARY. PROVIDE ACCESS AS NECESSARY. COORDINATE INSTALLATION WITH EQUIPMENT DETAIL.
 - COORDINATE ROUTE OF DUCTWORK WITH STRUCTURAL BEARING SYSTEM, POWER AND LIGHTING, STORAGE UNITS, BRINEWALLS, ETC.
 - COVER RETURN AIR OPENINGS WITH WIRE MESH SCREEN.
 - LOCATE THERMOSTATS AT 5' AFF. PROVIDE WITH GRADE. TAMPER RESISTANT LOCKABLE THERMOSTAT GUARD ARCHITECT TO VERIFY THERMOSTAT LOCATION PRIOR TO ROOM AND REGISTRATION.
 - PROVIDE INSULATION FOR OUTSIDE AIR DUCT FROM CONNECTION AT FAN COIL UNIT TO AND INCLUDING INSULATED PLUMB ROOM AT UNIT.
 - LINE REPRESENTS BOTH REFRIGERANT LIQUID LINE AND SUCTION LINE PIPING FOR UNIT AT SUGGESTED ROUTE.
 - FLUE TERMINATION TO BE LOCATED MINIMUM 10' AWAY FROM OUTSIDE AIR INTAKE.
 - ROUTE OF COMBUSTION AIR INTAKE AND EXHAUST SHUT TO LOCATION INDICATED. SLOPE EXHAUST VENT A MINIMUM OF 1/4" PER LINEAR FOOT. COORDINATE ROUTE OF COMBUSTION EXHAUST VENT WITH GENERAL CONTRACTOR. ELECTRIC, CONTRACTOR, MECHANICAL CONTRACTOR AND APPROVE LOCATION OF EXHAUST TERMINATION POINT. VERIFY CLEARANCE TO STRUCTURAL ELEMENTS. VERIFY CLEARANCE TO EXHAUST TERMINATION POINT. VERIFY CLEARANCE TO EXHAUST TERMINATION POINT FOR COMBUSTION INTAKE AND EXHAUST PIPING. MAINTAIN MINIMUM 18" OF CLEARANCE FROM ALL OUTSIDE AIR INTAKES.
 - LOCATE THERMOSTAT FOR EXHAUST AIR AT 5' AFF. 10' AFF. THERMOSTAT SHALL BE TAMPER RESISTANT LOCKABLE THERMOSTAT GUARD ARCHITECT TO VERIFY THERMOSTAT LOCATION PRIOR TO ROOM AND REGISTRATION.
 - LOCATE THERMOSTAT FOR EXHAUST AIR AT 5' AFF. 10' AFF. THERMOSTAT SHALL BE TAMPER RESISTANT LOCKABLE THERMOSTAT GUARD ARCHITECT TO VERIFY THERMOSTAT LOCATION PRIOR TO ROOM AND REGISTRATION.



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1 MECHANICAL FLOOR PLAN - FOURTH FLOOR - B
M-208 SCALE: 1/8" = 1'-0"

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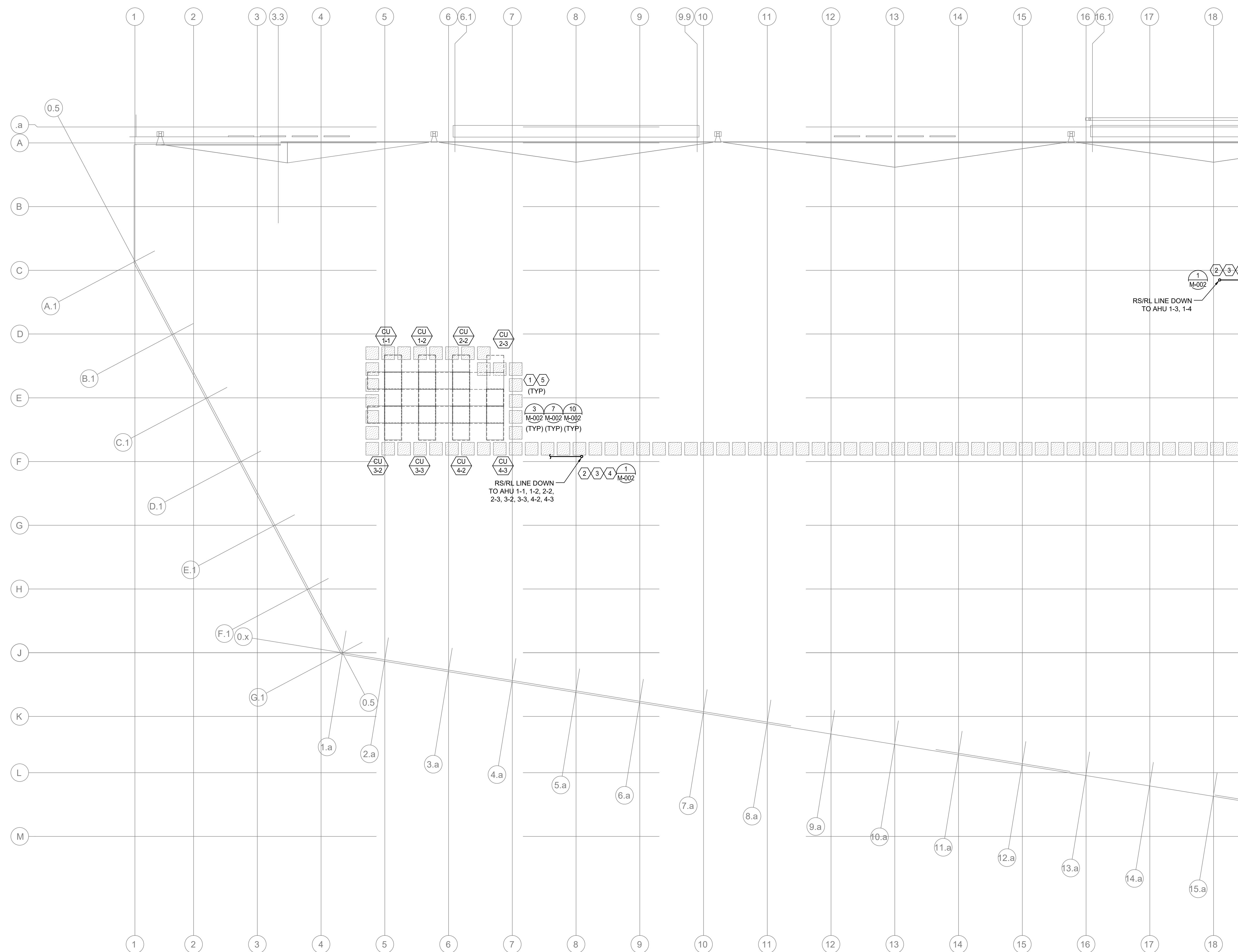
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DRAWING NAME + NUMBER
FOURTH FLOOR - B
MECHANICAL PLAN - B

DATE:

M-208
A&E Construction Co.
Received 9-17-24



- SHEET KEY NOTES**
1. HVAC EQUIPMENT SHOWN AS NOTCHED ON PLAN. ACCESS TO EQUIPMENT SHOWN AS AREA MARKED ABOVE/IN/TOUCH AREA. COORDINATE WITH MECHANICAL CONTRACTOR TO VERIFY ACCESS TO EQUIPMENT. VERIFY THAT THE SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.
 2. LINE REPRESENTS BOTH PERPENDICULAR AND PARALLEL LINE FROM UNIT AT SUGGESTED ROUTE.
 3. MECHANICAL CONTRACTOR SHALL VERIFY EXACT ROUTE FOR REFRIGERANT LINES PRIOR TO BEGING AND INSTALLING.
 4. MECHANICAL CONTRACTOR SHALL VERIFY EXACT ROUTE FOR REFRIGERANT LINES PRIOR TO BEGING AND INSTALLING.
 5. INSTALL CONDENSING UNIT SUPPORTS PERPENDICULAR TO MAIN STRUCTURAL BEAMS. REFER TO STRUCTURAL PLAN.



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COGENT CAPITAL GROUP

444 SKOKIE BLVD #301
 WILMETTE, ILLINOIS 60091

**SELF STORAGE
 CRESCENT BLVD**
 7400 SOUTH CRESCENT BLVD.
 PENNSAUKEN, NJ 08109

1 MECHANICAL FLOOR PLAN - ROOF - A
 M-209 SCALE: 1/8" = 1'-0"

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DRAWING NAME + NUMBER

ROOF
 MECHANICAL PLAN - A

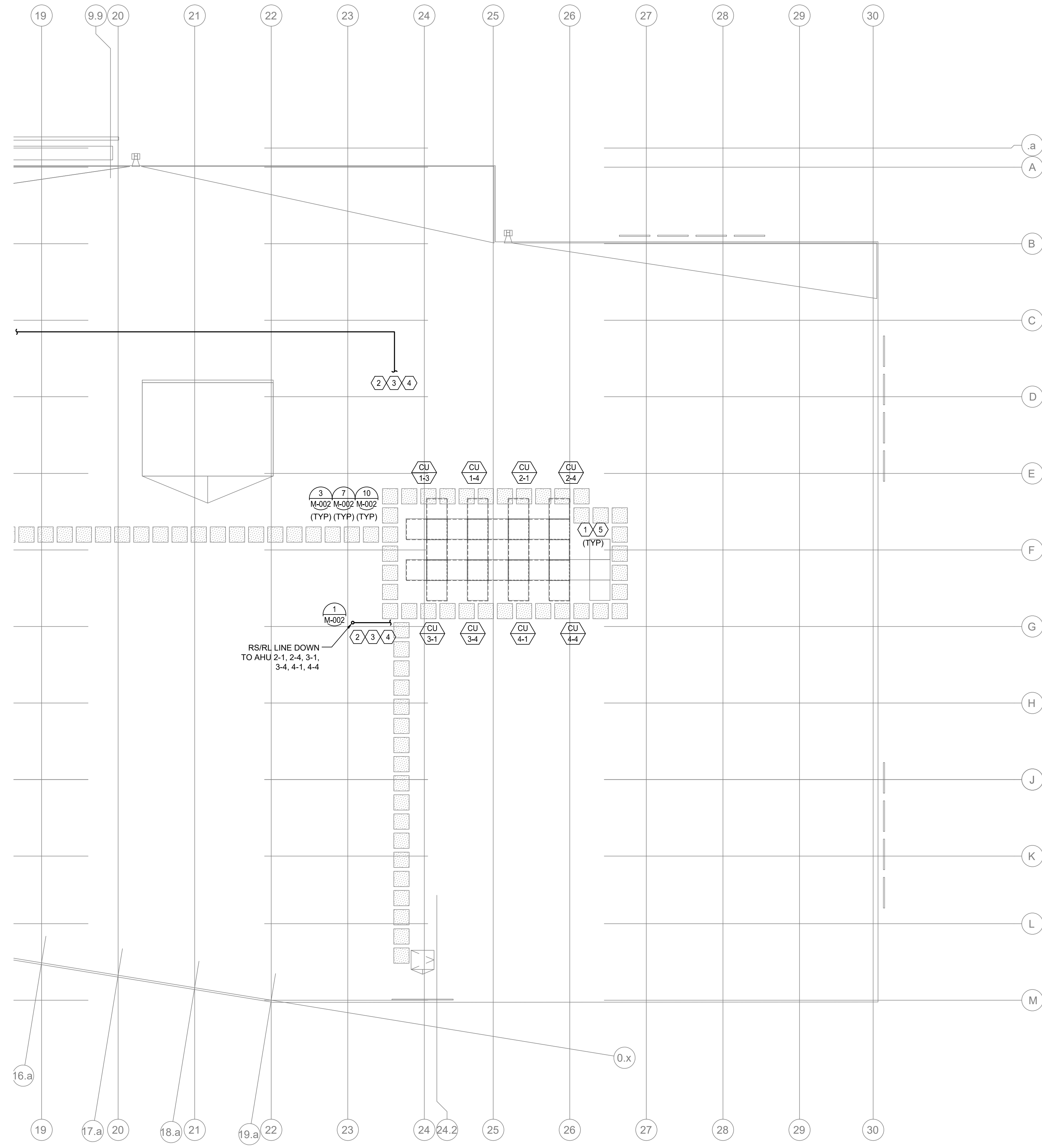
M-209
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 N.J. CORPORATE NUMBER: 24GA27943400
 08/21/24

DATE:



- SHEET KEY NOTES**
1. HVAC EQUIPMENT SHOWN AS MATCHED ON PLAN. ACCESS TO EQUIPMENT SHOULD BE AREA MARKED AND AS A MATCHED AREA. COORDINATE WITH MECHANICAL CONTRACTOR TO VERIFY THAT THE MAIN EQUIPMENT BEARINGS ACCESSIBLE. VERIFY THAT THE SYSTEM PIPING, ELECTRICAL, CONDUIT, STRUCTURE, AND/OR SUPPORTS IMPEDS ACCESS IN ANY WAY. COORDINATE INSTALLATION WITH EQUIPMENT SUPPLIER.
 2. LINE REPRESENTS BOTH REPRESENTATIVE GRID LINE AND SECTION LINE. PIPING FOR UNIT AT SUGGESTED ROUTE.
 3. INSTALL PERFORMER SHALL VERIFY EXACT ROUTE FOR REPRESENTATIVE LINES PRIOR TO BEING AND INSTALLING.
 4. MECHANICAL CONTRACTOR SHALL VERIFY EXACT ROUTE FOR REPRESENTATIVE LINES PRIOR TO BEING AND INSTALLING.
 5. INSTALL CONSIDERING UNIT SUPPORTS PERPENDICULAR TO MAIN STRUCTURAL BEAMS. REFER TO STRUCTURAL PLAN.



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 PENNSAUKEN, NJ 08109

1 MECHANICAL FLOOR PLAN - ROOF - B
 M-210 SCALE: 1/8" = 1'-0"

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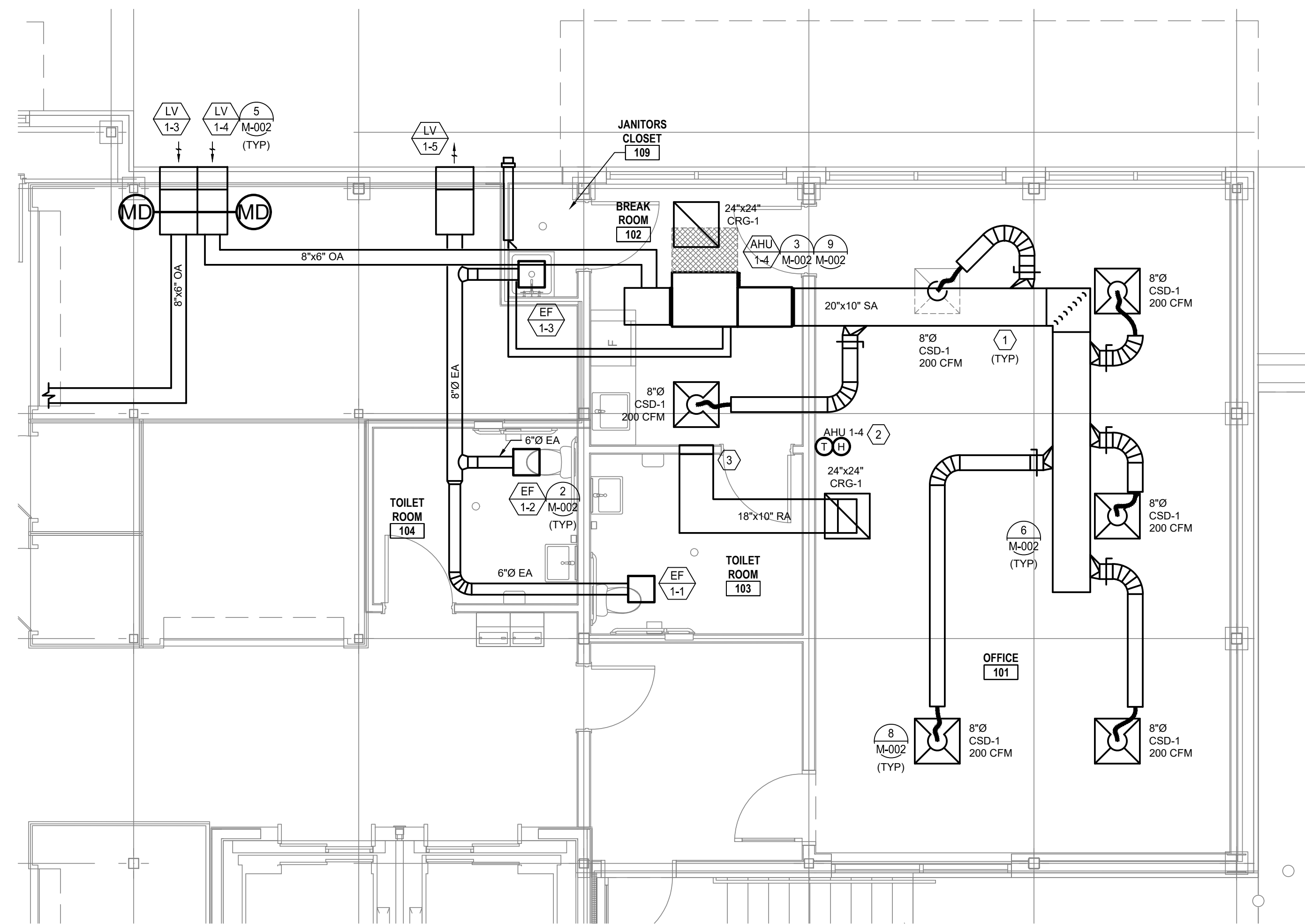
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DRAWING NAME + NUMBER
 ROOF
 MECHANICAL PLAN - B

M-210
 A&E Construction Co.
 Received 9-17-24

DATE: _____

- SHEET KEY NOTES** (A)
- COORDINATE ROUTE OF DUCTWORK WITH STRUCTURAL BEARING SYSTEM, POWER AND LIGHTING, STORAGE UNITS, SPRINKLERS, ETC.
 - MOUNT THERMOSTATS AT 5'-0" AFF. PROVIDE WITH OPAQUE TAMPER-RESISTANT LOCKABLE THERMOSTAT GUARD. ARCHITECT TO VERIFY THERMOSTAT LOCATIONS PRIOR TO ROUGH-IN AND INSTALLATION.
 - PROVIDE MINIMUM 18"x10" TRANSFER AIR OPENING IN WALL ABOVE CEILING.



1 ENLARGED MECHANICAL PLAN - OFFICE AREA
 M-401 SCALE: 1/4" = 1'-0"



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 ENLARGED PLANS

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DATE:

M-401

UNIT HEATER SCHEDULE (ELECTRIC)										
MARK	MANUFACTURER	MODEL	MIN OUT (MBH)	NOM (KW)	MOUNTING TYPE	FLA	MOPD	VPH	DISC TYPE	NOTES
EUH-1-1	QMARK	CWH3404F	5.1	1.5	WALL	7.2	20	208/1	FACTORY INSTALLED	A,D
EUH-1-2	QMARK	CWH3404F	5.1	1.5	WALL	7.2	20	208/1	FACTORY INSTALLED	A,D
EUH-1-3	QMARK	CWH3404F	5.1	1.5	WALL	7.2	20	208/1	FACTORY INSTALLED	A,D
EUH-1-4	QMARK	EFF1500	5.1	1.5	CEILING	12.5	20	120/1	FACTORY INSTALLED	B,D,E

MODEL NUMBERS SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND MODEL NUMBERS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.

NOTES:
A. MOUNT 12 INCHES ABOVE FINISHED FLOOR WITHOUT OBSTRUCTING AIRFLOW.
B. PROVIDE WITH UNIT MOUNTED THERMOSTAT.
C. PROVIDE NECESSARY MOUNTING BRACKET AND ACCESSORIES FOR WALL MOUNTING.
D. PROVIDE FACTORY MOUNTED DISCONNECT INSTALLED ON SERVICE SIDE OF UNIT.
E. PROVIDE NECESSARY MOUNTING BRACKET AND ACCESSORIES FOR CEILING MOUNTING.

LOUVER SCHEDULE									
MARK	SERVICE	MANUFACTURER	MODEL	SIZE (W x H)	CFM	MIN FREE AREA (SF)	MAX VEL (FPM)	MAX P.D. (IN. W.C.)	NOTES
LV-1-1	INTAKE	GREENHECK	ESD-202	20"x10"	160	0.4	449	0.025	A,B
LV-1-2	INTAKE	GREENHECK	ESD-202	20"x10"	160	0.4	449	0.025	A,B
LV-1-3	INTAKE	GREENHECK	ESD-202	20"x10"	160	0.4	449	0.025	A,B
LV-1-4	INTAKE	GREENHECK	ESD-202	18"x10"	120	0.3	436	0.024	A,B
LV-1-5	EXHAUST	GREENHECK	ESD-202	24"x10"	210	0.4	478	0.034	A,B
LV-2-1	INTAKE	GREENHECK	ESD-202	20"x10"	160	0.4	449	0.025	A,B
LV-2-2	INTAKE	GREENHECK	ESD-202	20"x10"	160	0.4	449	0.025	A,B
LV-2-3	INTAKE	GREENHECK	ESD-202	20"x10"	160	0.4	449	0.025	A,B
LV-2-4	INTAKE	GREENHECK	ESD-202	20"x10"	160	0.4	449	0.025	A,B
LV-3-1	INTAKE	GREENHECK	ESD-202	20"x10"	160	0.4	449	0.025	A,B
LV-3-2	INTAKE	GREENHECK	ESD-202	20"x10"	160	0.4	449	0.025	A,B
LV-3-3	INTAKE	GREENHECK	ESD-202	20"x10"	160	0.4	449	0.025	A,B
LV-3-4	INTAKE	GREENHECK	ESD-202	20"x10"	160	0.4	449	0.025	A,B
LV-3-5	EXHAUST	GREENHECK	ESD-202	18"x10"	140	0.3	444	0.029	A,B

MODEL NUMBERS SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND MODEL NUMBERS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.

NOTES:
A. PROVIDE STANDARD MILL FINISH.
B. FRAME TYPE SHALL MATCH WALL CONSTRUCTION. COORDINATE WITH ARCHITECT.

GRILLE, REGISTER AND DIFFUSER SCHEDULE										
MARK	MANUFACTURER	MODEL	CONSTRUCTION TYPE	FACE TYPE	MOUNTING LOCATION	BORDER TYPE	FACE SIZE (IN)	MAX NO.	MAX PRESS. DROP (IN. W.C.)	NOTES
CSD-1	KRUEGER	1400	STEEL	SEE PLAN	CEILING	23	SEE PLAN	30	0.08	A-C,F,G
TG-1	KRUEGER	S80	STEEL	SEE PLAN	WALL	-	SEE PLAN	40	0.1	D,F,J
CRG-1	KRUEGER	EG5	STEEL	SEE PLAN	CEILING	-	SEE PLAN	40	0.1	C,D,F,H,J

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NOTES:
A. 4" WY THROW PATTERN UNLESS OTHERWISE INDICATED BY FLOW ARROWS ON DRAWINGS. PROVIDE ONE SPARE LOOSE BLANK-OFF DEFLECTOR PER DIFFUSER FOR USE DURING BALANCING AS REQUIRED.
B. NECK SIZE SHOWN ON DRAWINGS. PROVIDE BRANCH DUCT TO MATCH NECK SIZE UNLESS OTHERWISE SHOWN ON DRAWINGS.
C. BAKED ENAMEL FINISH. WHITE TO MATCH CEILING COLOR.
D. FRONT BLADES PARALLEL TO LONG DIMENSION.
E. DOUBLE DEFLECTION BARS SHALL BE ADJUSTABLE.
F. FRAME TYPE TO MATCH CEILING/WALL CONSTRUCTION, COORDINATE WITH ARCHITECTURAL REFLECTED CEILING/WALL PLAN.
G. MINIMUM THROW IN FEET AT VELOCITY OF 50 FPM SHALL BE 5 FT.
H. PROVIDE BORDER TYPE TO MATCH CEILING CONSTRUCTION WITH EXPOSED BORDER MOUNTING, AND INSULATED PLENUM BOX WITH NECK.
I. PROVIDE DIFFUSERS, LINEAR SLOTS, AND GRILLES WITH NO EXPOSED MOUNTING SCREWS.

FURNACE/COOLING COIL SCHEDULE (NATURAL GAS HEAT)																							
MARK	MANUFACTURER	MODEL	SERVICE	SUPPLY/FAN			COOLING COIL				HEATING COIL				ELECTRICAL			NOTES					
				CFM	ESP (IN. HP)	MIN (MBH)	MODEL	TH (MBH)	SH (MBH)	(F DB)/(F WB)	(F DB)/(F WB)	(F DB)/(F WB)	MIN OUT (MBH)	NOM INPUT (MBH)	MIN EFF (%)	O/A (CFM)	VPH		MCA	MOCF	DISC TYPE	STARTER TYPE	
AHU-1-1	CARRIER	58SP6A080	1st FLOOR STORAGE	1,600	0.5	0.8	CAPMP48	33.9	33.4	85.8	69.7	64.3	62.3	18.4	80	96.0	160	115/1	12.8	20	NOTE G	FACTORY	A,O
AHU-1-2	CARRIER	58SP6A080	1st FLOOR STORAGE	1,600	0.5	0.8	CAPMP48	33.9	33.4	85.8	69.7	64.3	62.3	18.4	80	96.0	160	115/1	12.8	20	NOTE G	FACTORY	A,O
AHU-1-3	CARRIER	58SP6A080	1st FLOOR STORAGE	1,600	0.5	0.8	CAPMP48	33.9	33.4	85.8	69.7	64.3	62.3	18.4	80	96.0	160	115/1	12.8	20	NOTE G	FACTORY	A,O
AHU-1-4	CARRIER	58SP6A080	OFFICE SPACE	1,200	0.5	0.8	CAPMP36	23.2	21.9	76.9	63.7	56.3	55.1	28.7	40	96.0	120	115/1	7.2	15	NOTE G	FACTORY	A,O
AHU-2-1	CARRIER	58SP6A080	2nd FLOOR STORAGE	1,600	0.5	0.8	CAPMP48	32.5	32.1	85.8	70.0	65.1	62.9	17.1	80	96.0	160	115/1	12.8	20	NOTE G	FACTORY	A,O
AHU-2-2	CARRIER	58SP6A080	2nd FLOOR STORAGE	1,600	0.5	0.8	CAPMP48	32.5	32.1	85.8	70.0	65.1	62.9	17.1	80	96.0	160	115/1	12.8	20	NOTE G	FACTORY	A,O
AHU-2-3	CARRIER	58SP6A080	2nd FLOOR STORAGE	1,600	0.5	0.8	CAPMP48	32.5	32.1	85.8	70.0	65.1	62.9	17.1	80	96.0	160	115/1	12.8	20	NOTE G	FACTORY	A,O
AHU-2-4	CARRIER	58SP6A080	2nd FLOOR STORAGE	1,600	0.5	0.8	CAPMP48	32.5	32.1	85.8	70.0	65.1	62.9	17.1	80	96.0	160	115/1	12.8	20	NOTE G	FACTORY	A,O
AHU-3-1	CARRIER	58SP6A080	3rd FLOOR STORAGE	1,600	0.5	0.8	CAPMP48	32.6	32.1	85.8	70.0	65.0	62.9	17.1	80	96.0	160	115/1	12.8	20	NOTE G	FACTORY	A,O
AHU-3-2	CARRIER	58SP6A080	3rd FLOOR STORAGE	1,600	0.5	0.8	CAPMP48	32.6	32.1	85.8	70.0	65.0	62.9	17.1	80	96.0	160	115/1	12.8	20	NOTE G	FACTORY	A,O
AHU-3-3	CARRIER	58SP6A080	3rd FLOOR STORAGE	1,600	0.5	0.8	CAPMP48	32.6	32.1	85.8	70.0	65.0	62.9	17.1	80	96.0	160	115/1	12.8	20	NOTE G	FACTORY	A,O
AHU-3-4	CARRIER	58SP6A080	3rd FLOOR STORAGE	1,600	0.5	0.5	CAPMP48	32.6	32.1	85.8	70.0	65.0	62.9	17.1	80	96.0	160	115/1	12.8	20	NOTE G	FACTORY	A,O
AHU-4-1	CARRIER	58SP6A080	4th FLOOR STORAGE	1,600	0.5	0.8	CAPMP48	37.3	36.8	85.8	68.8	62.4	60.4	24.7	80	96.0	160	115/1	12.8	20	NOTE G	FACTORY	A,O
AHU-4-2	CARRIER	58SP6A080	4th FLOOR STORAGE	1,600	0.5	0.8	CAPMP48	37.3	36.8	85.8	68.8	62.4	60.4	24.7	80	96.0	160	115/1	12.8	20	NOTE G	FACTORY	A,O
AHU-4-3	CARRIER	58SP6A080	4th FLOOR STORAGE	1,600	0.5	0.8	CAPMP48	37.3	36.8	85.8	68.8	62.4	60.4	24.7	80	96.0	160	115/1	12.8	20	NOTE G	FACTORY	A,O
AHU-4-4	CARRIER	58SP6A080	4th FLOOR STORAGE	1,600	0.5	0.8	CAPMP48	37.3	36.8	85.8	68.8	62.4	60.4	24.7	80	96.0	160	115/1	12.8	20	NOTE G	FACTORY	A,O

MODEL NUMBERS SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND MODEL NUMBERS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.

NOTES:
A. ASSOCIATED CONDENSING UNIT SHALL BE BY THE SAME MANUFACTURER.
B. EQUIPMENT SIZED FOR 95°F AMBIENT TEMPERATURE.
C. PROVIDE 2" MERV 13 PLEATED THROWAWAY AIR FILTERS.
D. PROVIDE WITH BACK RETURN AIR CONNECTION.
E. PROVIDE WITH 7-DAY PROGRAMMABLE THERMOSTAT AND HUMIDISTAT WITH STAGED HEATING AND COOLING CAPABILITY.
F. PROVIDE ACRYLIC, VANDAL-PROOF, LOCKING THERMOSTAT COVER.
G. PROVIDE FACTORY MOUNTED DISCONNECT SWITCH INSTALLED ON SERVICE SIDE OF UNIT.
H. PROVIDE UNIT WITH INTEGRAL STARTER.
I. PROVIDE SINGLE POINT POWER CONNECTION.
J. SPECIFIED FAN ESP ACCOUNTS FOR DUCT LOSSES EXTERNAL TO UNIT. FILTER LOSS IS AT A MAXIMUM OF 400 FPM FACE VELOCITY.
K. PROVIDE MOTOR HORSEPOWER TO OVERCOME INTERNAL UNIT STATIC PRESSURE DROP PLUS SPECIFIED EXTERNAL STATIC PRESSURE DROP.
L. NOMINAL MOTOR HP SHALL BE NO LARGER THAN THE FIRST AVAILABLE NOMINAL MOTOR SIZE GREATER THAN THE BHP.
M. PROVIDE HEATER TO MEET OR EXCEED SCHEDULED MINIMUM MBH OUTPUT. NOMINAL INPUT IS BASED ON LISTED MANUFACTURER'S STANDARD PRODUCT.
N. COORDINATE EQUIPMENT GAS LOAD WITH PLUMBING CONTRACTOR IF DIFFERENT FROM THAT SCHEDULED. MEET MINIMUM EFFICIENCY SCHEDULED.
O. PROVIDE WITH COMBUSTION ASSIST FAN.

CONDENSING UNIT SCHEDULE														
MARK	SERVICE	MANUFACTURER	MODEL	REFR TYPE	TH (IN)	MIN NO OF STAGES	NO OF CIRCUITS	MCA	MOCF	VPH	DISC TYPE	STARTER TYPE	WEIGHT (LBS)	NOTES
CU-1-2	AHU-1-2	CARRIER	CA16EV048	R-410A	33.9	1	1	9.4	15	480/5	SEE NOTE E	SEE NOTE F	275	A,J
CU-1-3	AHU-1-3	CARRIER	CA16EV048	R-410A	33.9	1	1	9.4	15	480/5	SEE NOTE E	SEE NOTE F	275	A,J
CU-1-4	AHU-1-4	CARRIER	CA16EV036	R-410A	23.2	1	1	5.5	15	480/5	SEE NOTE E	SEE NOTE F	210	A,J
CU-2-1	AHU-2-1	CARRIER	CA16EV048	R-410A	32.5	1	1	9.4	15	480/5	SEE NOTE E	SEE NOTE F	275	A,J
CU-2-2	AHU-2-2	CARRIER	CA16EV048	R-410A	32.5	1	1	9.4	15	480/5	SEE NOTE E	SEE NOTE F	275	A,J
CU-2-3	AHU-2-3	CARRIER	CA16EV048	R-410A	32.5	1	1	9.4	15	480/5	SEE NOTE E	SEE NOTE F	275	A,J
CU-2-4	AHU-2-4	CARRIER	CA16EV048	R-410A	32.5	1	1	9.4	15	480/5	SEE NOTE E	SEE NOTE F	275	A,J
CU-3-1	AHU-3-1	CARRIER	CA16EV048	R-410A	32.6	1	1	9.4	15	480/5	SEE NOTE E	SEE NOTE F	275	A,J
CU-3-2	AHU-3-2	CARRIER	CA16EV048	R-410A	32.6	1	1	9.4	15	480/5	SEE NOTE E	SEE NOTE F	275	A,J
CU-3-3	AHU-3-3	CARRIER	CA16EV048	R-410A	32.6	1	1	9.4	15	480/5	SEE NOTE E	SEE NOTE F	275	A,J
CU-3-4	AHU-3-4	CARRIER	CA16EV048	R-410A	32.6	1	1	9.4	15	480/5	SEE NOTE E	SEE NOTE F	275	A,J
CU-4-1	AHU-4-1	CARRIER	CA16EV048	R-410A	37.3	1	1	9.4	15	480/5	SEE NOTE E	SEE NOTE F	275	A,J
CU-4-2	AHU-4-2	CARRIER	CA16EV048	R-410A	37.3	1	1	9.4	15	480/5	SEE NOTE E	SEE NOTE F	275	A,J
CU-4-3	AHU-4-3	CARRIER	CA16EV048	R-410A	37.3	1	1	9.4	15	480/5	SEE NOTE E	SEE NOTE F	275	A,J
CU-4-4	AHU-4-4	CARRIER	CA16EV048	R-410A	37.3	1	1	9.4	15	480/5	SEE NOTE E	SEE NOTE F	275	A,J

MODEL NUMBERS SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND MODEL NUMBERS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.

NOTES:
A. EQUIPMENT SIZED FOR 95°F AMBIENT TEMPERATURE.
B. COORDINATE WITH THE MANUFACTURER THE HORIZONTAL AND VERTICAL REFRIGERANT PIPE ROUTING TO DETERMINE PIPE SIZES FOR THE REFRIGERANT PIPING. MANUFACTURER SHALL PROVIDE DETAILED REFRIGERANT PIPING DIAGRAMS INCLUDING DIMENSIONAL DATA FOR ALL REFRIGERANT PIPING DEVICES. THE MANUFACTURER SHALL SIZE AND LOCATE THE ASSOCIATED REFRIGERANT TRAPS BASED ON THE ACTUAL ROUTING AND PROVIDE OTHER APPURTENANCES TO PROVIDE A FULLY FUNCTIONAL AND OPERATIONAL SYSTEM. COORDINATE WITH THE MANUFACTURER LOCATIONS FOR ALL REFRIGERANT PIPING DEVICES TO MAINTAIN SERVICEABILITY AND ACCESSIBILITY.
C. PROVIDE LIQUID LINE FILTER DRYER AND SIGHT GLASS.
D. PROVIDE PREFABRICATED EQUIPMENT SUPPORT RAILS.
E. DISCONNECT SWITCH FURNISHED BY DIVISION 26 CONTRACTOR.
F. STARTERS FOR ALL MOTORS SHALL BE FURNISHED INTEGRAL WITH UNIT.
G. COORDINATE SIZE OF CONDUCTOR TERMINATION LUGS WITH CONDUCTOR SIZES SHOWN ON ELECTRICAL DRAWINGS.
H. PROVIDE CONDENSER COIL HALO GUARDS.
I. COORDINATE NUMBER OF CIRCUITS PROVIDED WITH NUMBER OF CONNECTIONS ON DX COIL SERVED.
J. PROVIDE EXTENDED LINE SETS AS REQUIRED BY MANUFACTURER.

FAN SCHEDULE														
MARK	SERVICE DESCRIPTION	MANUFACTURER	MOUNTING	MODEL	CFM	ESP (IN)	NOM HP(WATTS)	FAN RPM	DRIVE (BELT/DIRECT)	VFD (Y/N)	ELECTRICAL		WEIGHT (LBS)	NOTES
											VPH	DISC TYPE		
EF-1-1	TOILET ROOM	GREENHECK	CEILING	SP-LP0511	70	0.5	(11)	831	DIRECT	N	120/1	PLUG	8	A
EF-1-2	TOILET ROOM	GREENHECK	CEILING	SP-LP0511	70	0.5	(11)	831	DIRECT	N	120/1	SWITCH	8	A
EF-1-3	JANITOR CLOSET	GREENHECK	CEILING	SP-LP0511	70	0.5	(11)	831	DIRECT	N	120/1	SWITCH	8	A
EF-3-1	TOILET ROOM	GREENHECK	CEILING	SP-LP0511	70	0.5	(11)	831	DIRECT	N	120/1	SWITCH	8	A
EF-3-2	TOILET ROOM	GREENHECK	CEILING	SP-LP0511	70	0.5	(11)	831	DIRECT	N	120/1	SWITCH	8	A
TF-1-1	ELECTRIC ROOM	GREENHECK	INLINE	SQ-140	1260	0.61	1/3	1140	DIRECT	N	120/1	SWITCH	94	B,C,D
TF-4-1	ELEVATOR SHAFT	GREENHECK	INLINE	SQ-140	1480	0.54	1/3	1140	DIRECT	N	120/1	SWITCH	94	B,C,D
CF-1-1	CIRCULATION	GREENHECK	INLINE	SQ-120-VG	380	0.2	1/							



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CLIENT + PROJECT



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UNAUTHORIZED REPRODUCTION OR OTHER USE OF THIS DRAWING IS PROHIBITED.

DRAWING NAME + NUMBER

MECHANICAL SPECIFICATIONS

M-701

G. SYSTEM TESTING AND ADJUSTING

Upon completion of each phase of the installation, test each system in conformance with local code requirements and as noted below. Furnish labor and equipment necessary to test each system installed under this contract. Assume all costs involved in making the tests and repairing and/or replacing any damages resulting therefrom.

Final system testing, balancing and adjustments (TAB) shall be performed by a Contractor certified by the National Environmental Balancing Bureau (NEBB). TAB shall include a written report by showing all current testing of the certified agencies procedural standard for testing, adjusting and balancing and shall comply with the strictest limitation of that standard for execution and reporting of all TAB work.

Work shall include but not be limited to: Perform test readings on fans, units, coils etc., and adjust equipment to deliver specified amounts of air. Prepare testing and balancing report by showing all supply quantities, air entering and leaving temperatures and pressures at design flow, fan and unit test readings, motor voltage and amp draws, and submit six copies of the final completed data to the Architect for evaluation and approval before final inspection of the project. Balance air systems to within plus or minus 10 percent for terminal devices and branch lines and plus or minus 5 percent for main ducts and air handlers. Adjust thermostat, and make adjustments in airflow to each diffuser to obtain uniform temperature (no greater than +/- 3 F in spaces. Document temperatures and adjustments in lab report. Adjust equipment to operate as intended by the specification. TAB report shall include a "report summary/remarks" section in accordance with the procedural standard that provides both system set-up and a summary of deficiencies as defined by the procedural standard.

TAB Contractor shall be responsible to calibrate, set, and adjust automatic temperature control sensors, actuators and control devices. Check proper sequencing of interlock systems, and operation of safety controls, adjust thermostats, and control setpoints. Limit temperature based adjustment to operate in accordance with the performance requirements of the Construction Documents. Adjust fans, etc. for proper and efficient operation. Notify the Architect that adjustments have been made and that system is operating satisfactorily. Calibrate, set, and adjust automatic temperature controls. Check proper sequencing of interlock systems, and operation of safety controls.

Division 23 Contractor shall align bearings and replace bearings that have dirt or foreign material in them with the bearings without additional cost to the Owner.

H. VIBRATION ISOLATION

Provide vibration isolation equipment and materials by a single manufacturer if type and deflection for equipment is not specified within the contract documents, reference ASHRAE Handbook HVAC Applications or provide per manufacturer's recommendations. Approved manufacturers include Amber Booth, Kinloch Noise Control, Mason Industries, Inc., Vibration Eliminator Co., Inc., and Universal Mounting and Controls, provided their systems are in compliance with the specified design and performance requirements.

General Requirements: Select vibration isolators by the weight distribution to produce uniform deflection. Vibration isolators shall have either known un-deflected height or calibration markings so that, after adjustment, the static deflection can be verified, thus determining that the load is within the proper range of the isolator. Isolators shall operate in the linear portion of the static deflection curve. Spring isolators shall have 50 percent excess capacity without becoming coil bound. Coiled vibration isolators with factory-applied paint. Coiled vibration isolators exposed to weather and other corrosive environments with factory-applied corrosion resistance protection. Install and adjust vibration isolators in accordance with manufacturer's written instructions.

Isolator Types:

- Type WP (Waffle Pads): Provide 5/16 inch thick neoprene pads ribbed or waffled on both sides. Manufacture pads with brinle bearing quality neoprene, and select for a maximum diameter of 50 and designed for 15 percent strain. Incorporate leveling steel lead, leveling plates where required between the equipment and the neoprene pad. If the isolator is bolted to the structure, install a neoprene vibration isolation washer and sleeve (Unimov Type G0060) or an approved shall be installed under the bolt head between the steel washer and the base plate. Provide Mason Industries Type W or equal.
- Type SPH (Spring and Neoprene Hangers): Provide a steel spring in series with a neoprene isolating element. The spring shall have a minimum additional travel to solid equal to 50 percent of the specified deflection. The neoprene element shall have a static deflection of not less than 0.3 inches with a strain not exceeding 15 percent. Unless otherwise specified, the static deflection of SPH hangers shall be 2 inches. Spring diameter and hanger top hole size shall be large enough to permit the hanger rod to swing through a 30 degree arc. Provide neoprene sleeve where the lower hanger rod passes through the steel hanger box, such that the hanger rod cannot contact the steel hanger. The diameter of the clear hole in the hanger box shall be at least 2/4 inch larger than the diameter of the hanger rod. When installed, do not cock the spring element and do not allow the hanger box to rotate through a full 360 degree arc without encountering obstructions. Provide Mason Industries Type S or equal.
- Type NR (Neoprene Bunting): Provide neoprene, rubber-in-shear bushings for lightweight (less than 100 pounds), suspended equipment supported from structure with all thread rod and angle iron or Unistrut. Saled for a maximum diameter of 50 and designed for 15 percent strain, with a static deflection of 0.10 inches. Provide Mason Industries Type HMB or equal.

I. REFRIGERANT AND OIL

Provide full refrigerant and oil charge in new air conditioning refrigeration systems, and maintain it for full term of the guarantee.

J. IDENTIFICATION

Provide manufacturer's standard pre-printed, semi-rigid snap-on or permanent adhesive, pressure-sensitive vinyl pipe markers. Color code pipe markers to comply with ANSI A13.1.

Install pipe markers on each HVAC piping system and include arrows to show direction of flow.

Locate pipe markers and color bands wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-enclosed locations.

Provide manufacturer's standard laminated plastic, color coded equipment markers. Conform to the following color code: Green for Cooling; Yellow for Heating; Yellow/Green for combination Cooling and Heating; Brown for Energy Reclamation; Blue for other equipment types. Conform to ANSI A13.1 for Hazardous Equipment.

Provide stenciled signs for equipment identification at Contractor's option or where distance of required identification requires lettering larger than 1 inch height. Stencil paint shall be exterior type, oil-based, alkylid enamel, minimum 1/4 inch height or greater as required for long distance identification, white, or black color for best contrast.

M. OPERATION AND MAINTENANCE INSTRUCTIONS

During the course of construction, collect and compile a complete brochure of equipment furnished and installed on this project. Include operational and maintenance instructions, manufacturer's catalog sheets, wiring diagrams, parts lists, approved submittals and shop drawings, warranties, and descriptive literature as furnished by the equipment manufacturer. Include an inside cover sheet that lists the project name, site, Owner, Architect, Engineer, General Contractor, Sub-Contractor, and in index of contents.

Submit three copies of literature bound in approved binders with index and tabs separating equipment types to the Architect, for the Engineer's review, at the termination of the work. Paper clips, staples, rubber bands, loose-leaf binding, and mailing envelopes are not considered approved binders. Final approval of systems installed under this contract shall be withheld until this equipment literature is received and deemed complete by the Architect and Engineer. Instruct workmen to save required literature shipped with the equipment itself for inclusion in this brochure.

Include Record Drawings as described above.

Refer to Division 01 for acceptance of electronic manuals for this project. For electronic manuals, refer to paragraph "Submittals" for requirements.

N. SPARE PARTS

Furnish to Owner, with receipt, the following spare parts for the equipment furnished for this project:
1. One set of spare filters of each type required for each unit, in addition to the spare set of filters, install new filters prior to testing, adjusting, and balancing work and before turning system over to Owner.
2. Furnish one complete set of bolts for each fan.
3. Furnish three operating keys for each type of air outlet and inlet that require them.

O. TRAINING

At a time mutually agreed upon between the Owner and Contractor, provide the services of a factory trained and authorized representative to train Owner's designated personnel on the operation and maintenance of the equipment provided for this project.

Provide training to include, but not be limited to, an overview of the system and/or equipment as it relates to the facility as a whole, operator and maintenance procedures and protocols prior to startup and shutdown, troubleshooting, servicing, preventive maintenance and appropriate operator training; and review of data included in the operation and maintenance manuals.

Submit a certification letter to the Architect stating that the Owner's designated representative has been trained as specified herein. Letter shall include date, time, attendees and subject of training. The Contractor and the Owner's representative shall sign the certification letter indicating agreement that the training has been provided.

Schedule training with Owner with at least 7 days advance notice.

P. WARRANTIES

Warrant each system and each element thereof against all defects due to faulty workmanship, design, or material for a period of 12 months from date of Substantial Completion, unless specific items are noted to carry a longer warranty in the construction documents or manufacturer's standard warranty exceeds 12 months. Name all defects, occurring within the warranty period(s), as stated in the General Conditions and Division 01.

Warranties shall include labor and material, including travel expenses. Make repairs or replacements without any additional costs to the Owner, and to the satisfaction of the Owner, Architect, and Engineer. Perform the remedial work promptly, upon written notice from the Engineer or Owner.

At the time of Substantial Completion, deliver to the Owner all warranties, in writing and properly executed, including time limits for warranties extending beyond the one year period and any actions the Owner must take in order to maintain warranty status. Each warranty instrument shall be addressed to the Owner and state the commencement date and term.

2. GENERAL MATERIALS AND INSTALLATION

A. BUILDING OPERATION

Comply with the schedule of operations as outlined in the architectural portions of the specification. Building shall be in operation at the time of Substantial Completion, unless interruption of building operation at a time when the building is not in operation and only with written approval of building Owner and/or tenant. Coordinate interruption of building operation with the Owner and/or tenant a minimum of seven (7) days in advance of work.

B. ROUGH-IN

Coordinate without delay all rough-in with other divisions. Conceal piping, conduit, and rough-in except in unfinished areas and where otherwise shown.

C. PENETRATIONS

Extend pipe insulation for insulated pipe through floor, wall and roof penetrations, including fire rated walls and floors. The vapor barrier shall be maintained. Size sleeve for a minimum of 1 inch smaller clear space between inside of sleeve and outside of insulation.

D. MOTORS AND STARTERS

Provide motors and starting equipment when not furnished with the equipment package. Motors shall have copper windings, Class B insulation, and standard square cage with starting torque characteristics suitable for the equipment served. Motors controlled by variable frequency drives shall be rated for either peaks and minimum run times in accordance with NEMA MG1, Part 31. Motors for air handling equipment shall be selected for quiet operation. Each motor shall be checked for proper rotation after electrical connection has been completed. Provide drip-proof enclosures for locations protected from weather and not in an stream of fan, and totally enclosed fan cooled enclosures for motors exposed to weather. Motors shall be manufactured by Century, General Electric, Louis Allis, Westinghouse, or approved equal.

Provide every motor, except fractional horsepower single phase motors with an approved type of "built-in" thermal overload protection, with a motor starter. Each starter shall be provided with overload heaters sized to the motor rating, and every three phase motor starter shall have overload heaters in each phase. Ambient compensated heaters shall be installed wherever necessary. Unless noted otherwise, motor starters shall be furnished by the Division 23 Contractor for installation and connection by the Division 26 Contractor. Starters shall be Allen-Bradley, Clark, Farnam, Square D, or approved equal.

E. ELECTRICAL WIRING

High voltage wiring is defined as 60 Volts or higher. Low voltage wiring is defined as less than 60 Volts. Low voltage wiring shall be provided by Division 26. Line voltage control and interlock wiring for mechanical systems shall also be provided by Division 26. Low voltage control wiring that be provided by Division 23. Furnish wiring diagrams to Division 26 as required for proper equipment hookup. Coordinate with Division 26 the actual wire strapping amps for mechanical equipment (from the equipment nameplate) to ensure proper installation.

Provide power and communication wiring with transient protection in accordance with IEEE C62.41.2. All control and interlock wiring shall comply with the NEC. Control wiring shall be sized to accommodate the voltage drop associated with the distance between the control device and the controller. Control wiring not installed in conduit shall be UL rated for plenum installation. All NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway according to the NEC and Division 26 requirements. Maximum allowable voltage for control wiring shall be 120 V. All low-voltage wiring shall meet NEC Class 2 requirements. Low-voltage power circuits shall be sub-fused when required to meet Class 2 current limit.

Conduit for Control Wiring: EMT with compression fittings, cold rolled steel, zinc coated or zinc-coated rigid steel with threaded connectors.

Pull and Junction Boxes: Size according to number, size, and position of entering raceway as required by National Electrical Codes. Enclosure type shall be suited to location.

Install wiring parallel to building lines whenever possible. Conceal all control wiring in finished rooms. Do not install Class 2 wiring in raceway containing Class 1 wiring. Boxes and panels containing high voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two wires (e.g., relay and transformers). All wire-to-device and wire-to-wire connections shall be made at a terminal block or terminal strip. All runs of communication wiring shall be unspliced length when that length is commercially available. Verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable. Label all wiring and cabling at each end within 2 inches of termination with the termination number. Label control devices used in the system with permanent labels using the identifiers that match the record documents.

F. EQUIPMENT FURNISHED BY OTHERS

Provide necessary equipment and accessories that are not provided by the equipment supplier or Owner to complete installation of equipment furnished by others at locations as indicated on the drawings, specified herein, or both. Equipment and accessories not provided by the equipment supplier may include, but not be limited to, buses, vents, valves, associated roof racks and caps to outdoors, dampers, in-line fans, roof fans, and control interlocks, etc. as required for proper operation of the complete system in accordance with the manufacturer's instructions.

Contractor shall be responsible for correct rough-in dimensions and shall verify them with Architect and/or equipment supplier prior to any installations.

G. ORDINANCES AND CODES

Work performed under this contract shall, at a minimum, be in conformance with applicable national, state and local codes having jurisdiction. Equipment furnished and associated installation work performed under this contract shall be in strict compliance with current applicable codes adopted by the local AHJ, including any amendments and standards as set forth by the following:

- National Electric Code (NEC)
- National Fire Protection Association (NFPA)
- National Environmental Balancing Bureau (NEBB)
- Occupational Safety and Health Administration (OSHA)
- American Society of Mechanical Engineers (ASME)
- American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
- American National Standards Institute (ANSI)
- American Society of Testing Materials (ASTM)
- Other national standards and codes where applicable

Where the contract documents exceed the requirements of the referenced codes, standards, etc., the contract documents shall take precedence. Where conflicts between codes, standards, ordinances, rules, and regulations exist, comply with the most stringent.

Promptly bring all conflicts observed between codes, ordinances, rules, regulations, referenced standards, and these documents to the attention of the Architect and Engineer for final resolution. Contractor will be held responsible for any violation of the law.

Pressure and pay for permits and licenses required for the accomplishment of the work herein described. Where required, obtain, pay for, and furnish certificates of inspection to Owner.

H. PROTECTION OF EQUIPMENT AND MATERIALS

Store and protect from damage equipment and materials delivered to job site. For materials and equipment susceptible to changing weather conditions, dampness, or temperature variations, store inside in conditioned spaces. For materials and equipment not susceptible to these conditions, cover with waterproof, tear-resistant, heavy tarp or polyethylene plastic as required to protect from dust, dirt, dirt, paint, water, or physical damage. Replace insulation that has become wet at any time during construction. Drying the insulation is not acceptable. Seal any tears or joints of internal fiberglass insulation. Equipment and material damaged by construction activities shall be rejected and Contractor shall furnish new equipment and material of a like kind at its own expense.

Keep premises broom clean of foreign material created during work performed under this contract. Piping, equipment, etc. shall have a neat and clean appearance at the termination of the work. Remove debris from above ceilings, including dust.

Plug, seal, or cap open ends of ductwork and piping systems while stored and installed during construction when not in use to prevent the entrance of debris into the systems. Remove temporary protection prior to starting equipment and turning the system over to the owner.

I. SUBSTITUTIONS

Materials, products, equipment, and systems described in the Bidding Documents establish a standard of material, dimension, appearance and quality to be provided by the Contractor. The base bid shall include only the products from manufacturers specifically named in the drawings and specifications. To request a substitution, require the Substitution Request Form from the Architect or Engineer. Complete and send the Substitution Request Form for each material, product, equipment, or system that is proposed to be substituted. The burden of proof of the merit of the proposed substitution is upon the proposer.

Unless stated otherwise in writing to the Engineer by the Contractor, Contractor warrants to the Engineer, Architect, and Owner the following:
1. Proposed substitution has been fully investigated and determined to meet or exceed the specified Work in all respects unless stated otherwise in the substitution request.
2. Proposed substitution is consistent with the Contract Documents and will produce indicated results, including functional clearances, maintenance service, and sourcing of replacement parts.
3. Proposed substitution has received necessary approvals of authorities having jurisdiction.
4. Same warranty will be furnished for proposed substitution as specified Work.
5. If accepted substitution fails to perform as required, Contractor shall replace substitute material or system that is originally specified and costs incurred thereafter.

6. Coordination, installation and changes in the Work as necessary for accepted substitution will be complete in all respects.
No substitutions will be considered unless the Substitution Request Form is completed and attached with the appropriate substitution documentation. No substitution will be considered prior to receipt of bid unless written request for approval to bid has been received by the Contractor at least ten (10) calendar days prior to the date for receipt of bids.
If the proposed substitution is approved prior to receipt of bids, such approval will be stated in an addendum. Bidders shall not rely upon approvals made in any other way. Verbal approval will not be given. No substitutions will be considered after the contract is awarded unless specifically provided in the contract documents.

J. SUBMITTALS

Assemble and submit for review shop drawings, material lists, manufacturer product literature for equipment to be furnished, and items requiring coordination between contractors under this contract. Provide submittals in sufficient detail so as to demonstrate compliance with these contract documents and design concept. Prior to transmitting submittals, verify that the equipment submitted is mutually compatible and suitable for the intended use, will fit the available space, and maintain manufacturer recommended service clearances. If the size of equipment furnished makes necessary any change in location or configuration, submit a shop drawing showing the proposed layout.
Transmit submittals as early as required to support the project schedule. Allow for two weeks Engineer review time, plus 10 hour mailing time via the Architect, plus a duplication of this time for resubmittal, if required. Only resubmit those sections requested for resubmittal.

Submittals shall contain the project name, applicable specification section, submittal data, equipment identification acronym as used on the drawings, and the Contractor's stamp. The stamp shall certify that the submittal has been checked by the Contractor, complies with the drawings and specifications, and is coordinated with other trades. Manufacturer product literature shall include shop drawings, product data, performance sheets, samples and other submittals required by this division. Highlight, mark, list, or indicate the materials, performance criteria, and accessories that are being proposed. General product catalog data not specifically noted to be part of the specified product shall be rejected and returned without review.

Submittals and shop drawings shall not contain the firm name, logo, seal, or signature of the Engineer. They shall not be copies of the work product of the Engineer. If the Contractor desires to use elements of such product, refer to paragraph "Electronic Drawing Files" for procedures to be used.

Separate submittals according to individual specification sections. Rejectable submittals will be rejected and returned without review. Catalog data shall be properly bound, identified, indexed and tabbed in a 3-ring binder. Each item or model number shall be clearly marked and accessories indicated. Label the catalog data with the equipment identification acronym or number as used on the drawings and include performance curves, capacities, sizes, weights, materials, finishes, wiring diagrams, electrical requirements and deviations from specified equipment or materials. For equipment with motor starters or VFDs, include short circuit current ratings. Mark out illegible items. Shop drawings will be returned without review if the above mentioned requirements are not met.

Provide the quantity of submittals required by Division 01. If not indicated and hard-copy sets are provided, submit a minimum of six (6) copies. Refer to Division 01 for acceptance of electronic submittals for this project. For electronic submittals, Contractor shall submit the documents in accordance with the procedures specified in Division 01. Contractor shall notify the Architect and Engineer that the submittals have been posted. If electronic submittal procedures are not defined in Division 01, Contractor shall include the website, user name, and password information needed to access the submittals. For submittals sent by email, Contractor shall copy the designated representatives of the Architect and Engineer. Contractor shall allow for the Engineer review time as specified above in the construction schedule. Contractor shall submit only the documents required to purchase the materials and/or equipment in the electronic submittal.

The checking and subsequent acceptance of submittals by the Engineer and/or Architect shall not relieve the Contractor from responsibility for deviations from the drawings and specifications, errors in dimensions, details, size of members, or quantities, omissions of components or fittings, coordination of electrical requirements, and not coordinating items with actual building conditions and adjacent work. Proceed with the procurement and installation of equipment only after receiving approved shop drawings relative to each item.

K. ELECTRONIC DRAWING FILES

In preparation of shop drawings or record drawings, Contractor may, at his option, obtain electronic drawing files in AutoCAD or DWG format or COORDINATE DTD-DWG files, both drive or direct download, as desired, from the Engineer for a shipping and handling fee of \$200 for a drawing set up to 12 sheets and \$15 per sheet for each additional sheet. Contact the Architect for written authorization and Engineer for the necessary release agreement form and to specify shipping method and drawing format. In addition to payment, the written authorization from the Architect and release agreement form from the Engineer must be received before electronic drawing files will be sent.

L. RECORD DRAWINGS (AS-BUILT DRAWINGS)

During progress of the work in this division, Contractor shall maintain an accurate record of all changes made during the installation of the system. Upon completion of the work, accurately transfer all record information to three identical sets of the approved shop drawings. Insert one set into each copy of the manual described below.

See Division 01 and General Conditions for additional information.

Division 23: HEATING, VENTILATING, AND AIR CONDITIONING

1. GENERAL INSTRUCTIONS

A. GENERAL REQUIREMENTS

All requirements under Division 01 and the general and supplementary conditions of these specifications apply to this section and division. Where the requirements of this section and division exceed those of Division 01, this section and division take precedence. Become thoroughly familiar with all its contents as to requirements that affect this division, section, or both. Work required under this division includes all material, equipment, appliances, transportation, services, and labor required to complete the entire system as required by the drawings and specifications, or reasonably inferred to be necessary to facilitate the function of each system as implied by the design and the equipment specified.

The specifications and drawings for the project are complementary, and any portion of work described in one shall be provided as if described in both. In the event of discrepancies, notify the Engineer and request clarification prior to proceeding with the work involved.

Drawings are graphic representations of the work upon which the contract is based. They show the materials and their relationships to one another, including sizes, shapes, locations, and connections. They convey the scope of work, indicating the intended general arrangement of the systems without showing all of the exact details as to elevations, offsets, control lines, and other installation requirements. Use the drawings as a guide when laying out the work and to verify that materials and equipment will fit into the designated spaces, and which when installed per manufacturers' requirements, will ensure a complete, coordinated, satisfactory, and properly operating system.

B. DEFINITIONS

Division: References contained in this specification follow the numbering system defined in the Construction Specifications Institute (CSI) MasterFormat 2004 Edition. Specification Divisions 01 through 13 provided with this project may reference the CSI MasterFormat 1995 Edition. The corresponding division references between the 2004 Edition and 1995 Edition are as follows:

2004 Edition	1995 Edition
1. Division 21 - Fire Suppression	Division 15
2. Division 22 - Plumbing	Division 15
3. Division 23 - HVAC	Division 15
4. Division 24 - Electrical	Division 16
5. Division 27 - Communications	Division 16
6. Division 28 - Electronic Safety and Security	Division 16

Furnish: "to supply and deliver to the project site, ready for unloading, unpacking, assembly, installation and erection."

Install: "to perform all operations at the project site including, but not limited to, the actual unloading, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, testing, commissioning, starting up and similar operations, complete, and ready for the intended use."

Provide: "to furnish and install."

Furnished by Owner (or Owner-Furnished) or Furnished by Others: "an item furnished by the Owner or under other divisions or contracts, and installed under the requirements of this division, complete and ready for intended use, including all items and services incidental to the work necessary for proper installation and operation. Include the installation under the warranty required by this division."

Engineer: Where referenced in this division, "Engineer" is the Engineer of Record and the Design Professional for the work under this division, and is a consultant to, and an authorized representative of the Architect, as defined in the General and/or Supplementary Conditions. When used in this division, Engineer means increased involvement by obligations to the Engineer, in addition to involvement by and obligations to the Architect.

AHJ: The local code and/or inspection agency (Authority) Having Jurisdiction over the work.

NRTL: Nationally recognized testing laboratory, as defined and listed by OSHA in 29 CFR 1910.4 (e.g., UL, ETL, CSA), and acceptable to the AHJ over this project. Nationally recognized testing laboratories and standards listed are used only to represent the characteristics required and are not intended to restrict the use of other NRTLs that are acceptable to the AHJ and standards that meet the specified criteria.

Substitution: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor. Substitutions include Value Engineering Proposals.

Substitutions For Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.

Substitutions For Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantages to Contractor or Owner.

The terms "approved equal," "equivalent," or "equal" are used synonymously and shall mean "accepted or acceptable to the Engineer as equivalent to the item or manufacturer specified." The term "approved" shall mean labeled, listed, or both, by an NRTL, and acceptable to the AHJ over this project.

C. PREBID SITE VISIT

Prior to submitting bid, visit the site of the proposed work and become fully informed as to the conditions under which the work is to be done. Failure to comply with this requirement shall not be considered sufficient justification for claims on the drawings are not necessarily intended to designate the required time, written descriptions of the firm given model numbers.

D. MATERIAL AND WORKMANSHIP

Provide new material, equipment, and apparatus under this contract unless otherwise stated herein, of best quality normally used for the purpose in good commercial practice, and free from defects. Install material and equipment in accordance with the manufacturer's installation instructions. Model numbers and the specifications or standards on the drawings are not necessarily intended to designate the required time, written descriptions of the firm given model numbers.

Work performed under this contract shall provide a neat and "workmanlike" appearance when completed, to the satisfaction of the Architect and Engineer. Workmanship shall be the finest possible by experienced mechanics. Installations shall comply with applicable codes and laws.

The complete installation shall function as designed and intended with respect to efficiency, capacity, noise level, etc. Abnormal noise caused by rattling equipment, piping, ducts, air devices, and squeaks in rotating components shall not be acceptable. Materials and equipment shall be of commercial specification grade in quality. Light duty and residential grade equipment shall not be accepted unless otherwise indicated.

Remove from the premises waste material present as a result of work, including cartons, crating, spacers, stickers, and/or excavation material not used in backfilling, etc. Clean equipment installed under this contract to present a neat and clean installation at the termination of the work.

Repair or replace public and private property damaged as a result of work performed under this contract to the satisfaction of authorities and regulatory having jurisdiction. Provide all safety lights, guards, and warning signs required for the performance of the work and for the safety of the public.

E. MANUFACTURERS

In other articles where lists of manufacturers are introduced, subject to compliance with requirements, provide products by one of the manufacturers specified.

Where a list is provided, manufacturers are listed alphabetically and not in accordance with any ranking or preference.

Where manufacturers are not listed, provide products subject to compliance with requirements from manufacturers that have been actively involved in manufacturing the specified product for no less than 5 years.

F. COORDINATION

Coordinate work with that of other trades so that the various components of the systems are installed at the proper time, will fit the available space, and will allow proper service access to those items requiring maintenance. Components which are installed without regard to the above shall be relocated at no additional cost to the Owner.

Unless otherwise indicated, the General Contractor shall provide chases and openings in building construction required for installation of the systems specified herein. Contractor shall furnish the General Contractor with information where chases and openings are required. Contractor shall keep informed as to the work of other trades engaged in the construction of the project and shall execute work in a manner as to not interfere with or delay the work of other trades.

Figured dimensions shall be taken in preference to scale dimensions. Contractor shall take his own measurements at the building, as variations may occur. Contractor shall be held responsible

3. DUCT INSULATION, DUCTWORK, ACCESSORIES, FLUES AND FANS

A. DUCT INSULATION

Provide fiberglass duct liner with fibers firmly bonded together with a thermosetting resin. Liner surface shall serve as a barrier against infiltration of dust and dirt, shall meet ASTM C1338 for fungi resistance, and shall be cleanable using duct cleaning methods and equipment outlined by North American Insulation Manufacturers Association (NAIMA) duct cleaning guide. Install with liner adhesive and mechanical fasteners in accordance with manufacturer's instructions and recommendations. Ductwork sizes shown on drawings are inside clear dimensions. Increase sheet metal by liner thickness in both directions where liner is installed.

Provide rectangular liner conforming to ASTM C1071, Type I or II that is 1-1/2 inch thick, 1-1/2 pound density, minimum R-6.1 Certaintec Corp. "Toughgrip" or equivalent, Johns Manville, Owens-Corning, Knauf, or Armstrong.

Provide round liner that is 1-1/2 inch thick, 1.5 pound density, minimum R-4.4 Johns Manville "Stenoelastic Flex" or equivalent, Certaintec or Owens-Corning.

Provide liner on the following interior air ducts and where specified on the drawings:

- Exposed round and rectangular supply ductwork and the first 15 feet of duct downstream of equipment outlets or 5 feet past first elbow, whichever is greater.
- Exposed round and rectangular return ductwork.

Cover concealed, rigid ductwork with ASTM C563, Type II flexible fiberglass insulation. Installed insulation shall be 1-1/2 inch thick, 1.5 pound density, minimum R-6.0 duct wrap, Certaintec or equivalent Johns Manville, Owens-Corning, or Knauf with heavy-duty foil-skin-out wrap, and with joints taped with 3 inch wide foil tape as follows:

- Round and rectangular supply and return air ductwork.
- Round and rectangular outside air ductwork.
- Round and rectangular exhaust and relief air ductwork within 10 feet of exterior discharge.

Cover Outdoor air, Exhaust air and Relief air plenums connected to exterior louvers with 1-1/2 inch thick, 1.5 pound density, rigid fiberglass insulation conforming to ASTM C612, Class 2.

Insulating materials, adhesives, coating, etc., shall not exceed flame spread rating of 25 and smoke developed rating of 50 per ASTM E84. Containers for mastic and adhesives shall have U.L. Label.

B. PLENUM INSULATION

Provide Firewrap 0.5 plenum insulation or ETS Schaefer Plenumshield blanket to encapsulate combustible materials located within a fire-rated return air plenum where permitted by AHJ. Plenum insulation shall be 1/2 inch thick, 6 to 8 PCF density, consisting of a high temperature, non-soluble material with aluminum foil encapsulating material and fiberglass reinforcing scrim coating. Plenum insulation shall be rated and certified per UL 1897 (modified), ASTM E136 for non-combustibility and ASTM E84UL, 725 for surface burning characteristics. Provide minimum 1 inch overlap at all seams and joints and secure insulation with stainless steel banding at locations and intervals per manufacturer's instructions.

C. DUCTWORK

Provide galvanized steel ductwork and housings as shown on drawings. Construct ductwork including fittings and transitions in conformance with current SMACNA standards relative to gauge, bracing, joints, etc. Minimum thickness of duct shall be 26-gauge sheet metal. Reinforce housings and ductwork over 30 inches with 1-1/4 inch angles not less than 5'-0" on centers, and closer if required for sufficient rigidity to prevent vibration. Support horizontal runs of duct from strap iron hangers on centers not to exceed 8'-0". Do not support ceiling grid, conduits, pipes, equipment, etc. from ductwork. Coordinate routing of ductwork with other contractors such that piping, electrical conduit, and associated supports are not routed through the ductwork.

Construct non-VAV supply ducts to meet SMACNA positive pressure of 2 inches w.g. Construct Return, Outdoor and Exhaust ductwork upstream of fans to meet SMACNA negative pressure of 1 inch w.g. Construct exhaust ductwork downstream of fans to meet SMACNA positive pressure of 1 inch w.g.

Seal ductwork with heavy liquid sealant, Applied Ironrig 601, Design Polymer DP-1010, United McGill duct sealer or approved equal, handcoated according to sealant manufacturer's instructions. Seal all longitudinal and transverse ductwork joints airtight to meet SMACNA Seal Class A. Tapes and mastic shall be listed and labeled in accordance with UL 181A.

Provide radius elbows, turns, and offsets with a minimum centerline radius of 1-1/2 times the duct width. Where space does not permit full radius elbows, provide short radius elbows with a minimum of two continuous splitter vanes. Vanes shall be the entire length of the bend. Provide offset elbows where space does not permit radius elbows, where shown on the drawings, or at the option of the contractor with the engineer's approval. Minored elbows less than 45 degrees shall not require turning vanes. Minored elbows 45 degrees and greater shall have single thickness turning vanes of same gauge as ductwork, rigidly fastened with gudge strips in ductwork. Vanes for minored elbows shall be provided in all supply and exhaust ductwork and in return and outside air ductwork that has an air velocity exceeding 1000 fpm. Do not install vanes in grease ductwork. The use of square brood, radius heel elbows is prohibited. Remove and replace all installed elbows of this type with an approved elbow at no additional cost to the owner.

Ducts shall be connected to fans, fan casings and fan plenums by means of flexible connectors. Flexible connectors shall be neoprene coated glass cloth canvas connectors, Duro-Dyne, Elgen, Ventilaflex or equal. Flexible connectors shall have a flame spread of 25 or less and smoke developed rating not higher than 50. Make airtight joints and install with minimum 1-1/2 inches slack.

Provide balancing dampers, manufactured by Cesso, Greenheck, Louvers & Dampers, Nalor Industries, Potluff, Ruskin, Tamco, or approved equal, where shown on drawings and wherever necessary for complete control of air flow. Splitter dampers shall be controlled by locking quadrants; provide Young Regulator or Verlox end bearings for the damper rod. Rectangular volume dampers shall be opposed blade interlocking type. Round volume dampers shall be single-blade type consisting of circular blade mounted to a shaft. Provide Featherstar model D10 or equal 45 degree rectangular and side lobe inlet fitting with model B03 damper with locking quadrant and insulation built out for round ductwork branch takeoffs to individual air devices. Omit damper at takeoff fitting when branch is located downstream of takeoff.

Where access to dampers through a hard ceiling is required, provide a Metropolitan Air Technology model RT-250 or equal by Young's Regulator concealed, cable operated volume damper with remote operator. Damper shall be adjustable through the offset face or frame with standard 1/4 inch ratchet or flat screwdriver. Cable assembly shall attach to damper as one piece with no linkage adjustment. Positive, direct, two-way damper control shall be provided with no sleeves, springs or screw adjustments to come loose after installation. Support cable assembly to avoid bends and kinks in cable.

Round or oval ductwork shall be FlakGroup Semco, United, Hercules Industries or equal, sheetmetal, with smooth interior surface, with low pressure (duct pressure class up to and including 2 inches w.g.) Round ductwork gauges per the following table (reference SMACNA HVAC duct construction standards for gauges when pressures exceed 2 inches w.g.):

Size	Duct Gauge	Fitting Gauge
14" & under	26	24
15" thru 24"	24	22

Lewis & Lambert, Linx Industries Linx-It Safe, or approved equal factory-manufactured round ductwork and fittings may be substituted for specified round branch ductwork, at Contractor's option. Heavy liquid joint sealant may be omitted on factory-manufactured round ductwork.

Low pressure (duct pressure class up to and including 2 inches w.g.) Fittings 24 inches in diameter and less shall be prefabricated, spot-welded and internally sealed. Continuously weld fittings larger than 24 inches in diameter. Fitting gauge shall be 22 gauge for 36 inch fittings and round, 20 gauge for larger sizes. 90 degree tees shall be conical type. Seal longitudinal and transverse ductwork joints airtight with heavy liquid sealant applied according to manufacturer's instructions. Provide gauge thickness in medium pressure (duct pressure class 2 inches to 6 inches w.g.) ductwork as recommended by SMACNA.

If permanent HVAC equipment is used during the construction period, provide temporary filters at all openings in the ductwork and inside equipment to protect the system from dust, dirt, paint, and moisture. Replace and maintain filters when needed, but not less than every month. On the day of Substantial Completion, clean the unit and ductwork and provide a new set of filters in the unit. Refer to section "Air Filters" for filter requirements.

D. FLEXIBLE DUCT

Low pressure (duct pressure class up to and including 2 inches w.g.) and medium pressure (duct pressure class 2.1 inch to 6 inches w.g.) flexible duct shall be Flemmaster type 6B, Thermflex type G-4M, M-KE, JPL type Silver Jacket, or equal fire resistant polyethylene protective vapor barrier, UL 181 Class 1, acoustical insulated duct, R-6.0 fiberglass insulation. Provide CPE liner with steel wire helix mechanically locked or permanently bonded to the liner.

Flexible duct runs shall not exceed 5 feet in length, and shall be installed fully extended and straight as possible avoiding tight turns. Install flexible duct in accordance with manufacturer's instructions. Support flexible duct at maximum 5 feet on center and within 6 inches of bends. Bands shall not exceed a centerline radius of one duct diameter. Duct sag shall not exceed 1/2 inch. Supporting material in direct contact with the duct shall not be less than 1-1/2 inches in width.

Connect flexible duct to rigid metal duct or air devices as recommended by the manufacturer. At a minimum, install two wraps of duct tape around the inner cone connection and a metallic or non-metallic clamp over the tape and two wraps of duct tape or a clamp over the outer jacket. Duct clamps shall be labeled in accordance with UL 181B and marked 181B-C. Duct tape shall be labeled in accordance with UL 181B and marked 181B-A.

E. AIR DEVICES

Provide air devices as scheduled on drawings, manufactured by Carnes, Krueger, Metalaire, Nalor Industries, Price, Taus, or Tuttle & Bailey. Select air devices to limit room noise level to no higher than NC-30 unless otherwise shown. Provide devices with a soft plastic gasket to make an airtight seal against the mounting surface. Coordinate final location, frame, and mounting type of air devices with architectural related ceiling plans.

Submit complete shop drawings including information on noise level, pressure drop, throw, CFM for each air device, styles, borders, etc. Clearly mark each with specified equipment number. Submit samples of each air device as requested by the Engineer.

Provide wall supply air registers with double deflection blades and opposed blade dampers. Provide wall return air grilles and exhaust air registers with horizontal 35 or 45 degree angle vision-proof bars. Provide concealed fasteners for wall-mounted registers and opposed blade dampers.

Provide ceiling mounted air devices of any type or surface mounted type as required to be compatible with ceiling construction. Provide ceiling diffusers and grilles with white enamel finish unless noted otherwise.

F. CONTROL DAMPERS

Provide factory fabricated, parallel blade control dampers sized as shown on the drawings and as specified. Individual damper sections shall not be larger than 48 inches x 60 inches with maximum blade width of 6 inches. Frame construction shall be minimum 16 gauge galvanized steel for rectangular dampers, 20 gauge for round, 1/8 inch thick for aluminum, with flanges for duct mounting. Provide elastomeric or neoprene seals, mechanically attached and field replaceable. Provide a minimum of one damper actuator per section. Test damper performance in accordance with AMCA 500-10.

Motorized dampers used for ventilation air make, exhaust air, or relief air shall have leakage rates not to exceed 4.0 CFM/square foot in full closed position at 1 inch W.G. pressure differential across the damper.

Provide dampers as manufactured by Greenheck, CESCO, Potluff, Nalor, or Ruskin. Reference manufacturer with model number for outside air dampers in Ruskin CD-50 construction of aluminum, and all other applications in Ruskin CD-35 construction of galvanized steel.

Provide damper operator for each automatic damper with sufficient capacity to operate the damper under all conditions and to guarantee light close-off of dampers against system pressure encountered. Each operator shall be provided with spring-return for normally closed or normally open position for fail safe operation to account for the low temperature, or power interruption as required by the control systems specified on the drawings. Damper operators shall be manufactured by Belimo, Johnson Controls or approved equal. Provide transformer for damper motors if different voltages are required.

G. FIRE DAMPERS

Provide fire dampers where shown on drawings, and as required by Code enforcing authority. Damper ratings shall be as required to maintain the fire and/or smoke barrier shown on the architectural drawings. Provide fire dampers conforming to NFPA-90A and UL 555 with recommended steel sleeves of length as required to meet the installed condition. 165 degree Fahrenheit fusible link, spring closed type, Nalor Industries, Ruskin, or United Air. Provide access door, sized per SMACNA with minimum size of 10 inch by 10 inch, in duct for inspection and service of fire damper and fusible link. Provide duct access doors within 12 inches of the device for after testing and maintenance. Label each door (with minimum 1 inch lettering) indicating which damper type is served. Door should be capable of being fully opened or provide removable door. Provide remote access door for test size 6 inch too small for 10 inch by 10 inch access door. Provide access door in ceiling or wall as required to access damper.

H. LOUVERS, PLENUMS, SCREENS

Provide intake and exhaust air louvers by Greenheck model ED-401 or equal American Warming & Ventilating, Cesco, Ruskin, Industrial Louvers or Louvers & Dampers as scheduled on the drawings. Coordinate exact size and location with architectural drawings. Louvers shall be stationary, with mill finish. Louvers shall have extruded aluminum blades, 0.080 inch wall thickness, 45 degree black angle, blades on 5 inch centers, frame shall be extruded aluminum, 0.080 inch wall thickness, with expanded flattened aluminum backbones. Provide louvers with a minimum free area of 45 percent, with a maximum air pressure drop of 0.1 inch at scheduled airflow.

Construct plenums with galvanized steel framing members and galvanized steel metal, braced with galvanized angles. Girdges and bracing shall conform to SMACNA recommendations for ductwork of this size. Where access doors are shown, provide hinged doors with #202 Ventlok latch. Make weight connections to louvers, sloping bottom of plenum to drain water to weepholes in bottom of louver.

Provide screens on louvers, ducts, hoods, fans, and openings to the outdoors as scheduled and/or noted on the drawings. Insect screens shall be 0.020 thickness, 1/4 inch mesh, stainless steel wire. Bird screens shall be 0.041-inch, 1/2 inch mesh galvanized steel wire. Provide motorized control dampers or backdraft dampers where shown on the drawings.

I. EXHAUST AIR SYSTEMS

Provide ceiling mounted exhaust fans as scheduled on the drawings, ACME, Carnes, Cook, Greenheck, Pennebary, or Twin City Fans complete with isolated lower unit and ceiling grille. Provide disconnect switch, backdraft damper, discharge duct, wall louver, and neoprene vibration isolators with all-thread, hanging rods.

Provide in-line (duct) mounted exhaust fans as scheduled on the drawings, ACME, Carnes, Cook, Greenheck, Pennebary, or Twin City Fans complete with isolated lower unit and ceiling grille. Provide backdraft damper, discharge duct, wall louver, and vibration isolation as scheduled or shown on the drawings.

J. PLASTIC FLUE GAS VENTS

Provide UL 1738 listed plastic flue gas vents, with positive or negative flue pressures complying with NFPA 211 and suitable for condensing gas appliances. Provide PVC system by "Plex" system 1738", or Polypropylene system by Centrobrom "Trendrol" or equal by Nova Fire Group, C-2ENS.

Where plastic gas vents are installed in a return air plenum, wrap the vent with fire rated plenum insulation. Reference Article "Plenum Insulation" for plenum-rated fire wrap. Coordinate vent material compatibility with the appliance manufacturer's installation instructions prior to purchasing and installation.

Flues shall be complete with necessary fittings, connectors, flashing cone, storm collar, trundle supports, guy wires, and other accessories, and shall be installed as recommended by the manufacturer, and in conformance with applicable codes. Flash flues, waterlogs, and the wall penetration.

4. HVAC EQUIPMENT

A. CONDENSING UNITS

Provide split system, air cooled condensing units as scheduled on the drawings, manufactured by Carrier, Lennox, or Trane, complete with factory installed hermetic or semi-hermetic motor/compressor assembly with internal spring vibration isolation, built-in thermal overload protection, and crankcase heater; top discharge condenser fan and motor low ambient control for operation to 40 degrees Fahrenheit; anti-short cycle timer, time delay relays; factory installed liquid line drier and low pressure switch; full refrigerant holding charge; and weatherlight housing constructed of zinc coated, heavy gauge, galvanized steel with weather-resistant baked enamel finish and factory installed condenser coil hail guards. Unit shall carry a five year guarantee on the compressor and refrigerant circuit, and a one year guarantee on the remaining components. Provide refrigerant piping sized as recommended by equipment manufacturer with foam-padded plastic insulation on the suction line as specified in this section. Provide equipment support rails for mounting condensing units on roof. Securely attach units to roof.

B. GAS-FIRED FURNACES

Provide gas-fired furnaces with orientation as scheduled on the drawings, manufactured by Carrier, Lennox, or Trane, complete with combustion air blower; high quality carbon steel heat exchanger; stainless steel ribbon burners, forward-curved centrifugal blowers, heavy duty multipass direct drive motor (or ball drive with PSC motor), insulated steel cabinet with baked enamel finish, fiber rock with 1 inch thick throwaway filters, fan switch and high limit control, intermittent pilot with thermoprocure, and gas valve for 100 percent safety shut-off control, and direct expansion cooling coils. Furnaces shall be approved by ADA and UL. Provide electronic programmable type thermostats, Honeywell seven-day model or approved equal, manual changeover type, multi-stage, as required to match unit heating and cooling staging.

C. EVAPORATOR COILS (FOR FURNACE SYSTEMS)

Provide coils as noted on the drawings, manufactured by Carrier, Lennox, or Trane, of the "A" type configuration, direct expansion type, complete with aluminum/epoxy coils, insulated steel cabinet with baked enamel finish, mastic coated drain pan, and capillary or expansion valve type control matched to the condensing unit. Pipe condensate drain to end over floor drain or as indicated on drawings.

D. ELECTRIC UNIT HEATERS

Provide electric unit heaters as scheduled on the drawings, manufactured by Berko, Bransch, Indeco, Markel, Omars, or Raywall, standard type propeller unit heaters with isolation routing brackets and hardware for horizontal airflow. Furnish heater fan motors complete with a manual motor starter with automatic thermal cutouts sized to the motor load, disconnect switch, and other code required safety devices. Provide unit mounted thermostat and manual summer/winter changeover switch.

5. PIPING AND PIPING INSULATION

A. REFRIGERANT PIPING AND INSULATION

Copper tubing: ASTM B 280, alloy C12200, type ACR, hand-drawn straight lengths, and soft-annealed coils; seamless copper tubing. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interiors prior to shipping.

Fittings: wrought-copper fittings: ANSI B16.22, streamlined pattern.

Brazing filler metal: BCUP - 5: copper (Cu), phosphorus (P) 4.8 - 6.2 percent, and silver (Ag) 14.5 - 15.0 for joining wrought copper fittings and copper tubing. Braze joints with a slow stream of dry nitrogen passing through the piping.

Insulate suction lines with 1-1/2 inch and liquid lines with 1/2 inch foamed plastic insulation. Amalgam or equal. Flange insulation shall have a flame spread of 25 or less, and a smoke developed rating of 65 or less when tested in accordance with ASTM E84. Coat insulation that is exposed to the elements with a protective sealer. Install and support piping to keep noise and vibration to a minimum. Support and secure piping to Unistrut type supports so that no vibration passes to the building structure. Pipe attachments shall be copper-plated or have nonmetallic coating for abrasion protection where attachments are in direct contact with copper tubing. Install a support within one foot of each change of direction. Mount pipe hangers around the outside of the insulation with saddles to prevent hangers from rupturing the insulation. Replace insulation that is cut or broken by the hangers.

Run refrigerant lines parallel and perpendicular to wall and floor lines and to appear straight and in good order. Plich suction lines down slightly (1 inch in 20 feet) towards the compressor. Provide oil traps at the base of vertical suction risers that are 6 feet high. Install liquid line sight glasses in liquid lines nearest the expansion valve. Factory mount expansion valves with the sensing bulbs shipped loose. Field mount expansion valve bulb after refrigerant piping is complete (damage may occur if bulbs come in contact with heat).

For systems of 5 ton capacity and smaller, the contractor shall have the option to provide copper refrigerant tubing line set sized as recommended by equipment manufacturer and of length as required for the installation. Provide minimum 1 inch thick foamed plastic insulation, Amalgam or equal, on the suction and liquid lines. Provide quick-connect flare tubing compression fittings or solder connections as required to match the connections of the condensing unit and evaporator coil.

B. SYSTEM EVACUATION AND CHARGING

Blow out refrigeration lines with dry nitrogen at a suitable pressure before making final connection at the condensing unit or coil to ensure against dirt, scale, or other foreign material being in the lines. Draw a vacuum to 29 inches of mercury. Break this vacuum by charging dry nitrogen gas into the system, raising the pressure to 0 PSIG. Repeat the latter two steps for a triple evacuation before the final evacuation is started. Make final evacuation by reducing the system absolute pressure to a maximum of 0.5 millimeters (500 microns) and allowing the pump to run at this pressure for a minimum of two hours.

Repeat the proper amount of refrigerant charge per the manufacturer's recommendations. Record the amount of refrigerant by weight charged into the system for each circuit recorded to be the nearest 1/4 pound on tags and attach tags to the liquid line near the condensing unit. Refrigerant shall be supplied by the HVAC Contractor.

6. TEMPERATURE CONTROLS

A. GENERAL REQUIREMENTS

Provide a complete temperature control system including control panels, controllers, thermostats, humidistats, sensors, time switches, override timers, actuators, relays, and wiring as required to control the systems as specified on the drawings.

Submit shop drawings of equipment provided for temperature control. Submit operation and maintenance data, including trouble-shooting maintenance guide, step-by-step procedures needed for each controller and thermostat, operation, inspection period, cleaning methods and materials, and calibration procedures.

Provide integrated wiring diagrams showing interconnections between field-installed equipment and package wiring furnished with the HVAC equipment. Control wiring shall be sized to accommodate the voltage drop associated with the distance between the control device and the controller.

Provide supervision and on-call check-out service as required to ensure that installation and operation of the temperature control system meets requirements of the drawings, specifications, and sequences of operation. The system shall be guaranteed for a period of one year following the acceptance of the system by the Architect/Engineer. Correct defects occurring during the period at no additional cost to the Owner.

Install control devices with top of device at 5'-0" AFF to meet ADA requirements unless otherwise noted on the plans.

B. THERMOSTAT CONTROL EQUIPMENT

Manufacturers and model numbers are listed for reference as to quality and features required for the control devices. Provide control devices with quality and features as indicated.

Seven day programmable, occupant/unoccupied thermostats for on/off stages of heating and cooling systems shall be Lux Products series TX100SE or equal with integral subbase. Order thermostat with multi-stage capability as required to match scheduled unit cooling/heating stages. Provide tamper resistant gages for thermostat.

Provide wall or duct-mounted humidistat as indicated on the drawings that is compatible with the thermostat.

7. SEQUENCE OF OPERATION

A. FAN COIL UNIT CONTROL

1. STORAGE UNITS

The time clock shall be interlocked with the Fan coil units and motorized outdoor dampers. Time clock shall energize Fan coil units and open motorized damper 5 times a day for 30 minutes each instance. Each instance shall occur every 4.5 hours starting at 12:00 AM.

Provide low voltage wiring to fan coils and motorized dampers.

During non-time clock instances the Fan coil unit shall energize when thermostat calls for heating or cooling. Outdoor air damper shall be open during non-time clock instances while fan coil is operating.

When the humidistat senses a rise in the space humidity above the humidity setpoint, and there is no call for cooling, activate the cooling system to remove moisture and maintain space temperature.

2. OFFICE UNIT (AHU 1-4)

The unit shall supply the lesser of the minimum rate of outdoor air or supply 3 complete air changes during the 1-hour period before normal occupied mode.

During occupied hours, operate fan coil unit and supply fan continuously and open interlocked outdoor air damper to maintain minimum ventilation. Cycle stage(s) of DX cooling and heat pump heating to maintain room thermostat set point.

During unoccupied hours, cycle the fan coil unit supply fan and cooling or heating system to maintain unoccupied setback temperature set points. Outdoor air damper shall be closed during unoccupied hours.

When return air humidity rises above humidity setpoint and there is no call for cooling, activate the cooling system to remove moisture and maintain space temperature.

Exhaust fan shall be interlocked with respective restroom light switch and be energized when light switch is 'on' and de-energized when light switch is 'off'.

B. TENANT RESTROOM EXHAUST FAN CONTROL (EF 1-1, 1-2, 3-1, 3-2)

C. JANITOR CLOSET EXHAUST FAN (EF 1-3)

Fan shall run continuously.

D. UNIT HEATER CONTROL

During occupied hours, operate unit supply fan and stages of heating to maintain room thermostat set point.

E. ELECTRICAL/ELEVATOR ROOM TRANSFER FAN (TF 1-1, 4-1): Interlock fan operation with thermostat. Fan shall cycle to maintain space temperature of 65 F.

F. CIRCULATION FAN (CF 1-1):

Fan shall run continuously.

END OF SECTION 23



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M-702

A&E Construction Co.
Received 9-17-24

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