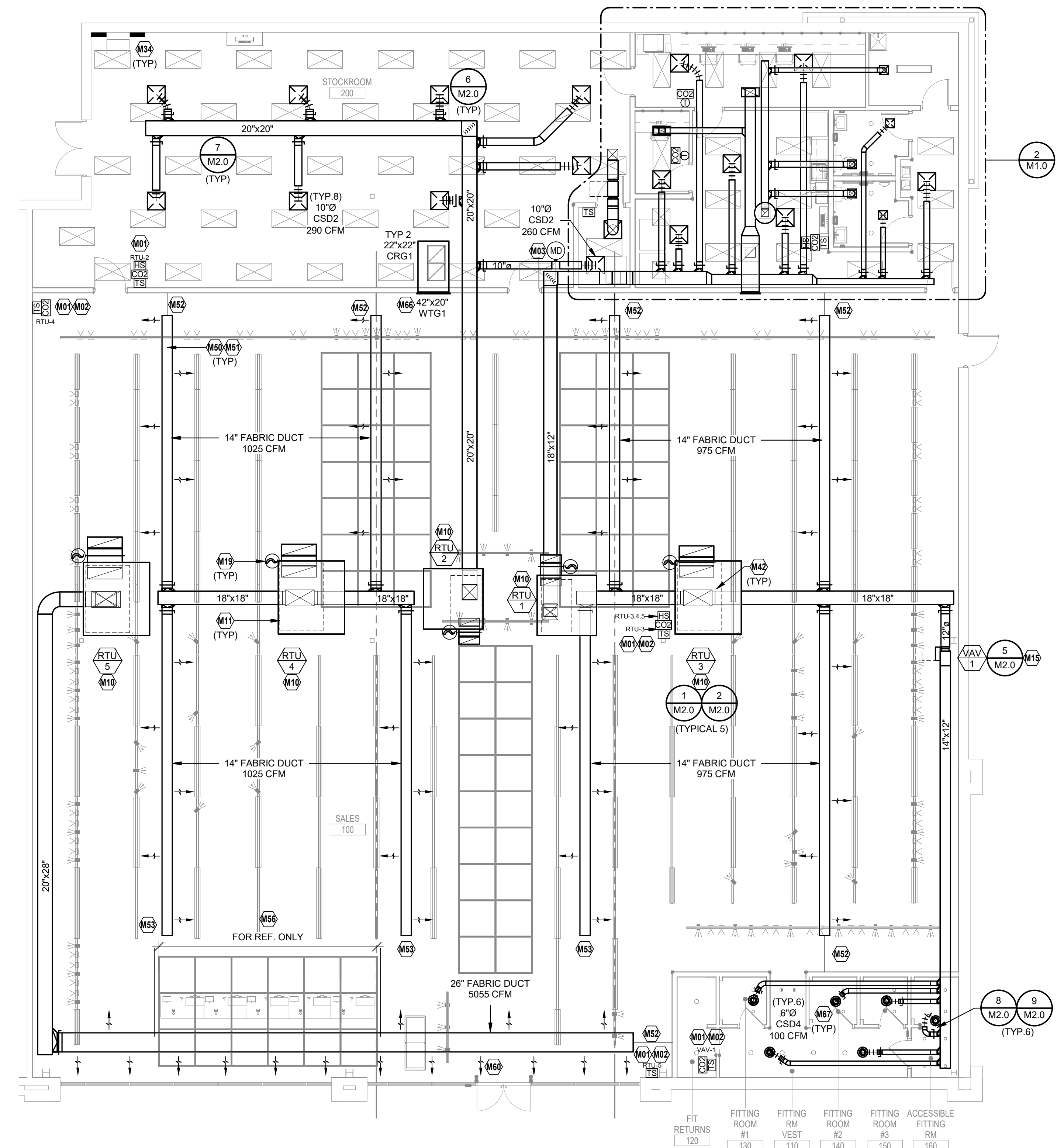


① ENLARGED BACK OF HOUSE HVAC PLAN  
1/8" = 1'-0"



② ENLARGED BACK OF HOUSE HVAC PLAN  
1/4" = 1'-0"

KEYNOTES ARE PROTOTYPICAL. MISSING KEYNOTE NUMBERS INDICATE A PROTOTYPICAL NOTE IS NOT USED OR REMOVED.

**MECHANICAL PLAN NOTES**

- M01 ALL THERMOSTATS AND SENSORS ARE FURNISHED BY EMS VENDOR AND INSTALLED BY DIVISION 26. UNLESS NOTED OTHERWISE, DIVISION 26 SHALL COORDINATE EXACT DEVICE QUANTITIES, LOCATIONS, AND POWER CONNECTIONS REQUIREMENTS WITH EMS VENDOR PRIOR TO CONSTRUCTION.
- M02 DO NOT INSTALL SENSORS ON WALL GRAPHICS. CONFIRM LOCATIONS OF SENSORS WITH PM PRIOR TO INSTALLATION.
- M03 INSTALL DAMPER AND ACTUATOR IN LOCATION INDICATED. DAMPER AND ACTUATOR FURNISHED BY FAN MANUFACTURER. CONTROLS RELAY FURNISHED BY EMS VENDOR.
- M04 MOTORIZED DAMPER SHALL BE ACCESSED THROUGH FAN ON ROOF AND IS SHOWN ON PLAN FOR REFERENCE ONLY. REFER TO MECHANICAL SCHEDULES FOR MORE INFORMATION.
- M10 PROVIDE NEW ROOFTOP UNIT WITH NEW ROOF CURB. PROVIDE A NEW SET OF MERV 13 AIR FILTERS IN UNIT BEFORE TURNING SYSTEM OVER TO OWNER. COORDINATE CONDENSATE PIPING WITH DIVISION 22.
- M11 DASHED LINE REPRESENT THE ROOFTOP UNIT CURB.
- M15 PROVIDE NEW VAV BOX IN SUPPLY AIR DUCT SERVING FITTING ROOMS. INSTALL VAV BOX IN ACCESSIBLE LOCATION AND COORDINATE CONTROLS WITH EMS VENDOR PRIOR TO ORDERING.
- M17 COORDINATE FINAL INSTALLED LOCATION SUCH THAT THE HVAC EQUIPMENT REMAINS ACCESSIBLE. VERIFY NO OTHER PIPING, ELECTRICAL CONDUIT, STRUCTURE, AND/OR CEILING SUPPORTS IMPEDE ACCESS IN ANY WAY. INSTALL HVAC EQUIPMENT WITHIN 16'-0" ABOVE FINISHED FLOOR FOR SERVICEABILITY.
- M19 SMOKE DETECTORS AND WIRING IN RETURN AIR DUCTS SHALL BE PROVIDED BY DIVISION 28 CONTRACTOR. SMOKE DETECTORS SHALL SHUT-DOWN UNIT UPON ALARM.
- M22 PROVIDE NEW ROOF-MOUNTED EXHAUST FAN AS SCHEDULED FOR GENERAL RESTROOM EXHAUST.
- M23 EXHAUST FAN SERVES TO PROVIDE TRANSFER AIR ONLY AND SHALL DISCHARGE AIR INTO THE STOCKROOM.
- M25 INSTALL VAV POWER MODULE FOR CONTROL OF OFFICE VAV DIFFUSERS IN AN ACCESSIBLE LOCATION ABOVE THE CEILING. DIVISION 26 CONTRACTOR SHALL PROVIDE 120V POWER TO MODULE. REFER TO ELECTRICAL DRAWINGS FOR DETAILS.
- M34 DO NOT ROUTE DUCTWORK OVER ELECTRICAL EQUIPMENT. NOTIFY ENGINEER OF CONFLICTS IN FIELD.
- M42 ROUTE SUPPLY AND RETURN DUCTWORK TO ROOF CURB DUCT CONNECTIONS AND TRANSITION DUCTWORK IN RISER AS NECESSARY.
- M50 INSTALL FABRIC DUCT ABOVE ARCHITECTURAL LIGHTING GRID. REFER TO BOXED NOTES FOR ADDITIONAL INFORMATION.
- M51 ARROWS INDICATE DIRECTION AND DISPERSION OF AIRFLOW VOLUME. PROVIDE VENTS ON FABRIC DUCT TO DIRECT AIRFLOW AS SHOWN ON PLAN.
- M52 EXTEND AND TIGHTEN HANGING CABLE TO WALL. GENERAL CONTRACTOR TO PROVIDE 2X WOOD BACKING. COORDINATE REQUIREMENTS WITH FABRIC DUCT MANUFACTURER.
- M53 FIELD FABRICATE L BRACKET FOR SUPPORTING END OF FABRIC DUCT. COORDINATE REQUIREMENTS WITH FABRIC DUCT MANUFACTURER.
- M56 DO NOT INSTALL AIR VENTS ON FABRIC DUCT ADJACENT TO BACKWRAP WALL. DIMENSION SHOWN FOR REFERENCE ONLY.
- M60 SUPPORT FABRIC DUCTWORK WITH MANUFACTURER'S DOUBLE-CABLE CROSS BRACING SUPPORTS. COORDINATE REQUIREMENTS WITH FABRIC DUCT MANUFACTURER.
- M65 LOUVERED DOOR FOR MAKEUP AIR BY GENERAL CONTRACTOR. REFER TO ARCHITECTURAL DRAWINGS FOR MORE INFORMATION.
- M66 PROVIDE GRILLE ON WALL FOR TRANSFER AIR. MOUNT AS HIGH AS POSSIBLE WITHIN STRUCTURE AND INSTALL WITH BLADES ANGLED UP TOWARDS STRUCTURE FOR REDUCED VISIBILITY.
- M67 COORDINATE LOCATION OF FITTING ROOM DIFFUSERS WITH LIGHTS, SPRINKLERS, SPEAKERS, AND OTHER CEILING DEVICES FOR A NEAT AND ORDERLY INSTALLATION. INSTALL CELING DEVICES IN-LINE WITH EACH OTHER WHERE POSSIBLE.

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. DO NOT INSTALL DUCTWORK BELOW THE BOTTOM OF THE LIGHT FIXTURES.

**FABRIC DUCT GENERAL NOTES:**  
 PROVIDE FABRIC DUCT THROUGHOUT THE SPACE AS SHOWN ON PLAN. FABRIC DUCT SHALL NOT REPLACE RECTANGULAR DUCT DROPS OR EXHAUST DUCTS. BASIS OF DESIGN SHALL BE "PRIHODA", "NMI" NONPOROUS FABRIC WITH "PERFORATIONS" (AIR OPENINGS) WITH ADJUSTABLE FLOW DEVICES (I.E. AFD'S) AT OPENINGS, AND ONE ROW, GALVANIZED CABLE. INTERNAL HOOP SUPPORT SYSTEM SHALL BE PROVIDED ON ALL FABRIC DUCT UNLESS NOTED OTHERWISE. INCLUDE ALL COMPONENTS AND ACCESSORIES REQUIRED TO MAKE A COMPLETE SYSTEM AS RECOMMENDED BY PRIHODA DURING BID PHASE, INCLUDING HANGING STRAPS AND CLIPS, END-CAPS, CONNECTIONS TO METAL DUCTS, ETC. PRIHODA FABRIC DUCT SHALL BE SIZED PER FACTORY RECOMMENDATIONS TO PROVIDE MINIMUM AIRFLOWS IN BRANCH DUCTS AS SHOWN. CONFIRM FABRIC DUCT COLOR WITH ARCHITECT PRIOR TO PROVIDE A 50 FPM THROW VELOCITY HALF WAY TO THE NEAREST ADJACENT FABRIC DUCT OR TO THE NEAREST PARTITION/DEMISING WALL AS APPLICABLE. VENTS ON FABRIC DUCT SHALL BE LOCATED AT 22.5 DEGREES BELOW HORIZONTAL UNLESS NOTED OTHERWISE.

**FABRIC DUCT DESIGN GUIDELINE:**  
 DISTRIBUTE AIRFLOW EVENLY ALONG FABRIC DUCT IN THE DIRECTION OF FLOW ARROWS. ORIENT AND SIZE FABRIC DUCT DIFFUSER OPENINGS TO PROVIDE A 50 FPM THROW VELOCITY HALF WAY TO THE NEAREST ADJACENT FABRIC DUCT OR TO THE NEAREST PARTITION/DEMISING WALL AS APPLICABLE. VENTS ON FABRIC DUCT SHALL BE LOCATED AT 22.5 DEGREES BELOW HORIZONTAL UNLESS NOTED OTHERWISE.

**FABRIC DUCT COORDINATION NOTE:**  
 DURING THE FIRST WEEK OF THE PROJECT, THE GENERAL CONTRACTOR'S SUPERINTENDENT, MECHANICAL SUB-CONTRACTOR, AND A REPRESENTATIVE FROM "PRIHODA" SHALL MEET AT THE PROJECT SITE FOR CONFIRMATION OF ALL FIELD DIMENSIONS AND POTENTIAL OBSTRUCTIONS. THIS EVENT MUST PRECEDE THE ORDERING OF ANY MATERIALS FROM "PRIHODA". CHANGE ORDERS AND EXPEDITING FEES WILL NOT BE APPROVED DUE TO LACK OF ON-SITE COLLABORATION AND/OR MEASUREMENT DURING SITE MEETING AT PROJECT COMMENCEMENT.

**FABRIC DUCT INSTALLATION NOTE:**  
 INSTALL FABRIC DUCT ABOVE ARCHITECTURAL LIGHTING SYSTEM. COORDINATE FABRIC DUCT INSTALLATION WITH GENERAL CONTRACTOR AND DIVISION 26. GENERAL CONTRACTOR SHALL VERIFY FABRIC DUCT IS INSTALLED SUCH THAT IT DOES NOT CLASH WITH ARCHITECTURAL LIGHTING SYSTEM, INCLUDING LIGHT FIXTURES, ARCHITECTURAL LIGHTING SYSTEM GRID AND SUSPENSION CABLES, OR ANY OTHER SUSPENDED FIXTURES WHEN DEFLATED.

THE DUCTWORK LAYOUT INDICATED ON THE DRAWINGS IS SCHEMATIC AND SHOWS DESIGNED INTENT ONLY. PRIOR TO FABRICATION AND INSTALLATION OF DUCTWORK, DIVISION 23 SHALL HAVE A QUALIFIED, EXPERIENCED SKETCHER PREPARE AND SUBMIT SHEET METAL SHOP DRAWINGS. SHOP DRAWINGS SHALL TAKE INTO ACCOUNT ALL EXISTING CONDITIONS, INCLUDING BUT NOT LIMITED TO, STRUCTURAL MEMBERS, CONDUITS AND PIPING TO REMAIN. SHOP DRAWINGS SHALL ALSO TAKE INTO ACCOUNT ALL NEW DESIGN CONDITIONS, INCLUDING BUT NOT LIMITED TO, STRUCTURAL MEMBERS, PIPING, CEILING, SOFFIT HEIGHTS, AND LIGHT FIXTURES.

SHOP DRAWINGS SHALL INDICATE ALL REVISIONS TO THE LAYOUT REQUIRED TO ACCOMMODATE THE EXISTING CONDITIONS AND/OR MAINTAIN THE CEILING HEIGHTS AND CLEARANCES REQUIRED. NOTIFY THE ARCHITECT AND ENGINEER OF ANY LOCATION WHERE THE DESIGN INTENT CANNOT BE MET PRIOR TO FABRICATION AND INSTALLATION OF DUCTWORK. REVISIONS TO DUCTWORK, EQUIPMENT, CONDUIT AND/OR PIPING REQUIRED BY CONTRACTOR'S FAILURE TO SUBMIT PROPERLY PREPARED SHOP DRAWINGS SHALL BE THE RESPONSIBILITY OF DIVISION 23 AT NO ADDITIONAL COST TO THE CLIENT OR DELAY TO THE PROJECT SCHEDULE.

GENERAL CONTRACTOR IS RESPONSIBLE FOR PROVIDING TO ARCHITECT, ENGINEER, LANDLORD, AND BUILDING OFFICIAL/INSPECTOR A FINAL TEST AND BALANCE REPORT PER THE SPECIFICATIONS. PROVIDE TEST AND BALANCE REPORT TO ARCHITECT, ENGINEER, AND LANDLORD PRIOR TO THE FINAL BUILDING INSPECTION.

**LANDLORD REQUIREMENTS:**  
 LANDLORD APPROVED ROOFING CONTRACTOR SHALL BE RESPONSIBLE FOR MAKING ALL CUTS THROUGH THE EXISTING ROOF, MODIFYING EXISTING OPENINGS, AND/OR ALTERING CURB FLASHING AT GENERAL CONTRACTOR'S EXPENSE. COORDINATE WITH GENERAL CONTRACTOR.

**EMS CONTROLS:**  
 CONTRACTORS ARE RESPONSIBLE FOR COORDINATING ALL EQUIPMENT CONTROLS WITH EMS VENDOR PRIOR TO PURCHASE AND INSTALLATION. CONTRACTORS SHALL COORDINATE WITH EMS VENDOR TO PROVIDE ALL NECESSARY EQUIPMENT AND ACCESSORIES FOR A FULLY FUNCTIONING SYSTEM.

**TEMPERATURE CONTROLS:**  
 EMS VENDOR SHALL FURNISH SENSORS AND CONTROL COMPONENTS AS INDICATED ON PLANS AND AS NECESSARY TO ACCOMPLISH THE INTENT OF THE DRAWINGS. ALL CONTROLS SHALL BE TIED INTO THE EMS SYSTEM UNLESS NOTED OTHERWISE.

GENERAL CONTRACTOR SHALL INSTALL CARRIER FURNISHED TEMPORARY THERMOSTATS AND FEED THE WIRING DOWN INTO THE SPACE FOR START UP AND CONTROL OF RTU(S) UNTIL THE EMS SYSTEM IS OPERABLE. REFER TO M3.0 FOR CARRIER CONTACT INFORMATION.

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**Project Number:**  
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**Sheet Title:**  
 MECHANICAL PLAN

**Sheet Number:**  
 M1.0

ROOFTOP UNIT CONTROL MATRIX									
CONTROL FEATURE	UNITS	RTU-1	RTU-2	RTU-3	RTU-4	RTU-5	POINT TYPE INTERFACE WITH DOC (READ/WRITE)	NOTES	
		SETPOINT OR Y/N	SETPOINT OR Y/N	SETPOINT OR Y/N	SETPOINT OR Y/N	SETPOINT OR Y/N			
BUILDING AUTOMATION SYSTEM (BAS)									
ENERGY MANAGEMENT SYSTEM INTERFACE		Y	Y	Y	Y	Y		BACNET	A
COOLING - EFFECTIVE OCCUPIED COOLING SETPOINT	F	72	72	72	72	72		READWRITE	
COOLING - EFFECTIVE UNOCCUPIED COOLING SETPOINT	F	77	77	77	77	77		READWRITE	
COOLING - MINIMUM COOLING SUPPLY AIR TEMPERATURE (SAT) SETPOINT	F	50	50	50	50	50		READWRITE	
COOLING - LOCKOUT TEMPERATURE SETPOINT	F	55	55	55	55	55		READWRITE	
DEAD BAND - MINIMUM HEATING AND COOLING TEMPERATURE SETPOINT DIFFERENCE	F	4	4	4	4	4			
HEATING - EFFECTIVE OCCUPIED HEATING SETPOINT	F	70	70	70	70	70		READWRITE	
HEATING - EFFECTIVE UNOCCUPIED HEATING SETPOINT	F	60	60	60	60	60		READWRITE	
HEATING - MAXIMUM HEATING SUPPLY AIR TEMPERATURE (SAT) SETPOINT	F	120	120	120	120	120		READWRITE	
DEHUMIDIFICATION SETPOINT - HUMIDITY SENSOR FEEDBACK	% RH	55	55	55	55	55		READWRITE	
ECONOMIZER - HIGH OUTSIDE AIR TEMPERATURE (OAT) LOCKOUT SETPOINT	F	75	75	75	75	75		READWRITE	
PROGRAMMED CONTROL FEATURES									
HVAC SYSTEM OCCUPIED/UNOCCUPIED MODE - EMS INTERFACE	Y	Y	Y	Y	Y	Y		READ	A
HVAC SYSTEM OCCUPIED/UNOCCUPIED MODE - PROGRAMMABLE THERMOSTAT (TEMPORARY)	Y	Y	Y	Y	Y	Y		READ	DV 23
REMOTE TEMPERATURE SENSOR	Y	Y	Y	Y	Y	Y		READ	EMS
REMOTE HUMIDITY SENSOR	Y	Y	Y	Y	Y	Y		READ	EMS
REMOTE CO2 SENSOR	Y	Y	Y	Y	Y	N		READ	EMS
DEMAND CONTROL VENTILATION (DCV) HIGH ALARM SETPOINT - CO2 SENSOR FEEDBACK	PPM	750	750	750	750	N/A		READWRITE	M
EQUIPMENT ACCESSORIES AND CONTROL MODULES									
OUTSIDE AIR DAMPER - MOTOR OPERATED (MODULATING)	Y	Y	Y	Y	Y	Y		READWRITE	M, N
INTEGRATED ECONOMIZER - DIFFERENTIAL ENTHALPY ENABLE (OA ENTHALPY * RA ENTHALPY)	BTU/LB	Y	Y	Y	Y	Y		READWRITE	G, H
ECONOMIZER FAULT DETECTION AND DIAGNOSTICS (FDD) SYSTEM	Y	Y	Y	Y	Y	Y		READ	P
RELIEF - BAROMETRIC DAMPER	Y	Y	Y	Y	Y	Y		Y	Y
RELIEF - CONSTANT VOLUME POWVERED EXHAUST FAN	N	N	Y	Y	Y	Y		READ STATUS	O, P
COOLING COIL (DX - STAGED)	Y	Y	Y	Y	Y	Y		READ STATUS	E, F
DEHUMIDIFICATION - HOT GAS REHEAT	Y	Y	Y	Y	Y	Y		READ STATUS	L
HEATING COIL (ELECTRIC)	Y	Y	Y	Y	Y	Y		READ STATUS	J, K
SUPPLY FAN CONTROL METHOD									
ON DURING OCCUPIED HOURS	Y	Y	Y	Y	Y	Y			B
UNIT START AND FAN OFF DELAY	Y	Y	Y	Y	Y	Y			B
CONSTANT VOLUME FAN CONTROL	Y	Y	N	N	N	Y		READ STATUS	B
VARIABLE VOLUME, 2-SPEED FAN CONTROL	N	N	Y	Y	Y	Y		READ STATUS	C
SAFETIES, INTERLOCKS, AND ALARMS									
SUPPLY AIR SMOKE DETECTOR - FIRE SAFETY SHUTDOWN	Y	Y	Y	Y	Y	Y		READ	D
RETURN AIR SMOKE DETECTOR - FIRE SAFETY SHUTDOWN	Y	Y	Y	Y	Y	Y		READ	D
LOW LIMIT FREEZE/STAT - FREEZE PROTECTION SAFETY SHUTDOWN	Y	N	N	N	N	N		READ	D, P
SAFETY CHAIN - SAFETY SHUTDOWN	Y	Y	Y	Y	Y	Y		READ	D
SAT ALARM - SAFETY SHUTDOWN	Y	Y	Y	Y	Y	Y		READ	D
SPT ALARM - SAFETY SHUTDOWN	Y	Y	Y	Y	Y	Y		READ	D
FIRE ALARM CONTROL PANEL - FIRE SAFETY SHUTDOWN INTERLOCK	Y	Y	Y	Y	Y	Y		READ	D, P

EMS VENDOR SHALL PROVIDE CONTROL PANEL, RELAYS, THERMOSTATS, TEMPERATURE SENSORS, HUMIDITY SENSORS, AND/OR CO2 SENSORS WHERE SHOWN ON THE DRAWINGS AND AS REQUIRED TO FACILITATE THE SCHEDULED SEQUENCE OF OPERATION. EACH UNIT SHALL CONTROL BASED ON ITS OWN INTERNAL SAFETIES, THE DELAYS, AND SEQUENCES UNLESS NOTED OTHERWISE. COORDINATE WITH OWNER FINAL BUILDING AND EQUIPMENT SCHEDULES DURING STARTUP. REFERENCE DIVISION SPECIFICATIONS FOR INDIVIDUAL DEVICE REQUIREMENTS.

**NOTES:**

- A. EMS SHALL PROVIDE REMOTE SETPOINT ADJUSTMENT, SCHEDULING, AND MONITORING OF THE POINTS LISTED IN THE SCHEDULE FOR EACH UNIT. THE RTU SHALL BE SCHEDULED WITH A MINIMUM OF AN OCCUPIED AND UNOCCUPIED SCHEDULE. ADDITIONAL UNIT SCHEDULES SHALL BE AVAILABLE FOR REMOTE IMPLEMENTATION IF REQUIRED.
- B. THE SUPPLY FAN SHALL RUN CONTINUOUSLY IN OCCUPIED MODE AND SHALL CYCLE ON AND OFF IN UNOCCUPIED MODE. A UNIT START DELAY IS USED WHEN TRANSITIONING FROM UNOCCUPIED TO OCCUPIED. FAN OFF DELAY ALLOWS THE SUPPLY FAN TO CONTINUE TO OPERATE AFTER HEATING AND COOLING STOPS.
- C. VIA FACTORY VFD, THE RTU OPEN BOARD SHALL DETERMINE FAN SPEED REQUIRED FOR HEATING AND COOLING. FACTORY VFD SHALL CONTROL TO 2 FAN SPEEDS. LOW SPEED SHALL NOT EXCEED 60% OF FULL SPEED AND SHALL DRAW NO MORE THAN 40% OF FAN POWER AT FULL SPEED. DURING FAN ONLY OR SINGLE STAGE COOLING, SUPPLY FAN SHALL OPERATE AT LOW SPEED. DURING HEATING, SECOND STAGE COOLING, DEHUMIDIFICATION OR FULL ECONOMIZER OPERATION, FAN SHALL OPERATE AT HIGH SPEED.
- D. IF A LOCAL UNIT CONTROL ALARM IS ACTIVE, THE SUPPLY FAN TURNS OFF IMMEDIATELY REGARDLESS OF OCCUPANCY STATE OR DEMAND.
- E. COOLING STAGES ARE CONTROLLED BY THE RTU OPEN COOLING CONTROL PID LOOP AND COOLING STAGES CAPACITY ALGORITHM. THEY CALCULATE THE REQUIRED NUMBER OF STAGES NEEDED TO SATISFY THE SPACE BY COMPARING THE SPACE TEMPERATURE TO THE EFFECTIVE OCCUPIED COOLING SETPOINT IN OCCUPIED MODE AND THE EFFECTIVE UNOCCUPIED COOLING SETPOINT IN UNOCCUPIED MODE. THE FOLLOWING CONDITIONS MUST BE TRUE FOR THE COOLING ALGORITHM TO OPERATE:
  - THE OUTDOOR AIR TEMPERATURE IS GREATER THAN THE COOLING LOCKOUT TEMPERATURE SETPOINT.
  - THE SUPPLY FAN HAS BEEN ON FOR AT LEAST 30 SECONDS.
  - THE UNIT HAS A VALID SUPPLY AIR TEMPERATURE INPUT.
  - THE UNIT HAS A VALID SPACE TEMPERATURE INPUT.
  - HEATING MODE IS NOT ACTIVE AND THE TIME GUARD BETWEEN MODES HAS EXPIRED.
  - ECONOMIZER IS UNAVAILABLE OR ECONOMIZER IS ACTIVE AND THE FOLLOWING ARE TRUE: (1) ECONOMIZER IS GREATER THAN 80% OPEN, (2) SUPPLY AIR TEMPERATURE IS GREATER THAN 3 DEGREES ABOVE THE MINIMUM COOLING SAT SETPOINT, AND (3) SPACE TEMPERATURE IS GREATER THAN 0.5 DEGREES ABOVE THE EFFECTIVE OCCUPIED TEMPERATURE SETPOINT.
- F. WHEN THE COOLING ALGORITHM PRECONDITIONS ARE MET, THE COMPRESSORS ARE ENERGIZED IN STAGES, AS APPLICABLE. ANTI-RECYCLE TIMERS ARE EMPLOYED TO PROTECT THE EQUIPMENT FROM SHORT-CYCLING. THERE ARE FIXED THREE-MINUTE MINIMUM ON-TIMES AND FIVE-MINUTE OFF-TIMES FOR EACH COMPRESSOR OUTPUT.
- G. DURING COMPRESSOR OPERATION, THE RTU OPEN CONTROL LOGIC MAY REDUCE THE NUMBER OF ACTIVE STAGES IF THE SUPPLY AIR TEMPERATURE EXCEEDS THE MAXIMUM HEATING SAT SETPOINT. A CYCLING STAGED OFF IN THIS FASHION MAY BE STARTED AGAIN AFTER THE NORMAL TIME-GUARD PERIOD HAS EXPIRED IF THE SUPPLY AIR TEMPERATURE HAS INCREASED ABOVE THE MINIMUM COOLING SAT SETPOINT.
- H. THE SYSTEM SHALL UTILIZE THE FACTORY MODULATING ECONOMIZER FOR FREE COOLING WHEN OUTDOOR AIR CONDITIONS ARE SUITABLE. FOR THE ECONOMIZER TO OPERATE DURING OCCUPIED HOURS, THE FOLLOWING CONDITIONS MUST BE TRUE:
  - OUTDOOR AIR TEMPERATURE IS LESS THAN THE SPACE TEMPERATURE AND LESS THAN THE ECONOMIZER HIGH OAT LOCKOUT SETPOINT.
  - THE INDOOR FAN HAS BEEN ON FOR AT LEAST 30 SECONDS.
  - THE UNIT HAS A VALID SUPPLY AIR TEMPERATURE INPUT.
  - THE UNIT HAS A VALID SPACE TEMPERATURE INPUT.
  - OUTDOOR AIR ENTHALPY IS LESS THAN THE SPACE ENTHALPY. (ENTHALPY STATUS SHALL READ "LOW").
  - IF ANY OF THE PRECEDING CONDITIONS ARE NOT TRUE AND THE SUPPLY FAN IS ON HIGH SPEED, THE ECONOMIZER SHALL BE SET TO THE DCV MINIMUM OUTDOOR AIR DAMPER POSITION (TBD BY TAB CONTRACTOR), IF ANY OF THE PRECEDING CONDITIONS ARE NOT TRUE AND THE SUPPLY FAN IS ON LOW SPEED, THE ECONOMIZER SHALL BE SET TO THE LOW FAN ECONOMIZER MINIMUM DAMPER POSITION (TBD BY TAB CONTRACTOR); IF ALL OF THE PRECEDING CONDITIONS ARE TRUE, THE ECONOMIZER PID LOOP SHALL MODULATE THE DAMPER. THE ECONOMIZER POSITION SHALL BE REDUCED AS THE SUPPLY AIR TEMPERATURE FALLS TO WITHIN 5 DEGREES OF THE MINIMUM COOLING SAT SETPOINT, BUT SHALL NEVER GOSE BELOW THE DCV MINIMUM OUTDOOR AIR DAMPER POSITION.
- I. DURING UNOCCUPIED HOURS, UNOCCUPIED FREE COOLING SHALL BE ENABLED. THE ECONOMIZER SHALL REMAIN CLOSED UNLESS THE FOLLOWING CONDITIONS ARE TRUE:
  - OUTDOOR AIR TEMPERATURE IS BELOW THE ECONOMIZER HIGH OAT LOCKOUT SETPOINT.
  - OUTDOOR AIR TEMPERATURE IS LESS THAN THE SPACE TEMPERATURE.
  - OUTDOOR AIR ENTHALPY IS LESS THAN THE SPACE ENTHALPY. (ENTHALPY STATUS SHALL READ "LOW").
  - IF ALL OF THE PRECEDING CONDITIONS ARE TRUE AND THE SPACE TEMPERATURE RISES 1 DEGREE ABOVE THE EFFECTIVE UNOCCUPIED COOLING SETPOINT, THE SUPPLY FAN SHALL START AND THE ECONOMIZER DAMPER SHALL OPEN AS NECESSARY TO COOL THE SPACE. THE DAMPER SHALL REMAIN OPEN UNTIL THE SPACE IS SATISFIED OR THE PRECEDING CONDITIONS ARE NO LONGER TRUE. IF ANY OF THE PRECEDING CONDITIONS ARE NOT TRUE, THE ECONOMIZER SHALL CLOSE COMPLETELY.
- J. HEATING STAGES ARE CONTROLLED BY THE RTU OPEN HEATING CONTROL PID LOOP AND HEATING STAGES CAPACITY ALGORITHM. THEY CALCULATE THE REQUIRED NUMBER OF STAGES NEEDED TO SATISFY THE SPACE BY COMPARING THE SPACE TEMPERATURE TO THE EFFECTIVE OCCUPIED HEATING SETPOINT IN OCCUPIED MODE AND THE EFFECTIVE UNOCCUPIED HEATING SETPOINT IN UNOCCUPIED MODE. THE FOLLOWING CONDITIONS MUST BE TRUE FOR THE HEATING ALGORITHM TO OPERATE:
  - OUTDOOR AIR TEMPERATURE IS LESS THAN THE HEATING LOCKOUT TEMPERATURE SETPOINT.
  - THE SUPPLY FAN HAS BEEN ON FOR AT LEAST 30 SECONDS.
  - THE UNIT HAS A VALID SUPPLY AIR TEMPERATURE INPUT.
  - THE UNIT HAS A VALID SPACE TEMPERATURE INPUT.
  - HEATING MODE IS NOT ACTIVE AND THE TIME GUARD BETWEEN MODES HAS EXPIRED.
- K. WHEN THE HEATING ALGORITHM PRECONDITIONS ARE MET, THE HEAT IS ENERGIZED IN STAGES, AS APPLICABLE. ANTI-RECYCLE TIMERS ARE EMPLOYED TO PROTECT THE EQUIPMENT FROM SHORT-CYCLING. THERE ARE FIXED ONE-MINUTE MINIMUM ON AND OFF TIMES FOR EACH HEATING OUTPUT.
- L. DURING HEATING OPERATION, THE RTU OPEN CONTROL LOGIC MAY REDUCE THE NUMBER OF ACTIVE STAGES IF THE SUPPLY AIR TEMPERATURE EXCEEDS THE MAXIMUM HEATING SAT SETPOINT. A HEAT STAGE TURNED OFF IN THIS FASHION MAY BE STARTED AGAIN AFTER THE NORMAL TIME-GUARD PERIOD HAS EXPIRED IF THE SUPPLY AIR TEMPERATURE HAS DECREASED BELOW THE MAXIMUM HEATING SAT SETPOINT.
- M. THE SYSTEM SHALL UTILIZE HUMIDITY SENSORS IN THE SALES AREA, STOCKROOM, AND EMPLOYEE LOUNGE. DEHUMIDIFICATION IS CONTROLLED BY THE RTU OPEN CONTROL. DEHUMIDIFICATION SYSTEM DURING OCCUPIED AND UNOCCUPIED MODE. THE FOLLOWING CONDITIONS MUST BE TRUE FOR THE DEHUMIDIFICATION SYSTEM TO OPERATE:
  - OUTDOOR AIR TEMPERATURE IS LESS THAN THE SPACE TEMPERATURE.
  - THE INDOOR FAN HAS BEEN ON FOR AT LEAST 30 SECONDS.
  - THE UNIT HAS A VALID SUPPLY AIR TEMPERATURE INPUT.
  - THE UNIT HAS A VALID SPACE RELATIVE HUMIDITY SENSOR INPUT.
  - HEAT MODE IS NOT ACTIVE AND THE TIME GUARD BETWEEN MODES HAS EXPIRED.
- N. IF ALL OF THE PRECEDING CONDITIONS ARE TRUE AND ANY ZONE RISES ABOVE THE DEHUMIDIFICATION SETPOINT, THE RTU OPEN SHALL ENABLE DEHUMIDIFICATION MODE AND ENERGIZE THE HUMIDIMIZER OUTPUT FOR ALL UNITS SERVING THAT ZONE. DEHUMIDIFICATION MODE SHALL CONTINUE UNTIL THE SPACE RELATIVE HUMIDITY DROPS BELOW THE DEHUMIDIFICATION SETPOINT BY A 5% FIXED HYSTERESIS.
- O. THE SYSTEM SHALL UTILIZE A CO2 SENSOR FOR THE SALES AREA, FITTING ROOM, STOCKROOM AND EACH OFFICE (HIGHEST READING WILL BE TAKEN FOR OFFICE DCV CONTROL). DCV IS CONTROLLED BY THE INDOOR AIR CO2 ALGORITHM. THE ALGORITHM CALCULATES THE CO2 MINIMUM DAMPER POSITION USING A PID LOOP. THE CALCULATED CO2 MINIMUM DAMPER POSITION IS THEN COMPARED AGAINST THE DCV MINIMUM POSITION SETPOINT AND THE GREATER VALUE BECOMES THE FINAL MINIMUM DAMPER POSITION. DURING OCCUPIED HOURS, THE INDOOR AIR CO2 SEQUENCE SHALL BE ENABLED. THE FOLLOWING CONDITIONS MUST BE TRUE FOR THE INDOOR AIR CO2 ALGORITHM TO OPERATE:
  - THE SUPPLY FAN HAS BEEN ON FOR AT LEAST 30 SECONDS.
  - THE UNIT HAS A VALID CO2 SENSOR READING.
- P. IF ALL OF THE PRECEDING CONDITIONS ARE TRUE, THE FACTORY OUTDOOR AIR DAMPER SHALL MODULATE BETWEEN ITS MINIMUM (ABS. MIN. OIA) AND MAXIMUM (MIN. OIA CFM) POSITION (TBD BY TAB CONTRACTOR). THE SYSTEM SHALL START TO MODULATE THE DAMPER OPEN WHEN CO2 LEVEL RISES TO 10 PPM (ADJUSTABLE ABOVE AMBIENT CO2 LEVEL) (400 PPM) AND SHALL CONTINUE TO OPEN TO ITS MAXIMUM POSITION AS CO2 LEVEL RISES TO AND ABOVE THE DCV HIGH ALARM SETPOINT. AS THE CO2 LEVEL DROPS, THE DAMPER SHALL START TO MODULATE TO ITS MINIMUM POSITION. DURING UNOCCUPIED HOURS, THE INDOOR AIR CO2 SEQUENCE SHALL BE DISABLED.
- Q. EQUIPMENT MANUFACTURER SHALL PROVIDE MODULATING DAMPER AND CONTROLS CAPABLE OF ADJUSTING THE DAMPER POSITION BASED ON DEMAND CONTROL VENTILATION TO MAINTAIN THE SCHEDULED OUTSIDE AIR AS SHOWN ON THE DRAWINGS. TAB CONTRACTOR SHALL COORDINATE DAMPER POSITION SETPOINTS IN FIELD DURING TESTING AND BALANCING TO MAINTAIN MINIMUM VENTILATION WHEN NOT IN ECONOMIZER. DAMPER SHALL BE CLOSED DURING UNOCCUPIED HOURS.
- R. POWERED EXHAUST FAN SHALL STAGE ON AND OFF ACCORDING TO DAMPER POSITION.
- S. DEVICE SHALL BE FACTORY MOUNTED AND PREWIRED FOR OPERATION SUBJECT TO THE RTU OPEN CONTROLLER.

**SEQUENCE OF OPERATION**

**A. ROOFTOP UNIT CONTROL (RTU-1,2,3,4,5)**

Refer to Rooftop Unit Control Matrix for sequence of operations.

**B. VAV DIFFUSER CONTROL (CSD1)**

In occupied mode, the VAV diffuser shall modulate airflow to maintain the room temperature setpoint (adjustable). Set VAV diffuser minimum position to maintain 30% of the maximum airflow.

The room occupancy sensor, upon sensing the space to be vacant for 15 minutes (adjustable), shall signal the diffuser through the EMS to maintain an unoccupied temperature setpoint (adjustable). When occupancy is detected, the EMS shall direct the diffuser to control to the room temperature setpoint.

The room CO2 sensor, upon reading a CO2 level above 100 PPM (adjustable) above ambient CO2 level (400 PPM), shall signal the diffuser through the EMS to modulate the zone damper between its minimum and maximum position. The system shall start to modulate the damper open when CO2 level rises 100 PPM above ambient CO2 level and continue to open to its maximum position as CO2 level rises to and above 700 PPM (adjustable) above ambient CO2 levels. As the CO2 level drops, the system shall start to modulate the damper to the minimum position.

In unoccupied mode, VAV diffuser control shall be disabled unless occupancy is detected. When occupancy is detected, the EMS shall direct the diffuser to control to the room temperature setpoint.

**C. MOTORIZED DAMPER CONTROL SERVING IT ROOM (MD)**

When RTU-2 is in heating mode, the motorized damper shall be closed.

When RTU-2 is in cooling mode and the supply air temperature drops below 65 degrees Fahrenheit (adjustable), the motorized damper shall open.

A damper and switch shall prove if the motorized damper is open when called. If failure to open occurs, an alarm shall be generated to the EMS.

**D. REPTOOR EXHAUST FAN CONTROL (EF-1)**

In occupied mode, the exhaust fan shall be enabled and the motorized damper shall open.

In unoccupied hours, the exhaust fan shall be disabled and the motorized damper shall be closed.

**E. IT ROOM EXHAUST FAN CONTROL (EF-2)**

A damper and switch shall prove if the motorized damper is open when called. If failure to open occurs, the fan shall not be enabled and an alarm shall be generated to the EMS.

**H. FITTING ROOM VAV BOX CONTROL (VAV-1)**

For single duct terminal units, upon a rise in space temperature above occupied setpoint (72 degrees Fahrenheit, adjustable), the terminal unit primary damper shall modulate towards its maximum cooling CFM. A damper and switch shall prove if the damper is open when called. If failure to open occurs, the fan shall not be enabled and an alarm shall be generated to the EMS.

During unoccupied hours, the unit shall sequence the same as the occupied cycle to maintain a reduced setback space temperature (78 degrees Fahrenheit, adjustable).

Heating/cooling auto-changover shall sequence terminal unit when associated RTU-3 is in heating mode as follows: when supply temperature is below 70 degrees Fahrenheit, the unit shall operate in the cooling mode, as described above. Upon a rise in supply temperature above 75 degrees Fahrenheit, the unit shall changover to the heating mode and modulate primary damper to modulate towards its maximum heating CFM. An increase in room temperature above heating setpoint shall cause primary damper to modulate towards its minimum heating CFM. If supply temperature decreases below 70 degrees Fahrenheit, the unit shall changover back to the cooling mode.

**CARRIER UNIT STARTUP REQUIREMENTS**

INSTALLING CONTRACTOR SHALL COMPLETE THE PRE-START CHECKLIST AND EMAIL JENIFER.TYE@COMFORTSYSTEMSUSA.COM TWO WEEKS PRIOR TO SCHEDULING EQUIPMENT STARTUP.

COORDINATE EQUIPMENT STARTUP WORK WITH COMFORT SYSTEMS USA EMAIL: JENIFER.TYE@COMFORTSYSTEMSUSA.COM, OFFICE: 317-246-5176

DEPARTMENT MANAGER EMAIL: KLORIKARAMDAD@COMFORTSYSTEMSUSA.COM, OFFICE: 317-246-4656

TECHNICAL SUPPORT EMAIL: RICK.FARRIS@COMFORTSYSTEMSUSA.COM, MOBILE: 317-638-5363 X444

**PRE-START CHECKLIST (VERIFY FOR ALL UNITS)**

- VERIFY ALL ITEMS ON THE EQUIPMENT ORDER RECEIVED.
- VERIFY ALL PACKAGING MATERIAL REMOVED FROM THE UNIT.
- VERIFY CURB GASKETS PROPERLY INSTALLED.
- VERIFY ROOFTOP UNIT INSTALLED LEVEL AND PROPERLY ALIGNED WITH CURB.
- VERIFY DUCTWORK/FABRIC DUCT COMPLETELY INSTALLED PER MECHANICAL PLANS.
- VERIFY OAT HOOD INSTALLED, AIR INLET SCREEN INSTALLED.
- VERIFY POWER EXHAUST ACCESSORY INSTALLED, (IF APPLICABLE).
- VERIFY CLEAN PLEATED FILTERS INSTALLED, MINIMUM MERV 8 RATING.
- VERIFY CONDENSATE DRAIN LINE INSTALLED, MINIMUM 2" DEEP TRAP, DRAIN PAN CHECKLEVEL.
- VERIFY SUPPLY FAN ROTATES FREELY IN THE HOUSING.
- VERIFY PULLEYS ALIGNED AND BELT TENSION CORRECT.
- VERIFY SMOKE DETECTORS INSTALLED IN DUCTWORK, CLEANED AND TESTED.
- VERIFY GAS METER INSTALLED AND GAS AVAILABLE FROM THE UTILITY. GAS PIPING COMPLETED, CHECKED FOR LEAKS AND PURGED (IF APPLICABLE).
- VERIFY GAS PIPING DRIP LEG INSTALLED PROPERLY, (DOWNSTREAM OF SHUTOFF VALVE AND NO INTERFERENCE WITH ACCESS DOOR).
- VERIFY FLUE HOOD INSTALLED.
- VERIFY JOBSITE POWER SUPPLY MATCHES THE VOLTAGE ON THE UNIT DATA PLATE.
- VERIFY ELECTRIC POWER CONNECTED TO UNIT VIA THE ACCESS PROVIDED, IF NOT, DATE POWER WILL BE AVAILABLE.
- VERIFY NO WIRES TOUCHING REFRIGERANT LINES OR SHARP EDGES.
- VERIFY ELECTRIC CONNECTORS AND TERMINALS TIGHT.
- VERIFY THRU-THE-CURB UTILITY CONNECTIONS COMPLETE.
- VERIFY UNIT TRANSFORMER PRIMARY TAPPED FOR JOBSITE VOLTAGE.
- VERIFY VENSTAR THERMOSTAT INSTALLED IN THE RETURN AIR DUCT DROP AND WIRED FOR TEMPORARY UNIT OPERATION.

**EMS INSTALLATION CHECKLIST**

ITEMS ON EMS CHECK-OFF LIST MUST BE COMPLETED PRIOR TO EMS AND GBS COMMISSIONING AT THE END OF THE JOB. SOME ITEMS LISTED BELOW MAY NOT BE APPLICABLE.

COORDINATE EQUIPMENT STARTUP WORK WITH COMFORT SYSTEMS USA. EMAIL: PAUL.SAWYER@COMFORTSYSTEMSUSA.COM OFFICE: 317-246-5170

**EMS CHECKLIST**

- REVIEW EMS PRINT SET AND INSTALL EMS OPUS PANE AND LCP AS DESCRIBED IN THE EMS PRINT SET.
- REVIEW EMS PRINT SET AND PULL ALL WIRE AND TERMINATE ON DEVICES AS DESCRIBED IN THE EMS PRINT SET.
- REVIEW EMS PRINT SET AND INSTALL ALL EMS HVAC CONTROLS AS DESCRIBED IN THE EMS PRINT SET.
- REVIEW EMS PRINT SET AND INSTALL ALL EMS LIGHTING CONTROLS AS DESCRIBED IN THE EMS PRINT SET.
- REVIEW EMS PRINT SET AND WATTSTOPPER SUBMITTAL AND INSTALL THE WATTSTOPPER LIGHTING SYSTEM AND PULL ALL WIRE AS DESCRIBED IN THE EMS PRINT SET AND WATTSTOPPER SUBMITTAL.

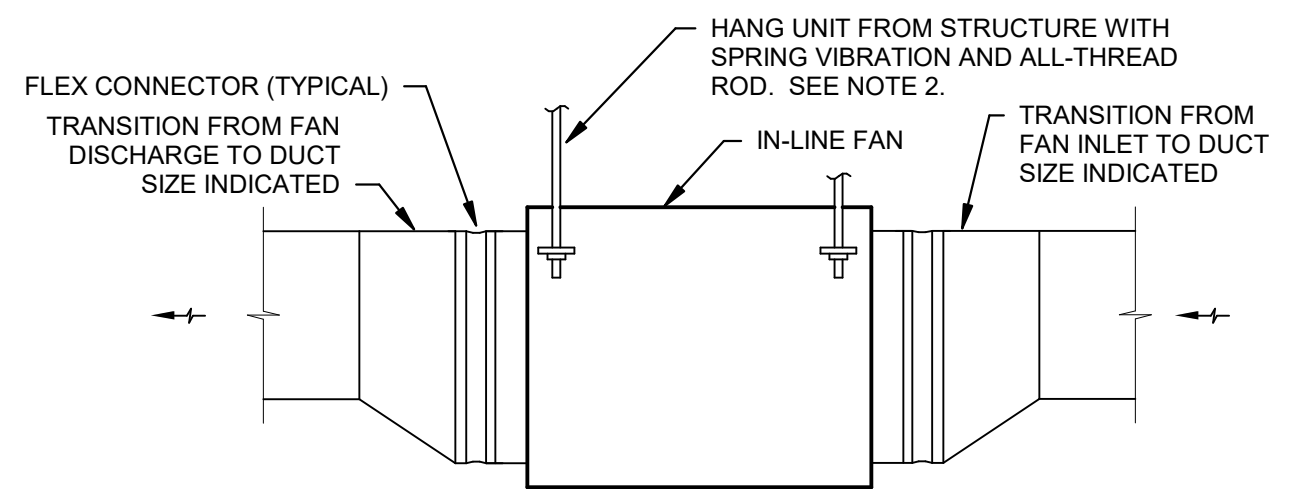
**ROOFTOP UNIT SCHEDULE (DX COOLING, ELECTRIC HEATING)**

MARK	MANUFACTURER	MODEL	NOMINAL TONS	SUPPLY FAN						COOLING COIL										HEATING COIL				MIN OIA	ABS MIN	ELECTRICAL V/PH	MCA	MOCP	WEIGHT (LBS)	NOTES		
				CFM	ESP (IN)	HP	TH (MBH)	SH (MBH)	EAT (°F DB)	(°F WB)	(°F DB)	(°F WB)	RFRF TYPE	MIN EFF (EER)	(IEER)	STAGES	MIN OUT (MBH)	NOM (KW)	EAT (°F DB)	LAT (°F DB)	MIN NO STAGES	MIN OUT (MBH)	NOM (KW)								EAT (°F DB)	LAT (°F DB)
RTU-1	CAPITVEAIRE	CASRTU-1-E-154-15	5	1,320	0.8	1.35	43	34	76.5	63.1	53.0	51.8	R-410A	13	16.5	2	36	12	62.7	85	2	175	75	4803	21.5	25	1280	A-W				
RTU-2	CAPITVEAIRE	CASRTU-1-E-304-18	7.5	2,580	0.8	5.0	73	57	74.2	62.6	54.0	52.9	R-410A	11	14.8	2	82	27	61.7	90	2	325	275	4803	43.8	45	1401	A-W				
RTU-3	CAPITVEAIRE	CASRTU-1-E-604-20	15	4,500	1.2	5.0	175	110	75.8	66.2	53.7	53.4	R-410A	11	14.2	2	180	54	53.7	90	2	1200	625	4803	85.1	90	2570	A-W				
RTU-4	CAPITVEAIRE	CASRTU-1-E-604-20	15	4,300	1.2	5.0	179	112	77.0	66.7	53.3	53.1	R-410A	11	14.2	2	175	54	53.0	90	2	1200	625	4803	81.6	90	2542	A-W				
RTU-5	CAPITVEAIRE	CASRTU-1-E-604-24	15	5,055	1.2	5.0	106	100	72.0	60.0	54.0	52.6	R-410A	11	14.2	2	150	54	68.0	90	2	0	0	4803	85.1	90	2583	A-S,W				

MODEL NUMBERS AND NOMINAL TONS LISTED SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER, MODEL NUMBERS, OR NOMINAL TONS 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.

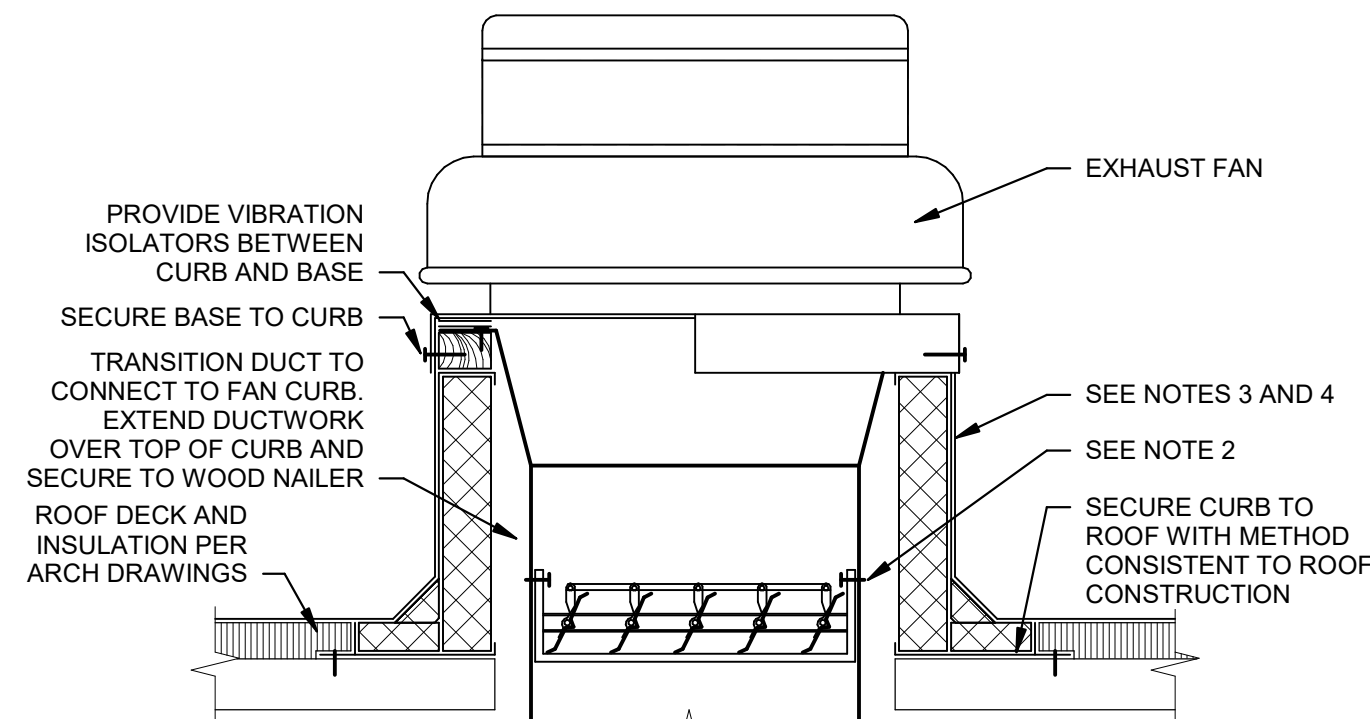
**NOTES:**

- A. REFER TO ROOFTOP UNIT CONTROL MATRIX FOR CONTROL FEATURES, MODULES, AND ACCESSORIES THAT SHALL BE PROVIDED WITH THE EQUIPMENT.
- B. EQUIPMENT SIZED FOR 100°F AMBIENT TEMPERATURE.
- C. PROVIDE 2 INCH MERV 13, EFFICIENT PLEATED THROWAWAY AIR FILTERS.
- D. PROVIDE FACTORY MOUNTED DISCONNECT INSTALLED ON SERVICE SIDE OF UNIT.
- E. STARTERS FOR ALL MOTORS SHALL BE FURNISHED INTEGRAL WITH MOTOR.
- F. PROVIDE FACTORY MOUNTED VARIABLE FREQUENCY DRIVE OR 3-SPEED MOTOR TO FACILITATE STAGED FAN SPEED CONTROL.
- G. COORDINATE SIZE OF CONDUCTOR TERMINATION LUGS WITH CONDUCTOR SIZES SHOWN ON ELECTRICAL DRAWINGS.
- H. PROVIDE 125 VAC, 20 AMP DUPLEX CONVENIENCE RECEPTACLE MOUNTED TO UNIT READY FOR FIELD WIRING WITH A COVER UL LISTED FOR WET AND DAMPER LOCATIONS WHEN IN USE.
- K. SPECIFIED FAN ESP ACCOUNTS FOR DUCT LOSSES EXTERNAL TO UNIT.
- L. PROVIDE MOTOR HORSEPOWER TO OVERCOME INTERNAL UNIT STATIC PRESSURE DROP PLUS SPECIFIED EXTERNAL STATIC PRESSURE DROP. NOMINAL MOTOR HP SHALL BE NO LARGER THAN THE FIRST AVAILABLE NOMINAL MOTOR SIZE GREATER THAN THE REQUIRED BHP.
- M. PROVIDE INSULATED CURB CURB WITH MINIMUM HEIGHT REQUIRED TO MAINTAIN BOTTOM OF EQUIPMENT A MINIMUM OF 8 INCHES ABOVE FINISHED ROOF SURFACE. PROVIDE SLOPED CURB IF NEEDED TO MATCH ROOF SLOPE. COORDINATE WITH ROOF INSULATION THICKNESS AND ROOF TAPER AT INSTALLED LOCATION. COORDIN



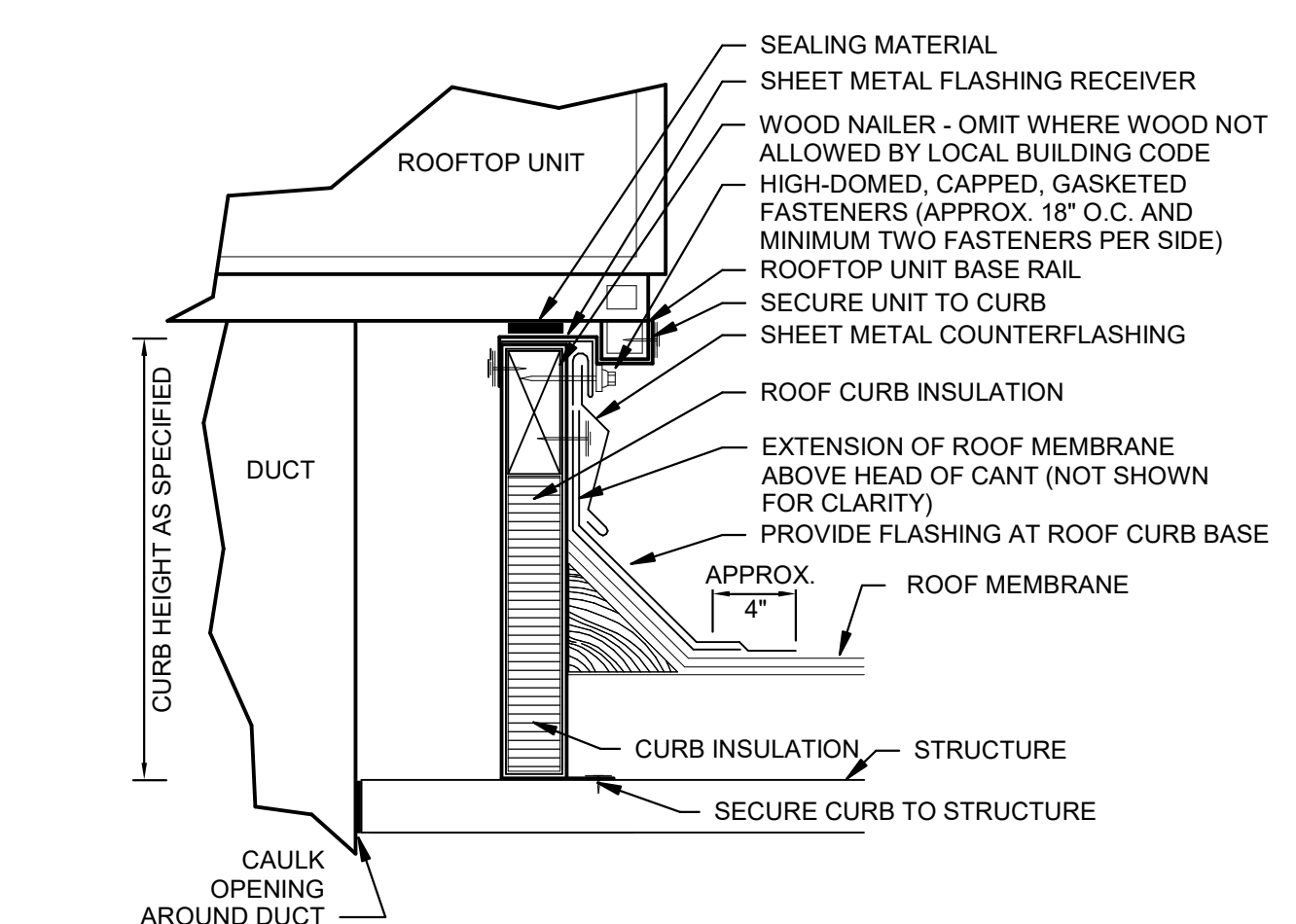
- NOTES:
- ARRANGEMENT SHOWN IS SCHEMATIC, ADJUST TO SUIT FIELD CONDITIONS AND MEET LOCAL CODE REQUIREMENTS.
  - FOR FANS 1 HP AND LESS, PROVIDE NEOPRENE RUBBER MOUNT HANGER (NR). FOR FANS LARGER THAN 1 HP, PROVIDE SPRING VIBRATION ISOLATION HANGER (SPNH).

4 IN-LINE DUCT-MOUNTED FAN DETAIL NTS



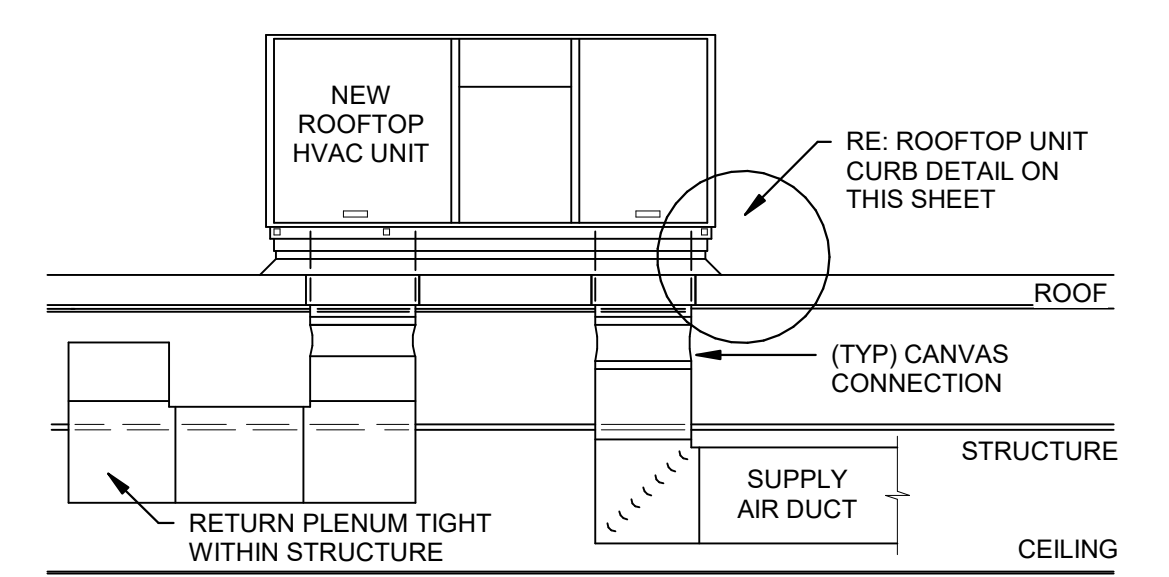
- NOTES:
- ARRANGEMENT SHOWN IS SCHEMATIC, ADJUST TO SUIT FIELD CONDITIONS AND MEET LOCAL CODE.
  - IF DAMPER IS SPECIFIED IN EQUIPMENT SCHEDULE, INSTALL DAMPER AT BASE OF CURB AND SECURE FROM ABOVE TO ALLOW SERVICE THROUGH TOP OF CURB.
  - PREFABRICATED INSULATED ROOF CURBS WITH TREATED WOOD NAILER, CANT, AND STEP AS REQUIRED TO ACCOMMODATE ROOF INSULATION, FRAME AND SECURE CURB TO ROOF WITH METHOD CONSISTENT WITH ROOF CONSTRUCTION. ROOF CURB SHALL BEAR ON ROOF STRUCTURE. REFER TO ARCHITECTURAL DRAWINGS AND CURB MANUFACTURER'S DETAILS FOR MORE INFORMATION.
  - FOR SLOPED ROOFS, PROVIDE CURB WITH DIMENSIONS CAPABLE OF COMPENSATING ROOF SLOPE TO ENSURE FAN IS INSTALLED LEVEL.

3 ROOF-MOUNTED DOWNBLAST FAN DETAIL NTS



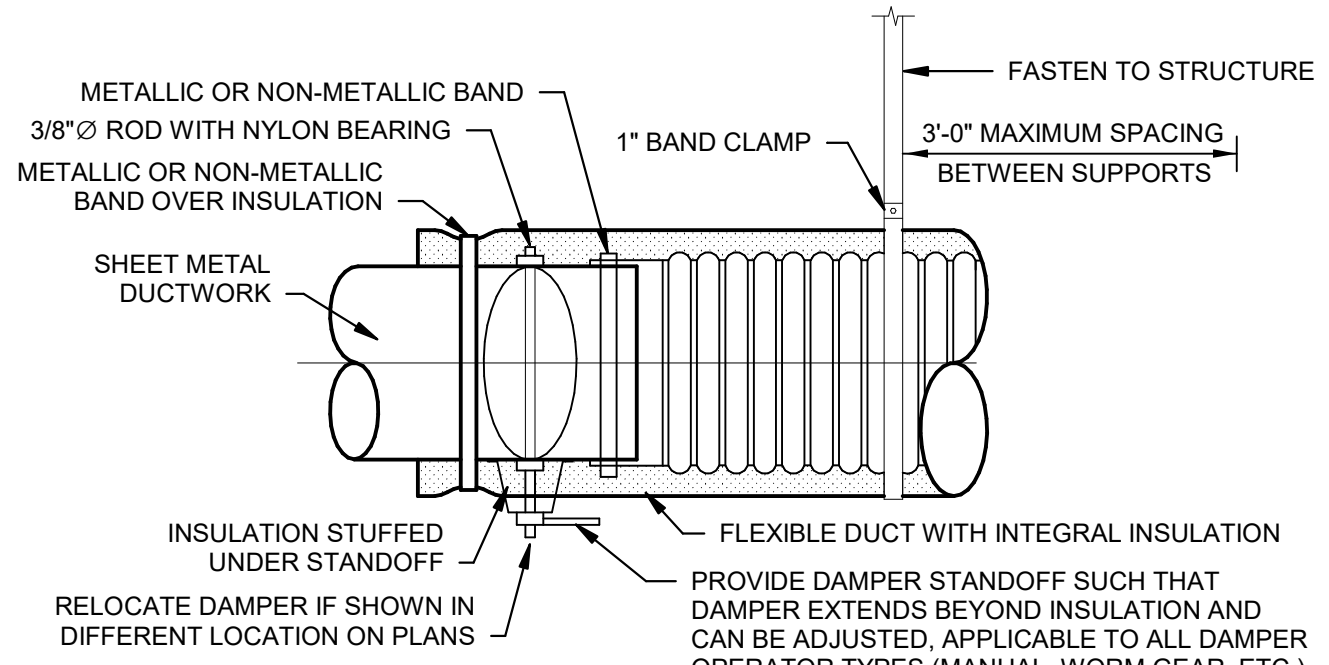
- NOTES:
- CUT METAL DECKING TO ALLOW CURB INSTALLATION ON STEEL FRAMING. AFTER CURB IS SET IN PLACE, TRIM REMAINING METAL DECKING AND INSTALL WITHIN CURB. TACK WELD DECKING TO SUPPORT STEEL. DO NOT WELD INTERIOR DECKING TO ROOF CURB. PROVIDE ADDITIONAL CROSS FRAMING TO SUPPORT INTERIOR DECKING AND FILL MATERIAL AS REQUIRED.
  - REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS FOR ROOF CURBS, ANCHORING AND SEISMIC/WIND RESISTANCE.

2 ROOF CURB DETAIL NTS



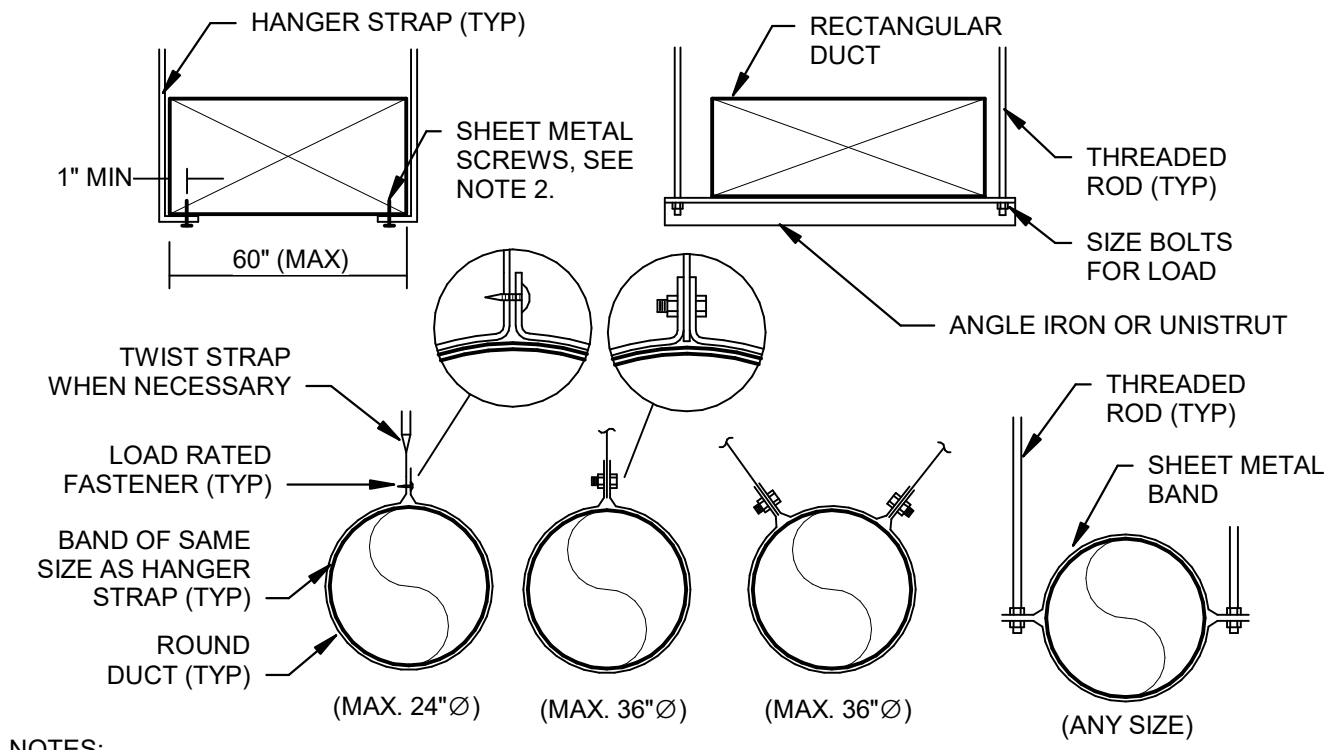
- NOTES:
- PROVIDE OPENING THROUGH ROOF AND ROOF DECK INSULATION NO LARGER THAN REQUIRED TO ALLOW DUCTS TO PASS THROUGH. REFER TO PLANS FOR DUCT SIZES. TRANSITION AS REQUIRED IN ROOF CURB TO RTU SUPPLY AND RETURN OPENINGS.
  - PROVIDE SLOPED ROOF CURB TO INSTALL ROOFTOP UNIT LEVEL TO ENSURE PROPER DRAINAGE. COORDINATE ROOF SLOPE WITH ARCHITECTURAL FLASH AND COUNTER FLASH ROOF PENETRATIONS, ETC. TO ENSURE WEATHER TIGHT INSTALLATION.

1 ROOFTOP UNIT - NEW CURB DETAIL NTS



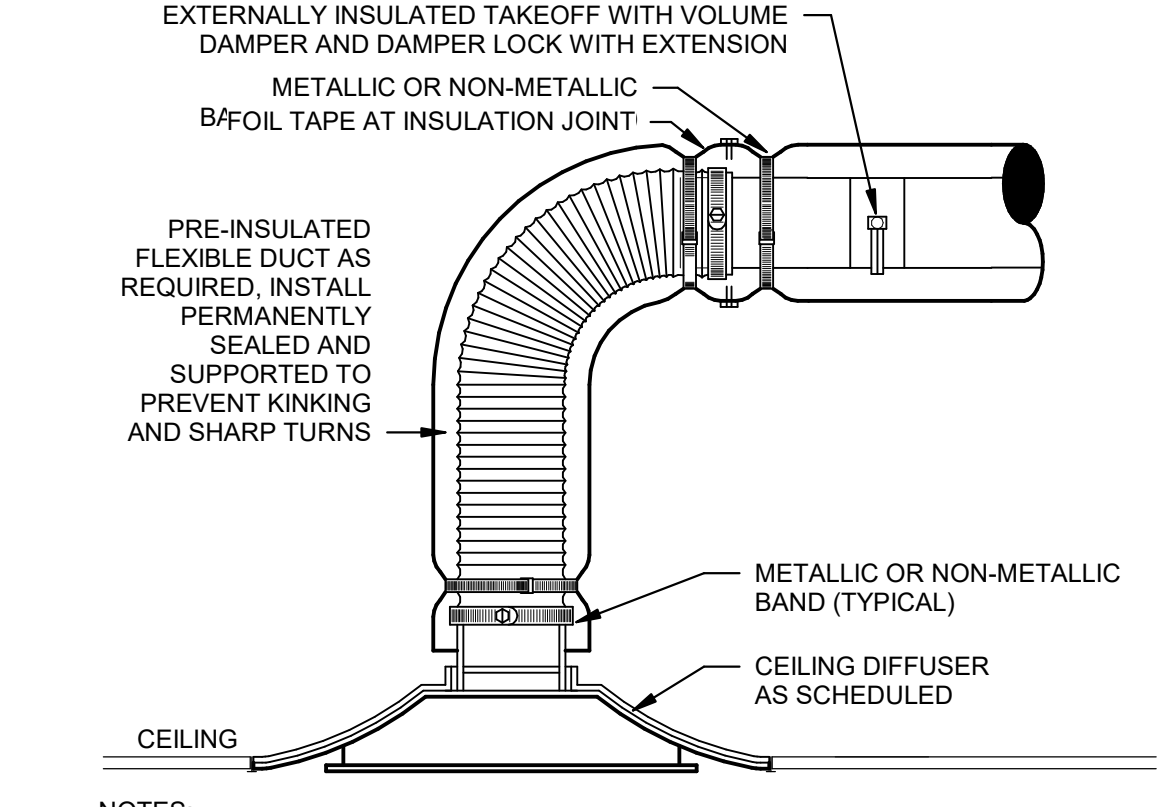
- NOTES:
- INSTALL FLEXIBLE DUCT IN AS STRAIGHT A RUN AS POSSIBLE. USE LONG RADIUS BENDS WHERE POSSIBLE. PULL DUCT TIGHT AT BOTH ENDS AND SECURE BOTH INNER LINER & OUTER INSULATION SKIN WITH TAPE & METAL CLAMPS.
  - EXTEND DAMPER ROD TO ACCOMMODATE INSULATION IF APPLICABLE. PULL ROD END TO EDGE OF DUCTWORK AS REQUIRED AND SEAL TO MAINTAIN VAPOR BARRIER.
  - INSTALL LOCKING QUADRANT TO HANDLE ON BOTTOM OF DUCT FOR EASE OF SERVICE.
  - FLEXIBLE DUCTWORK SHALL NOT EXCEED 5'-0" IN LENGTH AND SHALL HAVE NO MORE THAN ONE 90 DEGREE ELBOW.
  - DUCT SHALL EXTEND STRAIGHT FOR 6" FROM A CONNECTION BEFORE BENDING.

8 DAMPER AND FLEX DUCTWORK CONNECTION DETAIL NTS



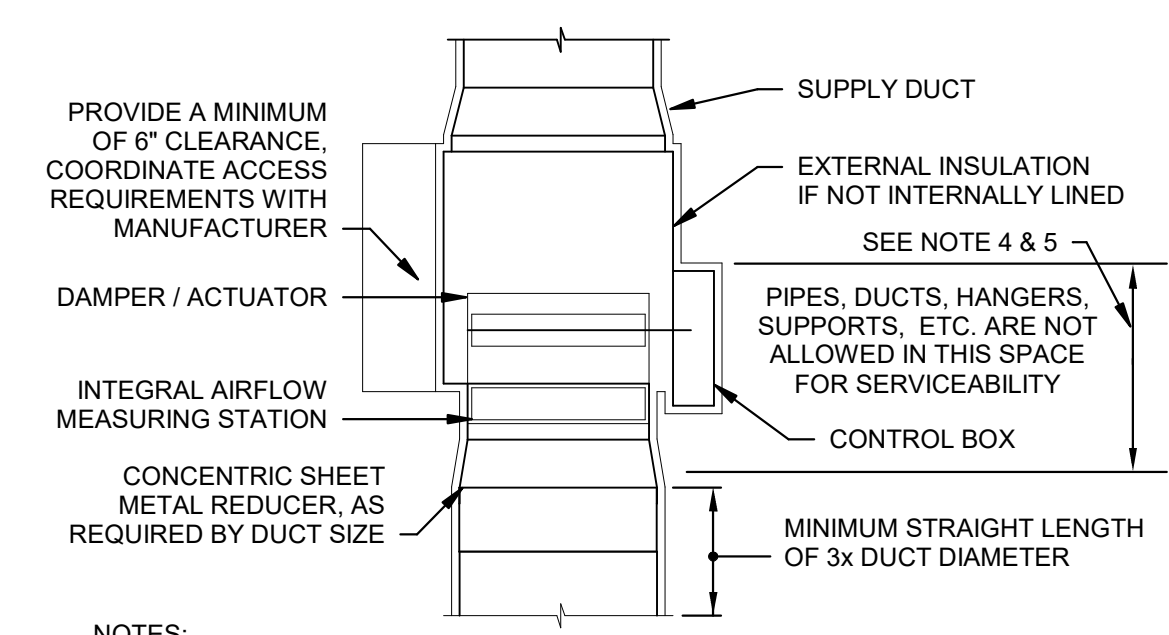
- NOTES:
- USE THREADED ROD FOR RECTANGULAR DUCTS LARGER THAN 60" WIDE.
  - OMIT SHEET METAL SCREWS IF HANGER STRAP IS CONTINUOUS AND LOOPS UNDER ENTIRE DUCT.
  - FOR ROUND DUCTS LARGER THAN 36" O.D. USE TWO HANGER RODS TO SUPPORT DUCT FROM EACH SIDE.
  - HANGERS MUST NOT DEFORM DUCT SHAPE.

7 DUCT HANGER - LOWER ATTACHMENT DETAILS NTS



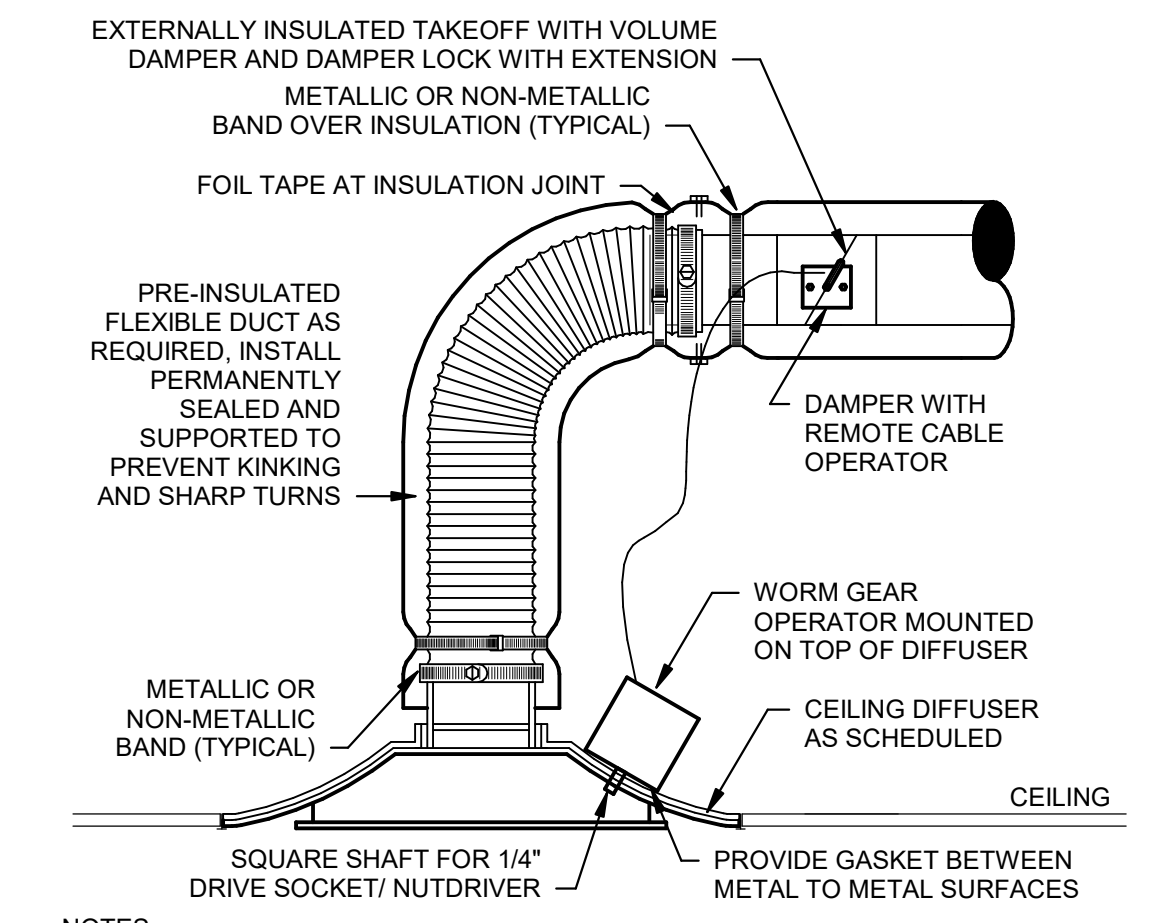
- NOTES:
- FLEXIBLE DUCT LENGTH MAY NOT EXCEED 5'-0". EXTEND RIGID DUCT AS REQUIRED.
  - DUCT SHALL EXTEND STRAIGHT FOR 6" FROM A CONNECTION BEFORE BENDING.

6 LAY-IN CEILING DIFFUSER DETAIL NTS



- NOTES:
- ARRANGEMENT SHOWN IS SCHEMATIC, ADJUST TO SUIT FIELD CONDITIONS AND MEET LOCAL CODE REQUIREMENTS.
  - SUPPORT TERMINAL UNIT AT BOTH ENDS WITH MINIMUM 2 INCH WIDE GALVANIZED 22 GAUGE HANGER STRAPS.
  - INSTALL TERMINAL UNIT NOT MORE THAN 3 FEET ABOVE CEILING FOR ACCESS.
  - THE GREATER OF A 30" MINIMUM CLEARANCE WIDTH OR THE TOTAL WIDTH OF THE BOX CONTROLLER AND ACTUATOR IS REQUIRED.
  - ALL ACCESS DOORS MUST BE ABLE TO OPEN A MINIMUM OF 90 DEGREES.

5 SINGLE DUCT VAV TERMINAL UNIT - COOLING ONLY DETAIL NTS



- NOTES:
- FLEXIBLE DUCT LENGTH MAY NOT EXCEED 5'-0". EXTEND RIGID DUCT AS REQUIRED.
  - DUCT SHALL EXTEND STRAIGHT FOR 6" FROM A CONNECTION BEFORE BENDING.

9 HARD CEILING DIFFUSER DETAIL NTS

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 MK

**CHECKED BY:**  
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**Sheet Title:**  
**MECHANICAL DETAILS**

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