

- ### HVAC NEW WORK NOTES:
- THIN LINES INDICATE EXISTING CONDITIONS TO REMAIN, BACKGROUND INFORMATION, OR WORK OF OTHER TRADES.
 - THICK SOLID LINES INDICATES NEW WORK. CUT, PATCH, AND FINISH EXISTING WALLS, DRYWALL CEILINGS, FLOORS, ROOFS, ETC. AS REQUIRED FOR NEW WORK. PATCH AND FINISH TO MATCH EXISTING CONDITIONS. COORDINATE ALL ROOF WORK WITH THE OWNER TO MAINTAIN ANY/ALL ROOFING WARRANTIES.
 - THESE DRAWINGS, ALONG WITH THE SPECIFICATIONS, COMBINE TO FORM THE ENTIRE CONSTRUCTION DOCUMENT PACKAGE. IF NO SPECIFICATIONS ARE INCLUDED WITHIN THIS TRADE DOCUMENT PACKAGE, NOTIFY ENGINEER PRIOR TO SUBMITTING ANY BIDS OR PERFORMING ANY WORK.
 - REMOVE AND REINSTALL EXISTING LAY-IN CEILINGS AS REQUIRED TO COMPLETE WORK IN AREAS WHERE LAY-IN CEILINGS ARE TO REMAIN. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATIONS. REPLACE DAMAGED CEILING MATERIALS TO MATCH EXISTING CONDITIONS.
 - CONTRACTOR MAY ADJUST DUCTWORK DIMENSIONS TO ACCOMMODATE FIELD CONDITIONS PROVIDED THE REVISED FREE AREA IS EQUAL TO OR EXCEEDS THAT SHOWN ON THE DRAWINGS. DUCTWORK SHOWN AS RECTANGULAR SHALL BE INSTALLED AS RECTANGULAR AND DUCTWORK SHOWN AS ROUND SHALL BE INSTALLED AS ROUND. FITTING TYPES SHALL BE INSTALLED AS INDICATED. STRAIGHT & BELLMOUTH TAPS ARE NOT PERMITTED.
 - VENTILATION IS CALCULATED BY THE VENTILATION RATE PROCEDURE DESCRIBED IN ASHRAE 62.1 SECTION 6.2 AND TABLE 403.3 IN THE OHIO MECHANICAL CODE.
 - BRANCH DUCTWORK RUNOUTS SHALL MATCH THE INLET SIZE OF THE TERMINAL DEVICE UNLESS NOTED OTHERWISE. FLEXIBLE DUCTWORK TO DIFFUSERS SHALL MATCH NECK SIZE OF DIFFUSER WHERE INDICATED.
 - SIZES OF LINED DUCTWORK ARE ACTUAL SHEET METAL SIZES.
 - CONTRACTOR SHALL UTILIZE A MAXIMUM 5/8" OF FLEXIBLE DUCT AT THE INLET OF EACH DIFFUSER.
 - ALL MATERIALS UTILIZED WITHIN THE CEILING PLENUM MUST COMPLY WITH NFPA 90A REQUIREMENTS FOR RETURN AIR CEILING CAVITY PLENUMS.
 - UNLESS INDICATED OTHERWISE, THE MC SHALL COORDINATE RETURN AIR PATHWAY FROM ENCLOSED SPACES TO MAIN RETURN AIR DUCTWORK WITHIN RESPECTIVE CEILING PLENUM BY PROVIDING OPENINGS ABOVE CEILING IN WALL NOT TO EXCEED 400 FPM. CLEARLY INDICATE RETURN AIR PATHWAY AND CALCULATIONS SHOWING VELOCITIES OF 400 FPM OR LESS WITH SHEET METAL DRAWINGS DURING SHOP DRAWING REVIEW.
 - INSTALL ALL MECHANICAL EQUIPMENT PER MANUFACTURERS INSTALLATION REQUIREMENTS INCLUDING RECOMMENDED SERVICE AND WORKING CLEARANCES.
 - ALL DUCTWORK CONNECTIONS TO VIBRATION ISOLATED EQUIPMENT SHALL HAVE CONNECTORS CAPABLE OF WITHSTANDING THE MAXIMUM DISPLACEMENT OF THE MACHINE WITHOUT STRAIN OR RUPTURE.
 - ALL DUCTWORK SHALL BE INSTALLED OVERHEAD TIGHT TO STRUCTURE AND ABOVE CEILING UNLESS NO CEILING EXISTS.
 - PROVIDE COMMISSIONING SERVICES ON THE PLUMBING SYSTEMS TO INCLUDE VERIFICATION OF PROPER INSTALLATION OF THE AIR DISTRIBUTION SYSTEM, INCLUDING VERIFYING INSTALLATION AND PROPER SET POINT OF BALANCE DAMPERS, TERMINAL BOX ACCESS, ROOFTOP UNIT ACCESS, COMPLETION OF INSULATION AND ASSOCIATED VAPOR BARRIER, AND BUILDING AUTOMATION SYSTEM CONNECTIVITY AND COMPLETE FUNCTIONALITY ALIGNING WITH VA REQUIREMENTS FOR CBQC BUILDINGS.
 - SUBSTITUTIONS NOT CLEARLY REQUESTED AND/OR INDICATED ON THESE DOCUMENTS ARE STRICTLY PROHIBITED.
 - ALL NEW WORK SHALL COMPLY WITH VA TIL PG 18-10.
 - BUILDING AUTOMATION SYSTEM (BAS) SHALL BE DESIGNED AS A STAND-ALONE SITE WITH PROVISIONS INCLUDED UNDER THIS CONTRACT FOR FUTURE CONNECTION TO A MASTER SYSTEM INTEGRATION PROJECT. TCC SHALL INCLUDE ALL NECESSARY LABOR AND MATERIALS FOR A FULLY-FUNCTIONAL LOCALIZED SYSTEM INCLUSIVE OF LABOR AND MATERIALS FOR FUTURE INTEGRATION.
 - TAB CONTRACTOR SHALL BE HIRED DIRECTLY BY THE GENERAL CONTRACTOR AND SHALL SEND REPORTS TO THE VA COR IN ADDITION TO THE LESSOR ENGINEER TEAM FOR REVIEW AND APPROVAL.
 - THERMOSTAT TO ALLOW FOR +/- 3-DEGREES CONTROL BY USERS AND NIGHT-TIME SETBACK.

HVAC DUCTWORK SYMBOL SCHEDULE

| SYMBOL | DESCRIPTION |
|--------|--|
| | SUPPLY AIR DIFFUSER |
| | RETURN AIR GRILLE |
| | EXHAUST AIR GRILLE |
| | 45° ENTRY BOOT TAKE-OFF (RECTANGULAR TO RECTANGULAR) |
| | 90° BRANCH TAKE-OFF (CONICAL FITTING) |
| | FLEXIBLE DUCT CONNECTION |
| | MITERED DUCT ELBOW WITHOUT TURNING VANES |
| | MITERED DUCT ELBOW WITH TURNING VANES |
| | RADIUS DUCT ELBOW |
| | DUCT OFFSET UP (IN THE DIRECTION OF AIR FLOW) |
| | DUCT OFFSET DOWN (IN THE DIRECTION OF AIR FLOW) |
| | RECTANGULAR TO ROUND TRANSITION |
| | SUPPLY OR OUTDOOR AIR DOWN |
| | SUPPLY OR OUTDOOR AIR DUCT UP |
| | RETURN OR RELIEF AIR DUCT DOWN |
| | RETURN OR RELIEF AIR DUCT UP |
| | EXHAUST AIR DUCT DOWN |
| | EXHAUST AIR DUCT DOWN |
| | BALANCING DAMPER - MANUAL |
| | DUCT SIZE (FIRST NUMBER IS SIDE SHOWN) |
| | THERMOSTAT |
| | HEAVY LINE WEIGHT INDICATES NEW WORK |
| | LIGHT LINE WEIGHT INDICATES EXISTING TO REMAIN OR WORK BY OTHER TRADES |
| | HEAVY DASHED LINE WEIGHT INDICATES DEMOLITION |
| | MECHANICAL EQUIPMENT WITH CLEARANCE |

HVAC ABBREVIATIONS

| SYMBOL | DESCRIPTION | SYMBOL | DESCRIPTION | SYMBOL | DESCRIPTION |
|--------|--|---------|---|--------|---|
| °C | DEGREES CELSIUS | EC | ELECTRICAL CONTRACTOR | NO. | NUMBER |
| °F | DEGREES FAHRENHEIT | EDB | ENTERING DRY BULB | NPSH | NET PUMP SUCTION HEAD |
| ø | DIAMETER | EER | ENERGY EFFICIENT RATIO | NTS | NOT TO SCALE |
| φ | FLAT OVAL | EF | EXHAUST FAN | OA | OUTSIDE AIR |
| ABBREV | ABBREVIATION | EFF | EFFICIENCY | OAD | OUTSIDE AIR DAMPER |
| ABD | ABANDONED | ELEC | ELECTRIC | OC | ON CENTER |
| ABV | ABOVE | ELEV | ELEVATION OR ELEVATOR | OD | OUTSIDE DIAMETER |
| AC | AIR CONDITIONING | ENT | ENTERING | OED | OPEN END DUCT |
| AD | ACCESS DOOR | EQ | EQUIVALENT | PD | PRESSURE DROP |
| AFF | ABOVE FINISHED FLOOR | ESP | EXTERNAL STATIC PRESSURE | PH | PHASE |
| AFG | ABOVE FINISHED GRADE | ETR | EXISTING TO REMAIN | PHC | PREHEAT COIL |
| AHU | AIR HANDLING UNIT | EWB | ENTERING WET BULB | PLBG | PLUMBING |
| AL | ACOUSTICALLY LINED | EWV | ENTERING WATER TEMPERATURE | PPH | POUND PER HOUR (STEAM) |
| ALUM | ALUMINUM | EX | EXISTING | PPM | PARTS PER MILLION |
| AMB | AMBIENT | EXH | EXHAUST | PRESS | PRESSURE |
| AMP | AMPERES | EXP | EXPOSED | PRV | PRESSURE REDUCING VALVE |
| AP | ACCESS PANEL | EXT | EXTERNAL | PSI | POUNDS PER SQUARE INCH |
| APD | AIR PRESSURE DROP | F | FURNACE | PTAC | PACKAGED TERMINAL AIR CONDITIONER |
| APPROX | APPROXIMATE | FC | FLEXIBLE CONNECTION | PUH | PROPELLER UNIT HEATER |
| ARCH | ARCHITECT, ARCHITECTURAL | FCU | FAN COIL UNIT | PVC | POLYVINYL CHLORIDE |
| ARRG | ARRANGEMENT | FD | FLOOR DRAIN | QTY | QUANTITY |
| AS | AIR SEPARATOR | FDC | FIRE DEPARTMENT CONNECTION | R | RISE (DUCTWORK) |
| ASTM | AMERICAN SOCIETY FOR TESTING AND MATERIALS | FDR | FIRE DAMPER | RA | RETURN AIR |
| ATC | AUTOMATIC TEMPERATURE CONTROL | FF | FINISHED FLOOR | RAD | RADIATED |
| ATM | ATMOSPHERE | FLA | FULL LOAD AMPERES | RD | ROOF DRAIN |
| ATU | AIR TERMINAL UNIT | FLR | FLOOR | REG | REGISTER |
| AVG | AVERAGE | FLM | FLOW MONITOR | REQ'D | REQUIRED |
| AWT | AVERAGE WATER TEMPERATURE | FOB | FLAT ON BOTTOM | RET | RETURN |
| BD | BALANCING (VOLUME) DAMPER | FOT | FLAT ON TOP | RH | RELATIVE HUMIDITY |
| BDD | BACK DRAFT DAMPER | FP | FIRE PROTECTION | RHC | REHEAT COIL |
| BEL | BELOW | FPI | FINS PER INCH | RHP | RADIANT HEATING PANEL |
| BFF | BELOW FINISHED FLOOR | FFM | FEET PER MINUTE | RL | REFRIGERANT LIQUID |
| BFP | BACKFLOW PREVENTER | FPS | FEET PER SECOND | RLA | RUNNING LOAD AMPERES |
| BHP | BRAKE HORSEPOWER | FS | FLOW SWITCH | RLF | RELIEF |
| BLDG | BUILDING | FSM | FIRE-SMOKE DAMPER | RP | REVOLUTIONS PER MINUTE |
| BOD | BOTTOM OF DUCT | FT | FEET OR FOOT | RZ | REDUCED PRESSURE ZONE |
| BOP | BOTTOM OF PIPE | FT HEAD | FEET OF HEAD PRESSURE | RS | REFRIGERANT SUCTION |
| BOS | BOTTOM OF STEEL | FTR | FINNED TUBE RADIATION | RX | REMOVE EXISTING |
| BTM | BOTTOM | GA | GAGE | SA | SUPPLY AIR |
| BTU | BRITISH THERMAL UNITS | GAL | GALLONS | SATU | SUPPLY AIR TERMINAL UNIT |
| BTUH | BRITISH THERMAL UNITS PER HOUR | GALV | GALVANIZED | SD | SMOKE DETECTOR |
| BWV | BACK WATER VALVE | GC | GENERAL CONTRACTOR | SDP | SMOKE DAMPER |
| CAP | CAPACITY | GPM | GALLONS PER MINUTE | SENS | SENSIBLE |
| CAV | CONSTANT AIR VOLUME | GR | GRILLE | SF | SQUARE FEET |
| CC | COOLING COIL | H | HUMIDISTAT | SG | SPECIFIC GRAVITY |
| CD | CEILING DIFFUSER | HD | HEAD | SH | SENSIBLE HEAT OR SHOWER |
| CFM | CUBIC FEET PER MINUTE | HORIZ | HORIZONTAL | SL | SOUND LINING |
| CFH | CUBIC FEET PER HOUR | HP | HORSEPOWER | SMACNA | SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION |
| CHR | CHILLED WATER RETURN | H.P. | HIGH PRESSURE | SP | STATIC PRESSURE |
| CHS | CHILLED WATER SUPPLY | HR | HEATING WATER RETURN | SPEC | SPECIFICATION |
| CLG | CEILING | HS | HEATING WATER SUPPLY | SPL | SOUND POWER LEVEL |
| CLN | CLEANOUT | HW | HEATING, VENTILATING, & AIR CONDITIONING DOMESTIC HOT WATER | SQ | SQUARE |
| CO2 | CARBON DIOXIDE | HWR | DOMESTIC HOT WATER RECIRCULATING | SS | STAINLESS STEEL |
| COMP | COMPRESSOR | HZ | HERTZ | ST | SOUND TRAP |
| CONC | CONCRETE | ID | INSIDE DIAMETER | STRUCT | STRUCTURAL |
| COND | CONDENSATE | IN | INCHES | SUP | SUPPLY |
| CONN | CONNECT, CONNECTION | INV | INVERT ELEVATION | TAB | TESTING, ADJUSTING, & BALANCING |
| CONT | CONTINUATION | KVA | KILOVOLT AMPERES | TEMP | TEMPERATURE |
| CP | CONDENSATE PUMP | KW | KILOWATT(S) | TP | TOTAL PRESSURE |
| CR | CONDENSATE RETURN | LAT | LEAVING AIR TEMPERATURE | TSP | TOTAL STATIC PRESSURE |
| CRU | CONDENSATE RETURN UNIT | LBS | POUNDS | TV | TURNING VANES |
| CS | CONDENSATE SUPPLY | LF | LINEAR FEET | TYP | TYPICAL |
| CU FT | CUBIC FEET | L.F. | LINEAR FEET | UC | DOOR UNDER CUT |
| CUH | CABINET UNIT HEATER | L.P. | LOW PRESSURE | UH | UNIT HEATER |
| CX | CONNECT TO EXISTING | LRA | LOCKED ROTOR AMPERES | UN | UNLESS OTHERWISE NOTED |
| CW | DOMESTIC COLD WATER | LWG | LEAVING WATER TEMPERATURE | UTF | UP THROUGH ROOF |
| D | DRAIN OR DEPTH | LWT | LEAVING WATER TEMPERATURE | V | VOLTS |
| DB | DRY BULB OR DECIBEL | MAX | MAXIMUM | VA | VOLTS AMPERES |
| DBL | DOUBLE | MBH | THOUSAND BTU'S PER HOUR | VAC | VACUUM |
| DDC | DIRECT DIGITAL CONTROLS | MC | MECHANICAL CONTRACTOR | VAV | VARIABLE AIR VOLUME |
| DEG F | DEGREES FAHRENHEIT | MCA | MINIMUM CIRCUIT AMPS | VD | VOLUME DAMPER |
| DEPT | DEPARTMENT | MECH | MECHANICAL | VEL | VELOCITY |
| DESIG | DESIGNATION | MFR | MANUFACTURER | VFD | VARIABLE FREQUENCY DRIVE |
| DFU | DRAINAGE FIXTURE UNITS | MIN | MINIMUM | VP | VENT PIPE |
| DIA | DIAMETER | MO | MOTOR OPERATED | VTR | VENT THROUGH ROOF |
| DIF | DIFFUSER | MOD | MOTOR OPERATED DAMPER | W | WATTS |
| DN | DOWN | MOP | MAXIMUM OVERCURRENT PROTECTION | W/ | WITH |
| DP | DIFFERENTIAL PRESSURE | MTD | MOUNTED | W/O | WITHOUT |
| DPT | DEW POINT TEMPERATURE | MVD | MANUAL VOLUME DAMPER | WB | WET BULB |
| DSP | DIFFERENTIAL STATIC PRESSURE | NA | NOT APPLICABLE | WC | WATER COLUMN |
| DTH | DOWN THRU FLOOR | NC | NOISE CRITERIA | WG | WATER GAGE |
| DTR | DUAL TEMPERATURE RETURN | N.C. | NORMALLY CLOSED | WMS | WIRE MESH SCREEN |
| DTS | DUAL TEMPERATURE SUPPLY | NIC | NOT IN CONTRACT | WPD | WATER PRESSURE DROP |
| DW | DOMESTIC WATER | N.O. | NORMALLY OPEN | | |
| DWG | DRAWING | | | | |
| DX | DIRECT EXPANSION | | | | |
| EA | EXHAUST AIR | | | | |
| EAT | ENTERING AIR TEMPERATURE | | | | |
| EATU | EXISTING AIR TERMINAL UNIT | | | | |

HVAC DESIGN CONDITIONS

| LOCATION | SUMMER | WINTER |
|--------------------|-----------------------|-----------|
| OUTSIDE CONDITIONS | 88.2°F DB / 73.1°F WB | 0.1°F DB |
| INTERIOR DESIGN | 75.0°F DB / 50% RH* | 72.0°F DB |

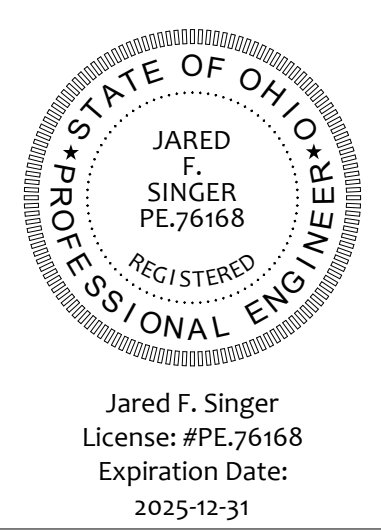
* SUMMER HUMIDITY LEVEL OF 50% RH IS ATTAINED PSYCHROMETRICALLY.

PHASE 2 HVAC DRAWING INDEX

| SHEET NUMBER | SHEET NAME | ISSUE DATE | REVISION | REVISION DATE | DESCRIPTION |
|--------------|------------------------------|------------|----------|---------------|-------------|
| 2-M0.0 | HVAC GENERAL INFORMATION | 06-17-2024 | | | |
| 2-M1.0 | HVAC NEW WORK - AREA A | 06-17-2024 | | | |
| 2-M1.1 | HVAC NEW WORK - AREA B | 06-17-2024 | | | |
| 2-M2.0 | MECHANICAL - ROOF - OVERALL | 06-17-2024 | | | |
| 2-M3.0 | HVAC DETAILS | 06-17-2024 | | | |
| 2-M4.0 | HVAC CONTROLS - PART 1 | 06-17-2024 | | | |
| 2-M4.1 | HVAC CONTROLS - PART 2 | 06-17-2024 | | | |
| 2-M5.0 | HVAC SCHEDULES | 06-17-2024 | | | |
| 2-M6.0 | HVAC SPECIFICATIONS - PART 1 | 06-17-2024 | | | |
| 2-M6.1 | HVAC SPECIFICATIONS - PART 2 | 06-17-2024 | | | |
| 2-M6.2 | HVAC SPECIFICATIONS - PART 3 | 06-17-2024 | | | |

REVISIONS:

INTERIOR BUILD-OUT - ISSUED FOR PERMITS
 MOTTER & MEADOWS
 ARCHITECT &
 WILMINGTON CBQC
 31 CLARK STREET WILMINGTON, OHIO
 CANTON OHIO 44702
 600 MARKET AVENUE NORTH



THIS DWG :
HVAC GENERAL INFORMATION

COMM 23144
DATE 06-17-2024

DWG
2-M0.0



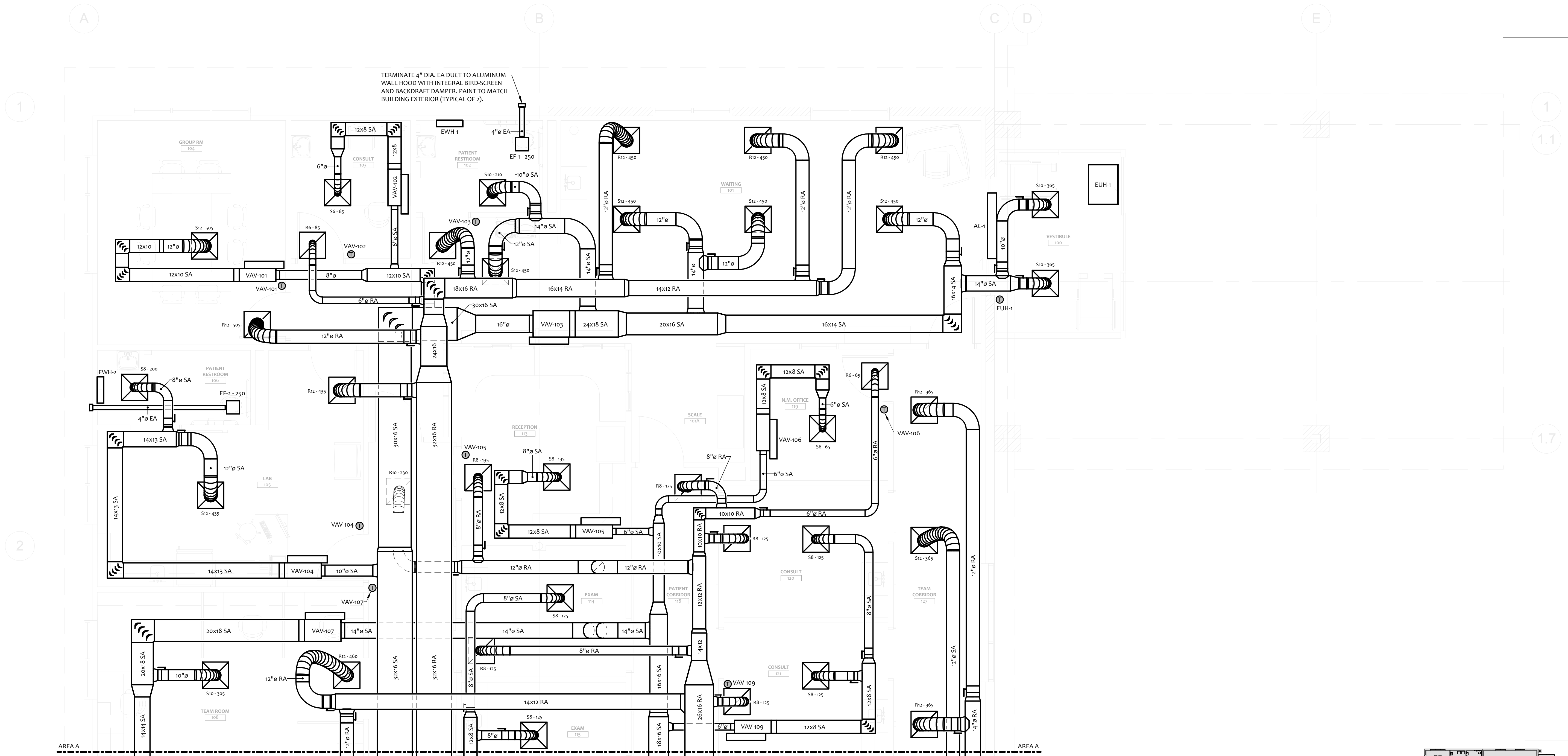
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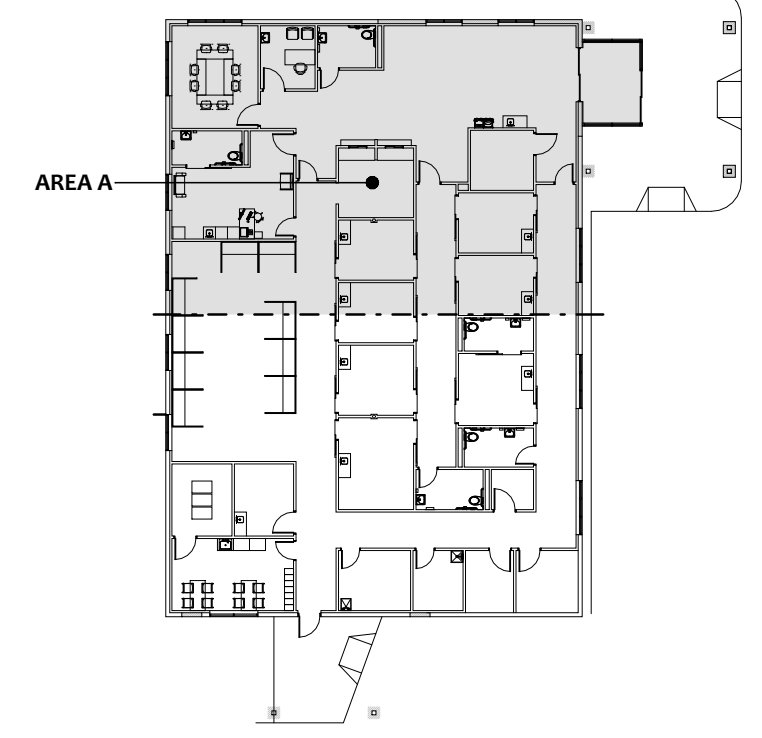
WILMINGTON CBQC
31 CLARK STREET WILMINGTON, OHIO

MOTTED MEADOWS
ARCHITECTS

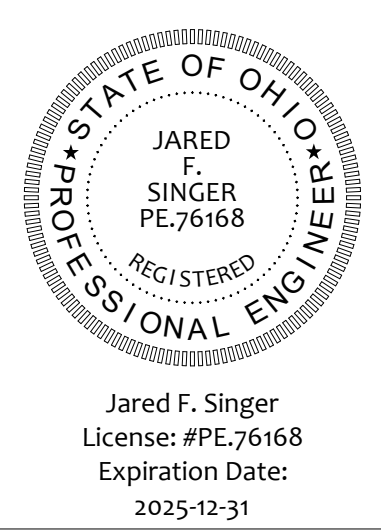
INTERIOR BUILD-OUT - ISSUED FOR PERMITS



1 HVAC NEW WORK - AREA A
SCALE: 1/4" = 1'-0"



KEY PLAN A
SCALE: 1/32" = 1'-0"



THIS DWG :
HVAC NEW WORK - AREA A

COMM 23144
DATE 06-17-2024

DWG
2-M1.0



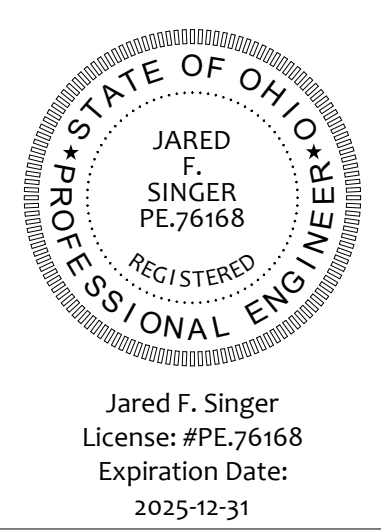
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MOTTED MEADOWS ARCHITECT &

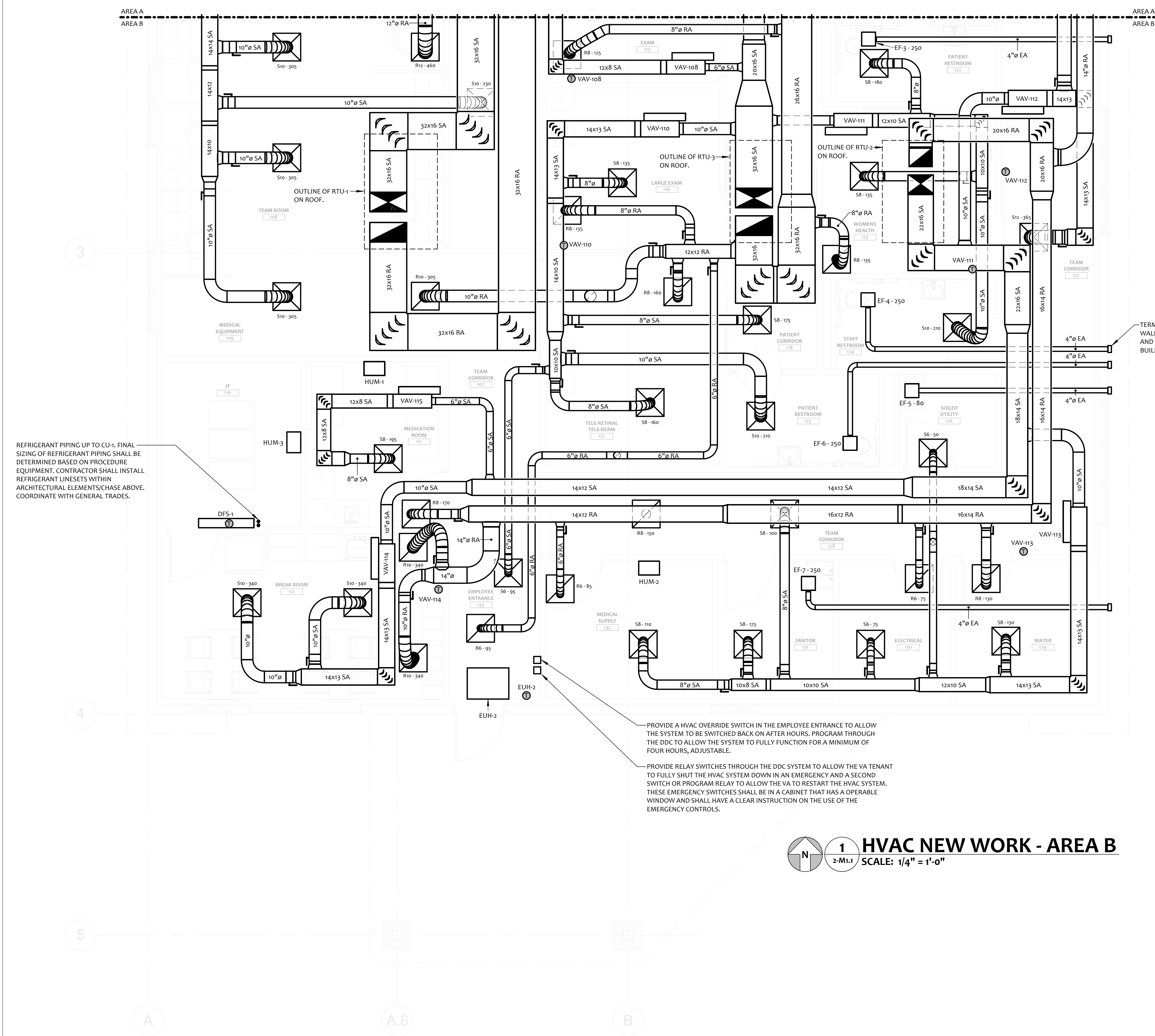
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| | |
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| THIS DWG : | |
| HVAC NEW WORK - AREA B | |
| COMM | 23144 |
| DATE | 06-17-2024 |

DWG
2-M1.1



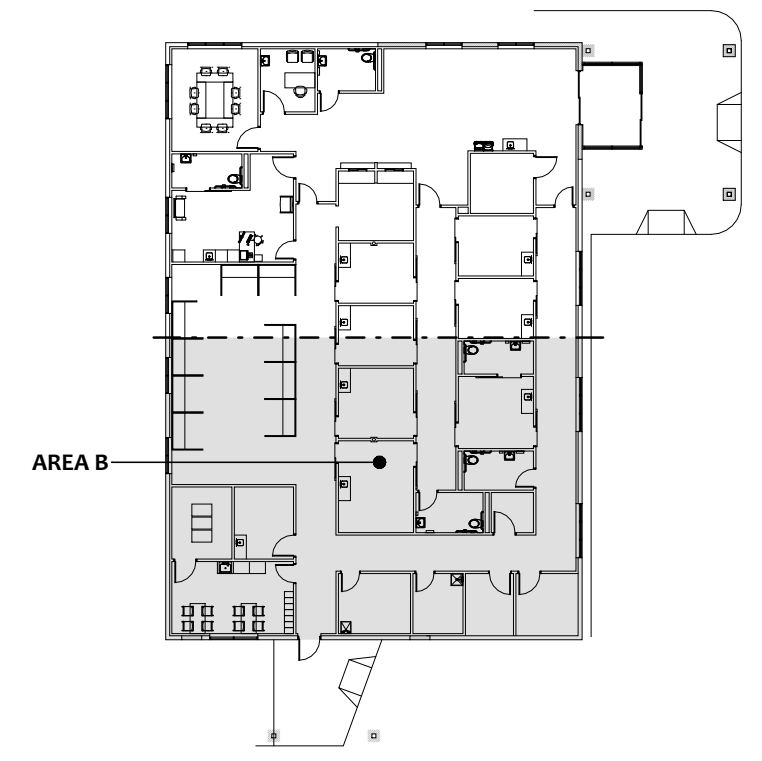
REFRIGERANT PIPING UP TO CU-1. FINAL SIZING OF REFRIGERANT PIPING SHALL BE DETERMINED BASED ON PROCEDURE EQUIPMENT. CONTRACTOR SHALL INSTALL REFRIGERANT LINESETS WITHIN ARCHITECTURAL ELEMENTS CHASE ABOVE. COORDINATE WITH GENERAL TRADES.

TERMINATE 4" DIA. EA DUCT TO ALUMINUM WALL HOOD WITH INTEGRAL BIRD-SCREEN AND BACKDRAFT DAMPER, PAINT TO MATCH BUILDING EXTERIOR (TYPICAL OF 5).

PROVIDE A HVAC OVERRIDE SWITCH IN THE EMPLOYEE ENTRANCE TO ALLOW THE SYSTEM TO BE SWITCHED BACK ON AFTER HOURS. PROGRAM THROUGH THE DDC TO ALLOW THE SYSTEM TO FULLY FUNCTION FOR A MINIMUM OF FOUR HOURS, ADJUSTABLE.

PROVIDE RELAY SWITCHES THROUGH THE DDC SYSTEM TO ALLOW THE VA TENANT TO FULLY SHUT THE HVAC SYSTEM DOWN IN AN EMERGENCY AND A SECOND SWITCH OR PROGRAM RELAY TO ALLOW THE VA TO RESTART THE HVAC SYSTEM. THESE EMERGENCY SWITCHES SHALL BE IN A CABINET THAT HAS AN OPERABLE WINDOW AND SHALL HAVE A CLEAR INSTRUCTION ON THE USE OF THE EMERGENCY CONTROLS.

1 HVAC NEW WORK - AREA B
SCALE: 1/4" = 1'-0"



KEY PLAN B
SCALE: 1/32" = 1'-0"



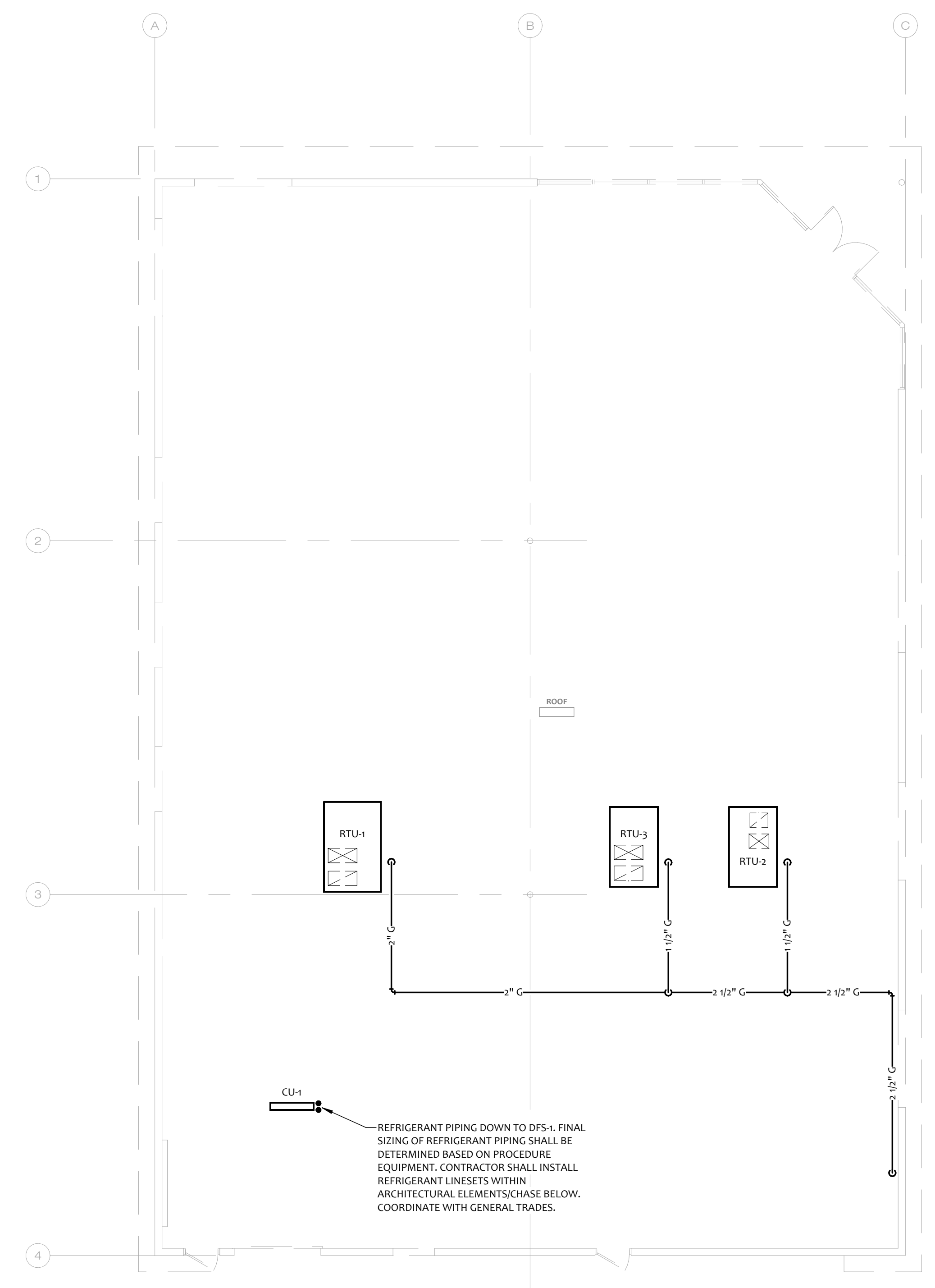
REVISIONS:

INTERIOR BUILD-OUT - ISSUED FOR PERMITS

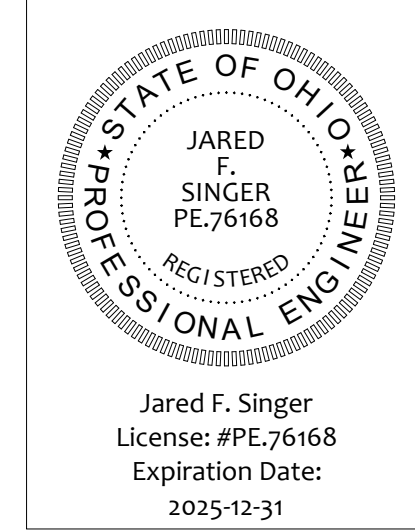
MOTT & MEADOWS
ARCHITECTS

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WILMINGTON CBOC
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MECHANICAL - ROOF - OVERALL
SCALE: 1/8" = 1'-0"



THIS DWG :
MECHANICAL - ROOF - OVERALL

COMM 23144
DATE 06-17-2024

DWG
2-M2.0

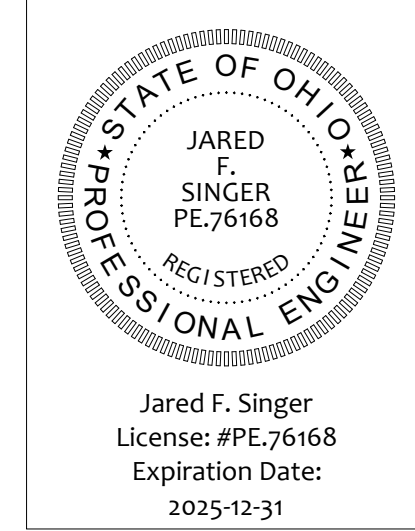


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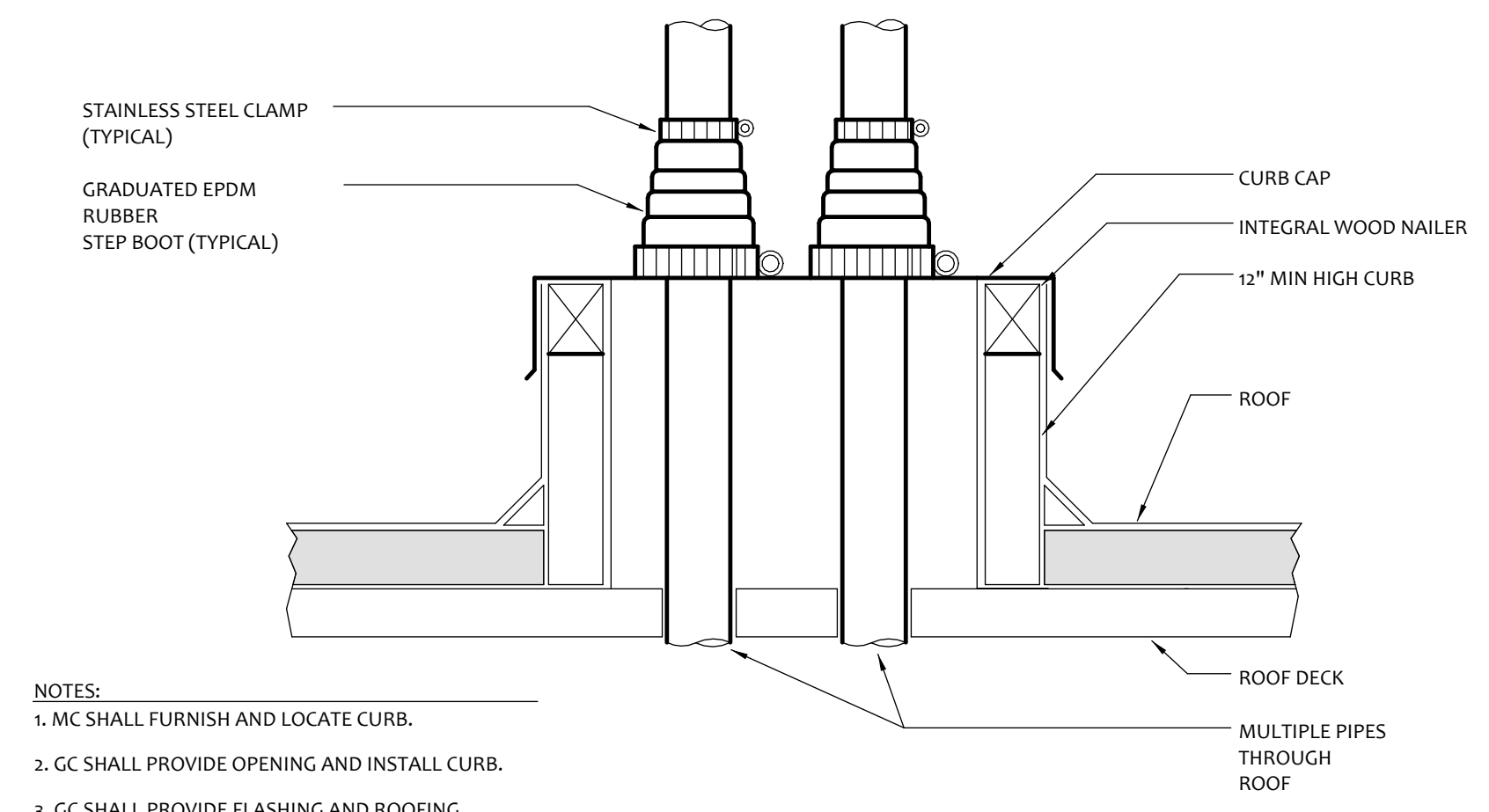
MOTTER & MEADOWS
 INTERIOR BUILD-OUT - ISSUED FOR PERMITS



THIS DWG :
 HVAC DETAILS

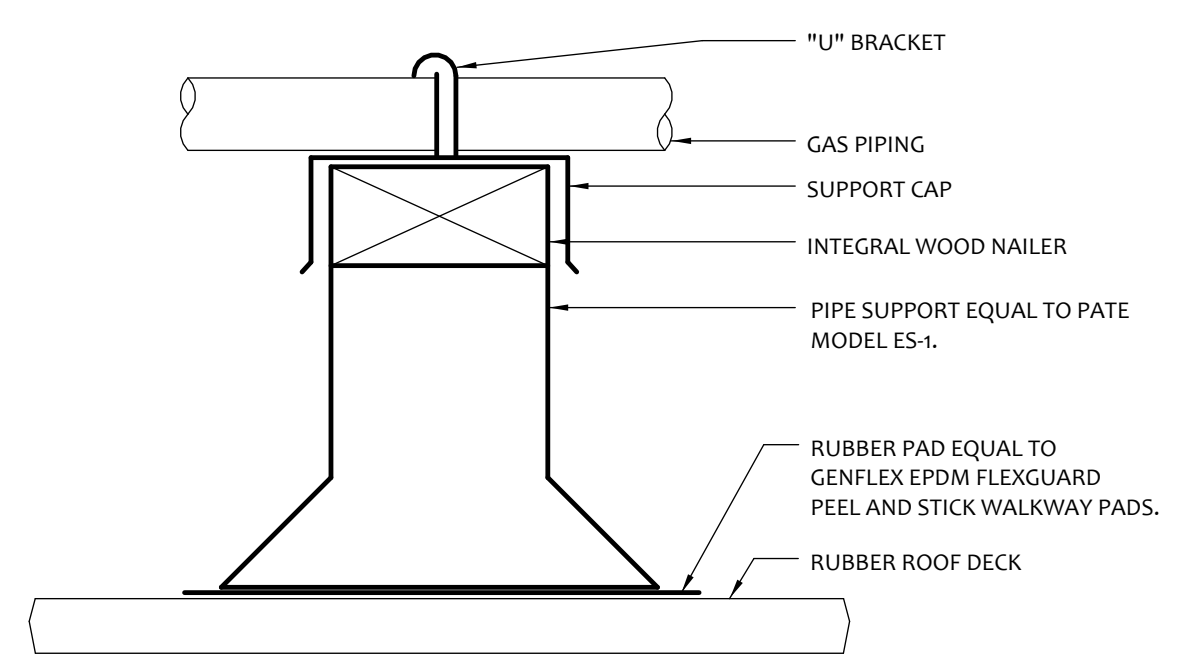
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DATE 06-17-2024

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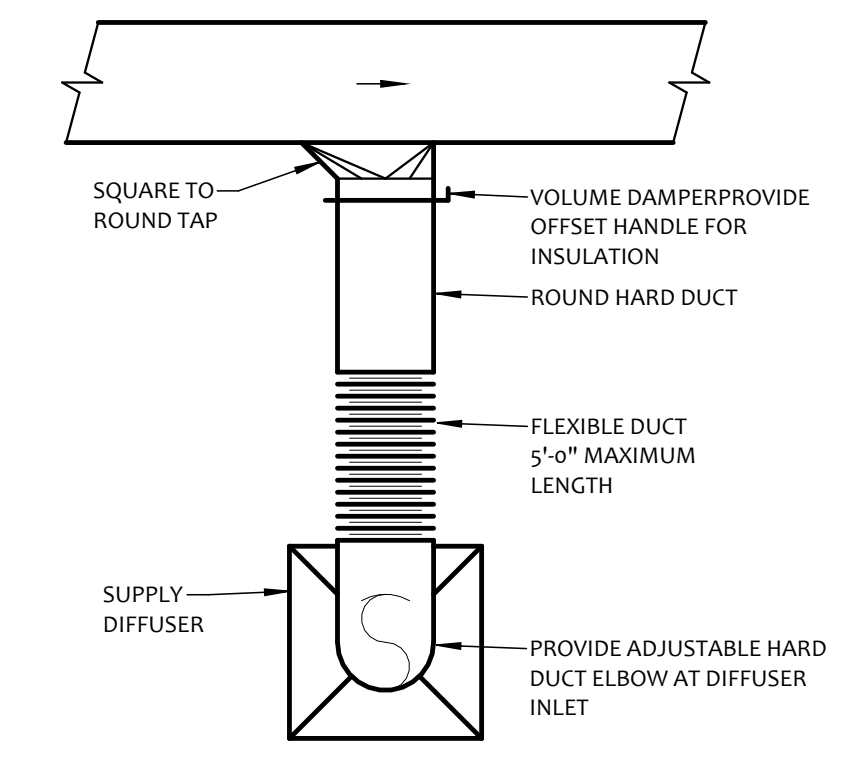


- NOTES:
1. MC SHALL FURNISH AND LOCATE CURB.
 2. GC SHALL PROVIDE OPENING AND INSTALL CURB.
 3. GC SHALL PROVIDE FLASHING AND ROOFING.
 4. COORDINATE ROOFWORK TO MAINTAIN ALL WARRANTIES.
 5. PROVIDE CURB WITH ADDITIONAL KNOCKOUTS FOR CONTROL AND POWER CONDUIT.

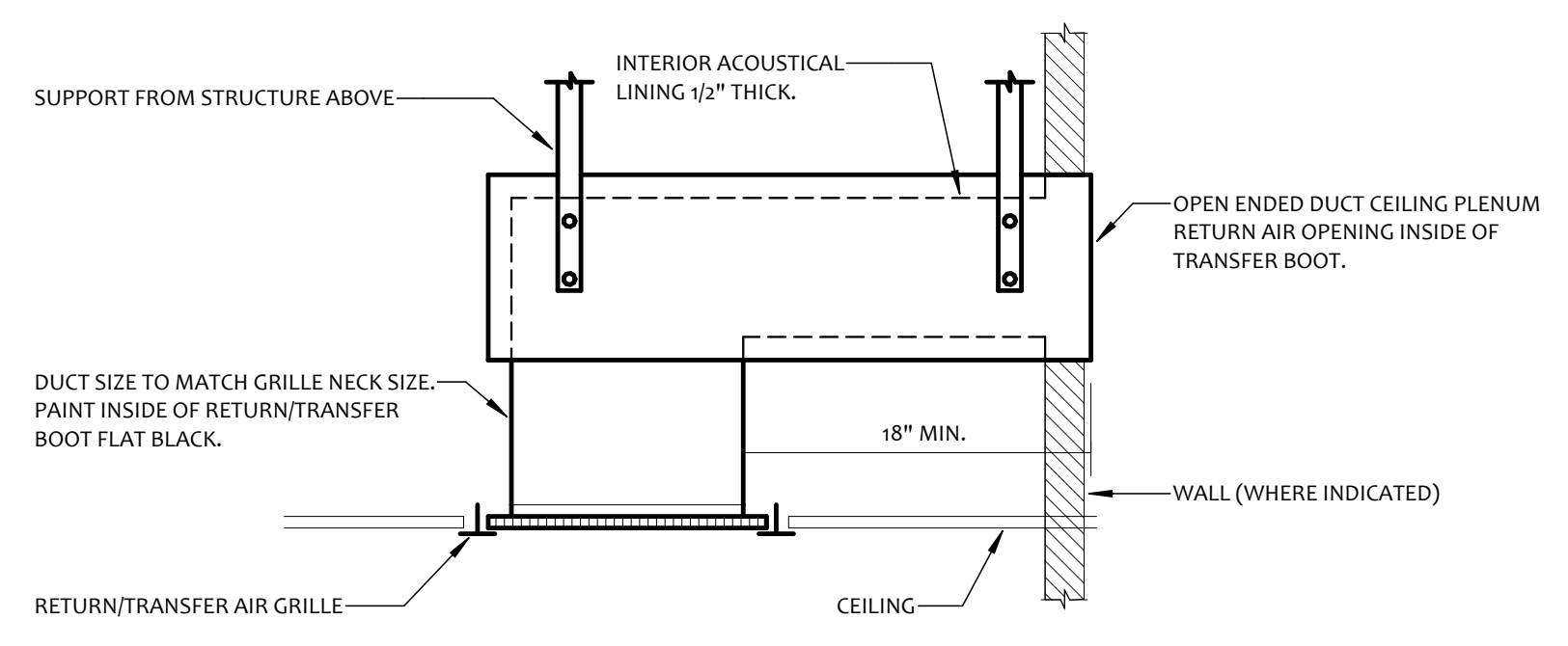
4 ROOF-MOUNTED PIPE CURB DETAIL
2-M3.0



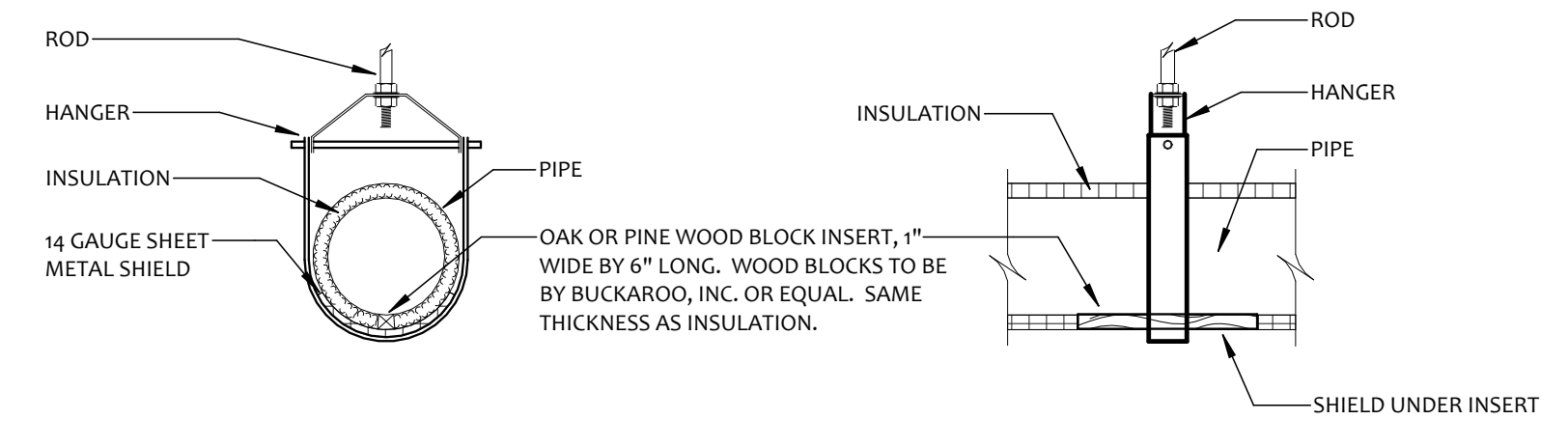
5 ROOF MOUNTED PIPE SUPPORT DETAIL
2-M3.0



1 GRILLE AND DIFFUSER DETAIL
2-M3.0



2 RETURN/TRANSFER AIR BOOT DETAIL
2-M3.0



3 HYDRONIC PIPE HANGER DETAIL
2-M3.0

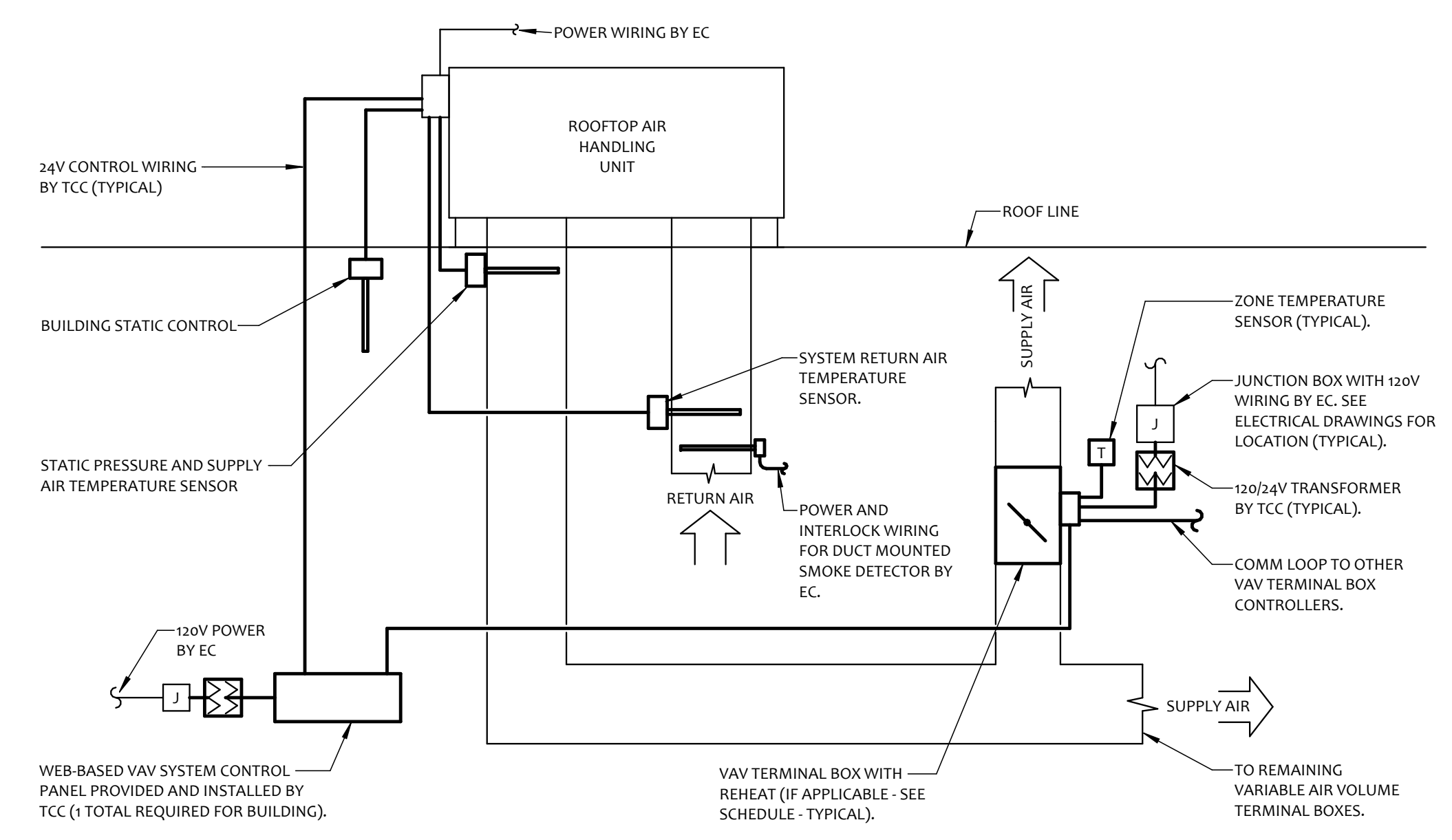
INTERIOR BUILD-OUT - ISSUED FOR PERMITS

REVISIONS:

600 MARKET AVENUE NORTH CANTON OHIO 44702

MOTTIER & MEADOWS ARCHITECTS

WILMINGTON CBOC
31 CLARK STREET WILMINGTON, OHIO

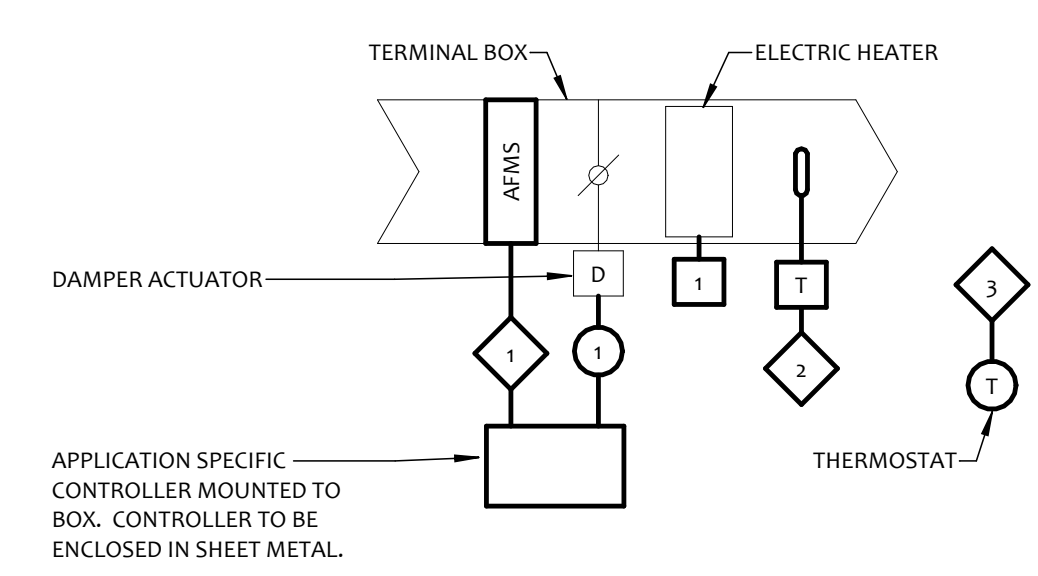


SEQUENCE OF OPERATION:
 THE ROOFTOP UNIT SUPPLY FAN SHALL RUN CONTINUOUSLY AND MODULATE AIRFLOW BASED ON DUCT STATIC PRESSURE. THE HEATING/COOLING CIRCUITS SHALL RUN AS REQUIRED TO DISCHARGE 55°F LEAVING AIR TEMPERATURE IN SUMMER AND 62°F LEAVING AIR TEMPERATURE IN WINTER (ADJUSTABLE). THE OUTSIDE AIR DAMPER SHALL BE OPEN TO MINIMUM AND MODULATE BASED ON REFERENCE ENTHALPY ECONOMIZER CAPABLE OF 100% DESIGN SUPPLY AIRFLOW.

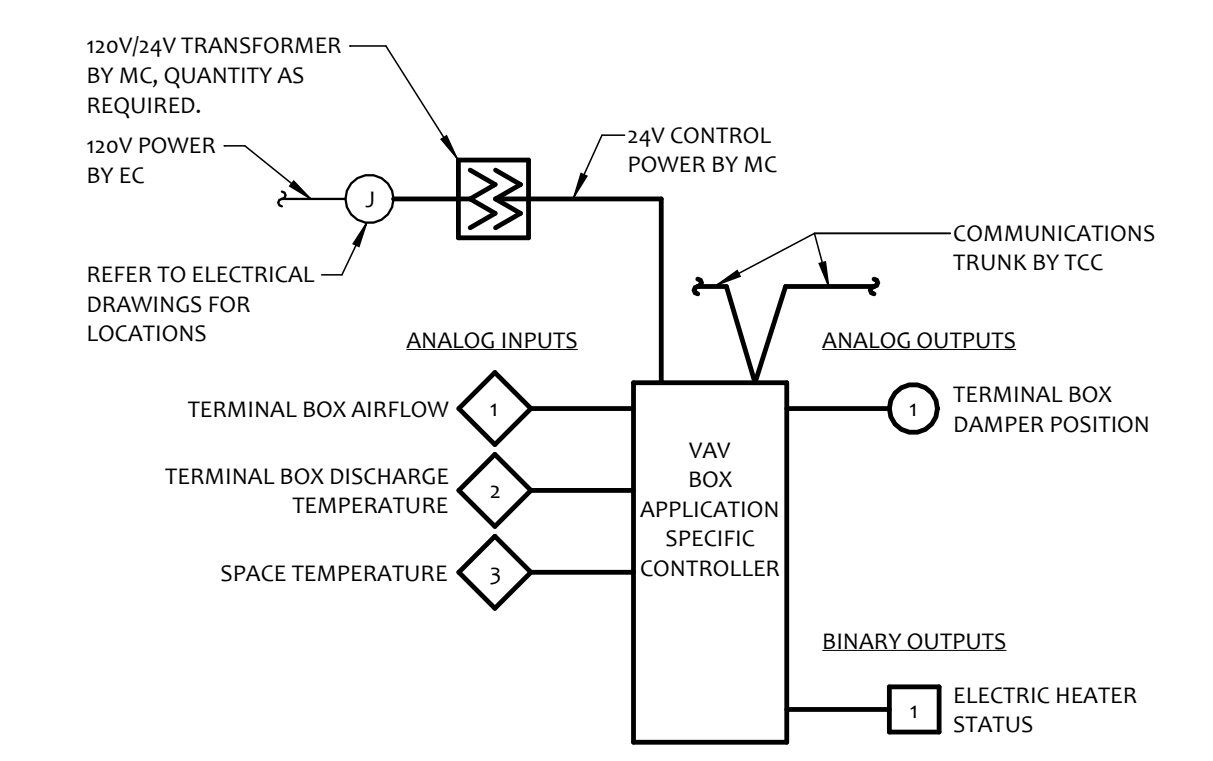
NOTE:
 1. ALL VAV COMPONENTS SHALL BE FURNISHED BY THE MC AND BE SET AND WIRED BY THE TCC.

3 VARIABLE VOLUME (VAV) SYSTEM CONTROL DIAGRAM
2-M4.0

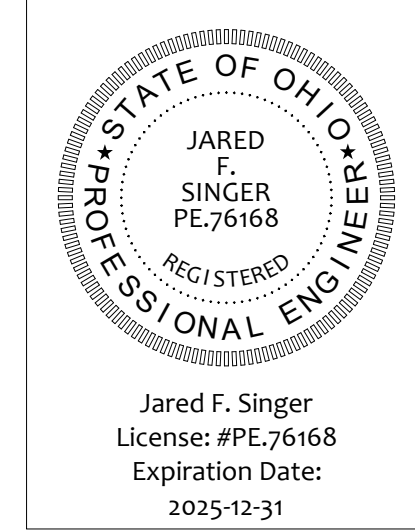
TERMINAL BOX SEQUENCE OF OPERATIONS:
 A ROOM TEMPERATURE SENSOR SHALL, THROUGH THE TERMINAL BOX CONTROLLER, MODULATE THE DDC AIR TERMINAL BOX DAMPER AND ELECTRIC HEATER IN SEQUENCE TO MAINTAIN ROOM SETPOINT REQUIREMENTS.
 THE SPACE TEMPERATURE SETPOINT SHALL BE MAINTAINED BY THE SPACE TEMPERATURE SENSOR MODULATING THE BOX DAMPER BETWEEN MINIMUM AND MAXIMUM CFM SETTINGS IN SEQUENCE WITH THE ELECTRIC HEATER.
 TERMINAL BOX CONTROLLERS SHALL BE TIED INTO THE RESPECTIVE ROOFTOP UNIT CONTROLLER. EACH TERMINAL BOX CONTROLLER SHALL ENABLE THE BAS OPERATOR TO MONITOR SPACE TEMPERATURE, DISCHARGE TEMPERATURE, ELECTRIC HEATER STATUS, AND AIR VOLUME.



1 TERMINAL BOX WITH ELECTRIC REHEAT CONTROL DIAGRAM
2-M4.0



INTERIOR BUILD-OUT - ISSUED FOR PERMITS



THIS DWG :
 HVAC CONTROLS - PART 1

COMM 23144
 DATE 06-17-2024

DWG
2-M4.0



| BUILDING AUTOMATION SYSTEM (BAS) DDC, CONTROLS, METERING, MONITORING AND INTEGRATION VIA THE VA NETWORK TO CHILlicothe VAMC ENGINEERING CONTROL CENTER (ECC) AND CHILlicothe MANAGEMENT SYSTEMS | | |
|---|---|---|
| <p>NOTE: IT IS THE DESIRED INTENT THAT THESE SYSTEM REPORT BACK OVER THE NETWORK TO THP CHILlicothe VAMC BAS IN THE ECO AND OTHER DESIGNATED CHILlicothe VAMC MANAGEMENT SYSTEMS, HOWEVER THE CHILlicothe VAMC BAS IN THE ECO IS CURRENTLY NOT ON THE INTERNET RATHER IT IS ON AN INTERNAL FIBER BACKBONE AND THERE IS NOT A DESIGNATED CHILlicothe VAMC MANAGEMENT SYSTEM IN PLACE OUTSIDE OF THE HONEYWELL BAS (THEY MAY BE DEVELOPED) THEREFORE THERE IS CURRENTLY NO SYSTEM IN PLACE FOR THE OBOC TO REPORT BACK TO OVER THE NETWORK (CURRENT AS OF 3/14/21). IF BY TIME THIS IS IN DESIGN A NETWORKED SYSTEM FOR MONITORING IS IN PLACE THEN THAT SYSTEM OR SYSTEMS SHALL BE INTEGRATED INTO. IF NOT, DESIGN/PROVIDE STAND ALONE NETWORK MANAGEMENT SYSTEMS VISIBLE OVER THE VA NETWORK TO CHILlicothe VAMC AND INCLUDE ALL EQUIPMENT TO ENABLE THE CAPABILITY FOR NETWORK INTEGRATION INTO A CHILlicothe VAMC MANAGEMENT SYSTEM IN THE FUTURE ONCE INSTALLED (EXAMPLE BEING UPS WITH NETWORK CARDS AND CAPABILITY TO REPORT SPECIFIED INFORMATION. FULL INTEGRATION BACK TO THE CHILlicothe VAMC ECO WOULD INCLUDE UPDATING GRAPHICS AT THE CHILlicothe VAMC.</p> <p>NOTE: INTEGRATION VIA THE VA NETWORK TO THE CHILlicothe VAMC ECC SHALL NOT RELIEVE THE LESSOR OF THEIR FULL RESPONSIBILITY FOR MAINTENANCE AND MONITORING OF THE BUILDINGS SYSTEMS (EXCEPT SPECIFICALLY OWNED VA IT EQUIPMENT). THIS INTEGRATION TO CHILlicothe VAMC IS FOR VA REQUIRED MONITORING, REPORTING, AND TRACKING CAPABILITIES NOT TO RELIEVE THE LESSOR OF THEIR REQUIRED MAINTENANCE.</p> <p>IMPLEMENTATION GUIDANCE (SOURCE PG8-12 OIT INFRASTRUCTURE STANDARD (OIT IS) FOR TELECOMMUNICATIONS SPACES V3.0 PARAGRAPH 4.3.7):</p> <p>A. MONITORING SHALL BE DEFINED A CONTINUAL REAL-TIME OBSERVATION OF A CONDITION OR SET OF CONDITIONS AFFECTING SPACES.</p> <p>B. CONNECT ALL VERTICAL RPDU TO THE RPDU MONITORING SYSTEM. MAXIMIZE CONNECTIVITY OF FACILITY EQUIPMENT WITHIN THE TELECOMMUNICATIONS.</p> <p>C. PROVIDE OUTPUT FEEDS FROM THE SYSTEM TO THE CHILlicothe MMAC ECC/BAS BUILDING MONITORING SYSTEM FOR REMOTE MONITORING CAPABILITIES.</p> <p>D. FUNCTIONAL DEFINITIONS OF MONITORING AND METERING SHALL NOT BE INTERPRETED TO REQUIRE SEPARATE SYSTEMS; A SINGLE SENSOR, DEVICE, OR SYSTEM MAY SUPPORT MULTIPLE MONITORING AND METERING FUNCTIONS.</p> <p>E. DETECTION, ALERTING, AND ALARMING FUNCTIONS, AS WELL AS AUTOMATIC TRIGGERING OF INTERVENTIONS, SHALL BE CONSIDERED PART OF A MONITORING SYSTEM. MONITORING SYSTEMS COLLECT FORENSIC DATA DURING A PERIOD WHEN A DETECTION THRESHOLD HAS BEEN EXCEEDED.</p> <p>F. ALERTS ARE COMMUNICATED WHEN A CONDITION THRESHOLD HAS BEEN REACHED OR EXCEEDED. ALERT TRIGGERS SHALL BE SET TO PROVIDE SUFFICIENT REACTION TIME TO RESPOND TO, INVESTIGATE, AND CORRECT THE UNDERLYING CAUSE OF THE CONDITION.</p> <p>G. ALARMING SYSTEMS SHALL COMMUNICATE WHEN AN ABSOLUTE LIMIT HAS BEEN EXCEEDED.</p> | | |
| SYSTEM | REQUIREMENTS | REFERENCES |
| CONTROL SYSTEM COMPUTER(S) (AKA OPERATORS TERMINAL), SERVERS, SOFTWARE, KEYS OARD— VISUAL -MOUSE | DESIGN AND SPECIFY TO REQUIRED A COMPUTER OR SERVER (AS REQUIRED) TO HOUSE ALL BAS, DDC, CONTROLS, MANAGEMENT SYSTEMS, MONITORING, AND METERING SYSTEMS, AND GRAPHICS. PROVIDE ALL REQUIRED HARDWARE AND SOFTWARE FOR THE SYSTEMS. IF RACK SPACE ALLOWS IN THE DESIGN, THE IDEAL SYSTEM WOULD BE LOCATED IN THE TELECOMMUNICATIONS ROOM AND BE RACK MOUNTED WITH A RACK MOUNTED KVM FOR SPACE SAVINGS (IF AN ALTERNATIVE LOCATION FOR THE DESK MOUNTED SOLUTION IS DETERMINED DURING DESIGN, THAT IS ACCEPTABLE AS WELL). | PG8-10 HVAC DESIGN MANUAL CHAPTER 5 HVAC CONTROL SYSTEMS |
| HVAC DDC | HVAC DDC CONTROL SYSTEM SHALL COMPLY WITH PG8-10 HVAC DESIGN MANUAL CHAPTER 5 HVAC CONTROL SYSTEMS. | PG8-10 HVAC DESIGN MANUAL CHAPTER 5 HVAC CONTROL SYSTEMS |
| COMMUNICATION PROTOCOLS IT DEVICES | MONITORED IT DEVICES SHALL USE THE SIMPLE NETWORK COMMUNICATION PROTOCOL (SNMP), CONFIGURED IN A SECURE MODE AS REQUIRED BY THE TRM. IMPLEMENTATIONS SHALL ADHERE TO THE VA IT AN SECURITY STANDARD: A. SNMP/S SECURED USING SSL B. SSL USING SECURE HASH ALGORITHM (SHA-1) AUTHENTICATION C. ADVANCED ENCRYPTION STANDARD (AES) ENCRYPTION, AT 128-BIT OR THE HIGHEST LEVEL SUPPORTED BY THE ATTACHED HARDWARE | PG8-12 OIT INFRASTRUCTURE STANDARD (OIT IS) FOR TELECOMMUNICATIONS SPACES V3.0 TABLE 26 MONITORED CONDITIONS |
| COMMUNICATION PROTOCOLS MONITORING SYSTEMS | TO SUPPORT DATA STREAM INTEGRATION, MONITORING SYSTEMS SHALL SUPPORT SECURED SNMP V3.0 FOR UPSTREAM COMMUNICATION AND AT LEAST ONE OF THE FOLLOWING INDUSTRIAL COMMUNICATION PROTOCOLS TO RECEIVE SENSOR DATA: A. BACNET OR BACNETIP B. MODBUS OR MODBUS IP C. CANBUS OR CANBUS IP D. FIELDBUS OR FIELDBUS-IP | PG8-12 OIT INFRASTRUCTURE STANDARD (OIT IS) FOR TELECOMMUNICATIONS SPACES V3.0 TABLE 26 MONITORED CONDITIONS |
| COMMUNICATION PROTOCOLS MONITORING DEVICES | MONITORING DEVICES AND SYSTEMS SHALL BE CAPABLE OF COMMUNICATION USING AT LEAST ONE OF THE FOLLOWING PROTOCOLS: A. SECURED SNMP V3.0 B. BACNET OR BACNETIP C. MODBUS OR MODBUS IP D. CANBUS OR CANBUS IP E. FIELDBUS OR FIELDBUS IP | PG8-12 OIT INFRASTRUCTURE STANDARD (OIT IS) FOR TELECOMMUNICATIONS SPACES V3.0 TABLE 26 MONITORED CONDITIONS |
| TR ROOM POWER | MONITOR CONTINUITY AND QUALITY OF: UTILITY POWER DELIVERY AND BRANCH CIRCUIT POWER OUTPUT SUPPORTING IT EQUIPMENT (FROM EACH DISTRIBUTION PANEL SERVING THE TR ROOM (A SIDE AND B SIDE)). INTEGRATE WITH AUTOMATED ENERGY METERING SYSTEM AND BAS. UNITS: KILOWATT-HOUSE (KWH). | PG8—12 OIT IS V3.0 PARAGRAPH 4.2.10.1 METERED ENERGY CONSUMPTION DATA, TABLE 19, AND PARAGRAPH 4.2.10.1.4 TOTAL IT EQUIPMENT ENERGY CONSERVATION CONSUMPTION PG8—12 OIT IS V3.0 PARAGRAPH 4.3.7 MONITORING, TABLE 26 MONITORED CONDITIONS, POWER PG8-12 OIT IS V3.0 APPENDIX B ROOM TEMPLATES (OIT RT) PG. 2 NOTES 4 AND 5, PG. 5 (SHOWS THE DISTRIBUTION PANEL, A SIDE AND B SIDE) |
| TR ROOM PDU | POWER DISTRIBUTION EQUIPMENT (PDUS) IN THE DATA CENTER SHALL HAVE BRANCH LEVEL METERING, OR IF PDU IN THE RACKS HAVE RACK-LEVEL POWER MONITORING, THIS SHALL BE CONNECTED TO A FACILITY BUILDING AUTOMATION SYSTEM (BAS)/ENERGY MANAGEMENT CONTROL SYSTEM (EMCS)/BAS/EMCS, COLLECT ACTUAL ENERGY USE DATA AT THE LEVEL CLOSEST TO THE IT EQUIPMENT USE OF A BAS/EMCS TO AUTOMATICALLY COLLECT AND CALCULATE THIS INFORMATION PROVIDES THE MOST ACCURATE MEASUREMENT. IF PDUS IN THE FACILITY HAVE THE CAPABILITY TO RECORD KWH THAT THEY SUPPLY (AND MOST MODERN UNITS DO), BAS/EMCS SHALL PERFORM AN AUTOMATED, RECORDING OF THE KWH READING ON THE PDU AT A SPECIFIED TIME FOR EACH REPORTING PERIOD (E.G., CALENDAR MONTH). FOR EXAMPLE, COLLECT KWH NUMBERS FOR ALL PDUS SUPPORTING THE DATA CENTER AT 9 A.M. ON THE FIRST CALENDAR DAY OF THE MONTH, AND SUMMATE THE CHANGE IN KWH NUMBERS FROM THE PREVIOUS PERIOD READING. | PG8—12 OIT IS V3.0 PARAGRAPH 4.2.10.1 METERED ENERGY CONSUMPTION DATA, TABLE 19, AND PARAGRAPH 4.2.10.1.4 TOTAL IT EQUIPMENT ENERGY CONSERVATION CONSUMPTION AND 4.2.10.1.5 TOTAL UNINTERRUPTIBLE POWER SUPPLY LOAD ENERGY CONSUMPTION |
| TR ROOM UPS | NETWORK CARD AND REPORTING CAPABILITY OF THE UPS FOR THE FOLLOWING: UPS SHALL BE MANAGED AND REPORT THE FOLLOWING INFORMATION TO A MANAGEMENT SYSTEM A. BATTERY AGE B. BATTERY CHARGE C. BATTERY FAULTS D. RUN-TIME ESTIMATE E. INSTANTANEOUS AND AVERAGE POWER LOAD INFORMATION F. LINE POWER OUTAGES AND BROWN-OUT OR LOW POWER CONDITIONS DATA CENTERS GENERALLY HAVE DEDICATED UPS SYSTEMS TO ENSURE IT EQUIPMENT POWER IS CONTINUOUSLY AVAILABLE. AT A SPECIFIED TIME FOR EACH REPORTING PERIOD (E.G., CALENDAR MONTH), COLLECT KWH NUMBERS FOR ALL UPS SYSTEMS SUPPORTING THE DATA CENTER AND SUMMATE THE CHANGE IN KWH NUMBERS FROM THE PREVIOUS PERIOD READING. | PG8—12 OIT IS V3.0 TABLE 26 MONITORED CONDITIONS, POWER VA OFHRM SITE INFRASTRUCTURE REQUIREMENTS V1.8 PARAGRAPH 2.4 C 4 PG8—12 OIT IS V3.0 PARAGRAPH 4.2.10.1 METERED ENERGY CONSUMPTION DATA, TABLE 19, AND PARAGRAPH 4.2.10.1.4 TOTAL IT EQUIPMENT ENERGY CONSERVATION CONSUMPTION |
| TR ROOM TEMPERATURE AND HUMIDITY | TR WIRING CLOSET CLASS B SPACE TEMPERATURE RANGE ITE TO 95t, RELATIVE HUMIDITY: 8 TO 80t NONCONDENSING TR WIRING CLOSET ENVIRONMENTAL MONITORING SOLUTION FOR TEMPERATURE AND HUMIDITY (E.G. UNINTERRUPTIBLE POWER SUPPLY (UPS) WITH NETWORK MANAGEMENT CARD, TEMPERATURE & HUMIDITY SENSOR, AND CENTRAL MONITORING BY WAY OF A SINGLE NETWORK CONNECTION IS REQUIRED USING A RJ— 45 PATCH CABLE) DUCTLESS SPLIT SYSTEMS AND STAND-ALONE HUMIDIFIER SHALL WORK ON THEIR OWN INTEGRAL CONTROLS. PROVIDE SPACE TEMPERATURE SENSOR, SPACE HUMIDITY SENSOR, AUXILIARY DRAIN PAN MOISTURE SENSOR (NOT FLOAT SWITCH) AND SUPPLY AIR TEMPERATURE SENSORS ON ALL DX UNITS AND/OR VAV TERMINALS AND CONNECT THESE TO THE CENTRAL CONTROL SYSTEM FOR TRENDING AND ALARM PURPOSES. THE CENTRAL CONTROL SYSTEM SHALL ALSO BE INTEGRATED OVER THE VA NETWORK TO THE CHILlicothe VAMC ENGINEERING CONTROL CENTER (ECC) FOR MONITORING AND ALARMS. NOTE 8.6 ALARM MONITORING: THE CENTRAL CONTROL SYSTEM SHALL MONITOR SPACE CONDITIONS AND UNIT STATUS AND SHALL ALARM THE LESSOR'S MAINTENANCE STAFF WHENEVER TEMPERATURE OR HUMIDITY ARE OUT OF TOLERANCE, WHEN WATER IS IN THE HVAC SECONDARY DRAIN PAN IF ONE IS PROVIDED, AND WHEN ANY SUPPLY AIR TEMPERATURE DOES NOT MATCH WHAT IS REQUIRED BY ROOM CONDITIONS. THE CENTRAL CONTROL SYSTEM SHALL ALSO BE INTEGRATED OVER THE VA NETWORK TO THE CHILlicothe VAMC ENGINEERING CONTROL CENTER (ECC) FOR MONITORING AND ALARMS. | VA OFHRM SITE INFRASTRUCTURE REQUIREMENTS M1.8 PARAGRAPH 2.5A2 DG8—12 OIT IS V3.0 TABLE 24 STATES: MONITORING:"MONITORED WITH INDICATORS ALLOWING OPERATORS TO DETERMINE THE GENERAL CONDITION OF THE COMPUTER ROOM. HUMIDITY CONTROL EQUIPMENT: NO DEDICATED HUMIDITY CONTROL EQUIPMENT REQUIRED. PGL8—12 OIT IS V3.0 TABLE 25 STATES: SPLIT SYSTEM AIR CONDITIONER EQUIPMENT, OPERATION: AUTOMATIC OPERATION TO MAINTAIN SET POINT TEMPERATURE IN THE TELECOMMUNICATIONS SPACE FOR OUTSIDE ENVIRONMENTAL CONDITIONS BETWEEN THE ASH RAE FUNDAMENTALS WEATHER DATA 99.6% COLUMN FOR HEATING (WINTER) AND 0.4% COLUMN COLLING (SUMMER). |

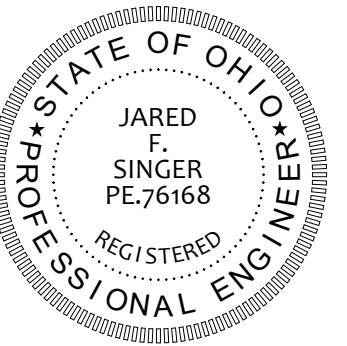
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INTERIOR BUILD-OUT - ISSUED FOR PERMITS



Jared F. Singer
License: #PE-76168
Expiration Date: 2025-12-31

THIS DWG :
HVAC CONTROLS - PART 2

COMM 23144
DATE 06-17-2024

DWG
2-M4.1



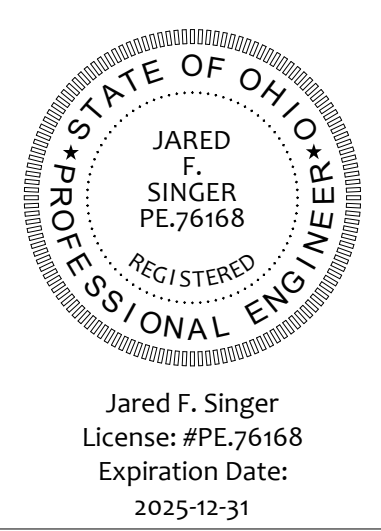
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INTERIOR BUILD-OUT - ISSUED FOR PERMITS



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THIS DWG :
HVAC SCHEDULES

COMM 23144
DATE 06-17-2024

DWG
2-M5.0



ROOFTOP UNIT SCHEDULE (RTU-X)

| MARK | MANUFACTURER | MODEL | SUPPLY FAN DATA | | | | | | DIRECT EXPANSION COIL | | | | | | HEATING | | | | CONDENSER FAN DATA | | ELECTRICAL DATA | | | | REMARKS | | | | | | |
|-------|--------------|-------------|-----------------|-----------------|------------------------|---------|--------|-------------|-----------------------|-----------------|-----------|--------------|---------------|---------------|--------------------|-----------------|-------|---------------|--------------------|------------|-----------------|-----------------|----------|------------------|---------|-------|-------|-------|------------|---------|---------------|
| | | | SUPPLY AIRFLOW | OUTSIDE AIRFLOW | EXTERNAL STATIC PRESS. | FAN RPM | DRIVE | NO. OF FANS | INDOOR MOTOR HP | SUPPLY MOTOR HP | TOTAL MBH | SENSIBLE MBH | EAT DB/WB (F) | LAT DB/WB (F) | NO. OF COMPRESSORS | COMPRESSOR TYPE | IEER | ENERGY SOURCE | INPUT MBH | OUTPUT MBH | EAT (F) | MINIMUM LAT (F) | QUANTITY | AMBIENT TEMP (F) | | VOLTS | PHASE | MCA | MOCP | FILTERS | WEIGHT (LBS) |
| RTU-1 | TRANE | YSJ150B4SAM | 3,750 | 500 | 1.963 H2O | 1,536 | DIRECT | (1) | 2.477 | 4.600 | 135.49 | 96.37 | 77.95 / 65.37 | 54.13 / 53.15 | 2 | SCROLL | 14.50 | NATURAL GAS | 200.00 | 162.00 | 56.59 | 94.99 | (1) | 95 | 208 | 3 | 67.00 | 90.00 | 2" MERV 13 | 1,503 | 1,2,3,4,5,6,7 |
| RTU-2 | TRANE | YSJ090A4SAM | 2,250 | 500 | 1.961 H2O | 1,333 | DIRECT | (1) | 1.583 | 3.000 | 88.48 | 62.44 | 79.03 / 66.21 | 53.38 / 52.96 | 2 | SCROLL | 15.10 | NATURAL GAS | 150.00 | 121.50 | 51.64 | 100.72 | (1) | 95 | 208 | 3 | 42.00 | 50.00 | 2" MERV 13 | 1,157 | 1,2,3,4,5,6,7 |
| RTU-3 | TRANE | DS00AA1000A | 3,200 | 500 | 1.955 H2O | 1,505 | DIRECT | (1) | 2.334 | 4.600 | 116.61 | 84.52 | 77.48 / 65.00 | 53.20 / 52.59 | 2 | SCROLL | 15.10 | NATURAL GAS | 150.00 | 121.50 | 58.70 | 93.12 | (1) | 95 | 208 | 3 | 56.00 | 80.00 | 2" MERV 13 | 1,183 | 1,2,3,4,5,6,7 |

REMARKS:
1. PROVIDE WITH SINGLE POINT POWER CONNECTION.
2. FURNISH UNIT WITH EXTENDED 3-YEAR COMPRESSOR WARRANTY AND R-410A REFRIGERANT.
3. PROVIDE WITH 14" TALL FULL PERIMETER CURB FOR MOUNTING ON ROOF.
4. FURNISH WITH 0-100% REFERENCE DRY BULB ECONOMIZER, CONVENIENCE OUTLET, OUTSIDE AIR HOOD, 2-STAGE MODULATING GAS HEAT, AND STAINLESS STEEL HEAT EXCHANGER.
5. FURNISH WITH FACTORY MOUNTED AND WIRED SMOKE DETECTOR IN THE RETURN AIR STREAM FOR SELF-CONTAINED UNIT SHUTDOWN UPON SENSING OF SMOKE.
6. STARTUP SHALL BE PERFORMED BY FACTORY AUTHORIZED PERSONNEL.
7. UNIT SHALL BE FURNISHED WITH PACKAGED HARDWARE AND CONTROL SYSTEM CAPABLE OF VARIABLE AIR VOLUME OPERATION WITH NETWORK INTERFACE CARD FOR BACNET INTEGRATION.

FAN SCHEDULE (EF-X)

| MARK | MANUFACTURER | MODEL | TYPE | AIRFLOW (CFM) | ESP | FAN RPM | DRIVE TYPE | WEIGHT | VOLTAGE | PHASE | WATTS | REMARKS |
|------|--------------|-----------------|---------|---------------|--------|---------|------------|--------|---------|-------|-------|---------|
| EF-1 | GREENHECK | SP-A250-QD | CEILING | 250 | 0.125" | 1000 | DIRECT | 24 | 120 | 1 | 67 | 1,2,3 |
| EF-2 | GREENHECK | SP-A250-QD | CEILING | 250 | 0.125" | 1000 | DIRECT | 24 | 120 | 1 | 67 | 1,2,3 |
| EF-3 | GREENHECK | SP-A250-QD | CEILING | 250 | 0.125" | 1000 | DIRECT | 24 | 120 | 1 | 67 | 1,2,3 |
| EF-4 | GREENHECK | SP-A250-QD | CEILING | 250 | 0.125" | 1000 | DIRECT | 24 | 120 | 1 | 67 | 1,2,3 |
| EF-5 | GREENHECK | SP-A50-90-VG-QD | CEILING | 80 | 0.125" | 887 | DIRECT | 12 | 120 | 1 | 35 | 1,2,3 |
| EF-6 | GREENHECK | SP-A250-QD | CEILING | 250 | 0.125" | 1000 | DIRECT | 24 | 120 | 1 | 67 | 1,2,3 |
| EF-7 | GREENHECK | SP-A250-QD | CEILING | 250 | 0.125" | 1000 | DIRECT | 24 | 120 | 1 | 67 | 1,2,3 |

REMARKS:
1. PROVIDE WITH INTEGRAL FACTORY-MOUNTED AND WIRED DISCONNECT.
2. PROVIDE WITH FACTORY-MOUNTED BACK-DRAFT DAMPER AND HANGING VIBRATION ISOLATION KIT.
3. EC SHALL POWER AND CONTROL WITH INTERLOCKED ROOM LIGHTING CIRCUIT.

TERMINAL BOX SINGLE DUCT WITH ELECTRIC REHEAT (VAV-X)

| MARK | MANUFACTURER | MODEL | INLET SIZE | MIN COOLING | MAX COOLING | MIN HEATING | MAX HEATING | HEATING KW | VOLTS/PHASE | REMARKS |
|---------|--------------|-------|------------|-------------|-------------|-------------|-------------|------------|-------------|---------|
| VAV-101 | KRUEGER | LMHS | 8 | 305 | 505 | 305 | 305 | 4.5 | 208/3 | 1,2,3 |
| VAV-102 | KRUEGER | LMHS | 6 | 55 | 85 | 55 | 85 | 1.0 | 208/3 | 1,2,3 |
| VAV-103 | KRUEGER | LMHS | 16 | 1,590 | 2,650 | 2,250 | 2,435 | 29.0 | 208/3 | 1,2,3 |
| VAV-104 | KRUEGER | LMHS | 10 | 635 | 635 | 635 | 635 | 7.0 | 208/3 | 1,2,3 |
| VAV-105 | KRUEGER | LMHS | 6 | 80 | 135 | 80 | 100 | 1.0 | 208/3 | 1,2,3 |
| VAV-106 | KRUEGER | LMHS | 6 | 40 | 65 | 40 | 75 | 1.0 | 208/3 | 1,2,3 |
| VAV-107 | KRUEGER | LMHS | 14 | 985 | 1,450 | 985 | 985 | 13.0 | 208/3 | 1,2,3 |
| VAV-108 | KRUEGER | LMHS | 6 | 250 | 250 | 250 | 250 | 3.0 | 208/3 | 1,2,3 |
| VAV-109 | KRUEGER | LMHS | 6 | 250 | 250 | 250 | 250 | 3.0 | 208/3 | 1,2,3 |
| VAV-110 | KRUEGER | LMHS | 10 | 680 | 680 | 680 | 680 | 8.5 | 208/3 | 1,2,3 |
| VAV-111 | KRUEGER | LMHS | 6 | 320 | 320 | 320 | 320 | 4.0 | 208/3 | 1,2,3 |
| VAV-112 | KRUEGER | LMHS | 10 | 450 | 750 | 580 | 580 | 7.5 | 208/3 | 1,2,3 |
| VAV-113 | KRUEGER | LMHS | 10 | 550 | 550 | 550 | 550 | 8.5 | 208/3 | 1,2,3 |
| VAV-114 | KRUEGER | LMHS | 10 | 410 | 680 | 410 | 410 | 4.5 | 208/3 | 1,2,3 |
| VAV-115 | KRUEGER | LMHS | 10 | 195 | 195 | 195 | 195 | 2.0 | 208/3 | 1,2,3 |

REMARKS:
1. PROVIDE WITH TERMINAL BOX CONTROLLER MATCHING SPECIFIED AND APPROVED BUILDING AUTOMATION CONTROLS SYSTEM NETWORK WITH DIGITAL READOUT THERMOSTAT.
2. PROVIDE WITH FIBER-FREE INTERNAL 1" CELLULAR INSULATION LINER, SOUND ATTENUATOR, 24V CONTROLS TRANSFORMER, HANGER BRACKETS, AND NEMA 1 STEEL ENCLOSURE.
3. HEATING WATER COIL PERFORMANCE SHALL BE BASED ON 140-DEG-F EVT AND 30-DEG-F DELTA, LIMITED TO 5' OF WPD AND 0.10" APD WITH MINIMUM 4-ROW HEATING COIL.

ELECTRIC UNIT HEATER SCHEDULE (EUH-X)

| MARK | MANUFACTURER | MODEL | INPUT (KW) | AIRFLOW (CFM) | VOLTAGE | PHASE | FLA | WEIGHT | REMARKS |
|-------|--------------|-----------------|------------|---------------|---------|-------|-----|--------|---------|
| EUH-1 | INDEECO | CUI #922U03000D | 3.0 | 250 | 208 | 3 | 9.7 | 115 | 1,2 |
| EUH-2 | INDEECO | CUI #922U03000D | 3.0 | 250 | 208 | 3 | 9.7 | 115 | 1,2 |

REMARKS:
1. PROVIDE WITH FACTORY MOUNTED AND WIRED DISCONNECT.
2. PROVIDE WITH REMOTE-MOUNTED LOW-VOLTAGE THERMOSTAT, FAN ON/AUTO SWITCH, AND CEILING MOUNTING BOX/KIT.

DUCTWORK SCHEDULE

| MARK | SERVICE | DUCT MATERIAL | PRESSURE CLASS | INSULATION | REMARKS |
|------|---|------------------|----------------|-------------------------------|---------|
| 1 | CONCEALED SUPPLY DUCT UPSTREAM OF VAV'S | GALVANIZED STEEL | 6" | EXTERNAL, 2" DUCTWRAP | 1,2 |
| 2 | CONCEALED SUPPLY DUCT DOWNSTREAM OF VAV'S | GALVANIZED STEEL | 2" | EXTERNAL, 2" DUCTWRAP | 1 |
| 3 | EXPOSED SUPPLY DUCTWORK | DOUBLE WALL | 2" | INTERNAL, 1" | 1 |
| 4 | RETURN DUCTWORK | GALVANIZED STEEL | 2" | INTERNAL, 1" ACOUSTICAL LINER | 1 |
| 5 | GENERAL EXHAUST DUCTWORK | GALVANIZED STEEL | 2" | NONE | 1,3 |
| 6 | EXTERIOR DUCTWORK | GALVANIZED STEEL | 10" | 2" RIGID BOARD | 1,2,4 |

REMARKS:
1. DUCT REQUIREMENTS FOR A GIVEN CONDITION ARE AS INDICATED UNLESS NOTED OTHERWISE.
2. DUCTWORK SHALL BE LEAK TESTED.
3. EXHAUST AIR DUCTWORK SHALL BE INSULATED WITH EXTERNAL 2" DUCTWRAP FROM EXTERIOR PENETRATION TO 1' PAST UPSTREAM ISOLATION DAMPER.
4. WRAP DUCTWORK WITH VENTURECLAD 1579G CW NATURAL ALUMINUM FLAT LAMINATE JACKET.

GRILLE AND DIFFUSER SCHEDULE

| MARK | MANUFACTURER | MODEL | SERVICE | OVERALL SIZE | NECK SIZE | REMARKS |
|------|--------------|-------|---------|--------------|-----------|---------|
| S6 | PRICE | SPD | SUPPLY | 24x24 | 6" DIA. | 1,2,3,4 |
| S8 | PRICE | SPD | SUPPLY | 24x24 | 8" DIA. | 1,2,3,4 |
| S10 | PRICE | SPD | SUPPLY | 24x24 | 10" DIA. | 1,2,3,4 |
| S12 | PRICE | SPD | SUPPLY | 24x24 | 12" DIA. | 1,2,3,4 |
| S14 | PRICE | SPD | SUPPLY | 24x24 | 14" DIA. | 1,2,3,4 |
| R22 | PRICE | PDDR | RETURN | 24x24 | 22x22 | 1,2,3,4 |

REMARKS:
1. SEE DRAWINGS FOR ACTUAL DESIGN AIRFLOW.
2. NOISE CRITERIA SHALL NOT EXCEED 20.
3. PROVIDE IN WHITE FACTORY FINISH UNLESS NOTED OTHERWISE.
4. EACH AIR TERMINAL DEVICE SHALL BE PROVIDED WITH A DUCT-MOUNTED BALANCE DAMPER AT BRANCH TAP.

AIR CURTAIN SCHEDULE (AC-X)

| MARK | MANUFACTURER | MODEL | NOZZLE WIDTH (IN) | MAX FPM AT NOZZLE | AVG. OUTLET VELOCITY FPM | AIRFLOW RATE (CFM) | OUTLET VELOCITY UNIFORMITY | POWER RATING (KW) | NUMBER OF MOTORS | MOTOR HP | HEATER KW | TEMP RISE (F) | VOLTAGE | PHASE | WEIGHT | REMARKS |
|------|--------------|----------|-------------------|-------------------|--------------------------|--------------------|----------------------------|-------------------|------------------|----------|-----------|---------------|---------|-------|--------|---------|
| AC-1 | POWERED AIR | EVE-148E | 48 | 3356 | 1386 | 1344 | 85% | 0.33 | 1 | 1/5 | 16 | 38 | 208 | 3 | 77 | 1,2 |

REMARKS:
1. PROVIDE WITH FACTORY MOUNTED AND WIRED DISCONNECT.
2. PROVIDE WITH INTEGRAL THERMOSTAT, FAN ON/AUTO SWITCH, AND SURFACE MOUNTING BOX/KIT.

AIR-COOLED CONDENSING UNIT SCHEDULE (CU-X)

| MARK | MANUFACTURER | MODEL | COOLING CAPACITY (BTU/H) | AIRFLOW RATE (CFM) | COOLING AIR TEMP (F) MIN / MAX | COMPRESSOR MODEL | COMPRESSOR OIL (TYPE / CHARGE) | MATED INDOOR UNIT | REFRIGERANT | SEER2 | POWER FACTOR / SENS. HEAT FACTOR | MCA | MOCP | VOLTAGE | PHASE | WEIGHT (LBS) | REMARKS |
|------|--------------|----------------|--------------------------|--------------------|--------------------------------|------------------|--------------------------------|-------------------|-------------|-------|----------------------------------|------|------|---------|-------|--------------|-----------|
| CU-1 | MITSUBISHI | TPKAA0361KA80A | 36,000 | 3,880 | 115 DB / 40 DB | MNB33FBRMC-L | FV505 / 45 | DFS-1 | R410A | 19.4 | 96.5 / 0.70 | 25.0 | 31.0 | 208 | 1 | 243 | 1,2,3,4,5 |

REMARKS:
1. DISCONNECT SWITCH SHALL BE FURNISHED, SET, AND WIRED BY THE EC.
2. FURNISH WITH SINGLE POINT ELECTRICAL CONNECTION.
3. PERFORMANCE BASED ON 95-DEG-F AMBIENT TEMPERATURE.
4. CONDENSING UNIT TO BE OF THE SAME MANUFACTURER AS EVAPORATOR UNIT.
5. FURNISH WITH ADVANCED WIND BAFFLE KIT FOR OPERATION DOWN TO MINIMUM 20-DEG-F AMBIENT TEMPERATURE.

HUMIDIFIER SCHEDULE (HUM-X)

| MARK | MANUFACTURER | MODEL | TYPE | LBS/HR | SPACE DESIGN | NO. CYLINDERS | VOLTAGE | PHASE | KW | MCA | MOCP | FULL WEIGHT | REMARKS |
|-------|--------------|-------|-----------|--------|----------------|---------------|---------|-------|-----|------|------|-------------|---------|
| HUM-1 | CONDAIR | EL | ELECTRODE | 5.5 | 72 DB / 40% RH | 1 | 120 | 1 | 2.0 | 16.8 | 25 | 113 | 1,2,3 |
| HUM-2 | CONDAIR | EL | ELECTRODE | 5.5 | 72 DB / 40% RH | 1 | 120 | 1 | 2.0 | 16.8 | 25 | 113 | 1,2,3 |
| HUM-3 | CONDAIR | EL | ELECTRODE | 5.5 | 72 DB / 40% RH | 1 | 120 | 1 | 2.0 | 16.8 | 25 | 113 | 1,2,3 |

REMARKS:
1. EC TO PROVIDE AND INSTALL DISCONNECT.
2. PROVIDE WITH FACTORY HUMIDISTAT.
3. PROVIDE WITH BACNET NETWORK INTERFACE COMMUNICATION PROTOCOL, INTEGRAL DISCHARGE MANIFOLD, USER-INTERFACE CONTROLLER, AND DRAIN COOLER.

FAN COIL UNIT SCHEDULE (DFS-X)

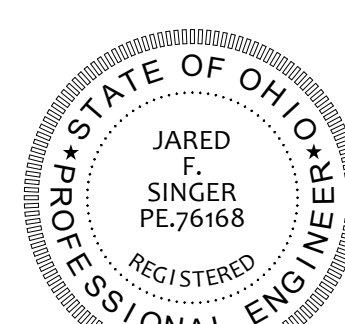
| MARK | MANUFACTURER | MODEL | AIRFLOW RATE AT COOLING, DRY (CFM) | AIRFLOW RATE AT COOLING, WET (CFM) | AIRFLOW RATE AT HEATING, DRY (CFM) | SOUND PRESS. LEVEL, COOLING DB(A) | SOUND PRESS. LEVEL, HEATING DB(A) | COOLING INTAKE AIR TEMP DB / WB | MCA | WEIGHT (LBS) | REMARKS |
|-------|--------------|-----------------|------------------------------------|------------------------------------|------------------------------------|-----------------------------------|-----------------------------------|---------------------------------|-----|--------------|---------|
| DFS-1 | MITSUBISHI | TRUYA0301KA70NA | 705-810-920 | 705-810-920 | 705-810-920 | 43-46-49 | 43-46-49 | 66 / 59 | 1.0 | 51 | 1,2,3,4 |

REMARKS:
1. FURNISH WITH FACTORY MOUNTED AND WIRED DISCONNECT SWITCH.
2. FURNISH WITH WIRED WALL THERMOSTAT.
3. SCHEDULED PERFORMANCE IS WITH MOTOR RUNNING AT HIGH SPEED.
4. FURNISH WITH CONDENSATE PUMP AND NETWORK CARD FOR INTEGRATION INTO THE BAS.

ELECTRIC WALL HEATER SCHEDULE (EWH-X)

| MARK | MANUFACTURER | MODEL | INPUT (KW) | AIRFLOW (CFM) | VOLTAGE | PHASE | FLA | REMARKS |
|-------|--------------|----------------|------------|---------------|---------|-------|-----|---------|
| EWH-1 | INDEECO | WAI 932U01500V | 1.125 | 160 | 208 | 1 | 5.8 | 1,2 |
| EWH-1 | INDEECO | WAI 932U01500V | 1.125 | 160 | 208 | 1 | 5.8 | 1,2 |

REMARKS:
1. PROVIDE WITH FACTORY MOUNTED AND WIRED DISCONNECT.
2. PROVIDE WITH INTEGRAL THERMOSTAT, FAN ON/AUTO SWITCH, AND SURFACE MOUNTING BOX/KIT.



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THIS DWG : HVAC SPECIFICATIONS - PART 1

COMM DATE 23144 06-17-2024

DWG 2-M6.0



- ALUMINUM STATOR HOUSING, STAINLESS STEEL CARTRIDGE, NON-METALLIC IMPELLER, CERAMIC BEARINGS AND SHAFT, EPDM O-RING AND GASKETS, MIN/MAX FLUID TEMPERATURE OF 40°/110°F, 125 PSIG MAX WORKING PRESSURE, UL LISTED, NSF LOW-LEAD COMPLIANT, DIRECT-WIRED. APPROVED MANUFACTURERS: BELL & GOSSETT, GRUNDFOSS, TACO.
- MASTER THERMOSTATIC MIXING VALVES
 - 1. MASTER DOMESTIC HOT WATER PLANT MIXING VALVES SHALL LOW LEAD BRASS, TAMPER RESISTANT WITH SAFETY LOCK NUT, REPLACEABLE CARTRIDGE, STAINLESS STEEL CHECK STOP SEATS, RATED TO 125 PSIG, ASSE 1019 LISTED. APPROVED MANUFACTURERS: ARMSTRONG, SYMMONS.
- REDUCED PRESSURE ZONE ASSEMBLY (ASSE 1019 LISTED)
 - 1. DOUBLE CHECK VALVE, 1/2" NPT, BRASS BODY, REPLACEABLE SEATS AND SEAT DISCS, TOP MOUNTED BALL VALVE TEST COCKS, LOW PRESSURE DROP. APPROVED MANUFACTURER: AMES, FEBCO, WATTS
- HVAC DUCTWORK SYSTEMS
 - 1. DUCTWORK AND FITTINGS
 - 1. SEE HVAC SYMBOL SCHEDULE UNLESS NOTED OTHERWISE.
 - 2. RECTANGULAR DUCTWORK ELBOWS SHALL BE MADE WITH RADIUS ELBOWS EQUAL TO 1+1/2 TIMES THE DUCT WIDTH TURNING RADIUS OR WITH SQUARE ELBOWS WITH AIRFLOW TURNING VANE.
 - 3. RECTANGULAR BRANCH DUCT TAKEOFFS SHALL BE MADE WITH 45° LEAD IN BOOTS.
 - 4. ROUND DUCTWORK ELBOWS SHALL BE MADE WITH 5-PIECE ADJUSTABLE OR DIE-FORMED STAMPED 1-1/2 TIMES THE DIAMETER TURNING RADIUS.
 - 5. ROUND DUCT TAKEOFFS SHALL BE MADE WITH 45° LEAD IN BOOTS OR CONICAL TAPS.
 - 6. ALL STRAIGHT TAPS ARE PROHIBITED.
 - 7. ALL DUCTWORK SHALL BE CONSTRUCTED AND INSTALLED PER SMACNA REQUIREMENTS.
 - 8. DUCTWORK SHALL BE GRADE 1 PRIME GALVANIZED SHEET METAL OF LOCK FORMING QUALITY. FLEXIBLE DUCTWORK SHALL BE LISTED UL 181 WITH FLAME SPREAD 1. SMOKE SPREAD EQUAL TO OR LESS THAN 25/50 AND SHALL BE INSULATED WITH 2" THICK FIBERGLASS WITH FOL SCRIM FACE. UTILIZE 0" PRESSURE CLASS ON LOW PRESSURE SYSTEMS AND 10" PRESSURE CLASS ON HIGH PRESSURE SYSTEMS. EXTERIOR DUCTWORK SHALL BE BLACK, FIRE-RETARDANT TYPE PER ASTM C91. MARINE HARDENING OR CRACKING. FLEXIBLE DUCTWORK SHALL NOT BE USED ON NEGATIVE PRESSURE SYSTEMS. APPROVED MANUFACTURERS: CLEVAFLUX, FLEXMASTER, THERMAFLEX.
 - 9. ACOUSTICAL DUCTWORK LINING SHALL BE ASTM C107 TYPE 2 LISTED, RIGID FIBERGLASS WITH ANTI-STATIC PROPERTY. FIBERGLASS LINING SHALL BE 1/2" THICK. MAXIMUM WORKING TEMPERATURE SHALL BE 180°F. AIR VELOCITY OF 6,000 FPM PER ASTM C107. WATER REPELLENCY AS PER INDA ST 8.6. FLAME SPREAD 1/ SMOKE SPREAD INDEX 25/50, MEETING SMACNA AND ASHRAE 61 REQUIREMENTS, GREEN GUARD CERTIFIED, NRC 0.9 (R6) AND R-VALUE OF 6.3 PER 1.5 INCH. APPROVED MANUFACTURERS: JOHNS MANVILLE, KNAUF, OWENS CORNING.
 - 10. ALL EXPOSED DUCTWORK SHALL BE PAINTED COLOR SPECIFIED BY THE ARCHITECT UNLESS NOTED OTHERWISE. EXPOSED DUCTWORK WITHIN MECHANICAL ROOMS IS NOT REQUIRED TO BE PAINTED.
 - 2. UNLESS NOTED OTHERWISE, BALANCING DAMPERS SHALL BE SINGLE BLADE TYPE, SYNTHETIC BEARING, RATED FOR ASSOCIATED PRESSURE CLASS AND VELOCITY, 180°F MAXIMUM TEMPERATURE, MINIMUM 20 GAUGE FRAME AND BLADE, CONSTRUCTED PER SMACNA REQUIREMENTS, WITH EXTENDED DAMPER SPACINGS.
 - 3. WHERE DIFFUSER OR GRILLE AIRFLOWS ARE INDICATED ON THESE DRAWINGS, DAMPERS SHALL BE PROVIDED WHETHER SPECIFICALLY INDICATED OR NOT.
 - 4. APPROVED MANUFACTURERS: GREENHECK, POTTFORF, RUSKIN, YOUNG REGULATOR
- GRILLES AND DIFFUSERS
 - 1. UNLESS NOTED OTHERWISE, GRILLES AND DIFFUSERS, TRANSITIONS, HANGERS, AND OTHER APPURTENANCES AS INDICATED ON THE DRAWINGS AND IN ACCORDANCE WITH THE PROJECT SCHEDULE REQUIREMENTS SHALL BE PERMANENTLY MOUNTED TO THE CEILING OR WALL. APPROVED MANUFACTURERS: GREENHECK, POTTFORF, RUSKIN, YOUNG REGULATOR.
- FORWARD CURVED WHEEL, ODP MOTOR MOUNTED ON VIBRATION ISOLATION, PERMANENTLY LUBRICATED BEARINGS, GALVANIZED STEEL CONSTRUCTION, INTERNALLY LINED WITH ACOUSTICAL INSULATION, THERMAL OVERLOAD PROTECTION, SPRING-LOADED ALUMINUM BACK-DRAFT DAMPER, AMERICAN STANDARD, KOHLER, MANSFIELD, TOTO.
- APPROVED MANUFACTURERS: COOK, GREENHECK.
- TERMINAL BOXES
 - 1. TERMINAL BOXES SHALL BE, VARIABLE AIR VOLUME OF STYLE, SEES, CAPACITIES AND WITH OPTIONS AS SHOWN ON THE DRAWINGS. TERMINAL BOXES SHALL BE CERTIFIED UNDER THE ARI STANDARD 880-94 CERTIFICATION PROGRAM AND CARRY THE ARI SEAL.
 - 2. THE TERMINAL BOX CASING SHALL BE MINIMUM 22 GAUGE GALVANIZED STEEL, INTERNALLY LINED WITH 1/2" DENSITY, FIBERGLASS INSULATION. TERMINAL BOXES SHALL BE 1/2" LB. DENSITY. ALL EXPOSED INSULATION SHALL BE NON-FIBROUS, OR FIBERGLASS INSULATION SHALL BE SEALED FROM THE AIRSTREAM WITH A FOIL REINFORCED LINER OR SOLID METAL LINING. THIS DISCHARGE CONNECTION SHALL BE SLIP AND DRAIN CONSTRUCTION FOR ATTACHMENT TO THE DRAIN.
 - 3. THE DAMPER SHALL BE HEAVY GAUGE STEEL WITH SHAFT ROTATING IN DELRIN OR BRASS OILITE SELF-LUBRICATING BEARINGS. NYLON BEARINGS ARE NOT ACCEPTABLE. SHAFT SHALL BE CLEARLY MARKED ON THE END TO INDICATE DAMPER POSITION. STICKERS OR OTHER REMARKING MARKINGS ARE NOT ACCEPTABLE. THE DAMPER SHALL BE CLEARLY MARKED WITH THE DAMPER POSITION TO PREVENT OVERSTROKING AND A SYNTHETIC SEAL TO MINIMIZE CLOSURE-OFF LEAKAGE.
 - 4. ACTUATORS SHALL BE CAPABLE OF SUPPLYING AT LEAST 35 IN.-LB. OF TORQUE TO THE DAMPER SHAFT FOR 15 MINUTES OF OPERATION. THE DAMPER SHALL BE CLEARLY MARKED FOR SERVICE ACCESS.
 - 5. AT AN INLET VELOCITY OF 2000 FPM, THE DIFFERENTIAL STATIC PRESSURE REQUIRED TO OPERATE ANY TERMINAL SIZE SHALL NOT EXCEED 0.15" W.G. FOR THE BASIC TERMINAL BOX.
 - 6. THE PNEUMATIC INLET VELOCITY SENSORS SHALL BE MULTI-PORT CENTER AVERAGE TYPE, WITH A MICROBIAL POLYMER FILTRATION PORTS PARALLEL TO THE TAKE-OFF POINT FROM THE SENSOR. SENSORS WITH MEASURING PORTS IN SERIES ARE NOT ACCEPTABLE. THE SENSORS MUST PROVIDE A MINIMUM DIFFERENTIAL PRESSURE SIGNAL OF 0.03 IN. W.G. AT INLET VELOCITIES OF 500 FEET PER MINUTE. ALL PNEUMATIC INLET VELOCITY SENSORS SHALL BE UL LISTED FIRE RETARDANT TYPE. TERMINAL BOX CONTROLS SHALL BE COMPATIBLE WITH PNEUMATIC INLET VELOCITY SENSORS SUPPLIED BY THE TERMINAL BOX MANUFACTURER.
 - 7. SOUND RATINGS FOR THE TERMINAL BOX SHALL NOT EXCEED 35 NC AT 1.0" STATIC PRESSURE. SOUND PERFORMANCE SHALL BE AS FOLLOWS:
 - 1. THE ELECTRIC HEATING COIL SHALL BE ETL LISTED TO UL1995 AND CSA 22.2 NO. 236, AND PROVIDED BY THE TERMINAL UNIT MANUFACTURER.
 - 2. THE ELECTRIC COIL CASING SHALL BE CONSTRUCTED FROM A MINIMUM 20 GAUGE, 0.038 INCH THICK GALVANIZED STEEL.
 - 3. THE HEATING ELEMENTS SHALL BE OPEN WIRE NICKEL CHROME CONSTRUCTION, SUPPORTED BY CERAMIC INSULATORS.
 - 4. THE INTEGRAL CONTROL PANEL SHALL BE A NEMA 30, TYPE 1 ENCLOSURE WITH HINGED ACCESS DOOR FOR ACCESS TO ALL CONTROLS AND SAFETY DEVICES.
 - 5. THE ELECTRIC COILS SHALL BE PROVIDED WITH A PRIMARY AUTOMATIC RESET THERMAL CUTOFF, SECONDARY MANUAL THERMAL RESET, AND AN ELECTRICAL FAN INTERLOCK TO PREVENT HEATER OPERATION WHILE THE HEATING ELEMENTS ARE HOT.
 - 6. MAGNETIC CONTACTORS SHALL BE SUPPLIED FOR EACH STAGE OF HEAT.
 - 7. THE ELECTRIC COILS SHALL BE PROVIDED WITH A DOOR COMPLETE WITH INTERLOCKING DISCONNECT SWITCH.
 - 8. THE ELECTRIC COILS SHALL BE PROVIDED WITH A SILICON CONTROLLED RECTIFIER (SCR) CONTROLLER.
 - 8. ACCEPTABLE MANUFACTURERS: KRUEGER, TITUS, PRICE
 - 9. HEATING ELEMENTS – STEEL FINNED TUBULAR ELEMENTS.
 - 1. OUTLET GRILLE – THE WAI HAS AN ARCHITECTURAL EXTRUDED ALUMINUM GRILLE WITH COLOR SELECTED BY THE ARCHITECT WITH CLOSELY SPACED, HEAVY BAR FINNED AND CONCEALED TAMPERPROOF THERMOSTATS FROM THE SPRING AND BEHIND FRONT COVER.
 - 2. BUILT-IN CONTROLS – AUTOMATIC RESET THERMAL CUTOFF, OVERTEMPERATURE WARNING LIGHT, FAN OVERRIDE AND TAMPERPROOF THERMOSTAT.
 - 3. FAN MOTOR – PERMANENTLY LUBRICATED, TOTALLY ENCLOSED MOTOR.
 - APPROVED MANUFACTURERS: INDEFECO, MARLEY, STERLING.
- FACTORY TEST
 - 1. FACTORY-ASSEMBLED UNITS, THE REFRIGERANT CIRCUIT SHALL BE PRESSURE-TESTED, EVACUATED, AND FULLY CHARGED WITH REFRIGERANT AND OIL.
 - 2. ON FACTORY-ASSEMBLED UNITS, THE UNIT CONTROLLER SHALL BE CONFIGURED AND RUN TESTED AT THE FACTORY TO MINIMIZE FIELD SETUP TIME.
 - 3. IF THE UNIT IS NOT CONFIGURED AND TESTED, THEN THE MANUFACTURER SHALL PROVIDE FIELD START-UP AND TESTING TO ENSURE THAT THE CONTROLLER IS FUNCTIONING PROPERLY.
- UNIT CONSTRUCTION
 - 1. BASE SHALL BE THE UNIT SHALL INCLUDE AN INTEGRAL DESIGN BASE RAIL WITH LIFTING POINTS CLEARLY MARKED AND VISIBLE ON THE BASE RAIL AND A 1/4 INCH FEMALE PIPE THREAD (FPT) CONNECTION FOR CONDENSATE DRAINAGE. THE UNIT BASE SHALL BE DESIGNED WITH A RECESSED CURB MOUNTING LOCATION. THE RECESSED CURB MOUNTING SURFACE SHALL PROVIDE A

- FIRE SUPPRESSION SYSTEM
 - 1. PIPING, FITTINGS, AND VALVES
 - 1. SEE FIRE SUPPRESSION SYMBOL SCHEDULE UNLESS NOTED OTHERWISE.
 - SPRINKLER HEADS
 - 1. ALL SPRINKLER HEADS SHALL BE NEW UNLESS NOTED OTHERWISE.
 - 2. TEMPERATURE RATING OF HEADS SHALL BE 165 DEGREES FAHRENHEIT UNLESS NOTED OTHERWISE.
 - 3. SPRINKLER HEADS SHALL BE UL LISTED AND FM APPROVED, MEETING NFPA REQUIREMENTS.
 - 4. SPRINKLER HEADS SHALL BE QUICK RESPONSE TYPE AND SHALL MATCH EXISTING HEADS INSTALLED IN ADJACENT AREAS.
 - 5. SPRINKLER HEADS INSTALLED IN CEILINGS, INCLUDING BULKHEADS, SOFFITS, ETC., BELOW 8'-0" SHALL BE CONCEALED WITH COVER PLATE COLOR MATCHING CEILING FINISH COLOR.
 - 6. SPRINKLER TYPE, COLOR, AND MANUFACTURER SHALL BE APPROVED BY THE OWNER, ARCHITECT, AND ENGINEER DURING THROUGH THE SUBMITTAL REVIEW PROCESS.
 - 7. APPROVED MANUFACTURERS: CENTRAL, RELIABLE, STARR, VIKING
 - FLOW SWITCHES
 - 1. PROVIDE RED POTTER ROEMER OR EQUIVALENT VIKING TAMPER PROOF SWITCH HOUSING WITH FLOW PADDLE WITH SIZE MATCHING ASSOCIATED PIPING, TWO SINGLE-POLE, DOUBLE-THROW MICROSWITCHES TO OPERATE SEPARATE CIRCUITS. COORDINATE FINAL VOLTAGE WITH FIRE ALARM SYSTEM WITH FINAL WIRING BY ELECTRICAL CONTRACTOR.
 - TAMPER SWITCHES
 - 1. PROVIDE RED POTTER ROEMER OR EQUIVALENT VIKING NOTIFIER MATCHING MONITORED VALVE ASSEMBLY TYPE (OST, BALL VALVE, ETC) WITH TWO SINGLE-POLE, DOUBLE-THROW MICROSWITCHES TO OPERATE SEPARATE CIRCUITS. COORDINATE FINAL VOLTAGE WITH FIRE ALARM SYSTEM WITH FINAL WIRING BY ELECTRICAL CONTRACTOR.
- PLUMBING SYSTEMS
 - 1. PIPING, FITTINGS, VALVES, AND SPECIALTIES
 - 1. SEE PLUMBING SYMBOL SCHEDULE UNLESS NOTED OTHERWISE.
 - 2. ALL INTERIOR AND EXTERIOR GAS PIPING SHALL BE PAINTED EXTERIOR COLOR SELECTED BY THE ARCHITECT UNLESS NOTED OTHERWISE.
 - 3. PUSH-TO-CONNECT COLD-PRESS STYLE GAS FITTINGS ARE NOT PERMITTED.
 - 4. PROVIDE SHUT-OFF VALVES ON ALL PLUMBING EQUIPMENT PIPING CONNECTIONS. BALANCING VALVES WITH INTEGRAL BALL OR BUTTERFLY VALVES ARE ACCEPTABLE FOR THIS USE.
 - 5. FITTINGS SHALL BE FACTORY-FORMED AND NOT ALTERED IN ANY WAY. MITERED JOINTS ARE PROHIBITED. LEAKING JOINTS SHALL BE REPAIRED WITH NEW PIPING AND FITTINGS. SOLDERED JOINTS SHALL BE REWORKED BY RE-SOLDERING OR REPLACING ENTIRELY. WELDED JOINTS SHALL BE CHIPPED OR GROUND AWAY AND RE-WELDED. THE USE OF ANY FILLER, CAULKING, PUTTY TO STOP LEAKING PIPES IS PROHIBITED.
 - 6. PROVIDE UNIONS AT ALL LOCATIONS WHERE PIPING SERVICES EQUIPMENT, COILS, AND PIPING SPECIALTIES TO PERMIT REMOVAL, REPLACEMENT, SERVICING, AND CLEANING. UNIONS SHALL BE INSTALLED IN COORDINATION WITH THE STATE AND LOCAL HEALTH DEPARTMENTS TO PERMIT REMOVAL OR REPLACEMENT THROUGH REMOVAL OF A SINGLE ASSEMBLY OF PIPING ON EACH HYDRONIC CONNECTION.
 - 7. PROVIDE TEMPERATURE AND PRESSURE (T&P) WATER RELIEF VALVES WITH ASSOCIATED DISCHARGE PIPING TO FLOOR DRAIN ON ALL HOT WATER GENERATION EQUIPMENT.
 - 8. PROVIDE CHECK PIPING ON ALL PUMP DISCHARGE. HORIZONTAL PIPING SHALL BE SWING-STYLE CHECK VALVES VERTICAL VALVES SHALL BE SILENT CHECK VALVES AND SHALL BE INSTALLED WHERE FLUID FLOW IS UPWARD. VERTICAL CHECK VALVES SHALL NOT BE INSTALLED IN VERTICAL SECTIONS OF PIPE WHEN FLOW IS DOWNWARD.
 - 9. WHERE EQUIPMENT FLUID FLOWS ARE INDICATED ON THESE DRAWINGS, WATER FLOW CONTROL VALVES SHALL BE PROVIDED WHETHER SPECIFICALLY INDICATED OR NOT.
 - 10. FUTURE STOPS SHALL BE QUARTER TURN PRECISION MACHINED BRASS BALL, PTFE SEALS, HIGH-TEMPERATURE O-RINGS, SINGLE PIECE MACHINED BRASS BODY, BLOW-OUT PROOF CHROME-PLATED BRASS STEM, REMOVABLE METAL HANDLE, AND 100% LEAK TESTED. INCLUDE ESCUTCHEONS AT ALL VISIBLE WALL PIPING PENETRATIONS, INCLUDING THOSE WITHIN CABINET BASES.
 - 11. ALL SINK AND LAVATORY DRAINS SHALL BE SUPPLIED WITH GRID STRAINERS UNLESS NOTED OTHERWISE.
 - PLUMBING FIXTURES
 - 1. WATER CLOSETS
 - 1. VITREOUS CHINA, HIGH EFFICIENCY, LOW CONSUMPTION (1.1-1.6 GPF), FULLY GATED TRAPWAY, ELONGATED BOWL, AND OPEN FRONT FLIP DOWN SEAT. COORDINATE SPUD LOCATION, MOUNTING TYPE, AND ADA REQUIREMENT WITH DRAWINGS. APPROVED MANUFACTURERS: AMERICAN STANDARD, KOHLER, MANSFIELD, TOTO.
 - 2. URINALS
 - 1. VITREOUS CHINA, HIGH EFFICIENCY, LOW CONSUMPTION (0.125-1.0 GPF), FULLY GATED TRAPWAY. COORDINATE ADA MOUNTING HEIGHT WITH DRAWINGS. APPROVED MANUFACTURERS: AMERICAN STANDARD, KOHLER, MANSFIELD, SLOAN.
 - 3. FIXTURE CARRIERS
 - 1. FIXTURE CARRIERS SHALL BE COORDINATED WITH ASSOCIATED FIXTURE AS APPROVED DURING THE SUBMITTAL PROCESS. INCLUDE CARRIERS THAT ARE ADJUSTABLE TO MEET MULTIPLE INSTALLATION REQUIREMENTS AND SUPPORT FEET WITHIN WALL SPACE UNLESS NOTED OTHERWISE.
 - FLUSH VALVES
 - 1. LOW CONSUMPTION MATCHING FIXTURE SCHEDULE, ADJUSTABLE TALLIECE, HIGH COPPER/LOW ZINC BRASS CASTINGS FOR DEZINCIFICATION RESISTANT PER ASTM, COMPLIANCE WITH ASSE 1073 AND ADA LISTED. APPROVED MANUFACTURERS: AMERICAN STANDARD, KOHLER, MOEN, SLOAN
 - LAVATORY SINKS
 - 1. VITREOUS CHINA, FRONT OVERFLOW, D-SHAPED BOWL WITH SELF-DRAINING DECK AREA AND COUNTERTOP BACK AND SIDE SPLASH GUARDS, ADA LISTED. INCLUDE GRID STRAINER, TALLIECE, AND INSULATION. COORDINATE MOUNTING TYPE, NUMBER OF HOLES, AND SPACING WITH PLUMBING TRIM INDICATED ON SCHEDULE. APPROVED MANUFACTURERS: AMERICAN STANDARD, ELKAY, JUST, KOHLER, MANSFIELD, MOEN.
 - STAINLESS STEEL SINKS
 - 1. STAINLESS STEEL SINKS SHALL BE FINISHED IN SATIN FINISH, 18 GAUGE, 304 STAINLESS, REAR CENTER DRAIN PLACEMENT, ADA LISTED. INCLUDE GRID STRAINER, TALLIECE, AND INSULATION. COORDINATE MOUNTING TYPE, NUMBER OF HOLES, AND SPACING WITH PLUMBING TRIM INDICATED ON SCHEDULE. APPROVED MANUFACTURERS: ELKAY, JUST, KOHLER, MOEN.
 - FAUCETS
 - 1. UNLESS NOTED OTHERWISE, FAUCETS SHALL BE SOLID BRASS CHROME PLATED, CERAMIC CARTRIDGE QUARTER TURN WIPER BLADE HANDLE OPERATION WITH AERATOR APPROVED BY THE LOCAL HEALTH DEPARTMENT, GOOSENECK SPOUT, ADA LISTED. APPROVED MANUFACTURERS: CHICAGO FAUCETS, KOHLER, MOEN.
 - CLEANOUTS
 - 1. CLEANOUTS SHALL BE FULL LINE SERVICE SIZE UNLESS NOTED OTHERWISE. APPROVED MANUFACTURERS: JR SMITH, WATTS, ZURN
 - FLOOR AND AREA DRAIN
 - 1. FLOOR SINKS SHALL BE CAST IRON RECEPTOR BODY WITH A WHITE ACID RESISTANT ENAMEL INTERIOR AND ANTI-SPLASH DOME STRAINER. COORDINATE FLOOR SINK FLANGE WITH FLOOR TYPE.
 - 2. INSTALL DRAINS WITH WATERPROOF ASSEMBLIES WITH FLASHING RISNG. FLOOR DRAINS SHALL INCLUDE FULL-SIZE TRAPS.
 - 3. FLOOR DRAINS SHALL HAVE REMOVABLE TOP CRATED RATED FOR 2,000-LB STATIC LOAD WITH TRAP SEALER, NICKEL BRONZE STRAINER, AND CAST IRON BODY. COORDINATE OUTLET TYPE WITH PIPING CONNECTION METHOD. APPROVED MANUFACTURERS: JR SMITH, WATTS, ZURN
 - 4. ROOF DRAINS SHALL BE MECHANICAL TYPE (THREADED, NO-HUB, GROOVED).
 - MOP BASINS
 - 1. MOLDED FROM ONE-PIECE HIGH IMPACT STRUCTURAL FIBERGLASS, SELF-DRAINING REMOVABLE STRAINER, 3" MOLDED-IN DRAIN, OFF-WHITE FINISH FINISHED, WITH WALL-MOUNTED ADA WRIST BLADE TWO HANDLE SERVICE VACUUM BREAKER MOP FAUCET WITH 3/4" GARDEN HOSE OUTLET, PAIL HOOK AND WALL BRACKET WITH SERVICE HOSE AND HOLDER. APPROVED MANUFACTURERS: HANGAR, STAINLESS STEEL BUMPER GUARDS, TWO-PANEL STAINLESS WALL GUARDS. APPROVED MANUFACTURERS: AMERICAN STANDARD, EL MUSTEE, FIAT
 - LAUNDRY TUBS
 - 1. MOLDED FROM ONE-PIECE HIGH IMPACT STRUCTURAL FIBERGLASS, FLOOR MOUNT WITH LEGS, SINGLE 18 GALLON BOWL, 13" DEEP TUB, INTEGRALLY MOLDED-IN DRAIN WITH STOPPER, 1/2" DRAIN CONNECTION, SLOPED AND SELF-DRAINING BACK SHELF, MOLD AND MILDEW RESISTANT, OFF-WHITE FINISH, WITH WALL-MOUNTED ADA WRIST BLADE TWO HANDLE SERVICE VACUUM BREAKER MOP FAUCET WITH 3/4" GARDEN HOSE OUTLET. APPROVED MANUFACTURERS: EL MUSTEE, FIAT.
 - SERVICE SINKS
 - 1. WALL HUNG, 14 GAUGE, 304 STAINLESS STEEL, SINGLE 19-GALLON BOWL, 2" DEEP TUB, INTEGRAL HIGH BACK SPLASH WITH BACK SPLASH-MOUNTED ADA WRIST BLADE TWO HANDLE SERVICE VACUUM BREAKER MOP FAUCET WITH 3/4" GARDEN HOSE OUTLET, 3/16" DRAIN SIZE, CAST IRON P-FOR 6 HOURS.
 - 2. NATURAL GAS SHALL BE TESTED PER THE INTERNATIONAL FUEL GAS CODE.
 - 3. SANITARY DRAIN AND VENT AND STORM PIPING SHALL BE TESTED PER THE STATE PLUMBING CODE IN CONJUNCTION WITH THE STATE AND LOCAL HEALTH DEPARTMENTS TO PERMIT REMOVAL OR REPLACEMENT THROUGH REMOVAL OF A SINGLE ASSEMBLY OF PIPING ON EACH HYDRONIC CONNECTION.
 - 4. THIS CONTRACTOR SHALL CLEAN AREAS OF CONSTRUCTION DAILY AS TO MAINTAIN A TIDY WORKSPACE.
 - PROJECT TURNOVER
 - 1. COORDINATE WITH THE OWNER, ARCHITECT, AND ENGINEER THE NUMBER AND TYPE OF OPERATIONS AND MATERIALS TO BE SUBMITTED AT PROJECT TURNOVER AND SUBMITTALS TO BE PROVIDED. PROVIDE THREE (3) HARDBOARD COPIES WITH A THREE-RING BINDER ALONG WITH A COMPOSITE AND SEARCHABLE SINGLE .PDF FILE. THE OPERATION AND MAINTENANCE MANUAL SHALL MINIMALLY INCLUDE THE FOLLOWING:
 - 1. NAME OF THIS CONTRACTOR AND ALL ASSOCIATED SUBCONTRACTORS ALONG WITH ADDRESSES, NAMES, AND EMERGENCY CONTACT INFORMATION.
 - 2. RELEVANT INFORMATION REQUIRED FOR DAILY OPERATION AND MANAGEMENT OF EQUIPMENT, INCLUDING REPLACEMENT PARTS LIST AND PERFORMANCE AND MAINTENANCE INFORMATION.
 - 3. APPROVED SUBMITTALS OF MATERIALS AND EQUIPMENT BEARING THE ENGINEERS SUBMITTAL REVIEW.
 - 4. STARTUP REPORTS, CERTIFICATES OF SEPARATION, CHLORINATION AND DISINFECTION PROCEDURES, AND BALANCE RECORDS.
 - 5. THIS CONTRACTOR SHALL INCLUDE TWO SEPARATE EIGHT-HOUR DAYS FOR ONSITE MECHANICAL SYSTEM TRAINING AND SUPPORT. COORDINATE FINAL TRAINING AND SUPPORT SESSIONS WITH THE OWNER.
 - 2. AS THE WORK PROGRESSES, RECORD ON A SET OF WHITE PRINTS, THE INSTALLED LOCATIONS, ELEVATIONS, SIZES AND DEPTHS OF ALL PIPING, SERVICES, TRENCHES, ETC. IN THE PROJECT WHEREVER THEY DIFFER FROM THOSE INDICATED ON THE CONTRACT DRAWINGS. ESTABLISH ALL DIMENSIONS FROM THE DATUM POINTS APPROVED BY THE ARCHITECT. THE ARCHITECT WILL REVIEW AND APPROVE THE ARCHITECT ONE (1) NEAT COPY OF WHITE PRINTS SHOWING REQUIRED RECORDED CHANGES INFORMATION.
- PLUMBING EQUIPMENT
 - 1. REPLACEABLE CARTRIDGE STYLE, MULTISPEED PSC THEMALLY PROTECTED MOTOR, SELF-LUBRICATING, NO MECHANICAL SEAL, STAINLESS STEEL FLANGES AND CASING CONSTRUCTION,

- PREPARATION OF COORDINATION DRAWINGS SHALL BE THE RESPONSIBILITY OF THE HVAC CONTRACTOR. DRAWINGS SHALL BE PREPARED IN REVIT-2023 AND THE MODEL SHALL BE PROVIDED TO THE DESIGN TEAM AS WELL AS THE DRAWINGS. AS-BUILT UPDATES OF THE MODEL SHALL BE REQUIRED.
- PREPARE COORDINATION DRAWINGS AT A MINIMUM SCALE OF 1/4" = 1'-0". SUBMIT REPRODUCIBLE DRAWINGS FOR REVIEW.
- QUANTITIES, DIMENSIONS AND LOCATIONS OF EQUIPMENT CONNECTIONS FOR PIPING, DUCTWORK AND ELECTRICAL SHALL BE VERIFIED WITH EQUIPMENT SUPPLIERS AND INCLUDED IN THE PREPARATION OF COORDINATION DRAWINGS. SHOW RELATION OF ALL ITEMS OF HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT, DUCTWORK AND PIPING, PLUMBING EQUIPMENT AND PIPING AND FIRE PROTECTION. INDICATE ALL ELECTRICAL DEVICES THAT AFFECT LOCATION OF HEATING, VENTILATING, AIR CONDITIONING AND PLUMBING EQUIPMENT, PIPING, DUCTWORK AND AIR INLETS OR OUTLETS. SHOW EXISTING ITEMS AFFECTING NEW INSTALLATION IN REMODELED AREAS. QUESTIONS AND INTERFERENCES SHALL BE INDICATED ON THE COORDINATION DRAWINGS FOR CLARIFICATION BY THE ARCHITECT/ENGINEER. IF THERE ARE NOT QUESTIONS AND INTERFERENCES INDICATED ON THE COORDINATION DRAWINGS, THE ARCHITECT/ENGINEER SHALL ASSUME THAT THE DRAWINGS AND SPECIFICATIONS ARE COMPLETE AND CORRECT AND WILL EXPECT THE INTENT OF SAID DOCUMENTS TO BE COMPLIED WITH, AND THE INSTALLATION TO BE COMPLETE IN ALL RESPECTS ACCORDING TO SAID INTENT.
- INDICATE LOCATION OF ALL ACCESS PANELS REQUIRED AND COORDINATE TYPE AND LOCATION WITH GENERAL TRADES.
- SECURE FROM OTHER TRADES (I.E., ACOUSTICAL CEILING, PLUMBING, ELECTRICAL, ETC.) ANY INFORMATION NECESSARY FOR THE DEVELOPMENT OF COORDINATION DRAWINGS. INCLUDE FRAMING AND SUSPENSION OF CEILINGS, LOCATION AND SIZE OF ELECTRICAL PULL BOXES, CONDUIT, BUS DUCTS, LIGHTING FIXTURES, ETC.
- PROVIDE COORDINATED SET OF WIRING DIAGRAMS FOR MOTORS, EQUIPMENT ITEMS AND TEMPERATURE CONTROL SHOWING LINE DIAGRAMS, POWER DIAGRAMS AND TERMINAL CONNECTIONS TO ENSURE PROPER OPERATION SPECIFIED. INCLUDE PROVISIONS TO ACCOMMODATE EQUIPMENT THAT IS SPECIFIED AS AN ACCEPTABLE ALTERNATIVE FROM EQUIPMENT THAT IS THE "SPECIFIED STANDARD" SO THAT, IF THE ACCEPTABLE ALTERNATIVE IS INSTALLED, THERE WILL BE NO CHANGE IN THE CONTRACT SUM.
- PROVIDE COORDINATION DRAWINGS FOR REVIEW AND SUBMITTAL TO THE ARCHITECT/ENGINEER FOR REVIEW. EACH TRADE MUST INDICATE ACCEPTANCE OF ILLUSTRATED CONDITIONS BY ATTACHING HIS ENDORSEMENT TO EACH DRAWING.
- PROCEED WITH INSTALLATION ONLY AFTER REVIEW OF COORDINATION DRAWINGS BY ARCHITECT/ENGINEER.
- AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)
- PHOTOCOPIED, REPRODUCED OR TRACED DRAWINGS OF THE ORIGINAL CONTRACT DOCUMENTS WILL NOT BE ALLOWED TO BE USED AS COORDINATION DRAWINGS. SINGLE LINE DRAWINGS OF THE DUCTWORK LAYOUT WILL NOT BE ALLOWED TO BE USED AS PART OF COORDINATION DRAWINGS. ELECTRONIC FILES OF THE ORIGINAL CONTRACT DOCUMENTS WILL NOT BE ALLOWED TO BE USED AS COORDINATION DRAWINGS.
- EQUIPMENT SUBMITTALS
 - 1. PROVIDE MANUFACTURER'S CERTIFIED SCALE DRAWINGS, CUTS, CATALOGS OR DESCRIPTIVE LITERATURE WITH COMPLETE LIST OF CHARACTERISTICS OF EQUIPMENT, DIMENSIONS, CAPACITY, COLOR REQUIREMENTS, MOTOR DRIVE AND TESTING. IN ADDITION, PROVIDE WORKING SHOP DRAWINGS OF DUCTWORK, PIPING, SPRINKLERS, TANK VALVE AND ANY OTHER DETAILS WHICH MAY BE REQUIRED TO CLARIFY INSTALLATION OF PIPING OR EQUIPMENT.
 - 2. PROVIDE COMPLETE LIST OF CHARACTERISTICS OF EQUIPMENT, DIMENSIONS, CAPACITY, COLOR REQUIREMENTS, MOTOR DRIVE AND TESTING. IN ADDITION, PROVIDE WORKING SHOP DRAWINGS OF DUCTWORK, PIPING, SPRINKLERS, TANK VALVE AND ANY OTHER DETAILS WHICH MAY BE REQUIRED TO CLARIFY INSTALLATION OF PIPING OR EQUIPMENT.
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- CONTINUOUS SURFACE FOR FIELD APPLICATION OF CURB GASKETING TO CREATE A WEATHER-TIGHT SEAL BETWEEN THE CURB AND UNIT.
- UNIT CASING – UNIT CASING SHALL HAVE DOUBLE WALL INSULATION WITH INJECTED FOAM. INSULATION APPLICATION SHALL MEET NFPA 90 REQUIREMENTS. INSULATION SYSTEM SHALL BE RESISTANT TO MOLD GROWTH IN ACCORDANCE WITH UL 181 AND ASTM C138 STANDARDIZED TEST METHODS.
- PAINT – EXTERIOR CHAMPAGNE COLOR PAINTED SURFACES SHALL BE DESIGNED TO WITHSTAND A MINIMUM OF 750 SALT SPRAY HOURS WHEN TESTED IN ACCORDANCE WITH ASTM B-117.
- MARKINGS AND DIAGRAMS – ALL NECESSARY TAGS AND DECALS TO AID IN THE SERVICE AND/OR INDICATING CAUTION AREAS SHALL BE PROVIDED. ELECTRICAL LADDER WIRING DIAGRAMS SHALL BE ATTACHED TO THE CONTROL PANEL.
- DOCUMENTATION – INSTALLATION AND MAINTENANCE MANUALS SHALL BE SUPPLIED WITH EACH UNIT.
- ACCESS DOORS SHALL BE DOUBLE WALL ACCESS DOORS SHALL BE PROVIDED IN THE FAN/ DISCHARGE COIL, FILTER, AND INLET SECTIONS. DOORS SHALL BE DOUBLE WALL CONSTRUCTION WITH A SOLID LINER AND A MINIMUM THICKNESS OF 1/2 INCH. DOORS SHALL BE ATTACHED TO THE UNIT WITH STAINLESS STEEL HINGES. A MINIMUM OF THREE 5/16-INCH HEX DRIVE, 90° OPENING STANDARD FINGER PULL LATCHES SHALL BE PROVIDED. VIEW PORTS SHALL BE PROVIDED IN THE SUPPLY FAN, ECONOMIZER, AND COOLING COIL SECTIONS. LATCHES SHALL BE SINGLE HANDLE ROTARY TYPE WITH MINIMUM THREE POINT CONTACT AND AN ADJUSTABLE HEIGHT HANDLE. PADLOCKABLE HANDLE SHALL BE PROVIDED. PANELS AND DOORS SHALL BE COMPLETELY GASKETED WITH A CLOSE-CELL, NEOPRENE GASKET. DOOR THRESHOLS SHALL BE PROVIDED AT ALL DOORS TO SECURE THEM WHILE SERVICING. DOORS THAT PROVIDE ACCESS TO POSITIVE PRESSURE SEGMENTS SHALL INCLUDE A SAFETY LATCH. THE SAFETY LATCH SHALL RELIEVE PRESSURE IF INADVERTENTLY OPENED DURING UNIT OPERATION.
- ECONOMIZER SECTION
 - MODULATING ECONOMIZER – THE ECONOMIZER SEGMENT SHALL BE DESIGNED TO USE OUTSIDE AIR FOR COOLING, VENTILATION, AND SHALL PROVIDE A MEANS OF EXHAUSTING AIR FROM THE AIR HANDLING UNIT. THE SEGMENT SHALL BE PROVIDED WITH A DAMPER.
 - OUTSIDE AIR (OA) AND EXHAUST AIR (EA) DAMPERS SHALL BE SIZED FOR 100% OF NOMINAL UNIT AIRFLOW. THE EA DAMPER ASSEMBLY SHALL HAVE A FACTORY INSTALLED FOLDABLE RAIN HOOD PERMANENTLY ATTACHED TO THE CABINET TO PREVENT WINDBLOWN PRECIPITATION FROM ENTERING THE UNIT. THE RAIN HOOD SHALL BE MOUNTED INTO THE CABINET AND SECURED FOR SHIPMENT SO THAT UPON INSTALLATION THEY CAN BE ROTATED UPWARDS AND SCREWED INTO PLACE.
 - OA INLET OPENINGS SHALL BE COVERED BY A FACTORY INSTALLED FOLDABLE RAIN HOOD PERMANENTLY ATTACHED TO THE CABINET TO PREVENT WINDBLOWN PRECIPITATION FROM ENTERING THE UNIT. THE RAIN HOODS ON THE LEFT AND RIGHT SIDES OF THE UNIT SHALL BE ROTATED INTO THE CABINET AND SECURED FOR SHIPMENT SO THAT UPON INSTALLATION THEY CAN BE ROTATED UPWARDS AND SCREWED INTO PLACE. THE RAIN HOODS SHALL CONTAIN A REMOVABLE AND CLEANABLE FILTER WITH AN EFFICIENCY RATING OF 50% BASED ON ASHRAE 52-76. DAMPER BLADES SHALL BE FABRICATED FROM A MINIMUM OF 16 GAUGE GALVANIZED STEEL. DAMPER SHAFTS SHALL BE FABRICATED FROM SOLID STEEL AND MOUNTED IN THE FRAME WITH BRONZE BEARINGS.
 - ECONOMIZER WITH FAULT DETECTION AND DIAGNOSTICS (FDD) – ECONOMIZER WITH FDD SHALL ALWAYS BE PROVIDED WHEN ECONOMIZER IS SELECTED. AS REQUIRED PER CALIFORNIA TITLE 24 AND ASHRAE 90-2019, FAULT DETECTION AND DIAGNOSTICS (FDD) SYSTEM SHALL PROVIDE ALARMS FOR:
 - DAMPER NOT MODULATING.
 - ECONOMIZER NOT AVAILABLE FOR SUITABLE OUTSIDE AIR CONDITIONS.
 - ECONOMIZER AVAILABLE FOR UNFAVORABLE OUTSIDE AIR CONDITIONS.
 - EXCESS OUTSIDE AIR.
 - TEMPERATURE SENSOR FAILURE/FAULT.
- ENERGY RECOVERY (ERV)
 - ERV PERFORMANCE SHALL BE ASHRAE 1060 CERTIFIED AND BEAR THE AHRF CERTIFIED LABEL. COMPONENTS THAT ARE INDEPENDENTLY TESTED OR RATED IN ACCORDANCE WITH SHALL NOT BE ACCEPTABLE. MANUFACTURER MEMBERSHIP IN AHRF IS AN ACCEPTABLE SUBSTITUTE.
 - CERTIFIED COMPONENTS SHALL FIRST BE LISTED AS ACTIVE IN THE AHRF DIRECTORY (WWW.AHRFDIRECTORY.ORG).
 - THE ENERGY RECOVERY CASSETTE SHALL BE A UL RECOGNIZED COMPONENT FOR FIRE AND ELECTRICAL SAFETY AND BEAR THE UR MARK. RECOGNIZED COMPONENTS SHALL BE LISTED IN THE UL DIRECTORY (ULTRP.COM).
 - THE ENERGY RECOVERY CASSETTE SHALL COMPLY WITH NFPA 96A STANDARD BY VIRTUE OF UL 1821 AND UL 900 STANDARDS FOR FIRE TESTS TO DETERMINE FLAMMABILITY AND SMOKE DENSITY.
 - THE ENERGY RECOVERY CASSETTE SHALL INCORPORATE A ROTARY WHEEL IN AN INSULATED CASSETTE FRAME COMPLETE WITH REMOVABLE ENERGY TRANSFER MEDIA, SEALS, DRIVE MOTOR, AND DRIVE BELT. CASSETTE FRAME AND STRUCTURAL COMPONENTS SHALL BE CONSTRUCTED OF 606 GALVANIZED STEEL FOR CORROSION RESISTANCE.
 - WHEEL STRUCTURE SHALL CONSIST OF A WELDED HUB, SPOKE, AND CONTINUOUS ROLLED RIM ASSEMBLY OF STAINLESS STEEL, AND SHALL BE SELF-SUPPORTING WITHOUT ENERGY TRANSFER SEGMENTS PRESENT. WHEEL STRUCTURE SHALL BE CONNECTED TO THE SHAFT BY MEANS OF TAPER LOCK BUSHINGS.
 - WHEEL BEARINGS SHALL BE PERMANENTLY SEALED AND SELECTED FOR A MINIMUM 30 YEAR 100 LIFE OF 400,000 HOURS. BEARINGS REQUIRING EXTERNAL GREASE FITTINGS OR PERIODIC MAINTENANCE ARE NOT ACCEPTABLE.
 - ENERGY TRANSFER MEDIA SHALL BE CONSTRUCTED OF A DURABLE SYNTHETIC LIGHTWEIGHT POLYMER. MEDIA SHALL BE WOUND CONTINUOUSLY WITH ONE FLAT AND ONE STRUCTURAL LAYER IN AN IDEAL PARALLEL PLATE GEOMETRY. AIRFLOW CROSS HEAT EXCHANGER SURFACE SHALL REMAIN LAMINAR. MEDIA SHALL NOT EXCEED 3 INCHES IN DEPTH.
 - ENERGY TRANSFER MEDIA SHALL BE SUITABLE FOR USE IN CORROSIVE, MARINE, OR COASTAL ENVIRONMENTS WITHOUT THE NEED FOR ADDITIONAL COATINGS. ENERGY TRANSFER MEDIA SHALL BE CAPABLE OF REPEATED WASHINGS WITHOUT SIGNIFICANT DEGRADATION OF THE DESCANT BOND AS DOCUMENTED BY TEST DATA.
 - DESCANT SHALL BE EITHER SILICA GEL OR MOLECULAR SIEVE AND PERMANENTLY BONDED TO THE ENERGY TRANSFER MEDIA WITHOUT THE USE OF BINDERS OR ADHESIVES, WHICH MAY DEGRADE DESCANT PERFORMANCE OVER TIME. DESCANT SHALL BE PERMANENTLY BONDED TO ACCEPTABLE DUE TO POTENTIAL DELAMINATION OR EROSION OF THE DESCANT FROM THE ENERGY TRANSFER MEDIA. DESCANT SHALL BE NON-MIGRATING NOR SHALL IT DISSOLVE OR DELIQUESC IN THE PRESENCE OF WATER OR HIGH HUMIDITY.
 - WHEELS SHALL BE PROVIDED WITH REMOVER SEGMENTS. UNIT SHALL BE DESIGNED TO FACILITATE SIDE SERVICEABLE REMOVAL. SIDE SERVICE SHALL ALLOW FOR REMOVAL OF ALL ERV SEGMENTS TO BE PULLED FOR REMOVAL. SEGMENTS SHALL BE REMOVABLE WITHOUT THE USE OF TOOLS TO FACILITATE MAINTENANCE AND CLEANING. ENERGY RECOVERY SEGMENTS SHALL BE CLEANABLE OUTSIDE OF THE CABINET WITH DETERGENT OR ALKALINE COIL CLEANER AND WATER. ENERGY TRANSFER SEGMENTS SHALL BE CAPABLE OF SUBMERSION IN A CLEANING SOLUTION. SUBMERSION SHALL BE CAPABLE OF RESTORING LATENT PERFORMANCE TO WITHIN AHRF CERTIFIED PERFORMANCE LIMITS.
 - ALL DIAMETER AND PERIMETER SEALS SHALL BE PROVIDED AS PART OF THE CASSETTE ASSEMBLY AND SHALL BE FACTORY SET. SEALS SHALL BE NON-CONTACT NYLON PILE BRUSH SEAL ORIENTED IN A LABYRINTH STYLE CONFIGURATION. DIAMETER SEALS SHALL BE FULLY ADJUSTABLE AND EASILY ACCESSIBLE. PERIMETER SEALS SHALL BE PERMANENTLY MOUNTED TO THE WHEEL RIM AND NOT REQUIRE ADJUSTMENT. SEALS THAT MOUNT TO THE FRAME ARE NOT ACCEPTABLE.
 - THE WHEEL DRIVE MOTOR SHALL BE A UL RECOGNIZED COMPONENT AND SHALL BE MOUNTED IN THE CASSETTE FRAME AND SUPPLIED WITH A SERVICE CONNECTOR OR JUNCTION BOX. THREE-PHASE MOTORS SHALL BE SUITABLE FOR USE IN BOTH STANDARD AND INVERTER RATED APPLICATIONS.
 - THE UNIT SHALL HAVE 1/2 INCH MERV 8 REPLACEABLE FILTERS FOR THE OUTSIDE AIR, AND EXHAUST AIR TO HELP KEEP THE WHEEL CLEAN AND REDUCE MAINTENANCE. THE ERV SHALL BE ENERGIZED BRIEFLY FOR CLEANING AND BLOCKING PROTECTION IF IT HAS NOT BEEN OPERATED FOR EXTENDED PERIODS.
 - THE ERV SHALL HAVE A BYPASS DAMPER. THE BYPASS DAMPER SHALL BE OPERATED TO HEATING/COOLING DEMAND.
 - THE ROOFTOP UNIT SHALL PROVIDE Frost PROTECTION FOR THE ERV. THE CONTROLLER SHALL VARY THE SPEED OF THE WHEEL TO PREVENT FROST CONDITION.
- BUILDING PRESSURE CONTROL
 - POWERED EXHAUST WITH VARIABLE FREQUENCY DRIVE (VFD) – A DWD FORWARD CURVED CENTRIFUGAL EXHAUST FAN SHALL BE PROVIDED TO EXHAUST BUILDING RETURN AIR TO RELIEVE BUILDING STATIC PRESSURE. EXHAUST AIRFLOW SHALL BE MODULATED VIA A FACTORY INSTALLED AND COMMISSIONED VARIABLE FREQUENCY DRIVE (VFD) WITH THE SAME NAMEPLATE HORSEPOWER AS THE EXHAUST FAN MOTOR. AN ACCESS DOOR SHALL BE PROVIDED ON AT LEAST ONE SIDE OF THE UNIT FOR FAN/MOTOR ACCESS.
 - VFD SHALL BE FACTORY TESTED AND MATCHED WITH EACH UNIT.
 - FOR POWERED EXHAUST – FAN OPTIONS ABOVE, USE THE FOLLOWING:
 - EXPANDED FAN MOTOR – FAN MOTORS SHALL BE NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) DESIGN BALL BEARING TYPES WITH ELECTRICAL CHARACTERISTICS AND HORSEPOWER AS SPECIFIED. SHAFT GROUNDING RINGS ON MOTORS SHALL BE PROVIDED TO PREVENT ELECTRICAL BEARING FLUTING DAMAGE BY SAFELY DIVERTING HARMFUL SHAFT VOLTAGES AND BEARING CURRENTS TO GROUND, INCREASING THE MOTOR LONGEVITY. MOTORS SHALL BE NON-FLAMMABLE (DOP) TYPE. THE MOTOR SHALL BE LOCATED WITHIN THE UNIT ON AN ADJUSTABLE BASE.
 - MOUNTINGS – FAN AND FAN MOTOR SHALL BE INTERNALLY MOUNTED AND ISOLATED ON A FULL WIDTH ISOLATOR SUPPORT CHANNEL USING 1/2 INCH SPRINGS THE FAN SHALL BE CONNECTED TO THE FAN CABINET USING A FLEXIBLE CONNECTION TO INSURE VIBRATION-FREE OPERATION.
 - BEARINGS AND DRIVES – FAN BEARINGS SHALL BE SELF-ALIGNING, PILLOW BLOCK OR FLANGED TYPE RE-GREASABLE BALL BEARINGS AND SHALL BE DESIGNED FOR AVERAGE LIFE 150 OF AT LEAST 200,000 HOURS. ALL BEARINGS SHALL BE FACTORY LUBRICATED AND EQUIPPED WITH STANDARD HYDRAULIC GREASE FITTINGS. FAN DRIVES SHALL BE SELECTED FOR A 1.5 SERVICE FACTOR AND ANTI-STATIC BELTS SHALL BE FURNISHED. ALL DRIVES SHALL BE FIXED PITCH. FAN SHAFTS SHALL BE SELECTED TO OPERATE WELL BELOW THE FIRST CRITICAL SPEED AND EACH SHAFT SHALL BE FACTORY COATED AFTER ASSEMBLY WITH AN ANTI-CORROSION COATING.
- FILTER SECTION
 - DRAW-THRU FILTERS
 - ANGLED FILTER RACK – 2 INCH (MERV 8) PLEATED FILTERS SHALL BE PROVIDED IN AN ANGLED FILTER RACK. FILTER EFFICIENCY SHALL BE RATED IN ACCORDANCE WITH ASHRAE STANDARD 52.2. ALL FILTER HOUSING SHALL BE HEAVY DUTY GALVANIZED STEEL DESIGNED FOR INDUSTRIAL APPLICATIONS. ALL FILTERS SHALL BE SIZE ACCESSIBLE WITH ACCESS DOORS PROVIDED ON BOTH SIDES OF THE FILTER SECTION.

- DIFFERENTIAL PRESSURE GAUGE – A FLUSH MOUNTED, FACTORY-INSTALLED DIFFERENTIAL PRESSURE GAUGE SHALL BE PROVIDED TO MEASURE PRESSURE DROP ACROSS BOTH FILTER BANKS. MANUFACTURER SHALL PROVIDE FULLY FUNCTIONAL GAUGES COMPLETE WITH TUBING.
- FINAL FILTERS
 - HIGH EFFICIENCY PARTICULATE AIR (HEPA) FILTER RACK – 12 INCH (MERV 17) HEPA FILTERS WITH 1 INCH (MERV 8) PLEATED PRE-FILTERS SHALL BE PROVIDED. FILTER EFFICIENCIES SHALL BE RATED IN ACCORDANCE WITH ASHRAE STANDARD 52.2. ALL FILTER HOLDING FRAMES SHALL BE OF HEAVY DUTY GALVANIZED STEEL DESIGNED FOR INDUSTRIAL APPLICATIONS. ALL FILTERS SHALL BE FRONT LOADING WITH ACCESS DOORS PROVIDED ON BOTH SIDES OF THE FILTER SECTION.
 - DIFFERENTIAL PRESSURE GAUGE – A FLUSH MOUNTED, FACTORY-INSTALLED DIFFERENTIAL PRESSURE GAUGE SHALL BE PROVIDED TO MEASURE PRESSURE DROP ACROSS BOTH FILTER BANKS. MANUFACTURER SHALL PROVIDE FULLY FUNCTIONAL GAUGES COMPLETE WITH TUBING.
- EVAPORATOR SECTION
 - COOLING COIL – EVAPORATOR COILS SHALL BE DIRECT EXPANSION TYPE WITH INTERLACED CIRCUITING TO ASSURE COMPLETE COIL FACE ACTIVITY DURING LOAD OPERATION. COIL TUBES SHALL USE COPPER WITH INTERNAL ENHANCED TUBES. TUBES SHALL BE ENHANCED MECHANICALLY, EXPANDED TO BOND WITH THE ALUMINUM FINS. ALL COILS SHALL BE PRESSURE-TESTED AT A MINIMUM OF 450 PSIG.
 - IAQ DRAIN PAN – THE IAQ DRAIN PAN SHALL BE DOUBLE-SLOPED WITH A CONDENSATE CONNECTION THROUGH THE BASE RAIL OF THE UNIT. DRAIN PANS FOR COOLING COILS SHALL MEET THE REQUIREMENTS OF ASHRAE 62.1. DRAIN PANS SHALL BE CONSTRUCTED OF STAINLESS STEEL.
- SUPPLY FAN SECTION
 - FAN – THE FAN SECTION SHALL BE EQUIPPED WITH A SIVIS AIRFOIL PLENUM WHEEL. PLENUM FAN SHALL BE DIRECT DRIVE. AN ACCESS DOOR SHALL BE PROVIDED ON THE OPPOSITE SIDE OF THE ROOFTOP UNIT FOR FAN/MOTOR ACCESS.
 - FAN MOTOR – FAN MOTOR SHALL BE NEMA DESIGN BALL-BEARING TYPES WITH ELECTRICAL CHARACTERISTICS AND HORSEPOWER AS SPECIFIED. MOTORS SHALL BE NOMINAL 1800 RPM, ODP TYPE.
 - ZONE VAV (ZSVAV) – IN COOLING MODE, REFRIGERATION CAPACITY OR COMPRESSOR STAGES ARE CYCLED ON OR OFF TO MAINTAIN DISCHARGE AIR TEMPERATURE (DAT). IN HEATING MODE, ADDITIONAL STAGES ARE CYCLED ON OR MODULATED TO MAINTAIN DAT SETPOINT. THE SUPPLY FAN SPEED SHALL BE MODULATED TO MAINTAIN ZONE TEMPERATURE SETPOINT. THE UNIT USES EITHER A BAS SIGNAL, RETURN AIR TEMPERATURE OR A ZONE TEMPERATURE SENSOR TO DETERMINE ZONE TEMPERATURE AND DEVIATION FROM SETPOINT.
 - ALL VFDs SHALL BE FACTORY TESTED AND MATCHED WITH EACH UNIT.
 - THE UNIT SHALL BE FACTORY TESTED AND MATCHED WITH SUPPLY FAN AIRFLOW SHALL BE VIEWABLE ON THE CONTROL PANEL AND COMMUNICABLE ACROSS THE BAS.
- DISCHARGE AIR PLENUM
 - MODULATING GAS HEAT: FOR APPLICATIONS REQUIRING GAS HEAT FOR MORNING WARM-UP, SUPPLY AIR (SA) TEMPERING, OR OTHER HEATING NEEDS, A MODULATING NATURAL GAS FURNACE IS AVAILABLE FOR FINER TEMPERATURE CONTROL. THE FURNACE IS LOCATED IN THE DA PLENUM, DOWNSTREAM OF THE SUPPLY FAN. THE DAT SENSOR IS LOCATED ACROSS THE FACE OF THE SUPPLY DUCT OPENING IN THE UNIT. IGNITION AND SAFETY CONTROLS SHALL BE INCLUDED AND FACTORY WIRED.
 - HEAT EXCHANGER – THE HEAT EXCHANGER SHALL BE CONSTRUCTED OF TUBULAR STAINLESS STEEL AND FLUE ASSEMBLY.
 - BURNER AND IGNITION CONTROLS – THE BURNER SHALL INCLUDE A DIRECT-DRIVEN INDUCED-DRAFT COMBUSTION FAN WITH ENERGY EFFICIENT DIRECT SPARK IGNITION, REDUNDANT MAIN GAS VALVES WITH PRESSURE REGULATOR.
 - COMBUSTION AIR FAN – THE INDUCER FAN SHALL MAINTAIN A POSITIVE FLOW OF AIR THROUGH EACH TUBE TO EXPEL THE FLUE GAS AND TO MAINTAIN POSITIVE PRESSURE WITHIN THE HEAT EXCHANGER RELATIVE TO THE CONDITIONED SPACE.
 - SAFETY DEVICES – A HIGH LIMIT CONTROLLER WITH AUTOMATIC RESET TO PREVENT THE EXHAUSTER FROM OVERHEATING SHALL BE PROVIDED. A FAN SPEED LIMITER SHALL BE PROVIDED. A CENTRIFUGAL SWITCH ON THE INDUCED DRAFT FAN MOTOR SHAFT SHALL PREVENT IGNITION UNTIL SUFFICIENT AIRFLOW IS ESTABLISHED THROUGH THE HEAT EXCHANGER. A ROLLOUT SWITCH SHALL PROVIDE SECONDARY AIRFLOW SAFETY PROTECTION. THE ROLLOUT SWITCH SHALL DISCONTINUE FURNACE OPERATION IF THE FLUE RECIRCULATION FAN SPEED IS TOO LOW.
 - FLUE – THE FURNACE FLUE SHALL BE SHIPPED LOOSE TO PROTECT IT FROM DAMAGE DURING TRANSIT. THE FLUE SHALL BE FIELD-MOUNTED BY THE INSTALLING CONTRACTOR. THE FLUE OUTLET SHALL BE LOCATED ABOVE THE UNIT TO HELP PREVENT RECYCLING OF COMBUSTION GASES BACK THROUGH THE HEAT EXCHANGER.
 - AGENCY CERTIFICATION – GAS HEATING UNITS SHALL BE DESIGNED IN CONFORMANCE WITH ANSI Z83.4-2016 (CSA 2.16-2016 STANDARDS AND SHALL CARRY A CSA LISTING. ALL GAS HEATING UNITS SHALL HAVE A SELF-EFFICIENCY RATED IN ACCORDANCE TO 2023 DEPARTMENT OF ENERGY EFFICIENCY CODE.
 - VALVES – FACTORY PROVIDED GAS HEATER ISOLATION VALVE SHALL BE SHIPPED LOOSE FOR INSTALLATION IN THE FIELD BY OTHERS. PUNCHED HOLES SHALL BE PROVIDED IN THE SIDE OF THE UNIT. HOLES SHALL BE CAPED FOR FIELD TO MAKE SURE THE HOLES ARE NOT OPEN. PENETRATION OPTION SHALL BE PROVIDED WITH PIPING TO EXTEND OUT OF THE UNIT.
 - SOUND ATTENUATOR
 - LOUD ATTENUATOR (SILENCER) SEGMENTS SHALL BE PROVIDED AS SHOWN ON DRAWINGS.
 - SILENCERS SHALL BE RECTANGULAR, 24 INCH LONG SOUND ATTENUATORS AS INDICATED ON DRAWINGS AND EQUIPMENT SCHEDULE.
 - OUTER CASINGS OF RECTANGULAR SILENCERS SHALL BE MADE OF 22 GAUGE TYPE 660 ALUMINUM.
 - INTERIOR PARTITIONS FOR RECTANGULAR SILENCERS SHALL NOT BE LESS THAN 26 GAUGE TYPE 660 GALVANIZED PERFORATED STEEL.
 - FILLER MATERIAL SHALL BE INORGANIC GLASS FIBER OF A PROPER DENSITY TO OBTAIN THE SPECIFIED ACOUSTIC PERFORMANCE AND BE PACKED UNDER NOT LESS THAN 3 PSI COMPRESSION TO ELIMINATE VOIDS DUE TO VIBRATION AND SETTLING. MATERIAL SHALL BE INERT, VERMIN-PROOF, AND MOISTURE-PROOF.
- CONDENSATE SECTION
 - CONDENSER FANS – CONDENSER FANS SHALL BE MATCHED UP WITH COMPRESSORS TO OPTIMIZE SYSTEM CONTROL. CONDENSER FANS SHALL BE PROPELLER TYPE WITH ALUMINUM BLADES, DIRECTLY DRIVEN BY PERMANENTLY LUBRICATED THREE PHASE MOTOR.
 - CONDENSER COIL – MICROCHANNEL CONDENSER COILS SHALL BE CONSTRUCTED OF PARALLEL FLOW ALUMINUM ALLOY TUBES METALLURGICALLY BRAZED TO ENHANCED ALUMINUM ALLOY FINS. CONDENSER CLEANING HATCHES SHALL BE PROVIDED FOR ACCESS TO CONDENSER COIL WITHOUT THE REMOVAL OF CONDENSER FANS. ALL COILS SHALL BE PRESSURE-TESTED AT A MINIMUM OF 450 PSIG.
 - SIGHT GLASSES SHALL BE ACCESSIBLE WITHOUT HAVING TO OPEN AIR HANDLER-SECTION ACCESS DOORS OR REMOVE PANELS.
 - FIXED SPEED COMPRESSORS – UNITS SHALL USE HERMETIC SCROLL COMPRESSORS, PIPED AND CHARGED WITH OIL AND R-410A REFRIGERANT. EACH COMPRESSOR SHALL BE PROTECTED FROM OVER-TEMPERATURE AND OVER-CURRENT CONDITIONS. COMPRESSORS SHALL BE VIBRATION-ISOLATED FROM THE UNIT, AND INSTALLED IN AN EASILY ACCESSIBLE AREA OF THE UNIT. ALL COMPRESSOR HOSE CONNECTIONS SHALL BE PERMANENTLY LUBRICATED TO MINIMIZE LEAKS. R-410A SHALL BE DESIGNED TO MINIMIZE LEAKING AIR TEMPERATURE CHANGES WHEN VARYING CAPACITY. STEPS OF CAPACITY CONTROL SHALL NOT EXCEED 2% OF UNIT CAPACITY WHEN MODULATING FROM MINIMUM TO MAXIMUM. HOT GAS BYPASS OPERATION SHALL NOT BE USED TO MEET MAXIMUM MODULATION STEPS OF CONTROL. VARIABLE SPEED COMPRESSORS SHALL BE USED IF UNIT IS NOT CAPABLE OF MEETING THE MAXIMUM MODULATION PERCENTAGE OF STEP CAPACITY.
 - IN LINE REFRIGERANT FILTER DRIERS – LIQUID LINE FILTER DRIERS SHALL BE PROVIDED AS A STANDARD ON THE UNIT.
 - CONDENSER ENCLOSURE – THE CONDENSER SECTION SHALL BE ENCLOSED BY A WIRE GRILL CONDENSER ENCLOSURE ON THE THREE EXPOSED SIDES.
 - CONDENSER TIE-OFF – IS SUPPLIED ON CONDENSER ROOF.
- CONTROLS
 - ENCLOSURE – UNIT SHALL BE FACTORY CONFIGURED, INSTALLED, WIRED, AND TESTED WITH A ROOFTOP UNIT CONTROLLER RETURNED IN A RAIN AND DUST-TIGHT, POWDER PAINTED, STEEL CABINET BEHIND HINGED, LATCHED, AND GASKET-SEALED DOOR. VFD CONTROL KEYPADS SHALL BE LOCATED IN THE CONTROL CABINET FOR ACCESSIBILITY AND SERVICING WHILE THE UNIT IS OPERATING.
 - 15' VOLT CONVENIENCE OUTLET – A DUPLEX GROUND FAULT CIRCUIT INTERRUPT (GFCI) RECEPTACLE SHALL BE FACTORY-MOUNTED IN A WEATHERPROOF ENCLOSURE AND WIRED FOR A 15-AMP LOAD. ELECTRICAL POWER SHALL BE DE-ENERGIZED TO THE CONVENIENCE OUTLET WHEN THE OPTIONAL UNIT MOUNTED DISCONNECT HAS BEEN TURNED OFF. UNIT POWERED OFF.
 - CONVENIENCE OUTLET SHALL INCLUDE TRANSFORMER TO STEP DOWN TO 120V.
 - BASIC CONTROLS – CONTROL SHALL INCLUDE AUTOMATIC START, STOP, OPERATING, AND PROTECTION SEQUENCES ACROSS THE RANGE OF SCHEDULED CONDITIONS AND TRANSIENTS. THE FOLLOWING CONTROLS SHALL BE PROVIDED:
 - START/STOP, ENERGY SAVER DELAY AND ANTI-RECYCLE TIMERS, CONDENSER FANS, AND UNIT ALARMS. AUTOMATIC RESET TO NORMAL OPERATION AFTER POWER FAILURE. SOFTWARE SHALL BE STORED IN NONVOLATILE MEMORY WITH PROGRAMMED SETPOINTS RETAINED IN SUPER MEMORY. REAL TIME CLOCK (RTC) MEMORY FOR A MINIMUM OF 5 YEARS.
 - SMART EQUIPMENT™ CONTROL – UNIT SHALL BE SUPPLIED WITH THE SMART EQUIPMENT CONTROL SYSTEM. ALL UNITS SHALL BE FACTORY COMMISSIONED, CONFIGURED, AND RUN TESTED.
 - STANDARD DISPLAY – THE DISPLAY SHALL BE ORGANIC LIGHT EMITTING DIODE (OLED) WITH GREEN CHARACTERS ON BLACK BACKGROUND PROVIDING HIGH VISIBILITY. THE DISPLAY SHALL PROVIDE A MINIMUM OF 175 CHARACTERS IN TOTAL WITH 35 CHARACTERS X 5 LINES. THE OLED DISPLAY SHALL BE 1.55 x 0.41 DOT MATRIX. THE DISPLAY SHALL SHOW AMBIENT TEXT, SYMBOLS, AND DESCRIPTIONS DOWN TO 40°F (4.0°C) WITHOUT NOTICEABLE DEGRADATION OF CONTRAST OR DISPLAY RESPONSE TIME. NUMERIC DATA SHALL BE PROVIDED IN IMPERIAL OR METRIC UNITS. A SEALD, MEMBRANE STYLE KEYPAD WITH 20 KEYS SHALL BE USED TO NAVIGATE THE CONTROL MENU. REAL TIME CLOCK (RTC) MEMORY FOR A MINIMUM OF 5 YEARS. TO ALLOW QUICK SELECTIONS, THE SOFTWARE ON THE UNIT WITH INTERFACE (UI) SHALL BE UPGRADABLE IN THE FIELD.
 - THE FOLLOWING DISPLAY INFORMATION SHALL BE AVAILABLE BASED ON SELECTED UNIT OPTIONS:
 - UNIT SUMMARY WITH SERIAL, MODEL NUMBER, LANGUAGE, UNIT STATUS, AND ENABLE. CONTROLLER HARDWARE, FIRMWARE, AND NETWORK INPUTS.
 - SENSOR INFORMATION SHALL BE PROVIDED FOR ALL SENSORS, INLET, AND SETPOINTS.
 - COMMISSIONING MENU SHALL HAVE OPTIONS TO VIEW KEY PARAMETERS SUCH AS OCCUPANCY, COOLING, HEATING, ECONOMIZER, ERV, MORNING WARM-UP, STAGGERED START/SAFETY SETUP, LOW AMBIENT AND DEMAND CONTROL VENTILATION (DCV).

- START-UP, AIR BALANCING AND COMMISSIONING WIZARD SHALL BE PROVIDED FOR FIELD TECHNICIANS TO COMPLETE UNIT CONFIGURATION AND START-UP.
- OCCUPIED, UNOCCUPIED, COAST MODES.
- DATE, TIME, TIME ZONE, SCHEDULES.
- COOLING ENABLE, STATUS, SETPOINTS, STAGES, COMPRESSOR CAPACITY, RUNTIME, ANTI-START CYCLE TIME, RAMP START, AND MORNING COOL DOWN.
- HEATING MODE, ENABLE, STATUS, STAGES, CAPACITY, RUNTIME, SETPOINTS, VALVE COMMANDS, AND MORNING WARM UP.
- SUPPLY FAN, RETURN/EXHAUST FAN STATUS, COMMAND, AIR PROVING SWITCH, VFD SPEED, RUNTIME, AND FAULTS.
- CONDENSER FAN STATUS AND MODULATING COMMAND, LOW AMBIENT.
- ECONOMIZER MODE, DAMPER POSITION, AIRFLOW, FRESH AIR, AND ALARMS FOR ECONOMIZER FDD.
- HIGH STATUS, ENABLE, HUMIDIFICATION CONTROL, AND VALVE COMMAND.
- ENERGY RECOVERY WHEEL STATUS, COMMAND, OUTPUT, TEMPERATURE.
- SMOKE CONTROL MODES, SENSOR INPUTS, SMOKE DETECTOR SHUTDOWN.
- UNIT ALARMS SUCH AS SAFETY SWITCH, PHASE MONITOR, COMPRESSOR SAFETY, FILTER DIFFERENTIAL PRESSURE, CARBON DIOXIDE (CO2), LOW PRESSURE, HIGH PRESSURE, FREEZE/ICE, BY LIGHT, AND CONDENSATE SWITCH. ALARMS MODE WITH UP TO 5 CURRENT ALARMS AND 25 PREVIOUS ALARMS WITH TIME AND DATE.
- DIAGNOSTICS – UPON START-UP OF THE UNIT CONTROLLER, IT SHALL RUN THROUGH A SELF-DIAGNOSTIC CHECKLIST BEFORE OPERATION AND SEQUENCE LOADING. THE ROOFTOP UNIT CONTROLLER SHALL CONTINUALLY MONITOR ALL INPUT AND OUTPUT POINTS TO MAINTAIN PROPER OPERATION. THE UNIT SHALL CONTINUE TO OPERATE IN A TROUBLE MODE OR SHUT DOWN AS NECESSARY TO PREVENT AN UNSAFE CONDITION FOR THE BUILDING OCCUPANTS OR TO PREVENT DAMAGE TO THE EQUIPMENT. IN THE EVENT OF A UNIT SHUTDOWN OR ALARM, THE OPERATING CONDITIONS, DATE, AND TIME SHALL BE STORED IN THE SHUTDOWN HISTORY TO FACILITATE SERVICE AND TROUBLESHOOTING. A MINIMUM OF 16 ERROR HISTORIES SHALL BE STORED.
- COMPRESSOR CAPACITY MODULATION – STAGING OF THE MULTIPLE FIXED SPEED COMPRESSORS SHALL BE USED TO CONTROL REFRIGERATION CAPACITY. UPON ENTERING COOLING MODE FROM OTHER MODES, THE UNIT CONTROLLER SHALL ESTIMATE THE COOLING REQUIREMENT AND MATCH IT CLOSELY TO THE CAPACITY IN ORDER TO REDUCE THE TIME REQUIRED TO SATISFY THE COOLING REQUIREMENTS. AFTER THE INITIAL CALCULATION, THE UNIT CONTROLLER SHALL ADD OR REDUCE STAGE AS NECESSARY TO ESTABLISH A BALANCE BETWEEN THE UNIT CAPACITY AND THE SPACE COOLING LOAD.
- TWINNING ENABLES SMOKE CONTROL SEQUENCES SHALL BE AVAILABLE THROUGH BAS COMMUNICATION. THE SMOKE CONTROL SEQUENCES SHALL BE USED WHENEVER THE SMOKE CONTROL BINARY INPUTS ARE TURNED ON TO REMOVE, EXHAUST, OR VENTILATE SMOKE, FLAMES, OR OTHER AIRBORNE CONTAMINANTS FROM THE OCCUPIED SPACE. THE UNIT CONTROLLER SHALL INCLUDE PURGE, PRESSURIZATION AND EVALUATION SEQUENCES OF OPERATIONS. SMOKE CONTROL INPUTS SHALL BE ASSIGNED A HIGHER PRIORITY OVER SMOKE DETECTOR AND SHALL OVERRIDE A SMOKE DETECTOR SHUTDOWN.
- TWINNING ENABLES CONTROL OF FLOORPLANS. A COMMON SUPPLY DUCT AND CONTROL ALGORITHM SHALL PROVIDE INDEPENDENT LOGIC UNIT CONTROL. THE INDEPENDENT LOGIC UNIT CONTROL SYSTEM SHALL NOT REQUIRE SWITCHOVER OR PRIMARY LOGIC IN CASE OF ROOFTOP UNIT FAILURE. THE UNIT SHALL PROVIDE QUICK RESPONSE TIME, SHARED DATA FOR SENSORS AND SETPOINTS, SIMPLE CONFIGURATION, AND EASY SETUP.
- TWINNING CONFIGURATION SHALL BE AVAILABLE THROUGH BACNET. NO ADDITIONAL CONTROL OR COMMUNICATION WIRING SHALL BE REQUIRED.
- BAS COMMUNICATIONS – THE UNIT SHALL HAVE OPEN BACNET BTL CERTIFIED PROTOCOL. INTEGRAL TO THE UNIT CONTROLLER. THE CONTROLLER SHALL BE CERTIFIED FOR BACNET COMMUNICATION PROTOCOL BY BACNET TESTING LABORATORY (BTL) TO MEET THE REQUIREMENTS OF THE ADVANCED APPLICATION CONTROL PROFILE. A CONTROL POINTS LIST, BACNET INTEROPERABILITY BUILDING BLOCKS (IBBs), AND PROTOCOL IMPLEMENTATION CONFORMANCE STATEMENT (PICS) SHALL BE PROVIDED BY THE MANUFACTURER TO FACILITATE COMMUNICATIONS PROGRAMMING WITH THE BAS.
- OPEN BACNET BTL CERTIFIED COMMUNICATION INTERFACE – THE BUILDING AUTOMATION SYSTEM (BAS) SHALL PROVIDE THE OWNER WITH A SIMPLE USER EXPERIENCE AND EASY SETUP. A CONTROLS. THE SYSTEM SHALL CONSIST OF SMART EQUIPMENT TECHNOLOGY AND MUST BE CAPABLE TO INTERFACE WITH OWNERS CERTIFIED BAS SYSTEM.
- APPROVED MANUFACTURERS: AIR ENTERPRISE, JOHNSON CONTROLS (JCI), TRANE.
- DUCT FREE SPLIT SYSTEMS
 - INDOOR UNIT
 - GENERAL:
 - THE LOW-AMBIENT 4-WAY CASSETTE SHALL BE STYLE INDOOR UNIT SHALL RECESS INTO THE CEILING WITH A CEILING GRILLE (ORDERED SEPARATELY. PART NUMBER: PGMNUM1UM). THE LOW-AMBIENT 4-WAY CASSETTE SHALL BE COMPATIBLE WITH 11 STANDARD, 11 MAX HEAT LOW AMBIENT HEATING AND 11 40° LOW AMBIENT COOLING-ONLY OUTDOOR UNITS. THE HEATING UNITS SHALL HAVE A STEADY STATE EFFICIENCY RATED IN ACCORDANCE TO 2023 DEPARTMENT OF ENERGY EFFICIENCY CODE.
 - AGENCY CERTIFICATION – GAS HEATING UNITS SHALL BE DESIGNED IN CONFORMANCE WITH ANSI Z83.4-2016 (CSA 2.16-2016 STANDARDS AND SHALL CARRY A CSA LISTING. ALL GAS HEATING UNITS SHALL HAVE A SELF-EFFICIENCY RATED IN ACCORDANCE TO 2023 DEPARTMENT OF ENERGY EFFICIENCY CODE.
 - VALVES – FACTORY PROVIDED GAS HEATER ISOLATION VALVE SHALL BE SHIPPED LOOSE FOR INSTALLATION IN THE FIELD BY OTHERS. PUNCHED HOLES SHALL BE PROVIDED IN THE SIDE OF THE UNIT. HOLES SHALL BE CAPED FOR FIELD TO MAKE SURE THE HOLES ARE NOT OPEN. PENETRATION OPTION SHALL BE PROVIDED WITH PIPING TO EXTEND OUT OF THE UNIT.
 - SOUND ATTENUATOR
 - LOUD ATTENUATOR (SILENCER) SEGMENTS SHALL BE PROVIDED AS SHOWN ON DRAWINGS.
 - SILENCERS SHALL BE RECTANGULAR, 24 INCH LONG SOUND ATTENUATORS AS INDICATED ON DRAWINGS AND EQUIPMENT SCHEDULE.
 - OUTER CASINGS OF RECTANGULAR SILENCERS SHALL BE MADE OF 22 GAUGE TYPE 660 ALUMINUM.
 - INTERIOR PARTITIONS FOR RECTANGULAR SILENCERS SHALL NOT BE LESS THAN 26 GAUGE TYPE 660 GALVANIZED PERFORATED STEEL.
 - FILLER MATERIAL SHALL BE INORGANIC GLASS FIBER OF A PROPER DENSITY TO OBTAIN THE SPECIFIED ACOUSTIC PERFORMANCE AND BE PACKED UNDER NOT LESS THAN 3 PSI COMPRESSION TO ELIMINATE VOIDS DUE TO VIBRATION AND SETTLING. MATERIAL SHALL BE INERT, VERMIN-PROOF, AND MOISTURE-PROOF.
 - CONDENSER FANS – CONDENSER FANS SHALL BE MATCHED UP WITH COMPRESSORS TO OPTIMIZE SYSTEM CONTROL. CONDENSER FANS SHALL BE PROPELLER TYPE WITH ALUMINUM BLADES, DIRECTLY DRIVEN BY PERMANENTLY LUBRICATED THREE PHASE MOTOR.
 - CONDENSER COIL – MICROCHANNEL CONDENSER COILS SHALL BE CONSTRUCTED OF PARALLEL FLOW ALUMINUM ALLOY TUBES METALLURGICALLY BRAZED TO ENHANCED ALUMINUM ALLOY FINS. CONDENSER CLEANING HATCHES SHALL BE PROVIDED FOR ACCESS TO CONDENSER COIL WITHOUT THE REMOVAL OF CONDENSER FANS. ALL COILS SHALL BE PRESSURE-TESTED AT A MINIMUM OF 450 PSIG.
 - SIGHT GLASSES SHALL BE ACCESSIBLE WITHOUT HAVING TO OPEN AIR HANDLER-SECTION ACCESS DOORS OR REMOVE PANELS.
 - FIXED SPEED COMPRESSORS – UNITS SHALL USE HERMETIC SCROLL COMPRESSORS, PIPED AND CHARGED WITH OIL AND R-410A REFRIGERANT. EACH COMPRESSOR SHALL BE PROTECTED FROM OVER-TEMPERATURE AND OVER-CURRENT CONDITIONS. COMPRESSORS SHALL BE VIBRATION-ISOLATED FROM THE UNIT, AND INSTALLED IN AN EASILY ACCESSIBLE AREA OF THE UNIT. ALL COMPRESSOR HOSE CONNECTIONS SHALL BE PERMANENTLY LUBRICATED TO MINIMIZE LEAKS. R-410A SHALL BE DESIGNED TO MINIMIZE LEAKING AIR TEMPERATURE CHANGES WHEN VARYING CAPACITY. STEPS OF CAPACITY CONTROL SHALL NOT EXCEED 2% OF UNIT CAPACITY WHEN MODULATING FROM MINIMUM TO MAXIMUM. HOT GAS BYPASS OPERATION SHALL NOT BE USED TO MEET MAXIMUM MODULATION STEPS OF CONTROL. VARIABLE SPEED COMPRESSORS SHALL BE USED IF UNIT IS NOT CAPABLE OF MEETING THE MAXIMUM MODULATION PERCENTAGE OF STEP CAPACITY.
 - IN LINE REFRIGERANT FILTER DRIERS – LIQUID LINE FILTER DRIERS SHALL BE PROVIDED AS A STANDARD ON THE UNIT.
 - CONDENSER ENCLOSURE – THE CONDENSER SECTION SHALL BE ENCLOSED BY A WIRE GRILL CONDENSER ENCLOSURE ON THE THREE EXPOSED SIDES.
 - CONDENSER TIE-OFF – IS SUPPLIED ON CONDENSER ROOF.
- ENCLOSURE – UNIT SHALL BE FACTORY CONFIGURED, INSTALLED, WIRED, AND TESTED WITH A ROOFTOP UNIT CONTROLLER RETURNED IN A RAIN AND DUST-TIGHT, POWDER PAINTED, STEEL CABINET BEHIND HINGED, LATCHED, AND GASKET-SEALED DOOR. VFD CONTROL KEYPADS SHALL BE LOCATED IN THE CONTROL CABINET FOR ACCESSIBILITY AND SERVICING WHILE THE UNIT IS OPERATING.
- 15' VOLT CONVENIENCE OUTLET – A DUPLEX GROUND FAULT CIRCUIT INTERRUPT (GFCI) RECEPTACLE SHALL BE FACTORY-MOUNTED IN A WEATHERPROOF ENCLOSURE AND WIRED FOR A 15-AMP LOAD. ELECTRICAL POWER SHALL BE DE-ENERGIZED TO THE CONVENIENCE OUTLET WHEN THE OPTIONAL UNIT MOUNTED DISCONNECT HAS BEEN TURNED OFF. UNIT POWERED OFF.
- CONVENIENCE OUTLET SHALL INCLUDE TRANSFORMER TO STEP DOWN TO 120V.
- BASIC CONTROLS – CONTROL SHALL INCLUDE AUTOMATIC START, STOP, OPERATING, AND PROTECTION SEQUENCES ACROSS THE RANGE OF SCHEDULED CONDITIONS AND TRANSIENTS. THE FOLLOWING CONTROLS SHALL BE PROVIDED:
 - START/STOP, ENERGY SAVER DELAY AND ANTI-RECYCLE TIMERS, CONDENSER FANS, AND UNIT ALARMS. AUTOMATIC RESET TO NORMAL OPERATION AFTER POWER FAILURE. SOFTWARE SHALL BE STORED IN NONVOLATILE MEMORY WITH PROGRAMMED SETPOINTS RETAINED IN SUPER MEMORY. REAL TIME CLOCK (RTC) MEMORY FOR A MINIMUM OF 5 YEARS.
 - SMART EQUIPMENT™ CONTROL – UNIT SHALL BE SUPPLIED WITH THE SMART EQUIPMENT CONTROL SYSTEM. ALL UNITS SHALL BE FACTORY COMMISSIONED, CONFIGURED, AND RUN TESTED.
 - STANDARD DISPLAY – THE DISPLAY SHALL BE ORGANIC LIGHT EMITTING DIODE (OLED) WITH GREEN CHARACTERS ON BLACK BACKGROUND PROVIDING HIGH VISIBILITY. THE DISPLAY SHALL PROVIDE A MINIMUM OF 175 CHARACTERS IN TOTAL WITH 35 CHARACTERS X 5 LINES. THE OLED DISPLAY SHALL BE 1.55 x 0.41 DOT MATRIX. THE DISPLAY SHALL SHOW AMBIENT TEXT, SYMBOLS, AND DESCRIPTIONS DOWN TO 40°F (4.0°C) WITHOUT NOTICEABLE DEGRADATION OF CONTRAST OR DISPLAY RESPONSE TIME. NUMERIC DATA SHALL BE PROVIDED IN IMPERIAL OR METRIC UNITS. A SEALD, MEMBRANE STYLE KEYPAD WITH 20 KEYS SHALL BE USED TO NAVIGATE THE CONTROL MENU. REAL TIME CLOCK (RTC) MEMORY FOR A MINIMUM OF 5 YEARS. TO ALLOW QUICK SELECTIONS, THE SOFTWARE ON THE UNIT WITH INTERFACE (UI) SHALL BE UPGRADABLE IN THE FIELD.
 - THE FOLLOWING DISPLAY INFORMATION SHALL BE AVAILABLE BASED ON SELECTED UNIT OPTIONS:
 - UNIT SUMMARY WITH SERIAL, MODEL NUMBER, LANGUAGE, UNIT STATUS, AND ENABLE. CONTROLLER HARDWARE, FIRMWARE, AND NETWORK INPUTS.
 - SENSOR INFORMATION SHALL BE PROVIDED FOR ALL SENSORS, INLET, AND SETPOINTS.
 - COMMISSIONING MENU SHALL HAVE OPTIONS TO VIEW KEY PARAMETERS SUCH AS OCCUPANCY, COOLING, HEATING, ECONOMIZER, ERV, MORNING WARM-UP, STAGGERED START/SAFETY SETUP, LOW AMBIENT AND DEMAND CONTROL VENTILATION (DCV).

- THE LOW-AMBIENT 4-WAY CASSETTE SHALL HAVE AN OPTIONAL MOTION DETECTION SENSOR (MCR-SMC(U)) TO ENABLE/DISABLE THE UNIT BASED ON MOTION WITH OPTIONAL TIME DELAY SETTINGS (REFER TO THE CONTROLS SECTION OF THIS SPECIFICATION FOR MORE MCR-SMC(U) DETAILS).
 - THE INDOOR UNIT SHALL HAVE A REMOVABLE EEPROM ON ITS PCB TO STORE ALL UNIT DATA. ALL DATA ON THE INDOOR UNIT EEPROM SHALL BE VIEWABLE FROM THE MANUFACTURER PROVIDED SERVICE SOFTWARE. THE INDOOR UNIT MAIN EEPROM SHALL BE REMOVABLE ALLOWING REPLACEMENT OF INDOOR UNIT PCB WITHOUT LOSING DIGITAL, FIELD PROGRAMMED DATA. THE INDOOR UNIT REMOVABLE EEPROM SHALL STORE THE FOLLOWING UNIT DATA: UNIT MODEL NUMBER, UNIT SERIAL NUMBER, UNIT PCB FIRMWARE AND INDOOR UNIT FIELD PROGRAMMED UNIT NAME/TAG VIEWABLE ON CONTROLS AND SERVICE SOFTWARE.
 - THE INDOOR UNIT SHALL FEATURE A DUAL SET POINT FUNCTION THAT ALLOWS USERS TO SET SEPARATE HEATING AND COOLING SET TEMPERATURES USING SUPPORTED LOCAL WIRED CONTROLLER AND CENTRAL CONTROL OPTIONS. DUAL SET TEMPERATURE ALLOWS THE USER TO SPECIFY A DEADBAND WHERE THE UNIT WILL NOT HEAT OR COOL WHEN ROOM TEMPERATURE IS BETWEEN THE HEATING AND COOLING SET TEMPERATURES. DUAL SET TEMPERATURE CAN BE USED WITH HEAT PUMP OR HEAT RECOVERY SYSTEMS.
 - THE INDOOR UNIT SHALL FEATURE AN EMERGENCY TEMPERATURE OUTPUT (ETO) FUNCTION THAT WILL PROVIDE A SIGNAL WHEN AN INDOOR UNIT IS IN ERROR STATUS. WHEN ENABLING ETO, A HIGH ROOM TEMPERATURE THRESHOLD CAN ALSO BE PROGRAMMED TO PROVIDE A SIGNAL WHEN THE ROOM TEMPERATURE LIMIT HAS BEEN EXCEEDED. THE ETO SIGNAL CAN BE USED TO ACTIVATE BACKUP SYSTEMS, PROVIDE A SIMPLE SIGNAL TO A BUILDING MANAGEMENT SYSTEM, OR TO PROVIDE A SIMPLE VISUAL/AUDIBLE NOTIFICATION LOCALLY (EX: LED, BUZZER, ETC.). A MIM-B14 EXTERNAL CONTACT CONTROL INTERFACE MODULE IS REQUIRED FOR EACH UNIT THAT WILL PROVIDE OR RECEIVE AN ETO SIGNAL.
- OUTDOOR UNITS:
 - GENERAL
 - THE FAC OUTDOOR UNIT SHALL BE COMPATIBLE WITH LOW-AMBIENT 4-WAY CASSETTE, DUCT 5 (HPS), AND HIGH-WALL INDOOR UNITS.
 - THE OUTDOOR UNIT SHALL BE CAPABLE OF GUARANTEED OPERATION IN COOLING MODE BETWEEN 33° – 120°F (5°C TO 49°C) OUTSIDE AMBIENT TEMPERATURES.
 - THE OUTDOOR UNIT SHALL BE CAPABLE OF GUARANTEED OPERATION IN HEATING MODE BELOW 33°F (5°C) DOWN TO 40°F (4°C) OUTSIDE AMBIENT TEMPERATURE WITH THE ADDITION OF FACTORY PROVIDED FRONT AND REAR WIND BAFFLES (ACCESSORY).
 - CONDENSING UNIT SALT SPRAY TEST METHOD: ASTM B917-18. THE HEAT EXCHANGER COVERED BY THE UNIT SHALL HAVE 100% RUST OR CORROSION PROTECTION TO 3,280 HOURS.
 - THE OUTDOOR UNIT SHALL HAVE AN ACCUMULATOR.
 - THE OUTDOOR UNIT SHALL AUTO-RESTART AFTER POWER LOSS.
 - THE OUTDOOR UNIT SHALL HAVE 100% RUST OR CORROSION PROTECTION, OVER-CURRENT PROTECTION, UNDER-VOLTAGE PROTECTION, TEMPERATURE LIMIT PROTECTION LOGIC, AND COMPRESSOR OVERLOAD SENSING.
 - THE OUTDOOR UNIT SHALL HAVE SNOW ACCUMULATION PREVENTION OPTION SETTING TO PREVENT SNOW FROM ACCUMULATING AND INTERFERING WITH THE UNIT OPERATION.
 - THE SYSTEM SHALL SUPPORT LIMITING THE MAXIMUM OPERATING CURRENT FROM 50% – 100% VIA OUTDOOR UNIT, WIRED CONTROLLER OR CENTRAL CONTROLS (MAXIMUM CURRENT CONTROL).
 - REFRIGERANT PIPING:
 - BOTH REFRIGERANT LINES FROM THE OUTDOOR UNIT TO INDOOR UNIT SHALL BE INSULATED.
 - INSTANT REFRIGERANT PIPE LENGTH AND VERTICAL SEPARATION SHALL BE WITHIN THE PUBLISHED MANUFACTURER'S SPECIFICATIONS.
 - UNIT CABINET:
 - THE CHASSIS SHALL BE FABRICATED OF GALVANIZED STEEL, BONDERIZED AND FINISHED WITH POWDER COATED BAKED ENAMEL.
 - FAN:
 - THE OUTDOOR UNIT SHALL BE FURNISHED WITH 1 AXIAL FAN WITH A BLDC MOTOR.
 - THE FAN MOTOR SHALL BE PERMANENTLY LUBRICATED, THERMAL PROTECTED, AND HAVE PERMANENTLY LUBRICATED BEARINGS, AND BE COMPLETELY VARIABLE SPEED.
 - ALL FAN MOTORS SHALL BE MOUNTED FOR QUIET OPERATION.
 - ALL FANS SHALL BE PROVIDED WITH A RAISED GUARD TO PREVENT CONTACT WITH MOVING PARTS.
 - THE OUTDOOR UNIT SHALL HAVE HORIZONTAL DISCHARGE AIRFLOW.
 - REFRIGERANT:
 - R410A REFRIGERANT SHALL BE REQUIRED FOR THE SYSTEM.
 - IF R410A REFRIGERANT MAY BE REQUIRED, AMOUNT IS BASED ON INSTALLED REFRIGERANT PIPE DIAMETERS AND LENGTHS.
 - COIL
 - THE OUTDOOR COIL SHALL BE OF NONFERROUS CONSTRUCTION WITH LANCED OR CORRUGATED PLATE FINS ON COPPER TUBING.
 - THE COIL SHALL BE PROTECTED WITH AN INTEGRAL METAL GUARD.
 - THE CONDENSING UNIT SALT SPRAY TEST METHOD: ASTM B917. THE HEAT EXCHANGER COVERED BY THE UNIT SHALL HAVE 100% RUST OR CORROSION PROTECTION TO 3,280 HOURS.
 - COMPRESSOR:
 - THE COMPRESSOR SHALL BE AN INVERTER DRIVE, DC VOLTAGE, TWIN BLDC ROTARY COMPRESSOR.
 - A CRANKCASE HEATING DEVICE SHALL BE FACTORY MOUNTED ON THE COMPRESSOR.
 - THE OUTDOOR UNIT COMPRESSORS SHALL HAVE A SOFT-START FUNCTION TO REDUCE ELECTRICITY DEMAND DURING SYSTEM START AND TO INCREASE COMPRESSOR RELIABILITY.
 - THE COMPRESSOR SHALL BE MOUNTED ON AN INTERNAL THERMAL OVERLOAD PROTECTOR.
 - THE COMPRESSOR SHALL BE MOUNTED TO AVOID THE TRANSMISSION OF VIBRATION.
 - ELECTRICAL:
 - THE OUTDOOR UNIT ELECTRICAL POWER SHALL BE 208/230 VOLTS, 1 PHASE, AND 60 HERTZ.
 - THE OUTDOOR UNIT SHALL BE CAPABLE OF OPERATING WITHIN VOLTAGE LIMITATIONS OF 187-238 VOLTS (208V/60HZ) OR 207-253 VOLTS (230V/60HZ).
 - THE OUTDOOR UNIT SHALL BE CONTROLLED BY INTEGRAL MICROPROCESSORS.
 - THE CONTROL SECTION BETWEEN THE INDOOR UNITS AND THE OUTDOOR UNIT SHALL BE 0.5VDC – 7VDC COMPLETED USING STRANDED, ANNEALED COPPER CONDUCTOR, 16 AWG, TWO-CORE CABLE TO PROVIDE TIGHT INTEGRATION OF THE SYSTEM.
 - THE INDOOR UNIT SHALL PROVIDE POWER TO THE INDOOR UNIT WITH 14 AWG X 3 POWER WIRE (120V/100' MAX. LENGTH). THE POWER WIRE SHALL BE RUN FROM THE CONDENSING UNIT TO INDOOR UNIT.
 - APPROVED MANUFACTURERS: JCI, DAIKIN, SAMSUNG
- BUILDING AUTOMATION SYSTEM AND TEMPERATURE CONTROLS
 - AS A SUBCONTRACTOR, THE CONTRACTOR SHALL PROVIDE THE TEMPERATURE CONTROLS CONTRACTOR (TCC) WITH THE BUILDING AUTOMATION SYSTEM (BAS) MANUFACTURER SHALL FURNISH AND INSTALL ALL COMPONENTS, LABOR, AND EQUIPMENT REQUIRED FOR THE WORK INDICATED WITHIN THE DRAWINGS AND SPECIFICATIONS FOR A FULLY INTEGRATED MATRIX BACNET BTL CERTIFIED SYSTEM INCORPORATING DIRECT DIGITAL CONTROL (DDC) FOR ENERGY MANAGEMENT, EQUIPMENT MONITORING, AND CONTROL FOR THE BUILDING AUTOMATION SYSTEM (BAS) AS SPECIFIED HEREIN.
 - THE CONTRACTOR SHALL PROVIDE ALL SOFTWARE AND HARDWARE, PRIMARY FIELD CONTROLLERS (PFC'S), APPLICATION SPECIFIC CONTROLLERS (ASC'S), SENSORS, CONTROL DEVICES, ACTUATORS, INSTALLATION, CALIBRATION, SUPERVISION, ADJUSTMENTS, WIRING, ANY REQUIRED AND NOT SPECIFICALLY ADDRESSED IN THIS SPECIFICATION BUT REQUIRED FOR SYSTEM FUNCTIONALITY AND FINE TUNING NECESSARY FOR THE BUILDING OPERATIONAL HVAC CONTROL SYSTEM. INSTALLATION SHALL COMPLY WITH LOCAL, STATE, AND FEDERAL CODE REQUIREMENTS AS APPLICABLE.
 - THE CONTRACTOR WILL BE RESPONSIBLE FOR ALL SYSTEM GRAPHICS SOFTWARE, PROGRAMMING, TRENDS, ALARMING AND SCHEDULING. THIS CONTRACTOR SHALL PROVIDE A COMPLETE LISTS DATABASE FOR THE PROJECT. THE DATABASE SHALL FOLLOW ALL THE NAMING STANDARDS AND EXPOSE ALL POINTS AS OUTLINED IN THE SPECIFICATION, DETAILED ON THE DRAWINGS. SERVER HARDWARE, SOFTWARE, GRAPHICS, SCHEDULING, TRENDS AND ALARMING ARE THE RESPONSIBILITY OF THIS CONTRACTOR. EVERY WIRE WILL BE LABELED AT THE PANEL AND EQUIPMENT AS TO ITS NAMING IN THE PROGRAM AND LOCAL NAME, NOT JUST ANY NUMBER.
 - ACCESSIBLE PNEUMATIC TUBING SHALL BE NON-COMBUSTIBLE POLYETHYLENE ESTER AMESTM FLAME RETARDANT AND NON-BURNING CHARACTERISTICS PER ASTM REQUIREMENTS FOR BUILDING PNEUMATIC CONTROLS.
 - INACCESSIBLE PNEUMATIC TUBING SHALL BE HARD DRAWN COPPER WITH FLARED COMPRESSION OR COPPER SOLDERED JOINTS.
 -

REVISIONS:

1. MATERIALS AND EQUIPMENT SHALL BE INSTALLED IN AN ORDERLY, NEAT, PLUMB, AND LEVEL, BY PROPERLY TRAINED AND CERTIFIED INSTALLERS ACROSS EACH DISCIPLINE.
 2. OWNER SHALL HAVE FIRST RIGHT OF REFUSAL FOR ANY AND ALL ITEMS BEING DEMOLISHED OR REMOVED FROM PROJECT SCOPE.
 3. WHERE EXISTING MECHANICAL, HVAC, PLUMBING, MEDICAL GAS, FIRE SUPPRESSION OR OTHER EQUIPMENT, DUCTWORK, PIPING, ETC, EXPLICITLY SHOWN OR INHERENTLY EXPRESSED WITHIN THESE CONTRACT DOCUMENTS ARE INDICATED TO BE REVISED, ALTERED, OR REMOVED, ALL APPURTENANCES ANCILLARY TO THE EFFORT SHALL BE INCLUDED WITHIN THIS SCOPE OF WORK, INCLUDING BUT NOT LIMITED TO PATCHING OF ROOFS, WALLS, FLOORS, ETC.
 4. PIPING, DUCTWORK, SPECIALTIES, AND EQUIPMENT SHALL BE INSTALLED TIGHT TO STRUCTURE ABOVE TO MAXIMIZE FUTURE CEILING HEIGHT OR OPEN CEILING HEAD SPACE.
 5. HVAC, PLUMBING, FIRE SUPPRESSION, SPECIALTIES, EQUIPMENT AND ANY/ALL ANCILLARY APPURTENANCES SHALL BE INSTALLED CONCEALED ABOVE CEILINGS WHERE APPLICABLE UNLESS SPECIFICALLY NOTED OTHERWISE OR WHERE NO PROPOSED CEILING EXISTS.
- 3.2 FIRE SUPPRESSION SYSTEM INSTALLATION
1. PROVIDE ALL MATERIALS, EQUIPMENT, PIPING, FITTINGS, HANGERS, VALVES, AND ALL OTHER APPURTENANCES NECESSARY FOR COMPLETE FIRE SUPPRESSION SYSTEMS IN ACCORDANCE WITH STATE AND LOCAL CODES, NFPA, AND AUTHORITIES HAVING JURISDICTION.
 2. THIS CONTRACTOR SHALL BE LICENSED BY THE STATE AS A CERTIFIED SPRINKLER DESIGNER OR PROFESSIONAL FIRE PROTECTION ENGINEER AND SHALL PREPARE SUBMITTAL DOCUMENTS FOR REVIEW INDICATING SPRINKLER PIPING LAYOUT, HEAD TYPES, ZONES, RISER LOCATIONS, FIRE PUMPS, AND HYDRAULIC CALCULATIONS. SUBMIT FIRE SUPPRESSION PACKAGE TO AUTHORITIES HAVING JURISDICTION, OWNER'S INSURANCE COMPANY, ARCHITECT, AND ENGINEER.
 3. THIS CONTRACTOR SHALL ACQUIRE A RECENT FLOW TEST PERFORMED WITHIN THE PAST YEAR OR PERFORM SAID TEST IN ACCORDANCE WITH THE FIRE DEPARTMENT AND WATER DEPARTMENT REQUIREMENTS.
 4. NEW SPRINKLER PIPING AND EXISTING PIPING TO BE REWORKED SHALL BE COORDINATED WITH EXISTING AND NEW MEP, STRUCTURAL AND ARCHITECTURAL ITEMS.
 5. RE-WORKED AND NEW SPRINKLER PIPING SHALL BE SUPPORTED PER NFPA 13 REQUIREMENTS.
 6. ALL PIPING SHALL BE COMPLETELY DRAINABLE.
 7. SPRINKLER PIPING COMPONENTS SHALL BE FACTORY SUPPLIED AND NOT MODIFIED IN ANY WAY.
- 3.3 PLUMBING SYSTEMS INSTALLATION
1. PROVIDE ALL MATERIALS, EQUIPMENT, PIPING, INSULATION, FITTINGS, HANGERS, VALVES, AND ALL OTHER APPURTENANCES NECESSARY FOR COMPLETE PLUMBING, DRAINAGE, AND PIPING SYSTEMS IN ACCORDANCE WITH STATE AND LOCAL CODES, ASPE, AND AUTHORITIES HAVING JURISDICTION.
 2. PROVIDE PLUMBING FIXTURES MATCHING PROJECT SCHEDULE AND SPECIFICATION REQUIREMENTS INCLUDING TRIM, QUARTER-TURN BALL VALVE STOPS, INSULATION KITS ON SUPPLY AND DRAINAGE PIPING (INCLUDING ADA FIXTURES), VACUUM BREAKERS WHERE BACK-SIPHONING MAY OCCUR, BRAIDED STAINLESS STEEL HOSES, FIXTURE CARRIERS AND PUBLIC FAUCET ASSE 1070 MIXING VALVES SPECIFIED OR INHERENTLY REQUIRED FOR INSTALLATION. METAL COMPONENTS SHALL BE CHROME PLATED BRASS UNLESS NOTED OTHERWISE.
 3. SANITARY P-TRAPS SHALL BE CHROME PLATED CAST BRASS BODY WITH CLEANOUT WITH 1/2 GAUGE SEAMLESS TUBULAR WALL BEND, CAST BRASS SLIP NUTS, AND CSA CERTIFICATION.
 4. ALL MATERIALS USED WITHIN RETURN AIR CEILING PLENUMS SHALL COMPLY WITH NFPA 90A AND BE RATED FOR SUCH USE.
 5. ALL PIPING VALVES, FITTINGS, SPECIALTIES, ETC, SHALL BE LISTED AS "DEZINCIFICATION RESISTANT" CONTAINING NO MORE THAN 1% ZINC.
 6. PLUMBING VENTS SHALL BE TERMINATED AT 18" ABOVE FINISHED ROOF ELEVATION.
 7. CHANGES IN PIPE SIZE SHALL BE USED WITH ECCENTRIC FITTINGS TO REDUCE AIR POCKETS IN PRESSURE PIPING.
 8. ALL SPECIALTIES REQUIRING PERIODIC MAINTENANCE AND OPERATION SHALL BE READILY ACCESSIBLE.
 9. PROVIDE DIELECTRIC FITTINGS IN CONNECTIONS OF DISSIMILAR METALS BETWEEN EQUIPMENT, PIPING, SPECIALTIES, AND ASSOCIATED HANGERS.
 10. ALL PIPING SYSTEMS SHALL BE COMPLETELY DRAINABLE, INCLUDING BASE OF RISERS, LOCATIONS OF TRAPPED WATER, AND INLET AND OUTLET OF COILS. DRAIN VALVE SHALL BE BALL-VALVE, QUARTER TURN, HOSE THREADED TERMINATION AND CAP.
 11. ALL HIGH-POINTS SHALL INCLUDE MANUAL AIR VENTS COMPRISED OF BALL-VALVE, QUARTER TURN, HOSE THREADED TERMINATION AND CAP.
 12. WHERE INTERIOR WALL PENETRATIONS OCCUR, PROVIDE MACHINE CUT STEEL SLEEVES 1" LARGER THAN OUTSIDE DIAMETER OF ASSOCIATED SERVICE PIPE. SEAL OPENING WATERTIGHT WITH APPROPRIATE MATERIAL OR FIRE CAULKING TO MAINTAIN RATING OF ASSEMBLY.
 13. WHERE EXTERIOR WALL PENETRATIONS OCCUR, PROVIDE MACHINE CUT STEEL SLEEVES 2" LARGER THAN THE OUTSIDE DIAMETER OF ASSOCIATED SERVICE PIPE. SEAL OPENING WATERTIGHT WITH MECHANICAL INTERLOCKING RUBBER WATER STOP RATED FOR 20 PSIG.
 14. BRANCH PIPING CONNECTIONS TO MAINS SHALL BE MADE AS INDICATED ON DRAWINGS (TOP / BOTTOM), CONNECTED WITH AMPLE SPACE FOR PIPING EXPANSION, PERMIT PROPER DRAINAGE OF SYSTEM, AND MINIMIZE HIGH-POINTS IN SYSTEM LEADING TO AIR POCKETS WHERE AIR VENTS ARE REQUIRED.
 15. SUPPORT ALL PIPING SYSTEMS AT INTERVALS REQUIRED BY CODE. SAGGING OR BENDS IN PIPING IS PROHIBITED. CLEVIS, TRAPEZE, SWIVEL, AND RISER CLAMPS ARE LISTED AS ACCEPTABLE. MAINTAIN DIELECTRIC SEPARATION OF DISSIMILAR METALS OR USE HANGERS OR SIMILAR MATERIAL.
 16. ALL PIPING SHALL BE CLEANED PRIOR TO INSTALLATION, INCLUDING UP-ENDING, POUNDING, OR SWABBING TO CLEAR ALL DEBRIS FROM PIPING INTERIOR.
 17. PROVIDE ALL VIBRATION AND EXPANSION CONTROL DEVICES INCLUDING GUIDES AND ANCHORS TO MITIGATE STRESS AND VIBRATION TO OTHER SYSTEM COMPONENTS, INCLUDING COILS, FIXTURES, PUMPS, AND EQUIPMENT.
 18. PROVIDE ALL HANGERS, RODS, CHANNEL, CLAMPS, WIRES, ETC REQUIRED FOR INSTALLATION OF PIPING SYSTEMS. WHERE PIPING IS INSULATED, HANGER SHALL BE OVERSIZED MATCHING OUTSIDE DIAMETER OF INSULATION AND SHALL REST IN INSULATION SHIELD WITH BLOCKING TO MAINTAIN INTEGRITY OF INSULATION. THERMAL BRIDGING IS PROHIBITED.
 19. PIPING INSULATION SHALL BE REPLACED WHERE REMOVED ON EXISTING PIPING DUE TO DEMOLITION OR NEW WORK. APPROVED FIBERGLASS INSULATION MANUFACTURERS: CERTANTEED, XENAFLEX, JOHNS MANVILLE, OWENS CORNING. APPROVED CLOSED-CELL ELASTOMERIC INSULATION MANUFACTURERS: ARMACELL, NOMACO.
 20. INSULATE ALL EQUIPMENT THAT SERVICES HEATING AND CHILLED WATER INCLUDING PUMPS, HEAT EXCHANGERS, EXPANSION/COMPRESSION TANKS, AIR/DIRT SEPARATORS, VALVE BODIES AND SPECIALTIES WITH FLEXIBLE ELASTOMERIC INSULATION OR MINERAL FIBER BOARD WITH FACTORY APPLIED JACKET.
 21. INSULATE ALL EQUIPMENT THAT SERVICES DOMESTIC HOT AND COLD WATER SYSTEMS INCLUDING PUMPS, HEAT EXCHANGERS, EXPANSION/COMPRESSION TANKS, VALVE BODIES AND SPECIALTIES WITH FLEXIBLE ELASTOMERIC INSULATION OR MINERAL FIBER BOARD WITH FACTORY APPLIED JACKET.
- 3.4 HVAC DUCTWORK SYSTEMS INSTALLATION
1. PROVIDE ALL MATERIALS, EQUIPMENT, PIPING, DUCTWORK, INSULATION, FITTINGS, HANGERS, DAMPERS, AND ALL OTHER APPURTENANCES NECESSARY FOR COMPLETE HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS IN ACCORDANCE WITH STATE AND LOCAL CODES, SMACNA, AND AUTHORITIES HAVING JURISDICTION.
 2. UNLESS NOTED OTHERWISE, THE MC SHALL COORDINATE RETURN AIR PATHWAY FROM ENCLOSED SPACES TO MAIN RETURN AIR DUCTWORK WITHIN RESPECTIVE CEILING PLENUM BY PROVIDING OPENINGS ABOVE CEILING IN WALL NOT TO EXCEED 400 F.P.M. CLEARLY INDICATE RETURN AIR PATHWAY AND CALCULATIONS SHOWING VELOCITIES OF 400FPM OR LESS WITH SHEET METAL DRAWINGS DURING THE SUBMITTAL REVIEW PROCESS.
 3. DUCTWORK SHALL BE SEALED AIR-TIGHT PER SMACNA REQUIREMENTS SEAL CLASS 'A'. DUCTWORK SEALING MATERIALS SHALL BE SPECIFICALLY INDICATED FOR SUCH USE, LEAD FREE, AND LOW VOC. APPROVED MANUFACTURERS: 3M, DOW, MCGILL
 4. CHANGES IN CROSS SECTIONAL AREA ARE PERMITTED PROVIDE PERCENTAGE OF FREE AREA MINIMALLY MEETS BASIS OF DESIGN AND ASPECT RATIO DOES NOT DEVIATE MORE THAN 25%.
 5. ALL DUCTWORK SHALL BE DIRECTLY SUSPENDED FROM STRUCTURE ABOVE. SUSPENSION FROM ANY OTHER ELEMENT BESIDES FROM STRUCTURE ABOVE IS STRICTLY PROHIBITED.
 6. ALL DUCTWORK INTERIOR TYPICALLY VISIBLE FROM BUILDING OCCUPANTS SHALL BE PAINTED FLAT BLACK.
 7. DUCTWORK SHALL BE CONTINUOUS WITH NO PENETRATIONS FROM OTHER MATERIALS, EQUIPMENT, PIPING, CONDUIT, WIRING, TELEDATA, ETC. PENETRATIONS OF DUCTWORK IS PROHIBITED.
 8. DUCTWORK SHALL BE PRESSURE TESTED PER SHRAE 90.1, SECTION 6 REQUIREMENTS.
 9. INSULATE ALL EQUIPMENT THAT SERVICES HEATING AND CHILLED WATER SYSTEMS INCLUDING PUMPS, HEAT EXCHANGERS, EXPANSION/COMPRESSION TANKS, AIR/DIRT SEPARATORS, VALVE BODIES AND SPECIALTIES WITH FLEXIBLE ELASTOMERIC INSULATION OR MINERAL FIBER BOARD WITH FACTORY APPLIED JACKET.
 10. INSTALL REQUIRED DUCTWORK GALLIE IN ASSOCIATION WITH PROPER STIFFENER INSTALLATION REQUIREMENTS. PULSATING OF DUCTWORK IS PROHIBITED.
 11. SUSPEND DUCTWORK WITH GALVANIZED STRAPPING, RODS, TRAPEZE, AND CABLE LOOP HANGERS APPROVED BY SMACNA. HANGERS DIRECTLY FASTENED TO DUCTWORK SHALL BE MADE VIA SHEET METAL SCREWS AND SEALED APPROPRIATELY.

END OF MECHANICAL SPECIFICATIONS

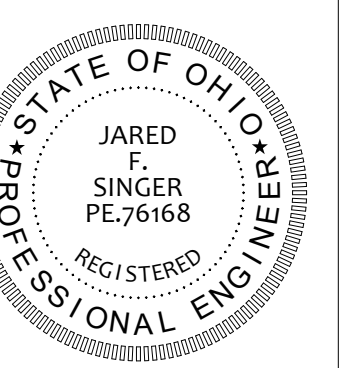
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MOTTIER & MEADOWS
ARCHITECTS

WILMINGTON CBOC
31 CLARK STREET WILMINGTON, OHIO

INTERIOR BUILD-OUT - ISSUED FOR PERMITS

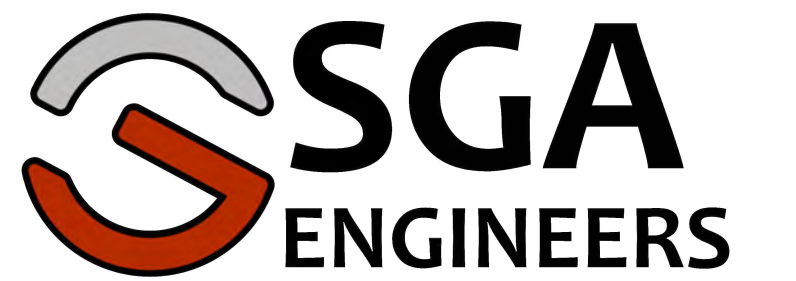


Jared F. Singer
License: #PE-76168
Expiration Date:
2025-12-31

THIS DWG :
HVAC SPECIFICATIONS
- PART 3

COMM 23144
DATE 06-17-2024

DWG
2-M6.2



MECHANICAL | ELECTRICAL | PLUMBING | FIRE | TECHNOLOGY
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