

ABBREVIATIONS - MECHANICAL

THIS IS A MASTER ABBREVIATIONS LIST. SOME ABBREVIATIONS MAY NOT APPLY TO THIS PROJECT.

Table with 2 columns: Abbreviation (e.g., (D), (E), (R), AC, AD, ADJ, AF, AFF, AHU, AI, AO, AS, ASHRAE, ATC, ATV, BAS, BHP, BI, BMS, BO, BT, BTU, BTUH, CD, CFM, CO, CM, CO2, CD, CONT, CRU, CT, CU, CUH, Cv, CWP, DB, DBL, DEG, DI, DIA, DMSS, DN, DO, DOAS, DP, DP, DRE, DWG, DWH, DX, EA, EAT, ECM, EF, EHC, ELEC, EMCS, ESP, ET, ETC, EUH, EWH, EWT, F, FD, FLA, FLEX, FP, FPM, FS, FT, GA, GAL, GALV, GC, GPH, GPM, GR, GUH, H) and Description (e.g., DEMOLISH, EXISTING, REMOVE, AIR CONDITIONING, ACCESS DOOR, ADJUSTABLE, AIRFLOW, ABOVE FINISHED FLOOR, AIR HANDLING UNIT, ANALOG INPUT, ANALOG OUTPUT, AIR SEPARATOR, AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR-CONDITIONING ENGINEERS, AUTOMATIC TEMPERATURE CONTROL, ATMOSPHERIC VENT, BUILDING AUTOMATION SYSTEM, BRAKE HORSEPOWER, BINARY INPUT, BUILDING MANAGEMENT SYSTEM, BINARY OUTPUT, BUFFER TANK, BRITISH THERMAL UNIT, BRITISH THERMAL UNIT PER HOUR, CONDENSATE DRAIN, CUBIC FEET PER MINUTE, CARBON MONOXIDE, CARBON DIOXIDE, CONTROLS, CONTINUED, CONDENSATE RETURN UNIT, COOLING TOWER, CONDENSING UNIT, CABINET UNIT HEATER, VALVE COEFFICIENT, CONDENSER WATER PUMP, DRY BULB, DOUBLE, DEGREE, DIGITAL INPUT, DIAMETER, DUCTLESS MINI-SPLIT SYSTEM, DOWN, DIGITAL OUTPUT, DEDICATED OUTDOOR AIR SYSTEM, DIFFERENTIAL PRESSURE (SENSOR), DEW POINT, DRYER EXHAUST, DRAWING, DOMESTIC WATER HEATER, DIRECT EXPANSION, EXHAUST AIR, ENTERING AIR TEMPERATURE, ELECTRONICALLY COMMUTATED MOTOR, EXHAUST FAN, ELECTRIC HEATING COIL, ELECTRICAL, ENVIRONMENTAL MANAGEMENT CONTROL SYSTEM, EXTERNAL STATIC PRESSURE, EXPANSION TANK, ETCETERA, ELECTRIC UNIT HEATER, ELECTRIC WATER HEATER, ENTERING WATER TEMPERATURE, DEGREES FAHRENHEIT, FIRE DAMPER OR FLOOR DRAIN, FULL LOAD AMPS, FLEXIBLE, FAN POWERED, FEET PER MINUTE, FLOW SWITCH, FOOT/FEET, GAUGE, GALLONS, GALVANIZED, GENERAL CONTRACTOR, GALLONS PER HOUR, GALLONS PER MINUTE, GRAINS, GAS FIRED UNIT HEATER, HUMIDIFIER OR HEIGHT)

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Table with 2 columns: Abbreviation (e.g., H2O, HD, HP, HVAC, HWT, HX, IN, KW, L, LAT, LBS, LF, LWT, M, MA, MAT, MAU, MBH, MCA, MERV, MFR, MOCP, NC, NO, NPSH, NTS, OA, OAT, OD, OS, P, PH, PHC, PICV, PPM, PRV, PSI, PSIA, PSIG, PTAC, QTY, R, RA, RAT, RCP, REF, RH, RHC, RPM, RTU, SA, SAF, SAT, SCH, SEC, SF, SP, SS, T, TEMP, T&P, T-STAT, TON, TSP, TYP, UH, V, VOLT, VAV, VEL, VF, VFD, W, W/ , WB, WC, WG, WPD) and Description (e.g., WATER, HEAD, HORSEPOWER, HEATING, VENTILATION, AND AIR-CONDITIONING, HEATING WATER TEMPERATURE, HEAT EXCHANGER, INCH, KILOWATT, LOUVER, LEAVING AIR TEMPERATURE, POUNDS, LINEAR FEET, LEAVING WATER TEMPERATURE, MOTOR OR MOTORIZED DAMPER OR METER, MIXED AIR, MIXED AIR TEMPERATURE, MAKEUP AIR UNIT, 1,000 BRITISH THERMAL UNITS PER HOUR, MINIMUM CIRCUIT AMPS, MINIMUM EFFICIENCY REPORTING VALUE, MANUFACTURER, MAXIMUM OVERCURRENT PROTECTION, NORMALLY CLOSED OR NOISE CRITERIA, NORMALLY OPEN OR NUMBER, NET POSITIVE SUCTION HEAD, NOT TO SCALE, OUTDOOR AIR, OUTDOOR AIR TEMPERATURE, OUTSIDE DIAMETER, OCCUPANCY SENSOR, PRESSURE OR PRESSURE SENSOR, PHASE, PREHEAT COIL, PRESSURE INDEPENDENT CONTROL VALVE, PARTS PER MILLION, PRESSURE REDUCING VALVE, POUNDS PER SQUARE INCH, POUNDS PER SQUARE INCH ABSOLUTE, POUNDS PER SQUARE INCH GAUGE, PACKAGED TERMINAL AIR CONDITIONER, QUANTITY, RADIUS, RISE, OR REMOVE, RETURN AIR, RETURN AIR TEMPERATURE, REFLECTED CEILING PLAN, RELIEF AIR FAN, RELATIVE HUMIDITY, REHEAT, RETURN AIR FAN, REHEAT COIL, REVOLUTIONS PER MINUTE, ROOF TOP UNIT, SUPPLY AIR, SUPPLY AIR FAN, SUPPLY AIR TEMPERATURE, SCHEDULE, SECONDS, SUPPLY FAN OR SQUARE FOOT, STATIC PRESSURE, SPLIT SYSTEM OR STAINLESS STEEL, TEMPERATURE, TEMPERATURE AND PRESSURE, THERMOSTAT, COOLING TONS (12,000 BTUH), TOTAL STATIC PRESSURE, TYPICAL, UNIT HEATER, VOLTAGE, VARIABLE AIR VOLUME, VELOCITY, VENTILATION FAN, VARIABLE FREQUENCY DRIVE, WIDTH OR WATTS, WITH, WET BULB, WATER COLUMN, WATER GAUGE, WATER PRESSURE DROP)

MECHANICAL GENERAL NEW WORK NOTES

- 1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL CODES AND REGULATIONS. MECHANICAL EQUIPMENT SHALL BE SELECTED TO MEET OR EXCEED THE REQUIREMENTS OF THE ENERGY CONSERVATION CODE. MECHANICAL WORK SHALL COMPLY WITH PROJECT SPECIFICATIONS.
2. FURNISH AND INSTALL ALL INCIDENTAL ACCESSORIES REQUIRED TO MAKE THE MECHANICAL WORK COMPLETE AND OPERATIONAL.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR INSPECTING, TESTING AND VERIFYING CONTROL SEQUENCES, LINE BY LINE, AND VERIFYING OPERATION OF THE EQUIPMENT. ALL EQUIPMENT, VALVES, DAMPERS ACTUATORS, ETC. SHALL BE FUNCTIONAL BEFORE PROJECT CLOSEOUT. COORDINATE WITH ELECTRICAL, FIRE ALARM AND TAB CONTRACTORS. REFER TO SECTION 239001 FOR MORE DETAIL.
4. THESE DRAWINGS ARE DIAGRAMMATIC. EXACT EQUIPMENT LOCATIONS AND DUCT AND PIPING ROUTING SHALL BE COORDINATED WITH THE BUILDING AND SITE CONDITIONS. THE ACTUAL EQUIPMENT AND MINIMUM CLEARANCE DIMENSIONS SHALL BE VERIFIED WITH THE SUPPLIERS.
5. EQUIPMENT, DUCTWORK, PIPING AND CONDUIT LAYOUT SHALL BE COORDINATED WITH BUILDING COMPONENTS AND OTHER TRADES PRIOR TO INSTALLATION. THE SYSTEM SHALL BE NEATLY ARRANGED TO MAXIMIZE SPACE ABOVE CEILINGS AND WITHIN CHASES. MAINTAIN MINIMUM EQUIPMENT AND DEVICE MAINTENANCE CLEARANCES. DEVICES SHALL BE READILY MAINTAINABLE. METERS AND GAGES SHALL BE ORIENTED FOR BEST VIEW. INSTALLED MATERIALS NOT COORDINATED SHALL BE REMOVED AND REINSTALLED AT NO ADDITIONAL COST.
6. DUCT OFFSETS SHALL BE MADE AT 15 OR 30-DEGREE ANGLES WHERE POSSIBLE BUT AT NO MORE THAN 45-DEGREES.
7. WALL-MOUNTED CONTROL SENSORS SHALL BE INSTALLED AT 48-INCHES ABOVE THE FLOOR TO THE TOP OF BACK-BOX. COORDINATE EXACT LOCATIONS WITH LIGHT SWITCHES. WHEN BOTH ARE INDICATED ADJACENT TO A DOOR, LOCATE THE SWITCH CLOSEST TO THE DOOR AND THE SENSOR WITHIN 12-INCHES OF THE SWITCH.
8. CONTROL AND ALARM DEVICES SHALL BE INSTALLED IN BACK-BOXES WITHIN EXISTING WALLS. SURFACE-MOUNTED CONDUIT AND RACEWAY WILL NOT BE ACCEPTED EXCEPT FOR EXISTING SOLID CONCRETE WALLS. DEVICE BACK-BOXES IN FIRE-RATED WALLS SHALL HAVE FIRESTOP PUTTY PADS OR EQUIVALENT UL-LISTED INSTALLATION.
9. INSTALL PENETRATIONS OF LIFE-SAFETY RATED ASSEMBLIES PER APPROVED UL-LISTED DETAIL IN ACCORDANCE WITH THE BUILDING CODE.
10. PROVIDE A DUCT ACCESS DOOR FOR EACH DUCT-MOUNTED DEVICE REQUIRING MAINTENANCE OR INSPECTION. REFER TO SECTION 23 33 00 FOR DOOR SIZING REQUIREMENTS. COORDINATE CEILING AND WALL ACCESS DOORS WITH DUCT ACCESS DOORS.
11. HVAC PIPING SHALL BE NO LESS THAN 3/4-INCH, EXCEPT REFRIGERANT PIPING.
12. ALL MOTORIZED EQUIPMENT SHALL BE CONNECTED TO DUCTWORK OR PIPING WITH FLEXIBLE CONNECTIONS.
13. EXTEND POWER CONDUIT AND WIRING FROM DEDICATED POWER SOURCES TO CONTROL EQUIPMENT AND DEVICES. COORDINATE POWER SOURCES WITH ELECTRICAL CONTRACTOR.
14. PIPING BRANCHES FROM MAINS TO HEATING AND COOLING COILS SHALL MATCH SCHEDULED SIZES UNLESS OTHERWISE NOTED.
15. MAINTAIN MINIMUM 36-INCH CLEARANCE FOR 120V/208V POWER OR 42-INCH CLEARANCE FOR 277/480V POWER AS REQUIRED BY THE NATIONAL ELECTRIC CODE FOR ELECTRICAL EQUIPMENT AND TO PROVIDE MAINTENANCE ACCESS.
16. FIELD VERIFY EXACT PIPING SIZES AND FLOW DIRECTIONS PRIOR TO CONNECTING TO PIPING SYSTEM.

MECHANICAL GENERAL DEMOLITION WORK NOTES

- 1. VERIFY PROJECT SITE EXISTING CONDITIONS PRIOR TO BID. EXISTING CONDITIONS INDICATED IN THESE DOCUMENTS ARE APPROXIMATE AND DO NOT INCLUDE EVERY COMPONENT.
2. RECORD EXISTING CONDITIONS PRIOR TO THE START OF WORK. REPAIR DAMAGES RESULTING FROM PROJECT WORK.
3. COORDINATE MATERIALS TO BE RETAINED BY THE OWNER PRIOR TO THE START OF DEMOLITION WORK. RETAINED MATERIALS SHALL BE DELIVERED TO A POINT DESIGNATED BY THE OWNER WITHIN A 10-MILE RADIUS OF THE PROJECT SITE. PROPERLY DISPOSE OF ALL REMAINING DEMOLITION MATERIALS. COMPLY WITH MATERIAL RECYCLING REQUIREMENTS. DO NOT ABANDON IN PLACE ANY ITEMS IDENTIFIED TO BE REMOVED UNLESS OTHERWISE NOTED.
4. THE SCOPE OF DEMOLITION FOR ITEMS TO BE REMOVED INCLUDES ASSOCIATED SUPPORTS, POWER CONNECTIONS, CONTROLS, ETC.
5. PERFORM ALL DEMOLITION INDICATED INCLUDING THAT REQUIRED TO INSTALL NEW WORK. REMOVE AND REINSTALL MATERIALS TO REMAIN AS NEEDED WHERE REQUIRED TO PERFORM DEMOLITION OR TO INSTALL NEW WORK. REPAIR DAMAGED SURFACES TO MATCH EXISTING ADJACENT SURFACES.
6. REMOVE DUCT, PIPING AND CONDUIT BACK TO POINTS INDICATED. PREPARE OPEN ENDS FOR CONNECTION TO NEW WORK INDICATED OR CAP.
7. REPAIR DAMAGE TO ANY OPENINGS IN LIFE-SAFETY RATED ASSEMBLIES CREATED BY THE DEMOLITION WORK PER APPROVED UL-LISTED DETAIL IN ACCORDANCE WITH THE BUILDING CODE.
8. PIPING AND CONDUIT TO BE REMOVED THAT IS LOCATED BELOW CONCRETE SLAB-ON-GRADE FLOORS OR WITHIN CONCRETE SOLID OR BLOCK WALLS MAY BE ABANDONED IN PLACE UNLESS NECESSARY TO INSTALL NEW WORK OR NOTED OTHERWISE. WHEN ABANDONING CUT PIPING OR CONDUIT BACK AT LEAST 1-INCH BEHIND THE SURFACE, PLUG THE ENDS AND PATCH THE SURFACE WITH SIMILAR MATERIAL.
9. DURING RENOVATION OF OCCUPIED AREAS MAINTAIN OPERATION OF EXISTING CONTROL SYSTEM. AT EACH PHASE RE-VERIFY OPERATION OF REMAINING CONTROLLED DEVICES AFTER REMOVAL WORK IS COMPLETE.
10. EXISTING SYSTEMS SERVING AREAS OCCUPIED DURING CONSTRUCTION SHALL BE KEPT IN OPERATION BY TEMPORARY MEANS. TEMPORARY MEANS INCLUDES TEMPORARY BYPASSES OR CONNECTIONS TO BUILDING SYSTEMS AND / OR CONNECTIONS TO TEMPORARY EQUIPMENT. ALL TEMPORARY MEANS, MATERIALS AND EQUIPMENT SHALL BE INCLUDED IN THE CONTRACT UNLESS OTHERWISE NOTED.

HAZARDOUS MATERIAL NOTES

- 1. HAZARDOUS MATERIALS WARNING: IF UNCOVERED MATERIALS ARE SUSPECTED OF CONTAINING ASBESTOS, LEAD-BASED PAINT, PCB'S OR ANY OTHER HAZARDOUS MATERIAL, STOP WORK IN THAT AREA AND REPORT THE CONCERN TO THE CONSTRUCTION MANAGER, OWNER, ARCHITECT AND ENGINEER IMMEDIATELY.

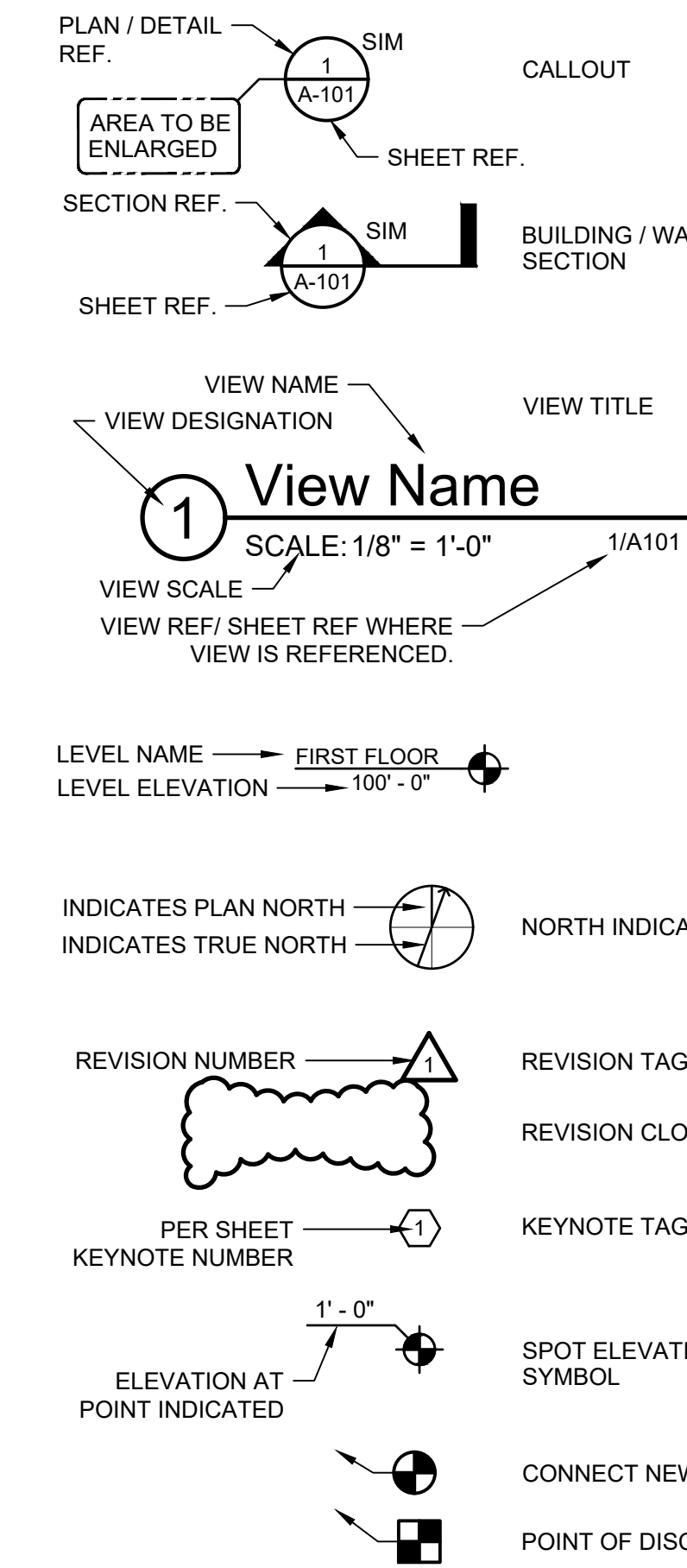
HVAC SYMBOLS

Table with 2 columns: SYMBOL and DESCRIPTION. Includes symbols for GRILLES (Eccentric Transition, Concentric Transition, Radius Offset, Mitered Offset, Radius Elbow, Mitered Elbow with Turning Vanes), SUPPLY DUCT, RETURN AIR DUCT, EXHAUST AIR DUCT, FLEX DUCT, DEMOLITION DUCTWORK OR EQUIPMENT, EXISTING DUCTWORK OR EQUIPMENT, NEW DUCTWORK OR EQUIPMENT (24x24, 24Ø, 24/18Ø), RECTANGULAR TAKE-OFF, ROUND TAKE-OFF, and ACCESS DOORS.

HVAC SYMBOLS CONTINUED

Table with 2 columns: SYMBOL and DESCRIPTION. Includes symbols for DAMPERS (Volume Damper, Fire Damper, Fire/Smoke Damper, Smoke Damper, Manual Damper, Gravity Backdraft Damper, Motorized Parallel Blade Damper, Motorized Opposed Blade Damper) and CONTROLS (Wall Module, Carbon Dioxide Sensor, Duct Mounted Smoke Detector, Duct Mounted Temperature/Humidity Sensor, Temperature Sensor, Humidity Sensor, Freezestat, Averaging Temperature Sensor in Air Duct, Occupancy Sensor, Manual Motor Starter, Fractional Horsepower).

STANDARD DETAILING SYMBOLS



MECHANICAL PIPING SYMBOLS

Table with 2 columns: SYMBOL and DESCRIPTION. Includes symbols for pipe with system abbreviation, ball valve, stop valve, 3-way valve, balancing valve, butterfly valve, control valve, 3-way control valve, pipe turn up/down, pipe bottom/top take off, pipe cap or plug, pipe union, and wye strainer.

MECHANICAL PIPING SYSTEMS

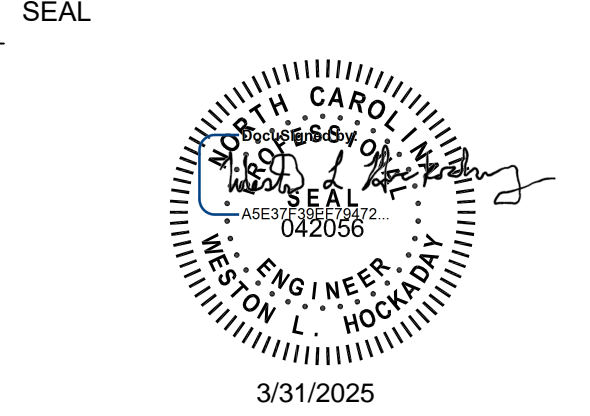
Table with 2 columns: SYMBOL and DESCRIPTION. Includes symbols for chilled water return, chilled water supply, drain, heating water return, and heating water supply.



Dewberry Engineers Inc. 2610 Wyckoff Road Suite 410 Raleigh, NC 27607-3073 919.881.9939 NC License No. F-0929



CLAYTON MIDDLE SCHOOL AHU 16 AND 17 REPLACEMENT 490 GUY RD, CLAYTON, NC 27520 CONSTRUCTION DOCUMENTS



KEY PLAN

SCALE

Table with 3 columns: NO., DESCRIPTION, DATE. Used for tracking revisions.

DRAWN BY: SF APPROVED BY: WH CHECKED BY: JT DATE: 3/31/2025

TITLE MECHANICAL SYMBOLS, ABBREVIATIONS & NOTES

PROJECT NO. 50185618

M-001

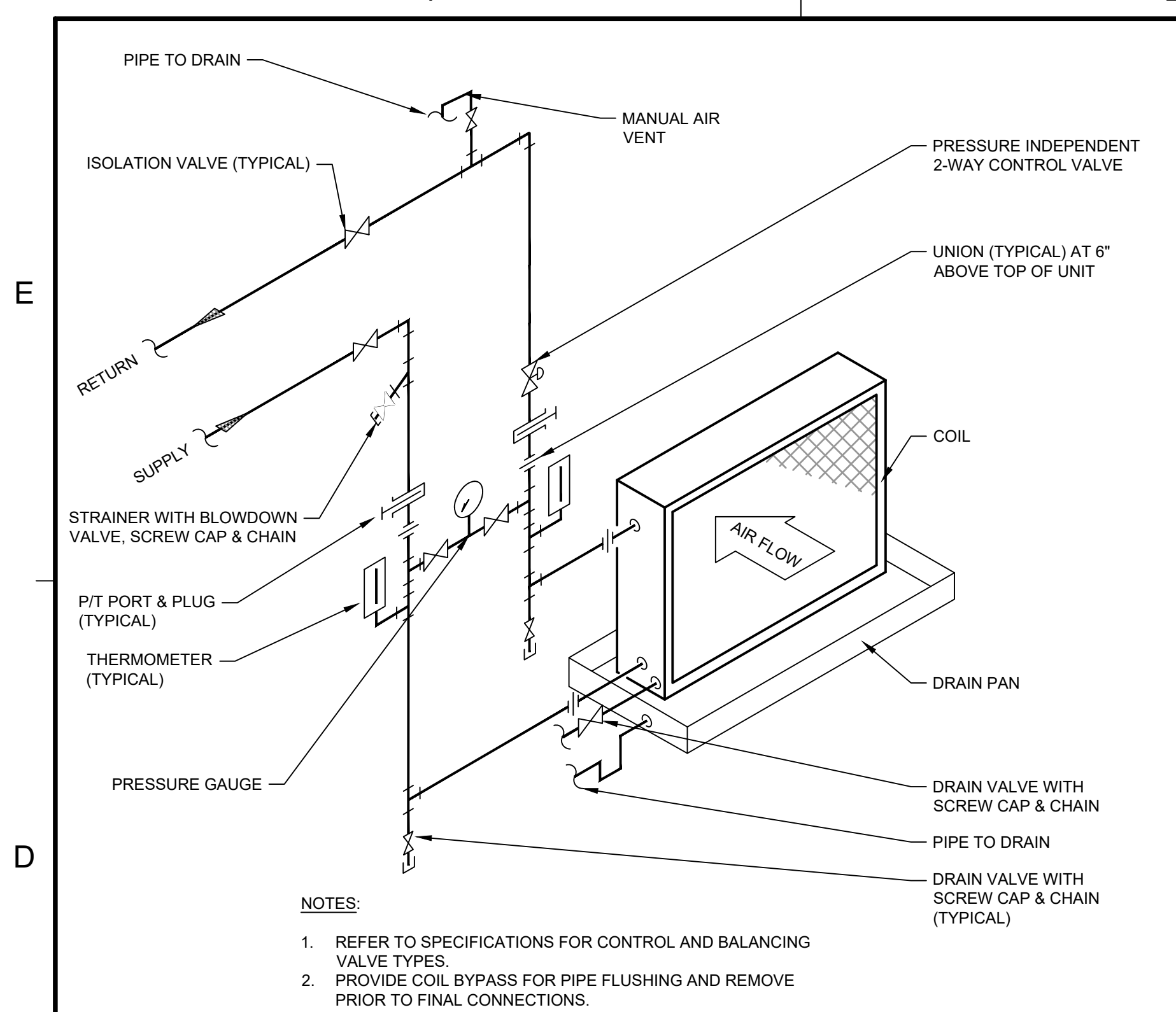
SHEET NO.

4/1/2025 3:54:40 PM P:\50185618\CAD\MMECHANICAL\50185618 M-001 MECHANICAL SYMBOLS, ABBREVIATIONS & NOTES.DWG

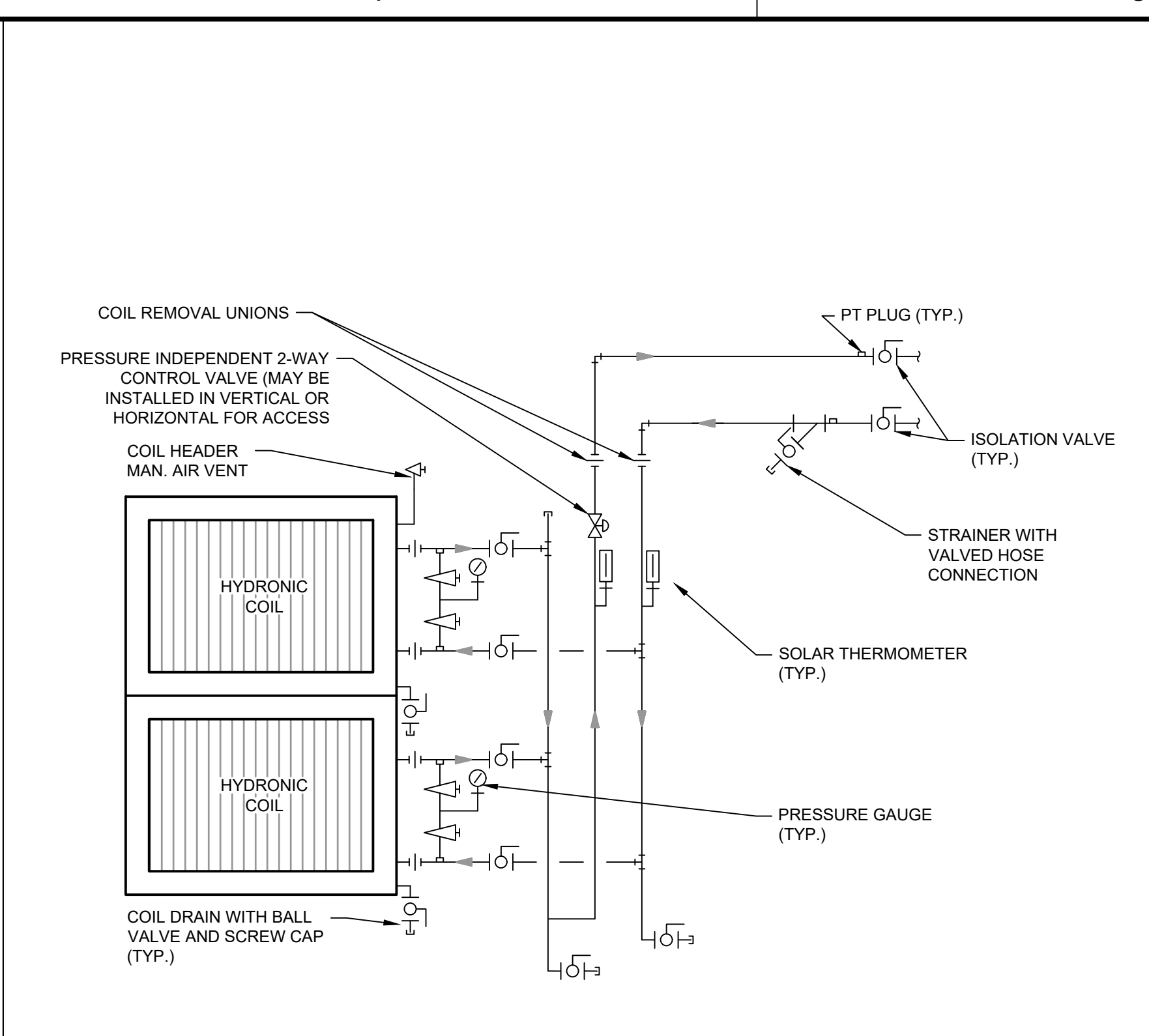
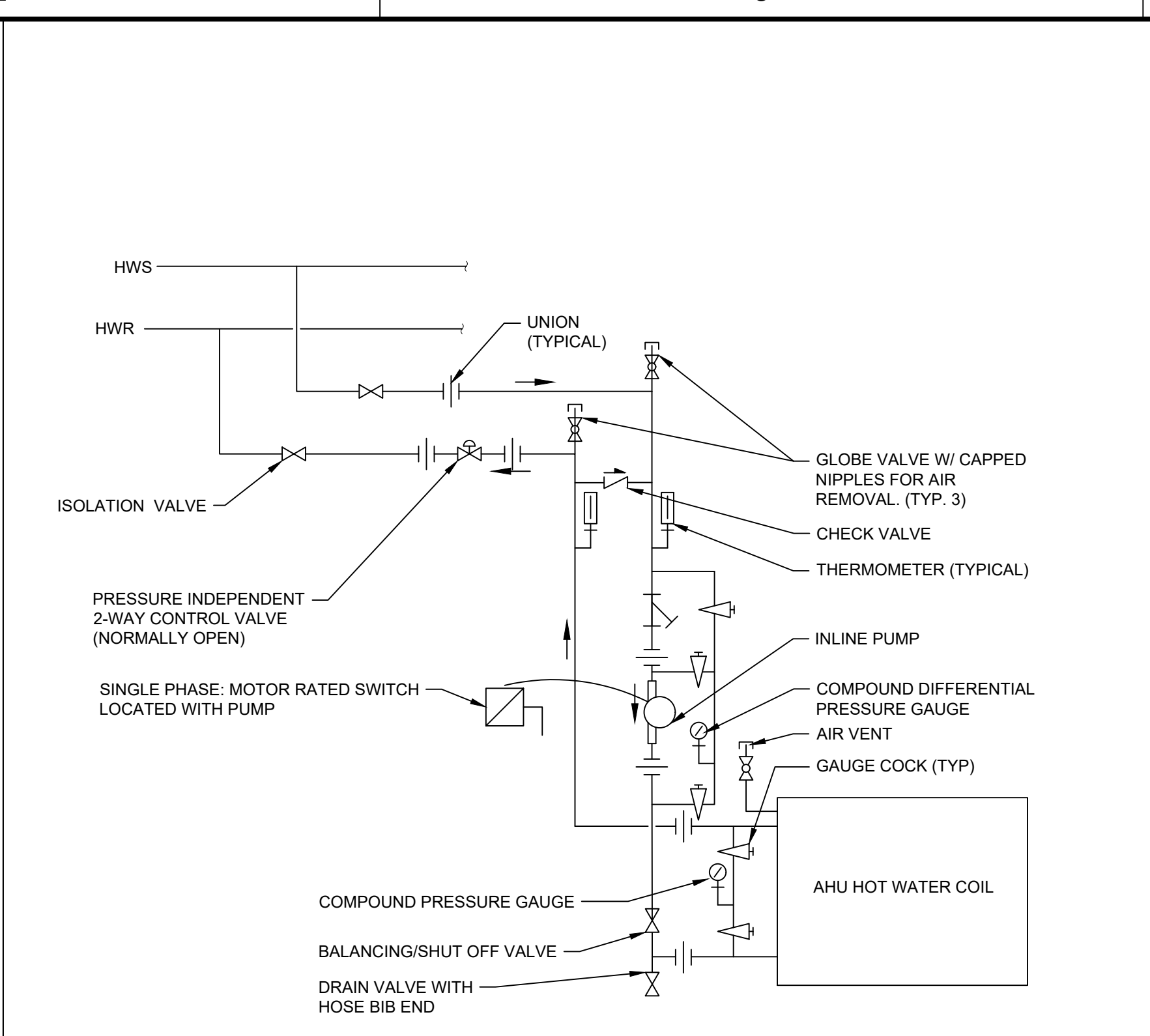








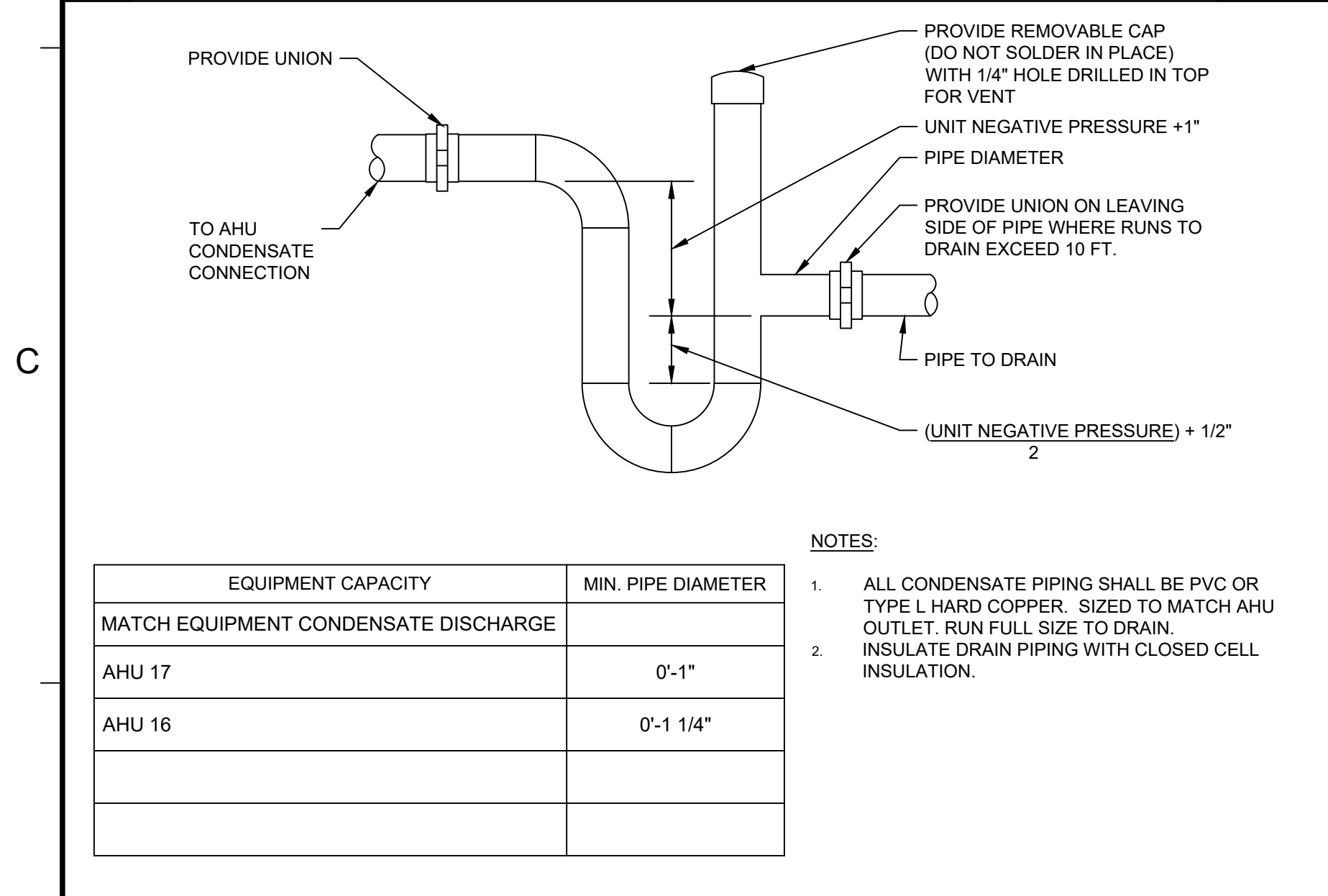
- NOTES:**
- REFER TO SPECIFICATIONS FOR CONTROL AND BALANCING VALVE TYPES.
  - PROVIDE COIL BYPASS FOR PIPE FLUSHING AND REMOVE PRIOR TO FINAL CONNECTIONS.



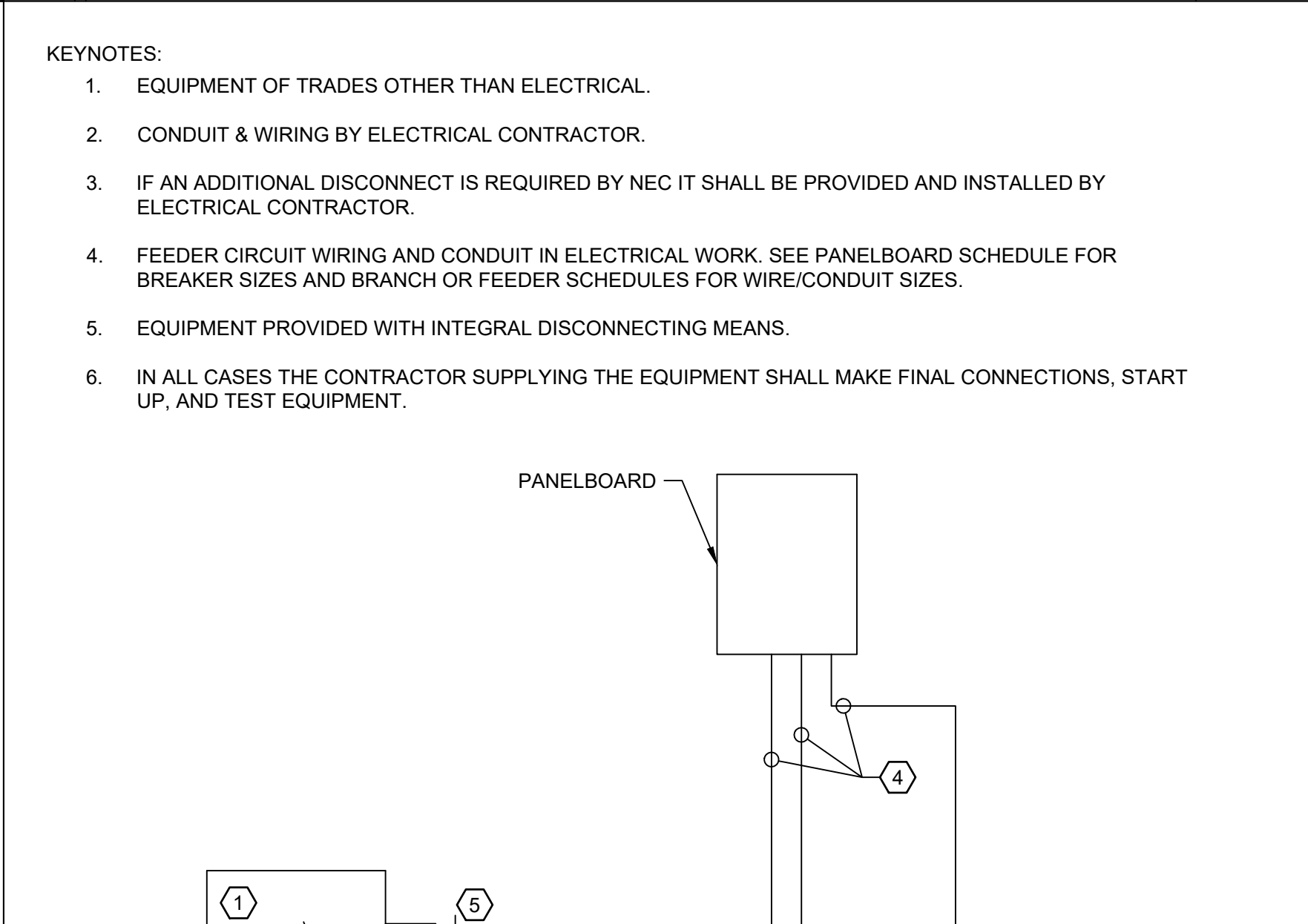
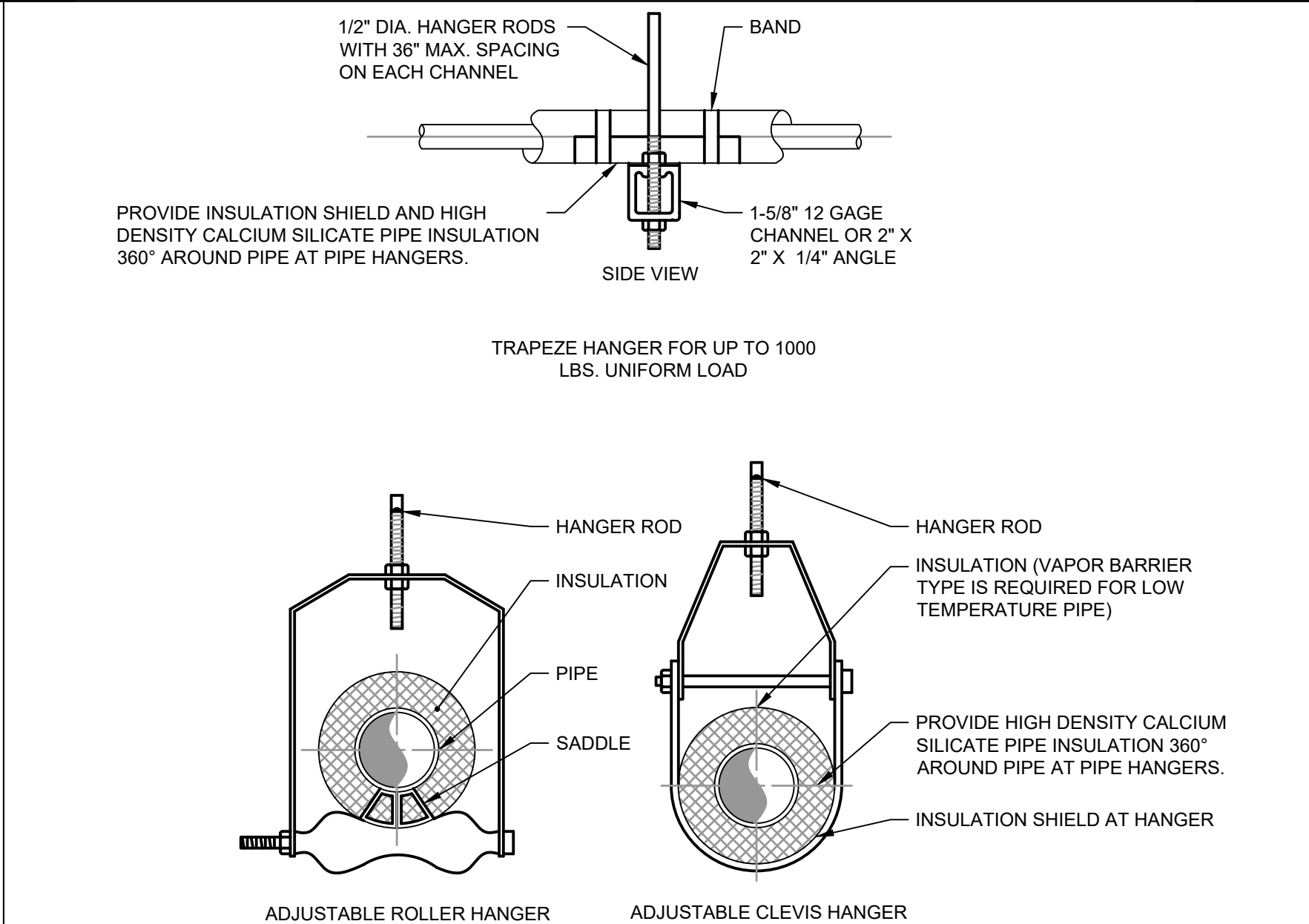
**1 AIR HANDLING UNIT SINGLE COIL**

**2 HOT WATER COIL WITH COIL PUMP**

**3 MULTIPLE HYDRONIC COIL WITH PICV**



- NOTES:**
- ALL CONDENSATE PIPING SHALL BE PVC OR TYPE L HARD COPPER. SIZED TO MATCH AHU OUTLET. RUN FULL SIZE TO DRAIN. INSULATE DRAIN PIPING WITH CLOSED CELL INSULATION.
  -

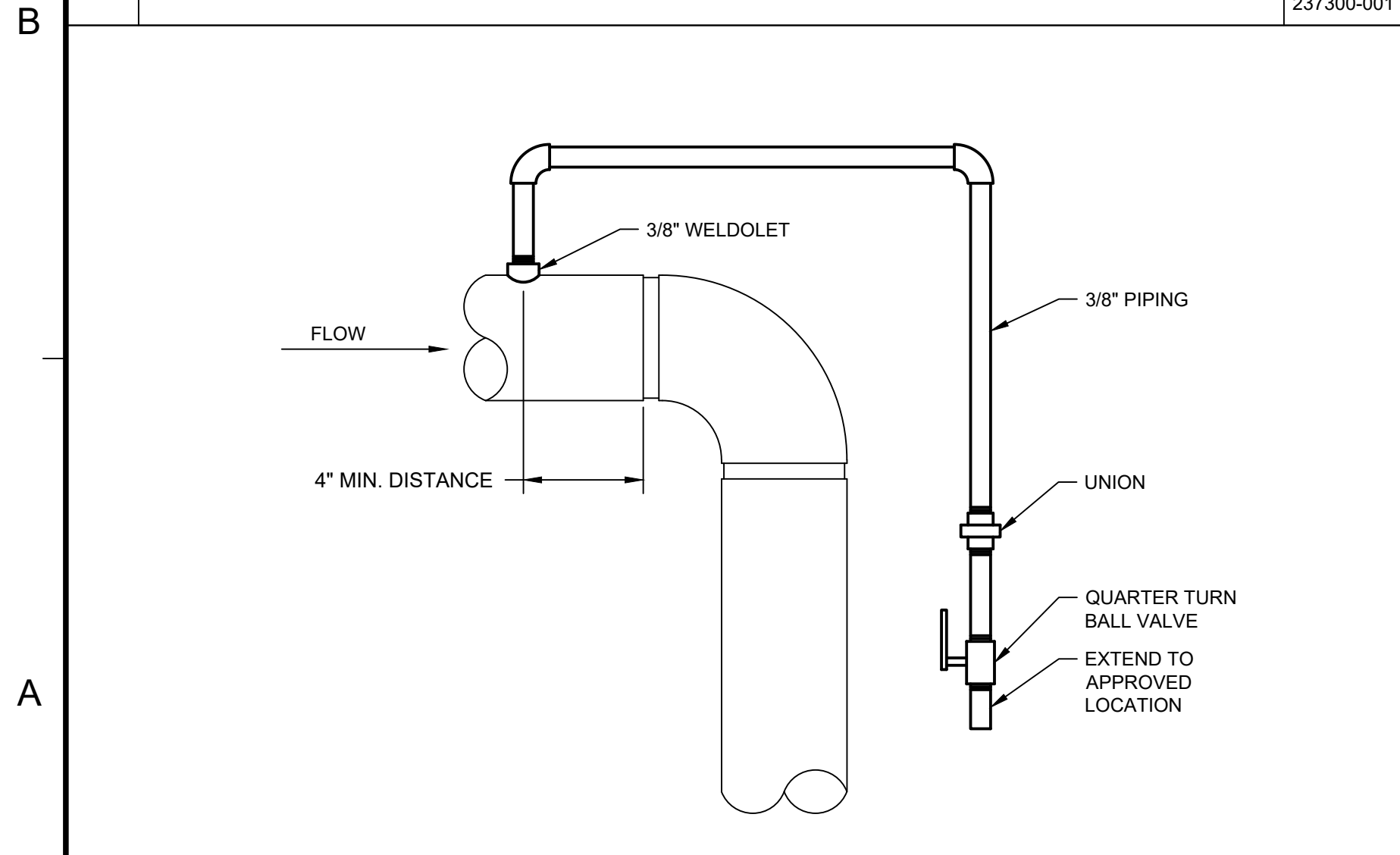


**6 ELECTRICAL TO MECHANICAL EQUIPMENT**

**4 AHU DRAIN TRAP - DRAW THROUGH**

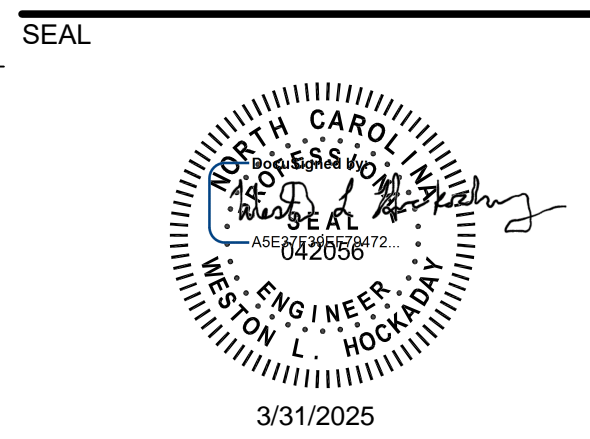
**5 TYPICAL PIPE HANGERS**

**SCALE: NTS**  
E002-13



**7 MANUAL AIR VENT ON MAIN**

**SCALE: NTS**  
232113-003



KEY PLAN

SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY \_\_\_\_\_ SF  
APPROVED BY \_\_\_\_\_ WH  
CHECKED BY \_\_\_\_\_ JT  
DATE \_\_\_\_\_ 3/31/2025  
TITLE

**DETAILS**

PROJECT NO. 50185618

**M-503**

SHEET NO.

**SEMI CUSTOM AIR HANDLING UNIT SCHEDULE  
OWNER PURCHASED, CONTRACTOR INSTALLED**

Table with columns for MARK, SERVICE, MECHANICAL ROOM, TYPE, BASIS OF DESIGN MANUFACTURER, TOTAL CAPACITY AIR FLOW (CFM), TOTAL CONNECTED AIR FLOW (CFM), ECONOMIZER (Y/N), DESIGN MAX. VENT. AIR FLOW (CFM), DEMAND CTRL. MIN. VENT. AIR FLOW (CFM), FILTER PREHEAT COIL, COOLING COIL, SUPPLY AIR FAN, and REHEAT COIL. Includes detailed specifications for each component.

- NOTES:  
1. REFER TO SECTION 237319 - AHUS FOR ADDITIONAL REQUIREMENTS. REFER TO UNIT DETAILS AND DIAGRAMS FOR COMPLETE CONFIGURATION AND DIMENSIONAL DETAILS.  
2. PROVIDE FAN STARTING AND DISCONNECTING MEANS AS SCHEDULED. (ECMI = INTELLIGENT ELECTRICALLY COMMUTATED MOTOR WITH 0-10V SIGNAL SPEED CONTROL WITH THERMAL OVERLOAD AND DISCONNECT OR VFD = VARIABLE FREQUENCY DRIVE WITH INTEGRAL DISCONNECT)  
3. UNIT CASING, COIL CAPACITIES AND COMPONENT APD'S ARE BASED ON THE TOTAL CAPACITY SUPPLY FAN AIRFLOW. TOTAL CONNECTED SUPPLY AIRFLOW IS INTENDED FOR TAB PURPOSES ONLY.  
4. INTERNAL STATIC PRESSURE SHALL INCLUDE SCHEDULED PRESSURE FOR DIRTY FILTERS.  
5. MOTORS SHALL NOT EXCEED 3000 RPM FOR DIRECT-DRIVE FANS IN ARRAY CONFIGURATIONS.  
6. PROVIDE STAINLESS STEEL COOLING COIL FRAME AND PAN WITH DISCHARGE ABOVE BASE RAIL.  
7. UNIT SECTIONS MUST FIT THROUGH MECHANICAL ROOM DOUBLE DOOR.  
8. PROVIDE MINIMUM 5-INCH HIGH CONTINUOUS PERIMETER AND INTERMEDIATE BASERAILS.  
9. PROVIDE ELECTRICAL PANEL FOR FAN ARRAY SINGLE POINT OF POWER CONNECTION WITH DISCONNECT.

**FAN SCHEDULE**

Table with columns: MARK, SERVICE, TYPE, MANUFACTURER / MODEL, AIR FLOW (CFM), ESP (IN WG), EC MOTOR (Y or N), DRIVE TYPE, SPEED (RPM), BRAKE MOTOR (HP), NOMINAL MOTOR (HP), MAX. SOUND (SONES), DAMPER TYPE, VOLTAGE/PHASE, STARTER/DSCNNCT MEANS, NOTES.

- NOTES:  
1. REFER TO SECTION 233400 FOR ADDITIONAL REQUIREMENTS.  
2. PROVIDE STARTING AND DISCONNECTING MEANS AS SCHEDULED. (MRS = MOTOR RATED SWITCH; MS/D = COMBINATION MOTOR-STARTER AND DISCONNECT; VFD = VARIABLE FREQUENCY DRIVE; AND DISC = DISCONNECT)  
3. PROVIDE VIBRATION ISOLATORS AND EQUIPMENT SUPPORTS. COORDINATE EXACT LOCATION OF ROOF OPENINGS AND STRUCTURAL SUPPORT.  
4. CONTRACTOR TO VERIFY AND SELECT FAN THAT MATCHES EXISTING ROOF CURB DIMENSIONS OR PROVIDE WITH CURB ADAPTER.  
5. PROVIDE WITH GRAVITY BACKDRAFT DAMPER, HINGED BASE, AND CURB ADAPTER.

**PUMP SCHEDULE**

Table with columns: MARK, SERVICE, TYPE, MANUFACTURER / MODEL, SUCTION (IN DIA), DISCHARGE (IN DIA), IMPELLER (IN DIA), FLOW (GPM), HEAD (FT H2O), EFF. (%), SPEED (RPM), BRAKE MOTOR (HP), NOMINAL MOTOR (HP), VOLTAGE/PHASE, STARTER/DSCNNCT MEANS, NOTES.

- NOTES:  
1. REFER TO SECTION 232123 FOR ADDITIONAL REQUIREMENTS.  
2. PROVIDE STARTING AND DISCONNECTING MEANS AS SCHEDULED. (MRS = MOTOR RATED SWITCH; MS/D = COMBINATION MOTOR-STARTER AND DISCONNECT; AND VFD = VARIABLE FREQUENCY DRIVE)  
3. PUMPS MOTOR SELECTION SHALL BE BASED ON NON-OVERLOADING SERVICE.

**VARIABLE FREQUENCY DRIVE SCHEDULE**

Table with columns: MARK, VOLTS, PHASE, HP, BYPASS, NEMA ENCLOSURE, MANUFACTURER, MODEL NO., NOTES.

- NOTES:  
1. REFER TO SECTION 230514 FOR ADDITIONAL REQUIREMENTS.  
2. FURNISHED BY MECHANICAL CONTRACTOR, INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR.

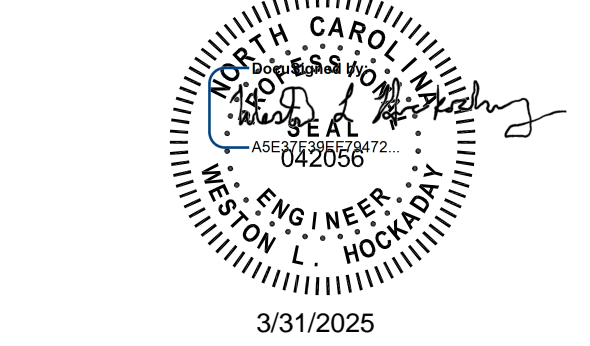


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JCPS  
CLAYTON MIDDLE SCHOOL  
AHU 16 AND 17 REPLACEMENT  
490 GUY RD,  
CLAYTON, NC 27520  
CONSTRUCTION DOCUMENTS

SEAL



KEY PLAN

SCALE

REVISIONS

Table with columns: NO., DESCRIPTION, DATE

DRAWN BY \_\_\_\_\_ SF

APPROVED BY \_\_\_\_\_ JT

CHECKED BY \_\_\_\_\_ JT

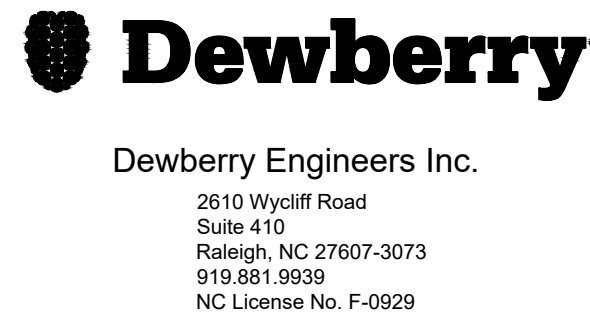
DATE \_\_\_\_\_ 3/31/2025

TITLE  
**SCHEDULES**

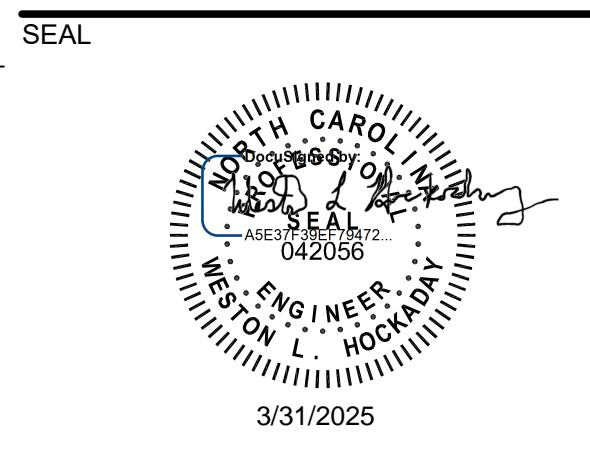
PROJECT NO. \_\_\_\_\_ 50185618

**M-601**

SHEET NO.



JCPS  
CLAYTON MIDDLE SCHOOL  
AHU 16 AND 17 REPLACEMENT  
490 GUY RD,  
CLAYTON, NC 27520  
CONSTRUCTION DOCUMENTS



KEY PLAN

SCALE

REVISIONS table with columns for NO., DESCRIPTION, and DATE.

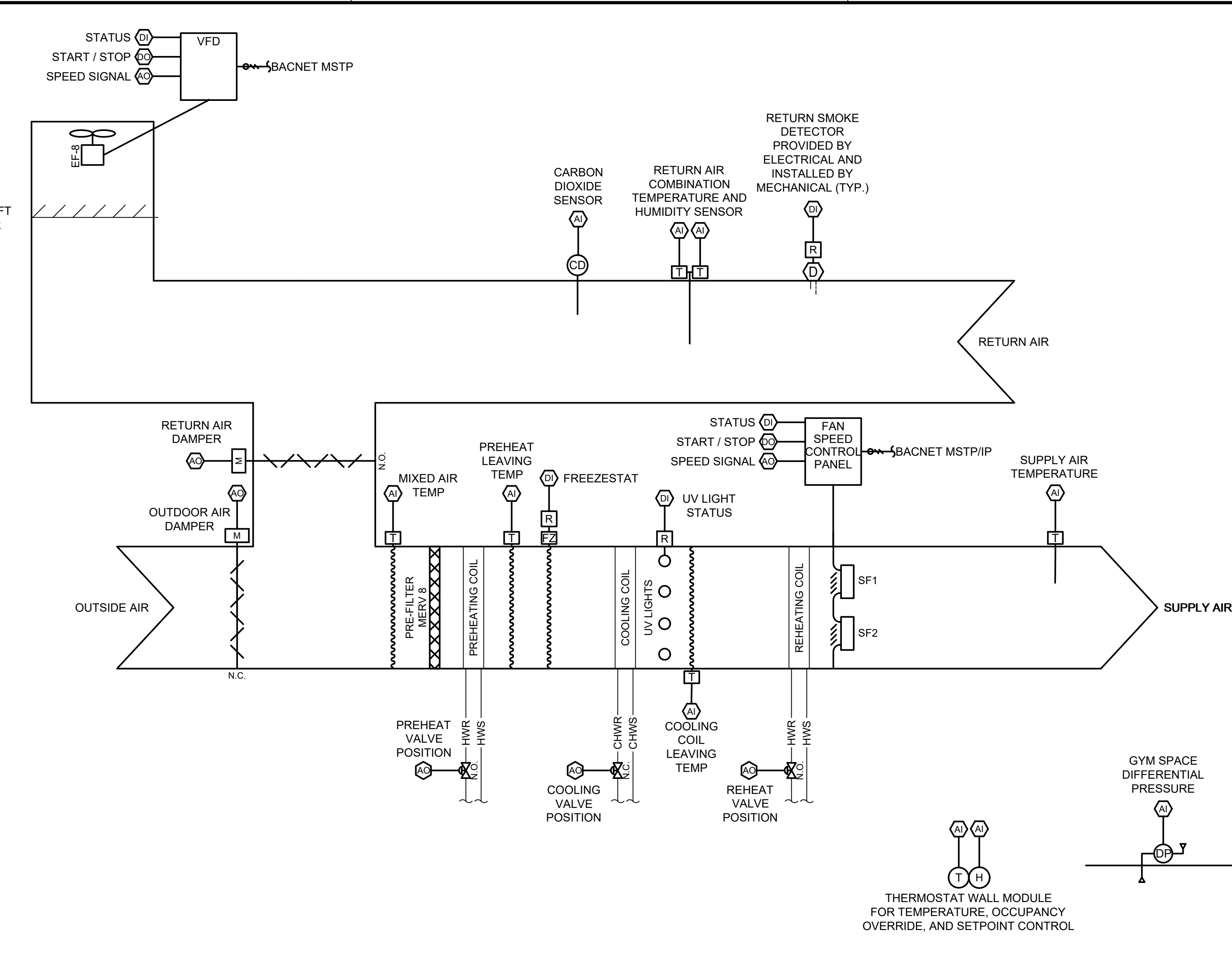
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APPROVED BY: WH  
CHECKED BY: WH  
DATE: 3/31/2025

# CONTROL SCHEMATIC & SEQUENCE

PROJECT NO. 50185618

# M-701

SHEET NO.



## 1 AHU16 SINGLE ZONE VARIABLE VOLUME AHU WITH RELIEF FAN

SCALE: NTS

0 - SINGLE ZONE (CHANGEOVER) VAV AIR HANDLING UNITS - CHILLED, PREHEAT, REHEAT, AND ECONOMIZER & RELIEF FAN

0.1. Operation

A. Safety Devices: Safeties shall be in operation at all times (Fan in auto, hand, override, etc). Fan command/status mismatch is proxy for safety alarm(s).

- Return Smoke Detector Shutdown: When the fire alarm is active, stop fan. Generate an alarm. Safety shall be hardwired and require manual reset (via fire alarm system control panel).
- Freeze Protection
  - If mixed air temperature falls below 39°F (adj), generate an alarm.
- Freezestat: When the freezestat senses temperature below 37°F, stop fans, open cooling and heating coil valve, and return all other valves and dampers to failed positions. Generate an alarm. Safety shall be hardwired and require manual reset. BAS shall enable HW plant and enable CHW pumps for water circulation. A freezestat trip shall override valve commands for all other safeties (i.e. during simultaneous safety trips, the freezestat valve operation shall take precedent)
- After all safeties have cleared, allow AHU operation.

B. Supply Fan Wall Array

- The supply fan array shall run continuously in occupied mode.
- Determine fan status(s) through a current sensor. If a fan fails to start as commanded, generate an alarm.
- On a signal to start, after all safeties have been cleared, energize the fan.
- Once outdoor air damper status is proved open, enable the relief fan.
- The supply fan array speed shall modulate in conjunction with the cooling and reheating coils to maintain space conditions. See "Space Temperature Control" for additional requirements.

C. Relief Fan

- If the fan fails to start as commanded, generate an alarm.
- A single space pressure control loop for each pressure zone shall modulate, from 0-100%, to maintain the building pressure at a setpoint, initially set to 0.05 in. wg (adj.). Upon a rise in space differential pressure above the setpoint, the loop shall increase. As the space differential pressure falls below the setpoint, the loop shall decrease.
  - Single DP sensor AHUs: space pressure setpoint shall be verified and determined by TAB, initially +0.05 in wg (adj.). If DP sensor signal goes to zero or infinity, generate an alarm and stop the relief fan.
  - Reference the DP sensor location(s) on the BAS floorplan.
- Once the outdoor air damper is proven open, and the space pressure control loop has risen above an adjustable threshold, equal to the minimum relief fan speed, initially 15% (adj.), and supply fan(s) status is proven, after all safeties have been cleared, energize the relief fan.
- Fan speed signal shall be equal to the space pressure loop output but no less than the minimum speed.
- Once the space pressure control loop has fallen below minimum fan speed, stop the relief fan.

D. Outside, Return, and Relief Dampers

- General
  - The outside and return dampers shall have a minimum ventilation, economizer, and demand control ventilation (DCV) mode. Display the active mode on the graphics.
  - The outside and return dampers shall be modulated using a single signal with an output of 0-100%. The outside air damper shall be modulated from 0-100% on a signal of 0-50%, then the return air damper shall be modulated from 100%-0% on a signal of 50-100%.
  - The relief shall be barometric damper control.
- Minimum Ventilation Operation
  - When the fan is running, the outside and return dampers are indexed to the active minimum outside air (min OA) position, to be determined by TAB based on DCV.
    - Note to TAB contractor: The position of each damper shall be determined individually to maintain the design OA flow (see AHU schedule) as the fan modulates. Record each position at design

and minimum fan speeds and provide to BAS Contractor for balance point in programming (non-adj). Do not use actuator end-stops for balancing.

- B) Active minimum outside air damper (min OA) position setpoint will be reset linearly by the BAS between the two positions required at minimum and maximum fan speeds. The minimum outdoor air damper position will be lesser at higher fan speeds.
- 3. Integrated Economizer Operation (OA Temperature/Humidity Enable)
  - When the fan is running, the outside air temperature falls below 65°F (adj), and the outside air enthalpy falls below 28 BTU/lb (adj), modulate the outside and return air dampers to maintain the mixed air temperature at 2°F (adj.) degrees below the active supply air setpoint.
  - When the outside air temperature falls below 35°F (adj), disable economizer mode.
  - If the economizer cannot maintain the space temperature at the cooling setpoint, enable mechanical cooling to help maintain setpoint.
- 4. Demand Control Ventilation Operation (DCV)
 

Device	UNOCC.	WARMUP	OCCUPIED	OCCUPIED MIN VENT.
Outside Air Damper	CLOSE	CLOSED	DCV MIN	MINIMUM VENT

  - Modulate the outside and return air dampers between the active minimum OA position at 1,200 ppm CO2 (adj) to the active DCV position (to be determined by TAB) at 800 ppm CO2 (adj).
    - Note to TAB contractor: Each damper DCV position shall be determined individually until a measured building pressure of 0.02 to 0.05 in wg is achieved at exterior doors or common corridors for each area served by the AHU. Record each position at design and minimum fan speeds and provide to BAS Contractor for balance point in programming (non-adj). Do not use actuator end-stops for balancing.
  - Active DCV outside air damper position setpoint will be reset linearly by the BAS between the two positions required at minimum and maximum fan speeds. The DCV outdoor air damper position will be lesser at higher fan speeds.

E. Space Temperature Control

- The supply fan array, chilled water, and heating coils shall all work in unison to maintain space conditions.
- The AHU shall have a space heating setpoint (68°F, adj) and a cooling setpoint (72°F, adj).
- Chilled Water Coil (CHW) - Cooling Operation
  - The AHU shall have a PID which operates from 0-100% for cooling operation.
  - When supply fans are running, and the cooling PID is greater than zero, modulate/index the mechanical cooling to maintain the supply air temperature setpoint of 55°F (adj).
  - Provide adjustable supply air temperature reset based on OA temperatures.
  - As the space cooling PID increases from 0-100%, the supply fan speed shall be reset between minimum (12,000cfm 70%, adj) and maximum cooling speeds (16,500cfm 100%, adj) to maintain the space at the cooling setpoint.
    - Note to TAB contractor: The supply fan minimum speed shall be set based on the speed required to ensure minimum OA flow can be maintained even at minimum fan speed. The supply fan maximum cooling speed shall be set to achieve design airflow for the AHU.

- Deadband Operation
  - When the AHU is between the heating and cooling setpoints, the AHU shall operate at minimum fan speed, and chilled water and preheat valves modulate to maintain supply air temperature setpoint.
- Heating Reheat Coils (HW), Preheat Coil (PHW) - Heating Operation
  - The AHU shall have a PID which operates from 0-100% for heating operation.
  - When the supply fans are running, and the heating PID is greater than zero, modulate preheat control valve to maintain the preheat leaving air temperature setpoint at 55°F (adj).
  - As the space heating PID increases from 0-100%, the heating supply air temperature setpoint shall be reset from 75°F to 95°F.

- When the supply fans are running, and the heating PID is greater than zero, modulate reheat control valve to maintain the active heating supply air temperature setpoint.
- As the space heating PID increases from 0-100%, the supply fan speed shall be reset between minimum (12,000cfm 70%, adj) and maximum heating speeds (16,500cfm 100%, adj) to maintain the space at the heating setpoint.
  - Note to TAB contractor: The supply fan maximum heating speed shall be set to achieve 90°F supply air temperature with both heat stages (at design OA conditions).
- Low Limit Freeze Protection PID will modulate the preheat control valve to maintain preheat leaving air temperature at 50°F (adj).
- If the preheat control valve cannot maintain heating setpoint modulate reheat control valve maintain space temperature as second stage heating.

- F. Dehumidification
- If the relative humidity in the space rises above 60% (adj), turn on fan, modulate the cooling coil valve to maintain cooling coil discharge temperature setpoint of 53°F (adj.), and modulate reheat valve to maintain the space at the active cooling temperature setpoint. The unit shall return to normal operation when the return relative humidity falls below 55% (adj).
  - If return humidity remains above 65% (adj) for 15 minutes (adj), generate an alarm.
  - This applies to unoccupied and occupied operation.

- G. Additional Control Requirements
- Provide with wall module for space temperature, humidity, occupancy override, and setpoint control.
  - Monitor UV light status and shall run when fan is running. Provide with door switch disable.

- 0.2. Unoccupied Mode Operation
- A. Unit shall operate as described above, except:
- Fan mode shall cycle On/Off with heating and cooling demand, dampers shall be in off position. Outside air shall not be introduced unless economizer is active.
  - Increase cooling setpoint to 78°F (unoccupied cooling setpoint, adj) and decrease heating setpoint to 62°F (unoccupied heating setpoint, adj).
  - If the occupancy override is pressed, or the space temperature rises above the unoccupied cooling setpoint, or falls below the unoccupied heating setpoint, place the unit into preoccupancy mode. The AHU shall control to the occupied setpoints.
  - The unit shall return to unoccupied operation when occupied setpoints are reached, the minimum runtime of 30 minutes (adj) has been met, and the occupancy override expires.

- 0.3. Preoccupancy Mode Operation
- A. Unit shall enter preoccupancy period prior to occupied period in accordance with optimum start/stop strategy.
- B. Unit shall operate as described above, except:
- Dampers shall be in off position. Outside air shall not be introduced unless economizer is active.
- C. Enable morning warmup when outdoor air temperature is below 55°F (adj.) and heating load raises above a user defined setpoint, initially 50% (adj.). Start fans and modulate the reheat hot water control valve to provide morning warm up sequence during preoccupancy to maintain max heating discharge temperature setpoint.

- 0.4. Graphical Interface
- A. Provide a graphical display for the Air Handling Unit, with a schematic of the unit and the following points:
- System on/off
  - Occupancy status
  - Freezestat, supply or return smoke, relief pressure low limit, and supply pressure high limit alarms
  - Outside, return, and relief air damper commands
  - Minimum Ventilation, Economizer, or Demand Control Ventilation mode
  - Mixed air temperature, preheat leaving, and Economizer setpoints
  - DCV setpoints
  - Supply fan on/off, mode, and runtime
  - Supply fan status, speed and alarm
  - Relief fan status, speed, and on/off alarm
  - PHW/HW/CHW coil valve commands and heating/cooling mode
  - Dehumidification mode and setpoints
  - Space temperature and heating/cooling setpoints
  - Space temperature setpoint max and min limits
  - Space override status
  - Return humidity, alarm, and alarm setpoint
  - Return CO2 level, alarm and alarm setpoint
  - Space differential pressure, setpoint, alarm, and alarm setpoints
  - UV light status
  - Supply, Cooling Coil, Mixed, Preheat leaving air temperatures and alarms

POINT NAME	FAN INTERFACE MATRIX		
	HARDWIRED	INTEGRATION	GRAPHIC DISPLAY
FAN COMMAND	X	X	HARDWIRED
FAN SPEED COMMAND (%)	X	X	HARDWIRED
FAN STATUS	X	X	HARDWIRED
FAN SPEED FEEDBACK (%)		X	COM
FAN CURRENT (A)		X	COM
FAN POWER (kW)		X	COM
FAN ALARM		X	COM
FAN IN HAND		X	COM
FAN AIRFLOW (CFM)		X	COM
FAN STATIC PRESSURE		X	COM
FAN STATIC SETPOINT		X	COM
FAN K-FACTOR		X	COM
FAN ARRAY RUNTIME		X	COM

