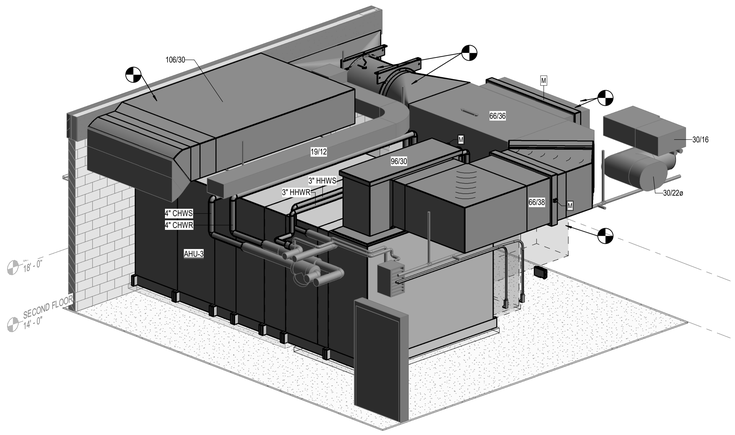
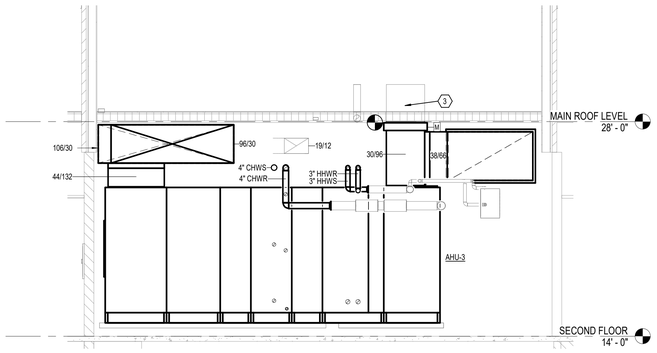
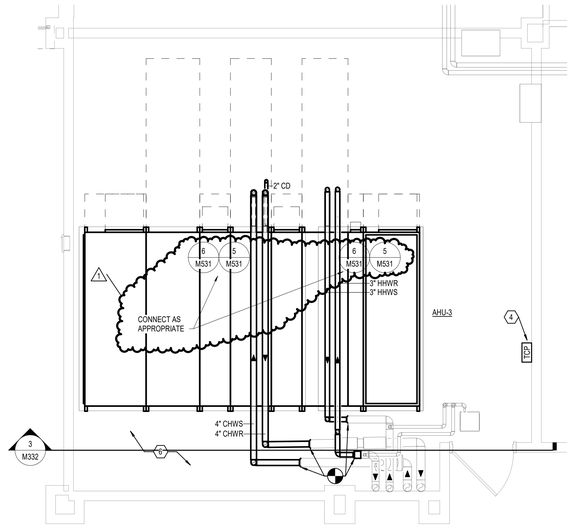


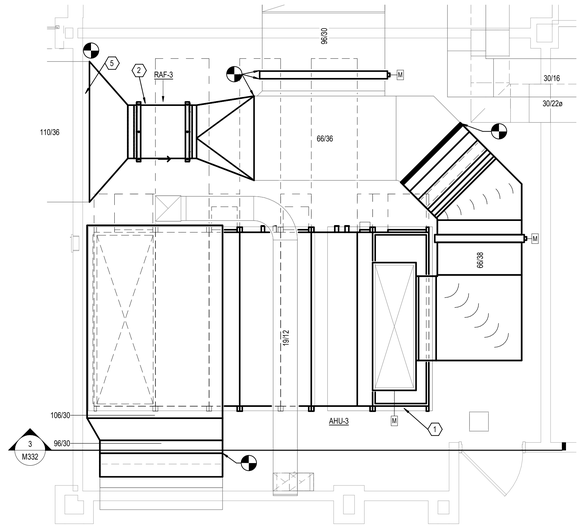
4 AHU-3 3D VIEW LOOKING SW



3 AHU-3 SECTION
1/4" = 1'-0"



2 MECHANICAL ROOM M4 HYDRONICS PLAN
1/4" = 1'-0"



1 MECHANICAL ROOM M4 MECHANICAL PLAN
1/4" = 1'-0"

GENERAL NOTES

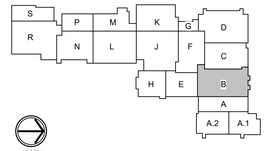
A REFER TO SHEET M-000 FOR GENERAL MECHANICAL NOTES, SYMBOLS AND ABBREVIATIONS.
B REFER TO DRAWING M-500 SERIES FOR MECHANICAL DETAILS.
C REFER TO DRAWING M-600 SERIES FOR MECHANICAL SCHEDULES.
D CONTRACTOR SHALL VERIFY IN FIELD WHICH PIPE IS SUPPLY AND WHICH PIPE IS RETURN AND CONNECT APPROPRIATELY, REGARDLESS OF WHICH PIPES ARE SHOWN TO BE CONNECTED ON PLANS.

SHEET KEYNOTES

1 THIS AHU SHALL BE KNOCKDOWN / KIT / FIELD DISASSBMILED. THE AHU MFGR SHALL COORDINATE WITH THE CONTRACTOR TO ENSURE THAT ALL COMPONENTS TO BE BROUGHT INTO THE SPACE ARE ABLE TO FIT THROUGH A 4'0"W X 6'0T DOOR. NOTE THAT IN-SITU AHU LEAKAGE TESTING IS REQUIRED. THE CONTRACTOR AND AHU MFGR ARE EQUALLY RESPONSIBLE TO ENSURE THE AHU PASSES LEAKAGE TESTING AFTER AHU IS INSTALLED.
2 MOUNT UNIT ON VIBATION ISOLATORS WITH A STATIC DEFLECTION OF 2". PROVIDE FLEXIBLE DUCT CONNECTORS UPSTREAM AND DOWNSTREAM OF FAN. ENSURE 36" OF ACCESS IS MAINTAINED IN FRONT OF THE FAN ACCESS DOOR FOR MOTOR REPLACEMENT.
3 LOCATE AIRFLOW MEASURING STATION. CONTRACTOR SHALL LOCATE AFMS IN MAXIMUM POSSIBLE STRAIGHT SECTION OF OA DUCT. VERIFY INSTALL LOCATION WITH MFGR. AFMS TYPE TO BE SELECTED BY T.C.C. FROM AVAILALBE OPTIONS IN SPECIFICATION. PROVIDE ACCESS DOOR AS INDICATED
4 T.C.C. SHALL OBSERVE THE EXISTING CONTROL PANEL. ENSURE THAT ALL MISCELLANEOUS DEVICES (UNIT HEATERS, EXHAUST FANS, ETC.) THAT PASS THROUGH THIS CONTROLLER ARE REROUTED THROUGH THE NEW CONTROLLER AND BROUGHT INTO THE FRONT END. MAINTAIN EXISTING SEQUENCE OF OPERATION FOR THESE DEVICES.
5 SCOPE OUT THE EXISTING RETURN DUCT PATH USING A BORESCOPE CAMERA. EXTENT OF SCOPE SHALL EXTEND 50 FEET INTO THE RETURN DUCT. CUT ACCESS DOOR INTO NEW OR EXISTING DUCT WITHIN 36" OF MECHANICAL ROOM WALL. START SCOPE IN THE MECHANICAL ROOM AND PROCEED INTO THE BUILDING RETURN AIR DUCT. TAKE HIGH RESOLUTION PICTURES EVERY 60" AND DOCUMENT ANY AIRFLOW OBSTRUCTIONS. PROVIDE PICTURES TO ENGINEER. THIS TASK SHALL BE PERFORMED BEFORE THE 2026 SPRING BREAK TO ALLOW THE OWNER AND ENGINEER TO REACT TO ANY CONDITIONS OBSERVED.
6 LOCATE ALL EXISTING NIPPLES OR COUPLINGS ON EXISTING TO REMAIN HYDRONIC PIPES. REMOVE AND REPLACE THESE FITTINGS WITH DIELECTRIC FLANGES PER SPECIFICATION. PERFORM VISUAL INSPECTION TO VERIFY ALL INSTANCES ARE LOCATED AND REPLACED. INSULATE TO FORM A CONTINUOUS INSULATION BARRIER. FOR BUDGETING PURPOSES ASSUME A TOTAL QUANTITY OF 4 FITTINGS IN THIS ROOM.

1

KEY PLAN



kbsd CONSULTING
275 VETERANS WAY
SUITE 300
CARMEL, IN 46032

NOBLESVILLE HS AHU REPLACEMENTS - BID PACK 3
NOBLESVILLE SCHOOLS
18111 CUMBERLAND RD, NOBLESVILLE, IN 46060

05-30-2025
Job# 24023

SCALE:	AS NOTED
DRAWN BY:	Author
DESIGNED BY:	Designer
CHECKED BY:	Checker
DATE:	09/27/2024
PROJECT #:	24023

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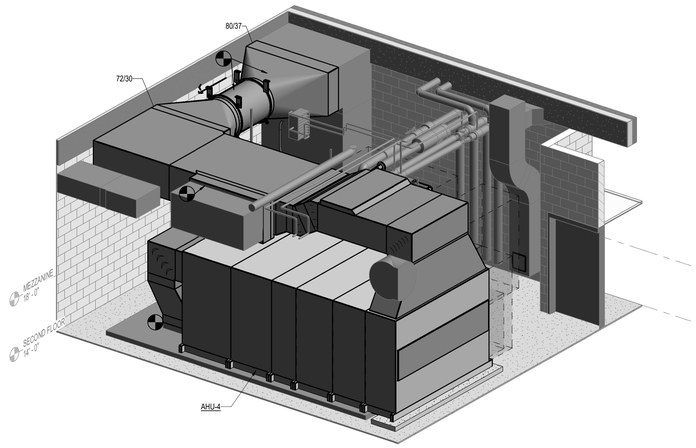
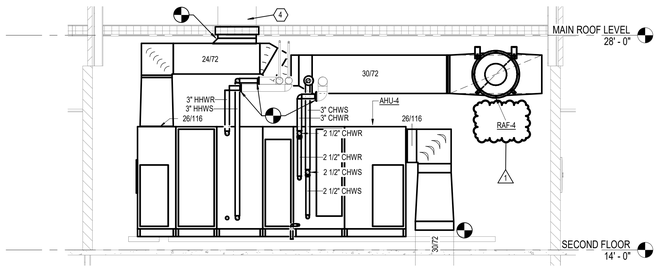
1	ADD #1 BP3	06.25.25

MECHANICAL ROOM M4 MECHANICAL PLAN

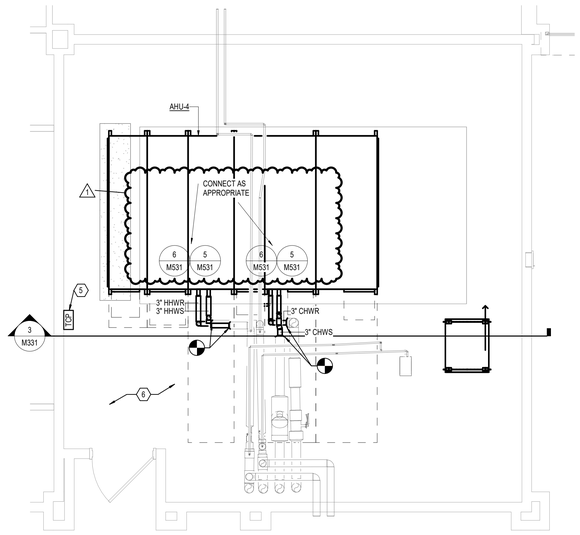
M332



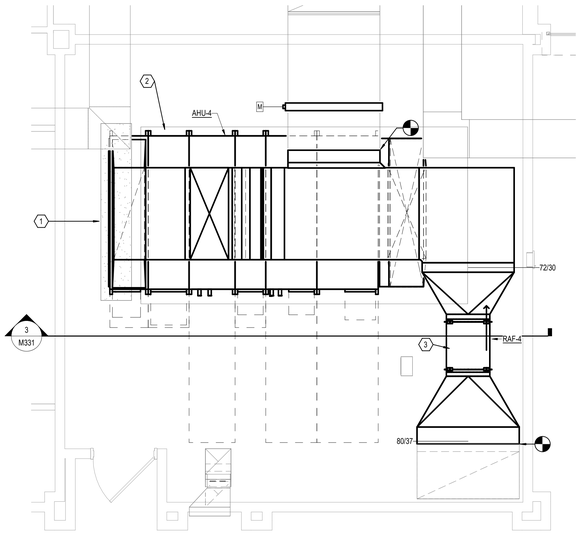
4 AHU-4 3D VIEW LOOKING NW



3 AHU-4 SECTION
1/4" = 1'-0"



2 MECHANICAL ROOM M3 HYDRONICS PLAN
1/4" = 1'-0"



1 MECHANICAL ROOM M3 MECHANICAL PLAN
1/4" = 1'-0"

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SHEET KEYNOTES

1 OUTLINE OF NEW HOUSEKEEPING PAD SHALL MATCH PAD HEIGHT OF EXISTING PAD (~4". VERIFY IN FIELD). USE 3,000 PSI CONCRETE WITH #5 REBAR @ 12" OC. PAD IS DESIGNED TO SUPPORT THE LEFT AND RIGHT EDGES OF THE AHU. PAD DOES NOT EXTEND FULLY UNDER THE CENTER OF THE UNIT.
2 THIS AHU SHALL BE KNOCKDOWN / KIT / FIELD DISASSBMLED. THE AHU MFGR SHALL COORDINATE WITH THE CONTRACTOR TO ENSURE THAT ALL COMPONENTS TO BE BROUGHT INTO THE SPACE ARE ABLE TO FIT THROUGH A 4'0"W X 6'0"T DOOR. NOTE THAT IN-SITU AHU LEAKAGE TESTING IS REQUIRED. THE CONTRACTOR AND AHU MFGR ARE EQUALLY RESPONSIBLE TO ENSURE THE AHU PASSES LEAKAGE TESTING AFTER AHU IS INSTALLED.
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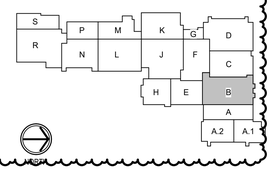
1

KEY PLAN



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SUITE 300
CARMEL, IN 46032

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05-30-2025
Job# 24023

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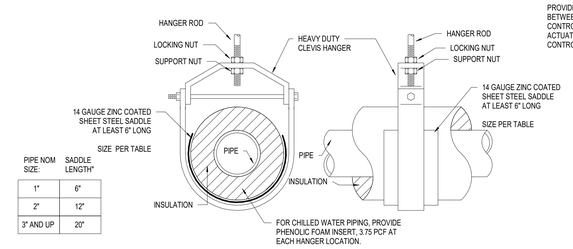
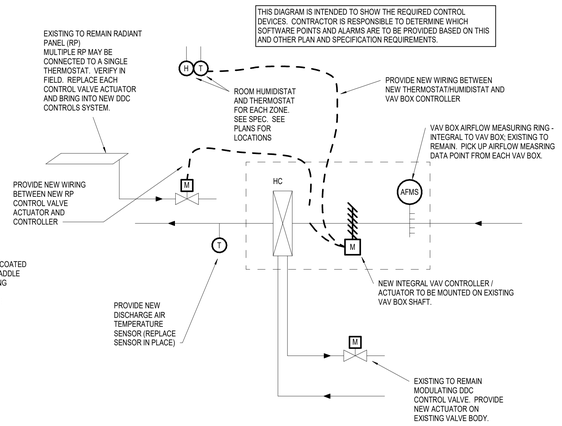
1	ADD #1 BP3	06.25.25

MECHANICAL ROOM M3 MECHANICAL PLAN

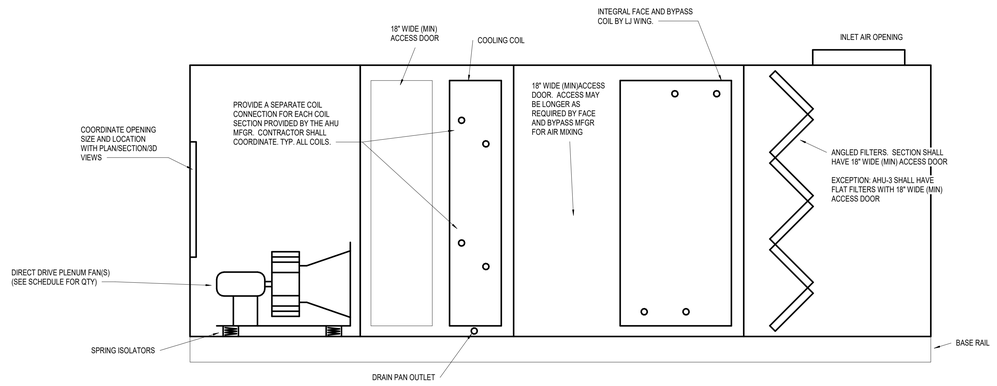
M331



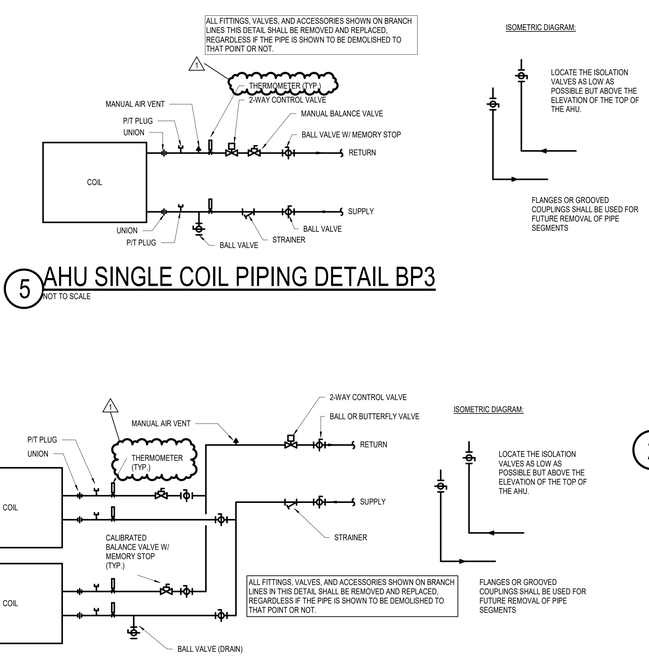
8 CLEVIS HANGER DETAIL BP3
NOT TO SCALE



4 VAV DEVICE AND SENSOR DIAGRAM BP3
NOT TO SCALE

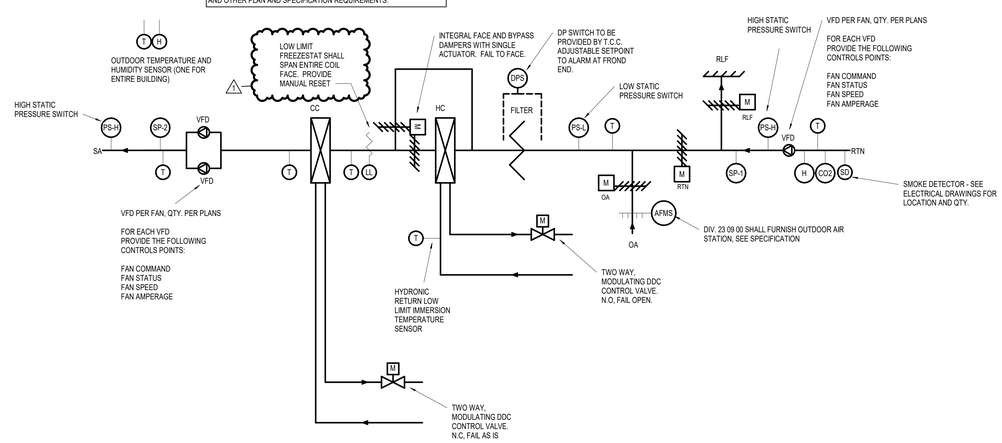


1 AHU SECTION BP3
NOT TO SCALE



5 AHU SINGLE COIL PIPING DETAIL BP3
NOT TO SCALE

6 AHU STACKED COIL PIPING DETAIL BP3
12" = 1'-0"



2 AHU DEVICE AND SENSOR DIGRAM BP3
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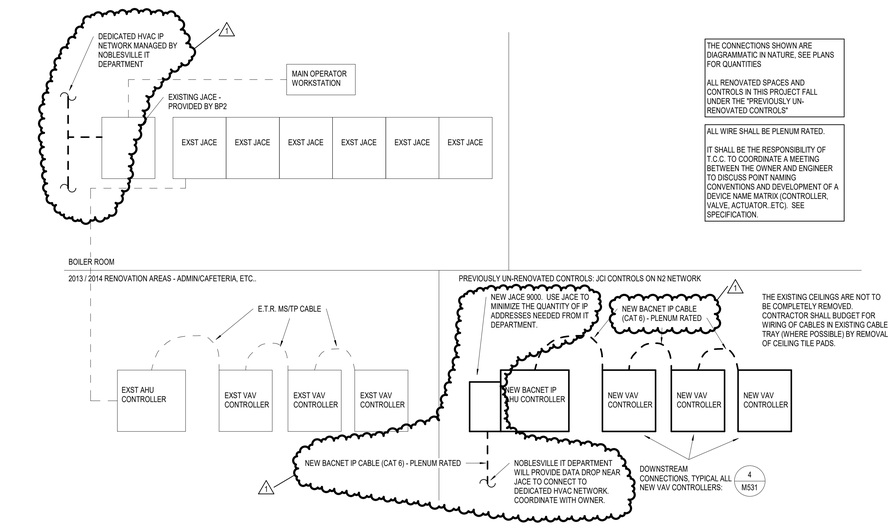
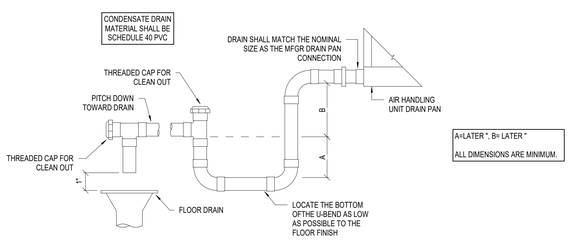


3 CONTROLS NETWORK DIAGRAM BP3
NOT TO SCALE



7 NEGATIVE PRESSURE CONDENSATE DRAIN TRAP DETAIL BP3
12" = 1'-0"

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SUITE 300
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NOBLESVILLE HS AHU REPLACEMENTS - BID PACK 3
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18111 CUMBERLAND RD, NOBLESVILLE, IN 46060

05-30-2025
Job# 24023

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1	ADD #1 BP3	06.25.25

MECHANICAL DETAILS

M531

GENERAL NOTES

A REPLACE ALL THERMOSTATS SHOWN.

B ALL EXISTING TO REMAIN CONTROL VALVES WHERE THE ACTUATOR HAS BEEN REPLACED SHALL HAVE A CHECKOUT PROCEDURE COMPLETED: VERIFY THAT THE TSTAT IS COMMUNICATING AND THE VALVE PHYSICALLY RESPONDS TO OPEN AND CLOSE SIGNALS.

C T.C.C. SHALL DOCUMENT CONDITION OF VAV BOX AND ACTUATOR / SHAFT. OBSERVE THE SHAFT ON BOTH SIDES OF THE VAV BOX AND ENSURE DAMPER SHAFT IS ABLE TO ROTATE FREELY. TAKE PICTURES OF EACH BOX AND SUBMIT TO ENGINEER.

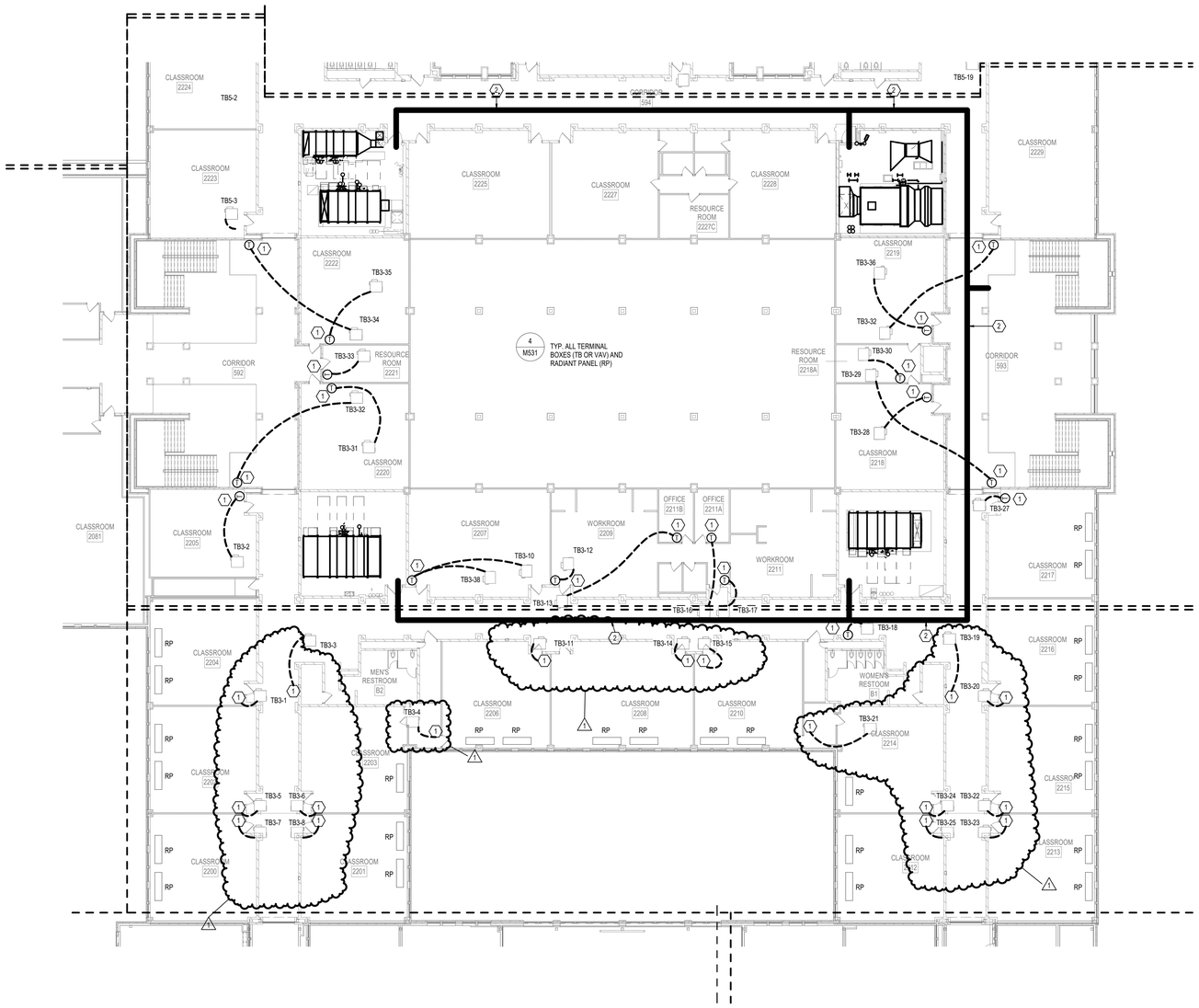
D CONTRACTOR SHALL PROVIDE APPROPRIATE FLOOR / WALL PROTECTION MATERIAL TO PREVENT DAMAGE WHILE TRANSPORTING ANY MATERIALS OR EQUIPMENT.

E REPLACE ALL CONTROL VALVE ACTUATORS WITHIN SCOPE AREA THAT SERVE RADIANT PANELS. SEE "VAV DEVICE AND SENSOR DIAGRAM".

SHEET KEYNOTES

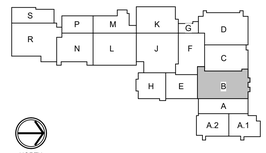
1 REPLACE THERMOSTAT. SEE DETAIL.

2 POTENTIAL PATH OF SUPPLIES AND MATERIAL TRANSPORT TO MECHANICAL ROOMS. DO NOT COMPLETELY BLOCK ANY EXIT WHEN SCHOOL IS IN SESSION. ANY PATH THAT IS TO REMAIN ACTIVE FOR CONSTRUCTION DURING SCHOOL SHALL BE FENCED OFF WITH SAFETY FENCING, HOWEVER FENCING SHALL NOT IMPEDE EXIT PATHS WHEN SCHOOL IS IN SESSION.



1 SECOND FLOOR MECHANICAL CONTROLS PLAN BP3
1/16" = 1'-0"

KEY PLAN



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18111 CUMBERLAND RD, NOBLESVILLE, IN 46060

ANDREW P. STAPLES REGISTERED PE11400737 STATE OF INDIANA PROFESSIONAL ENGINEER
05-30-2025
Job# 24023

SCALE:	AS NOTED
DRAWN BY:	Author
DESIGNED BY:	Designer
CHECKED BY:	Checker
DATE:	09/27/2024
PROJECT #:	24023

REVISIONS:

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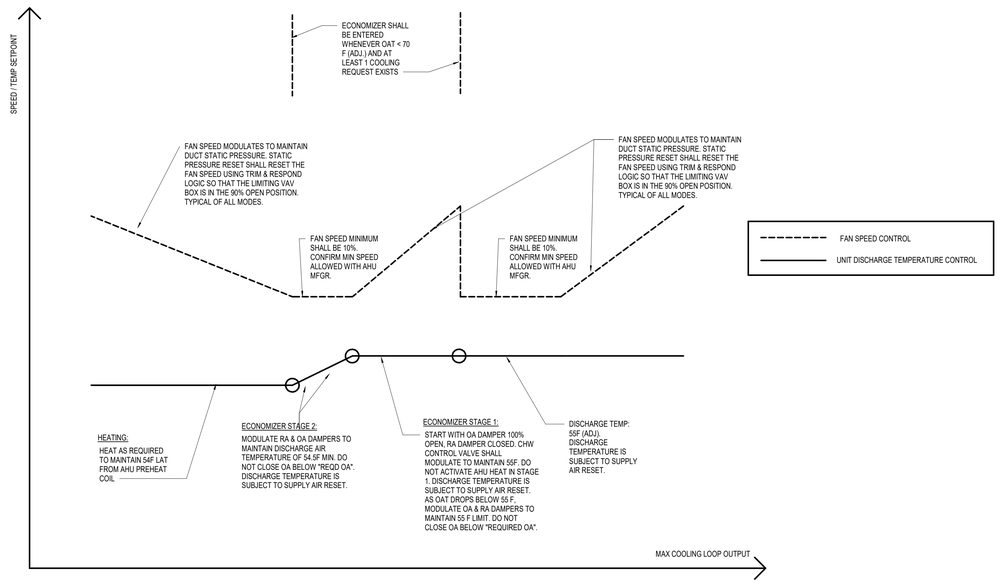
1	ADD #1 BP3	06.26.25

CONTROLS AND LOGISTICS PLAN

M732



1 MZ VAV TEMPERATURE MAP BP3
NTS

SCHEDULED PRE-COOL PERIODS

1. THE OWNER SHALL HAVE THE ABILITY FROM THE FRONT END TO SCHEDULE A PRECOOL PERIOD DURING THE NIGHT BEFORE AN ANTICIPATED MAXIMUM COOLING DAY (MCD).

2. THE PRECOOL PERIOD SHALL TEMPORARILY OVERRIDE ALL OF THE SPACE SETPOINTS THROUGHOUT THE BUILDING SO THAT THE COOLING SETPOINT IS ADJUSTED TO 69F (ADJ.). THIS SHALL ONLY APPLY DURING PERIODS WHERE THE BUILDING IS UNOCCUPIED AND THE OUTDOOR AIR DAMPERS ARE SHUT.

3. THE START OF THE PRECOOL PERIOD SHALL BE ADJUSTABLE, WITH A DEFAULT OF 1:00 AM (ADJ.).

4. DURING THE PRECOOLING PERIOD THE CHILLER SHALL BE LIMITED TO A MAXIMUM OF 60% CAPACITY BY ADJUSTING THE CHILED WATER SUPPLY TEMPERATURE SETPOINT.

5. THE END OF THE PRECOOL PERIOD SHALL BE 11:30 AM (ADJ.).

6. ONCE THE BUILDING GOES INTO OCCUPIED MODE DURING THE MCD - THE THERMOSTAT EFFECTIVE SETPOINT SHALL BE GRADUALLY BLENDED FROM THE NIGHT PRECOOL SETPOINT OF 69F TO THE NORMAL COOLING SETPOINT OVER A PERIOD OF 4 HOURS (ADJ.).

7. UPON COMPLETION OF THE MAXIMUM COOLING DAY THE BUILDING SHALL REVERT TO THE NORMAL SETPOINTS AND CONTROL. ALL PARAMETERS SHALL BE ADJUSTABLE

CONTROLS CHECKOUT PROCEDURE

A. CONTACT ENGINEER TO COORDINATE A CONTROLS SYSTEM CHECKOUT. ALLOW 3 WORKING WEEKS NOTICE. SCHEDULE MEETING IN APPROPRIATE AMBIENT CONDITIONS FOR THE BOILER AND CHILLER TO OPERATE. ANTICIPATE TWO SEPARATE TESTING DAYS APPROXIMATELY 6 MONTHS APART.

B. THE FOLLOWING POINTS MUST BE ABLE TO BE OVERRIDDEN FOR EACH AIR SYSTEM AS REQUIRED FOR DEMONSTRATION PURPOSES:

1. OUTDOOR AIR TEMPERATURE
2. SPACE TEMPERATURE
3. OCCUPIED / UNOCCUPIED STATUS

C. AIR HANDLING UNIT (AHU) SYSTEMS CHECKOUT:

1. A RANDOM AHU WILL BE SELECTED.
2. ENGINEER WILL REQUEST THE AIR SYSTEM START IN MAXIMUM COOLING MODE. INCREMENTALLY BACK PARAMETERS DOWN TO SIMULATE PARTIAL COOLING, THEN ECONOMIZER, THEN HEATING MODES. AFTER FULL HEATING IS REACHED, REVERSE DIRECTION AND RETURN TO FULL COOLING INCREMENTALLY.

D. VARIABLE AIR VOLUME (VAV) BOX SYSTEM CHECKOUT:

1. A RANDOM SAMPLE OF 5 VAV BOXES WILL BE SELECTED.
2. ENGINEER WILL REQUEST THE AIR SYSTEM START IN MAXIMUM COOLING MODE. INCREMENTALLY BACK PARAMETERS DOWN UNTIL THE VAV BOX MINIMUM FLOW IS REQUESTED FROM THE CONTROLLER.
3. INCREMENTALLY LOWER THE COOLING LOOP OUTPUT (OR INCREASE HEATING LOOP OUTPUT) UNTIL HEATING IS DEMANDED. VERIFY THAT THE VAV BOX DISCHARGE AIR TEMPERATURE INCREASES TO ITS MAXIMUM.
4. LOWER THE LOOP COOLING OUTPUT (OR INCREASE HEATING LOOP OUTPUT) INTO FULL HEATING MODE. VERIFY THE VAV BOX AIRFLOW INCREASES WHILE KEEPING DISCHARGE AIR TEMPERATURE CONSTANT.
5. RETURN TO FULL COOLING INCREMENTALLY.

G. RETURN FAN

1. VERIFY THAT FANS ARE OPERATIONAL AND RUN WHEN DEMANDED.
2. VERIFY RETURN FAN SPEED TRACKS THE APPROPRIATE CONTROL SIGNAL

VAV TERMINAL REHEAT

AIR TERMINALS (VAV BOXES) ARE PRESSURE INDEPENDENT SHUTOFF BOXES WITH HOT WATER REHEAT.
1. A DISCHARGE AIR TEMPERATURE SENSOR SHALL BE PROVIDED FOR EACH VAV BOX. DEVICE SHALL BE FURNISHED, WIRED, AND INSTALLED BY 23 09 00.
2. COOLING DESIGN AND MINIMUM CFM SHALL MATCH THE EXISTING VAV BOX SCHEDULES TO BE PROVIDED BY OWNER (LATER). FULL COOLING DEMAND SHALL BE ACCOMPLISHED WITH THE AIR VALVE FULLY OPEN AND THE HHW CONTROL VALVE FULLY CLOSED. A DROP IN COOLING LOAD SHALL CAUSE THE VAV BOX TO MODULATE ITS AIRFLOW DOWN TO ITS SCHEDULED MINIMUM. VAV BOX AIRFLOW OPERATION SHALL BE A SLOW CONTROL LOOP - REACTING TO A STEP CHANGE IN REQUIRED AIRFLOW IN AN APPROXIMATE TIMELINE OF ~5 MINUTES.
3. STAGE 1 HEAT: WHERE RADIANT PANELS EXIST WITHIN A ZONE THE RADIANT PANELS SHALL ACT AS THE 1ST STAGE OF HEAT. ALLOW CONTROL VALVE TO MODULATE OPEN TO A MAXIMUM OF 50% (ADJ.) ONCE MAXIMUM VALVE POSITION HAS BEEN REACHED FOR A PERIOD OF 5 MINUTES ALLOW STAGE TWO HEATING.
NOTE THAT IN ORDER FOR THE RADIANT PANEL STAGE TO BE ENABLED ALL RADIANT PANELS WITHIN A ZONE SHALL BE SERVED BY A SINGLE CONTROL VALVE. T.C.C. SHALL VERIFY IN FIELD.
PROVIDE A TOGGGLE FOR THE OWNER FOR EACH AHU SYSTEM TO DISABLE RADIANT PANEL HEATING FOR ALL THE ZONES SERVED BY THAT AHU.

STAGE 2 HEAT: UPON A CALL FOR HEAT FROM THE SPACE THERMOSTAT, THE HHW CONTROL VALVE SERVING THE AIR TERMINAL (AKA VAV) BOX SHALL MODULATE UP TO A MAXIMUM DISCHARGE AIR TEMPERATURE OF 90F (ADJ. FOR EACH ZONE).
4. ONCE MAXIMUM DISCHARGE TEMPERATURE IS REACHED AND THERE IS STILL A HEATING DEMAND, AIRFLOW THROUGH VAV BOX SHALL MODULATE UP TO THE REHEAT CFM.
5. WHEN THE SPACE OCCUPANCY SENSORS INDICATE THE SPACE IS UNOCCUPIED THE VAV BOX MINIMUM SHALL BE RESET TO ZERO. THIS DOES NOT FORCE VAV BOX TO ZERO UNLESS THE SPACE LOAD ALSO DROPS TO ZERO.

1

VAV TERMINAL REHEAT POINTS LIST

THE FOLLOWING POINTS SHALL BE ABLE TO BE VIEWED, TRENDED, AND ALARMED AT THE FRONT END INTERFACE. IN ADDITION, THE POINTS INDICATED AS ADJUSTABLE IN THE SEQUENCE SHALL BE ABLE TO BE CONTROLLED FROM THE FRONT END.
DISCHARGE AIR TEMPERATURE
ZONE TEMPERATURE
ZONE SETPOINT
AIR VALVE POSITION
CONTROL VALVE % OPEN (USE CONTROLLER LOOP OUTPUT ONLY – DO NOT USE POSITIONER)

MULTIPLE ZONE VAV SEQUENCE

1. UNOCCUPIED MODE:
A. OUTDOOR AIR DAMPER SHALL BE CLOSED DURING ALL UNOCCUPIED PERIODS, SCHEDULED THROUGH BAS.
B. SUPPLY FANS SHALL BE ALLOWED TO RUN DOWN TO THE MINIMUM SPEED ALLOWED BY MOTOR MFGR. PROVIDE THE MINIMUM SPEED ON SUBMITTAL.
C. BELOW THE SAFE MINIMUM SPEED, THE AHU SHALL CYCLE TO SATISFY THE AVERAGE SPACE TEMPERATURE. A DEADBAND OF +/- 3 DEGREES SHALL BE USED FOR THE SPACE AVERAGE TO CYCLE THE FANS.
D. MORNING WARM UP:
- ENABLED AT OUTSIDE AIR TEMPERATURES BELOW 50F (ADJ).
- PRIOR TO OCCUPIED MODE BEING ENABLED, AT A TIME DETERMINED BY THE BMS BASED ON OUTSIDE AIR TEMPERATURE AND THE HISTORIC TIME IT TAKES THE INDIVIDUAL ZONES TO REACH OCCUPIED SPACE TEMPERATURE SET POINTS, THE UNIT SHALL ENTER THE MORNING WARM-UP MODE. IN THIS MODE, ALL VAV BOXES WHOSE SPACE TEMPERATURES ARE BELOW THE OCCUPIED HEATING SETPOINT SHALL MODULATE THEIR DAMPERS FULLY OPEN AND THE AHU DISCHARGE TEMPERATURE SHALL BE 90F. ONCE EVERY SPACE HAS REACHED ITS OCCUPIED MODE HEATING SETPOINT OR MORE THAN 10% OF THE SPACES HAVE EXCEEDED THEIR COOLING MODE SET POINT, THE AHU SHALL RETURN TO ITS NORMAL OCCUPIED MODE OF OPERATION.
E. DISCHARGE AIR TEMP CONTROL:
- WHENEVER THE HEATING LOOP OUTPUT OF MORE THAN 10% OF VAVS IS GREATER THAN 90% FOR MORE THAN 5 MINUTES THE DAT FROM THE AHU SHALL BE RESET UPWARD BY TRIM AND RESPOND LOGIC UP TO A MAX OF 65F.

2. SUPPLY FAN CONTROL:
A. THE SUPPLY FAN SHALL MODULATE TO MAINTAIN DUCT STATIC PRESSURE SETPOINT AT 1.2" (ADJ.). SUPPLY AIR STATIC PRESSURE SHALL BE RESET AS SHOWN IN DIAGRAM.

3. RETURN FAN CONTROL:
A. RETURN FAN SPEED CONTROL SHALL OCCUR IN TWO STAGES:
STAGE 1:
THE RETURN FANS VFD SPEED SHALL MODULATE TO MAINTAIN +0.01" (ADJ.) AS MEASURED AT SP-1. THE ASSOCIATED RELIEF DAMPER SHALL MODULATE TO MAINTAIN BUILDING PRESSURE AT +0.04" (ADJ.). RELIEF DAMPER CONTROL LOOP SHALL BE MUCH SLOWER THAN THE RETURN FAN SPEED CONTROL LOOP.
STAGE 2:
ONCE THE RELIEF DAMPER HAS BEEN 100% OPEN FOR TWO MINUTES, THE SETPOINT FOR SP-1 SHALL BE RESET UPWARD BY T&R LOGIC TO MAINTAIN BUILDING PRESSURE.

4. SUPPLY AIR TEMPERATURE RESET
A. DISCHARGE AIR TEMPERATURE (DAT) RESET SHALL OCCUR WHENEVER ALL OF THE FOLLOWING CONDITIONS ARE MET:
- WHENEVER THE AVERAGE OF THE HIGHEST 25% OF HUMIDISTATS SERVED BY THIS SYSTEM READ BELOW 55% RH (ADJ.)
- WHEN CALLED FOR IN THE TEMPERATURE MAP
B. THE BMS SHALL MONITOR THE DAMPER POSITION OF ALL VAV TERMINALS SERVED BY AN INDIVIDUAL AIR HANDLING UNIT. THE AHU DAT SHALL RESET BASED ON THE TOTAL NUMBER OF ASSOCIATED VAVS CALLING FOR COOLING. A VAV IN COOLING MODE WITH A DAMPER POSITION ABOVE 80% SHALL BE CONSIDERED A VAV CALLING FOR COOLING. IF MORE THAN 10% OF THE VAV TERMINALS ARE CALLING FOR COOLING THE DAT SHALL BE RESET DOWNWARD BY TRIM AND RESPOND LOGIC UNTIL THE NUMBER OF VAVS CALLING FOR COOLING IS LESS THAN 10% OR THE MINIMUM RESET TEMPERATURE OF 55 DEG. F. IS REACHED. IF NO VAV TERMINALS ARE CALLING FOR COOLING THE DAT SHALL BE INCREASED BY TRIM AND RESPOND LOGIC UNTIL THE MAXIMUM DAT OF 68F IS REACHED. ALL PARAMETERS SHALL BE ADJUSTABLE.
C. WHENEVER THE AVERAGE OF THE HIGHEST 25% OF HUMIDISTATS SERVED BY THIS SYSTEM READ ABOVE 55% RH (ADJ.) THE RTU SHALL REDUCE DAT BY TRIM AND RESPOND LOGIC:
- INOPERATIVE RH SENSORS SHALL BE DROPPED FROM THE AVERAGE.

5. SEE TEMPERATURE MAP ON THIS SHEET FOR OCCUPIED COOLING, OCCUPIED HEATING, AND ECONOMIZER MODE INSTRUCTIONS

6. VENTILATION (OA):
A. THE RTU SHALL BE PROVIDED WITH A FLOW MEASURING DEVICE ON THE OUTDOOR AIR INTAKE. THE SYSTEM SHALL MODULATE DURING OCCUPIED PERIODS TO PROVIDE THE REQUIRED VENTILATION AS SCHEDULED ("REQD OA"). TO ACHIEVE THE DESIRED AIRFLOW TWO STAGES OF DAMPER CONTROL ARE REQUIRED:
STAGE 1:
WITH RETURN AIR DAMPER WIDE OPEN, MODULATE OA DAMPER.
IF OA DAMPER AND RA DAMPER ARE BOTH WIDE OPEN FOR 4 MINUTES, INITIATE STAGE 2
STAGE 2:
OUTDOOR AIR DAMPER SHALL BE FROZEN AT 100% OPEN. ADJUST RA DAMPER CLOSED UNTIL OA AFMS INDICATES CORRECT AIRFLOW.
B. RETURN AIR CO2 CONTROL:
THE DESIGN VENTILATION AIR SHALL BE RESET DOWNWARD AS REQUIRED TO KEEP THE RETURN AIR CO2 AT A CONSTANT SETPOINT. COORDINATE SETPOINT WITH OWNER TO MATCH EXISTING SETPOINT. AT NO POINT SHALL THE OA DAMPER OPEN PAST THE DESIGN OA RATE PER THE AHU SCHEDULE, REGARDLESS OF CO2 INDICATION. THE REDUCED VENTILATION RATE AS ADJUSTED BY CO2 SHALL BE CALLED "REQUIRED OA".

AHU POINTS LIST (APPLIES TO ALL SINGLE ZONE AND MULTIPLE ZONE AHUS)

THE FOLLOWING POINTS SHALL BE ABLE TO BE VIEWED, TRENDED, AND ALARMED AT THE FRONT END INTERFACE. IN ADDITION, THE POINTS INDICATED AS ADJUSTABLE IN THE SEQUENCE SHALL BE ABLE TO BE CONTROLLED FROM THE FRONT END.

RETURN AIR TEMPERATURE
RETURN AIR CO2
RETURN AIR HUMIDITY
RELIEF DAMPER LOOP OUTPUT
RETURN AIR PLENUM STATIC PRESSURE (SP-1)
RETURN DAMPER LOOP OUTPUT
OUTDOOR AIRFLOW MEASURING STATION
OUTDOOR AIR DAMPER LOOP OUTPUT
MIXED AIR TEMPERATURE
LOW STATIC PRESSURE SWITCH STATUS
FILTER DP SWITCH STATUS
PREHEAT CONTROL VALVE LOOP OUPUT
FREEZE PROTECTION PUMP COMMAND (BASE BID ONLY)
FREEZE PROTECTION PUMP STATUS (BASE BID ONLY)
HYDRONIC RETURN LOW LIMIT IMMERSION TEMPERATURE SENSOR (BASE BID ONLY)
LOW LIMIT TEMPERATURE SENSOR
PREHEAT COIL DISCHARGE TEMPERATURE
COOLING CONTROL VALVE LOOP OUPUT
COOLING COIL DISCHARGE TEMPERATURE
FAN COMMAND (PER FAN)
FAN STATUS (PER FAN)
FAN SPEED (PER FAN)
FAN AMPERAGE (PER FAN)
AHU DISCHARGE SUPPLY AIR TEMPERATURE (DAT)
DUCT STATIC PRESSURE SENSOR
HIGH STATIC PRESSURE SWITCH STATUS

GENERAL CONTROLS SAFETIES AND ALARMS

1. BUILDING OCCUPANCY SCHEDULE:
A. THE OWNER SHALL HAVE THE ABILITY TO DEFINE THE OCCUPANCY SCHEDULE OF EACH AIR HANDLING SYSTEM SEPARATELY OR AT ONCE.

2. SPACES THAT INDICATE UNOCCUPIED DURING SCHEDULED OCCUPIED HOURS SHALL BE CALLED "DAY UNOCCUPIED".

3. SPACES THAT INDICATE OCCUPIED DURING SCHEDULED OCCUPIED HOURS SHALL BE CALLED "DAY OCCUPIED".

4. ALL PERIODS SCHEDULED AS "UNOCCUPIED"SHALL BE CALLED "NIGHT".

5. ACTIVATION OF DUCT MOUNTED SMOKE DETECTOR(S) SHALL STOP ALL FANS IN THE ASSOCIATED AIR HANDLER OR ROOFTOP UNIT.

6. FOR AHU OR RTU WITH AN ASSOCIATED FREEZESTAT THE FREEZESTAT SENSOR ACTIVATION SHALL CLOSE THE OUTDOOR AIR DAMPERS AND OPEN THE HOT WATER VALVE TO PREVENT FREEZING. FAN SHALL CONTINUE TO RUN AT DEMANDED SPEED. AN ALARM SHALL BE SENT TO THE FRONT END.

7. FOR ANY UNITS WITH ASSOCIATED FREEZE PROTECTION PUMPS, THE PUMP SHALL BE ENERGIZED AND RUN WHENEVER THE OUTDOOR AIR TEMPERATURE IS BELOW 35F, REGARDLESS IF UNIT IS RUNNING OR NOT. PUMP SHALL BE EQUIPPED WITH A CURRENT TRANSFORMER (CT), ALARM WHEN PUMP IS CALLED FOR AND FAILS TO RUN.

8. BUILDING SPACE PRESSURE SENSORS ARE SHOWN ON PLANS. SIGNALS SHALL BE AVERAGED TO PROVIDE ONE UNIFORM AHURTU PRESSURE SIGNAL FOR EACH SET OF SENSORS (SEE NOTES ON PLANS). PROVIDE DIGITAL FILTER TO MINIMIZE WIND SPIKES. IF ANY SIGNAL BECOMES INOPERATIVE IT SHALL BE DROPPED FROM THE AVERAGE.

9. FOR VARIABLE SPEED FANS – THE DUCT OR PLENUM STATIC PRESSURE SENSORS LOCATED DOWNSTREAM MAY DOUBLE AS HIGH STATIC PRESSURE SENSORS AND SHALL SHUT THE ASSOCIATED FANS DOWN WHEN EXCESSIVE PRESSURES ARE OBSERVED. ALARM AT FRONT END.

10. FOR VARIABLE SPEED FANS – THE DUCT OR PLENUM STATIC PRESSURE SENSORS LOCATED UPSTREAM OF THE FANS SHALL SHUT THE ASSOCIATED FANS DOWN WHEN LOW PRESSURES ARE OBSERVED. ALARM AT FRONT END.

11. ALL RTU/AHU FANS SHALL BE PROVIDED WITH CURRENT TRANSFORMERS (CT) TO DETERMINE FAN STATUS.

12. WHERE MULTIPLE PARALLEL FANS ARE REQUIRED TO RUN IN UNISON – THE FAN SPEED FOR EACH SHALL BE THE SAME.

13. FAN SPEED MINIMUM SHALL BE ALLOWED TO TURN DOWN TO 10%.

14. WHERE INDIVIDUAL ACTUATORS ARE SHOWN FOR THE RETURN AIR AND OUTDOOR AIR DAMPERS - THESE DAMPERS SHALL MODULATE IN SEQUENCE. ONE OF THE TWO SHALL BE 100% OPEN AND THE OTHER SHALL MODULATE AS REQUIRED WHENEVER OPERATING IN MIXED AIR MODE (BOTH RA AND OA FLOW IS PRESENT).

15. THE MOTOR OVERLOAD AMPERAGE SHALL BE BROUGHT IN AS AN ANALOG INPUT VIA BACNET FROM EACH VFD. THE FULL LOAD AMP LIMIT FOR EACH MOTOR SHALL BE SET IN THE CONTROL SYSTEM. THIS LIMIT SHALL OVERRIDE THE SPEED SIGNAL AND LIMIT SPEED IF THE AMPERAGE READING IS ABOVE THE FULL LOAD AMPERAGE. THE FULL LOAD AMP LIMITS SHALL BE SET IN THE FIELD FOR ALL VFDS SERVING THE AHU FANS AND THE HHW AND CHW PUMPS. THIS "CURRENT LIMIT" OR EQUIVALENT IS A FEATURE OF THE VFD AND WILL LIMIT THE VFD OUTPUT FREQUENCY SO THE AMP LIMITS ARE NOT EXCEEDED.

16. WHERE A LOW LIMIT TEMPERATURE TRANSMITTER IS PROVIDED FOR THE RETURN LEG OF HYDRONIC COILS -THE SEQUENCE SHALL AUTOMATICALLY OVERRIDE AND REDUCE THE OUTDOOR AIR SETPOINT WHENEVER THE SENSOR INDICATES 55F (ADJ.) OR BELOW. THIS WILL ALLOW MORE RETURN INTO THE MIXED AIR AND INCREASE THE MIXED AIR TEMPERATURE. ALARM AT FRONT END. NOTE THAT THIS DOES NOT AFFECT THE SUPPLY AIR DEMANDED. WHEN TEMPERATURE TRANSMITTER SIGNAL BECOMES INOPERATIVE OR OUT OF RANGE AN ALARM SHALL BE SENT TO THE FRONT END.

17. TCC SHALL PROVIDE STANDARD ALARMS ON FRONT END. VERIFY AND COORDINATE FINAL ALARM POINTS WITH OWNER. FOR BUDGETING PURPOSES, THE TCC SHALL ASSUME THAT ANY SOFTWARE POINT COULD BE REQUESTED BY THE OWNER TO ALARM. PROVIDE TIERED ALARMS PER LATEST ASHRAE STANDARDS.

18. F&BP DAMPER OPERATION (WHERE EQUIPPED): WHEN THE OAT IS ABOVE 40F (ADJ.) THE F&BP DAMPER SHALL BE OPEN TO THE COIL (0% BYPASS). TEMPERATURE CONTROL SHALL BE ACHIEVED BY THE MODULATING CONTROL VALVE. WHEN THE OAT FALLS BELOW 40F (ADJ.) THE CONTROL VALVE SHALL OPEN FULLY AND TEMPERATURE CONTROL SHALL BE ACHIEVED BY MODULATING THE F&BP DAMPERS. UPON ACTIVATION OF THE FREEZESTAT THE F&BP DAMPER SHALL FAIL OPEN TO THE COIL (0% BYPASS) TO PROTECT THE COOLING COIL DOWNSTREAM SHOULD ANY RESIDUAL AIR BE MOVING THROUGH THE AHU.

kbsd CONSULTING
275 VETERANS WAY
SUITE 300
CARMEL, IN 46032

NOBLESVILLE HS AHU REPLACEMENTS - BID PACK 3
NOBLESVILLE SCHOOLS
18111 CUMBERLAND RD, NOBLESVILLE, IN 46060

05-30-2025
Job# 24023

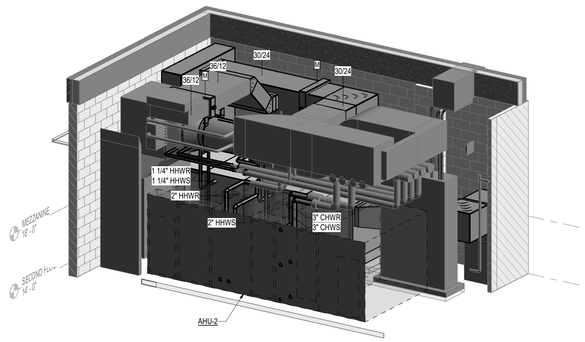
SCALE:	AS NOTED
DRAWN BY:	Author
DESIGNED BY:	Designer
CHECKED BY:	Checker
DATE:	09/27/2024
PROJECT #:	24023

REVISIONS:

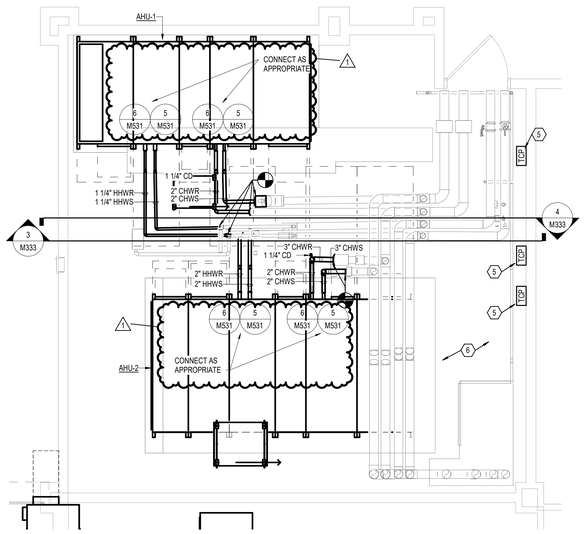
#	DESCRIPTION	DATE
1	ADD #1 BP3	06.25.25

SEQUENCE OF OPERATIONS

M831

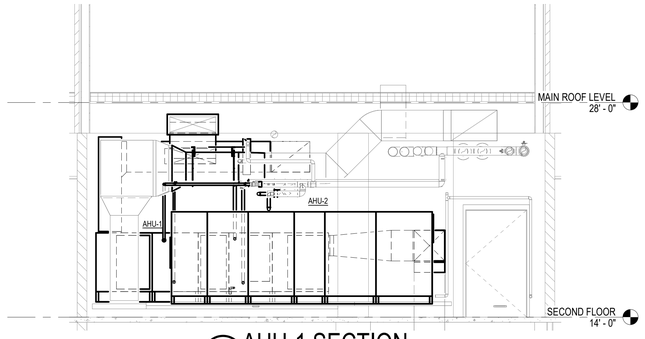


5 AHU-1 3D VIEW LOOKING SW



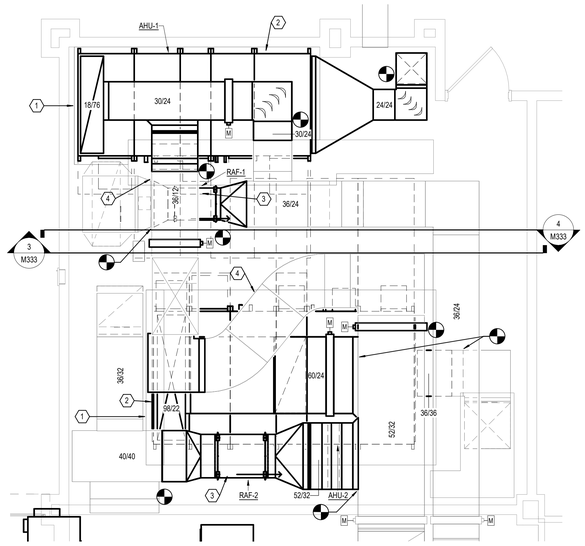
2 MECHANICAL ROOM M5 HYDRONICS PLAN

1/4" = 1'-0"



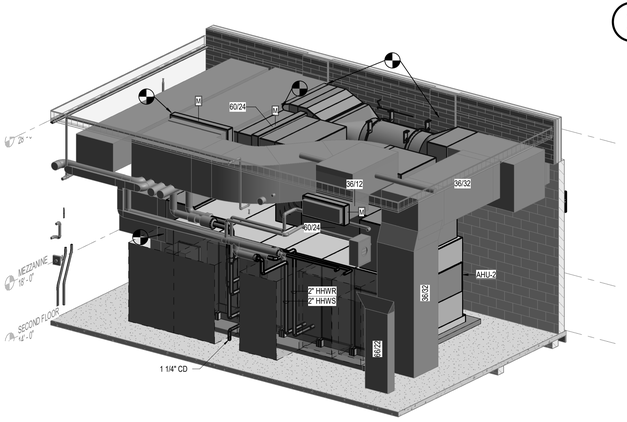
3 AHU-1 SECTION

1/4" = 1'-0"

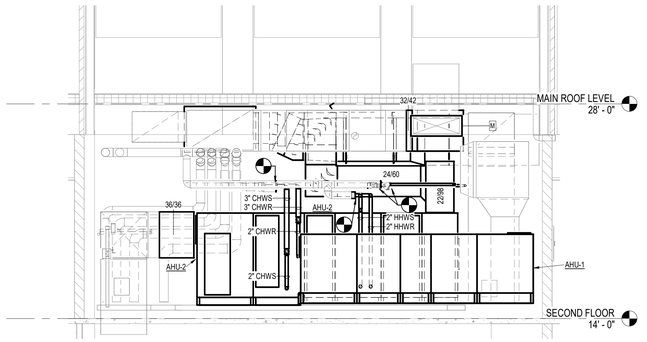


1 MECHANICAL ROOM M5 MECHANICAL PLAN

1/4" = 1'-0"



6 AHU-2 3D VIEW LOOKING NE



4 AHU-2 SECTION

1/4" = 1'-0"

GENERAL NOTES

A REFER TO SHEET M-000 FOR GENERAL MECHANICAL NOTES, SYMBOLS AND ABBREVIATIONS.

B REFER TO DRAWING M-500 SERIES FOR MECHANICAL DETAILS.

C REFER TO DRAWING M-600 SERIES FOR MECHANICAL SCHEDULES.

D CONTRACTOR SHALL VERIFY IN FIELD WHICH PIPE IS SUPPLY AND WHICH PIPE IS RETURN AND CONNECT APPROPRIATELY, REGARDLESS OF WHICH PIPES ARE SHOWN TO BE CONNECTED ON PLANS.

SHEET KEYNOTES

1 OUTLINE OF NEW HOUSEKEEPING PAD SHALL MATCH PAD HEIGHT OF EXISTING PAD (~4". VERIFY IN FIELD). USE 3,000 PSI CONCRETE WITH #5 REBAR @ 12" OC. PAD IS DESIGNED TO SUPPORT THE LEFT AND RIGHT EDGES OF THE AHU. PAD DOES NOT EXTEND FULLY UNDER THE CENTER OF THE UNIT.

2 THIS AHU SHALL BE KNOCKDOWN / KIT / FIELD DISASSBMLED. THE AHU MFGR SHALL COORDINATE WITH THE CONTRACTOR TO ENSURE THAT ALL COMPONENTS TO BE BROUGHT INTO THE SPACE ARE ABLE TO FIT THROUGH A 4'0"W X 6'0"T DOOR. NOTE THAT IN-SITU AHU LEAKAGE TESTING IS REQUIRED. THE CONTRACTOR AND AHU MFGR ARE EQUALLY RESPONSIBLE TO ENSURE THE AHU PASSES LEAKAGE TESTING AFTER AHU IS INSTALLED.

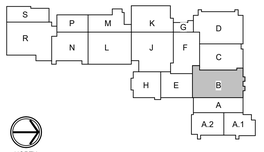
3 MOUNT UNIT ON VIBATION ISOLATORS WITH A STATIC DEFLECTION OF 2". PROVIDE FLEXIBLE DUCT CONNECTORS UPSTREAM AND DOWNSTREAM OF FAN. ENSURE 36" OF ACCESS IS MAINTAINED IN FRONT OF THE FAN ACCESS DOOR FOR MOTOR REPLACEMENT.

4 LOCATE AIRFLOW MEASURING STATION. CONTRACTOR SHALL LOCATE AFMS IN MAXIMUM POSSIBLE STRAIGHT SECTION OF OA DUCT. VERIFY INSTALL LOCATION WITH MFGR. AFMS TYPE TO BE SELECTED BY T.C.C. FROM AVAILALBE OPTIONS IN SPECIFICATION. PROVIDE ACCESS DOOR AS INDICATED

5 T.C.C. SHALL OBSERVE THE EXISTING CONTROL PANEL. ENSURE THAT ALL MISCELLANEOUS DEVICES (UNIT HEATERS, EXHAUST FANS, ETC..) THAT PASS THROUGH THIS CONTROLLER ARE REROUTED THROUGH THE NEW CONTROLLER AND BROUGHT INTO THE FRONT END. MAINTAIN EXISTING SEQUENCE OF OPERATION FOR THESE DEVICES.

6 LOCATE ALL EXISTING DIELECTRIC NIPPLES OR COUPLINGS ON EXISTING TO REMAIN HYDRONIC PIPES. REMOVE AND REPLACE THESE FITTINGS WITH DIELECTRIC FLANGES PER SPECIFICATION. PERFORM VISUAL INSPECTION TO VERIFY ALL INSTANCES ARE LOCATED AND REPLACED. INSULATE TO FORM A CONTINUOUS INSULATION BARRIER. FOR BUDGETING PURPOSES ASSUME A TOTAL QUANTITY OF 4 FITTINGS IN THIS ROOM.

KEY PLAN



KBSO CONSULTING
275 VETERANS WAY
SUITE 300
CARMEL, IN 46032

NOBLESVILLE HS AHU REPLACEMENTS - BID PACK 3

NOBLESVILLE SCHOOLS

18111 CUMBERLAND RD, NOBLESVILLE, IN 46060

ANDREW P. STEINER REGISTERED PE11400737 STATE OF INDIANA PROFESSIONAL ENGINEER
05-30-2025
Job# 24023

SCALE:	AS NOTED
DRAWN BY:	Author
DESIGNED BY:	Designer
CHECKED BY:	Checker
DATE:	09/27/2024
PROJECT #:	24023

REVISIONS:

#	DESCRIPTION	DATE
1	ADD #1 BP3	06.25.25

MECHANICAL ROOM M5 MECHANICAL PLAN

M333