

1 MECHANICAL EQUIPMENT YARD
Scale: 1/4" = 1'-0"

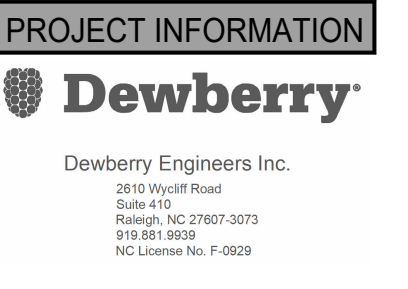


GENERAL NOTES:

- SEE SHEET M00.01 FOR LEGEND AND GENERAL MECHANICAL PROJECT NOTES.
- REFER TO EQUIPMENT SCHEDULES FOR PIPING BRANCH SIZES FROM MAINS TO HEATING AND COOLING COILS.

KEYNOTES:

- 8" EXHAUST FLUE & 8" COMBUSTION AIR INTAKE UP TO ROOF.



PROJECT INFORMATION

ROSEWOOD MIDDLE SCHOOL ADDITION
WAYNE COUNTY PUBLIC SCHOOLS
541 North Carolina 581 S. Goldsboro, NC 27530

SEALS

NOT FOR CONSTRUCTION

DKA JOB NUMBER
2401

DEWBERRY NUMBER
50171439

REVISIONS

NO.	DESCRIPTION

WALL RATING LEGEND:

- 1-HR RATED FIRE BARRIER
- 2-HR RATED FIRE BARRIER
- 3-HR RATED FIRE BARRIER
- 4-HR RATED FIRE BARRIER

KEYPLAN:

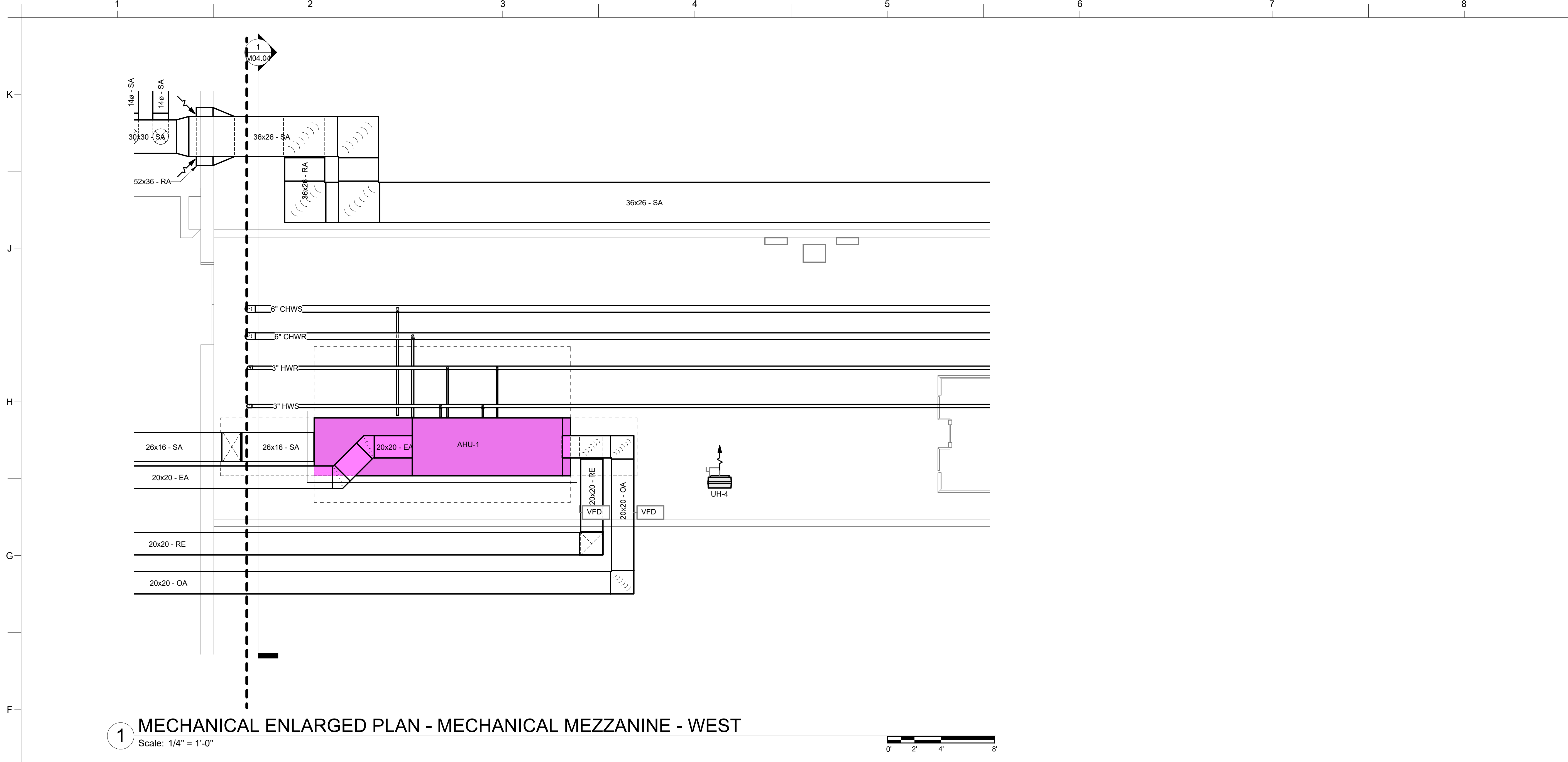
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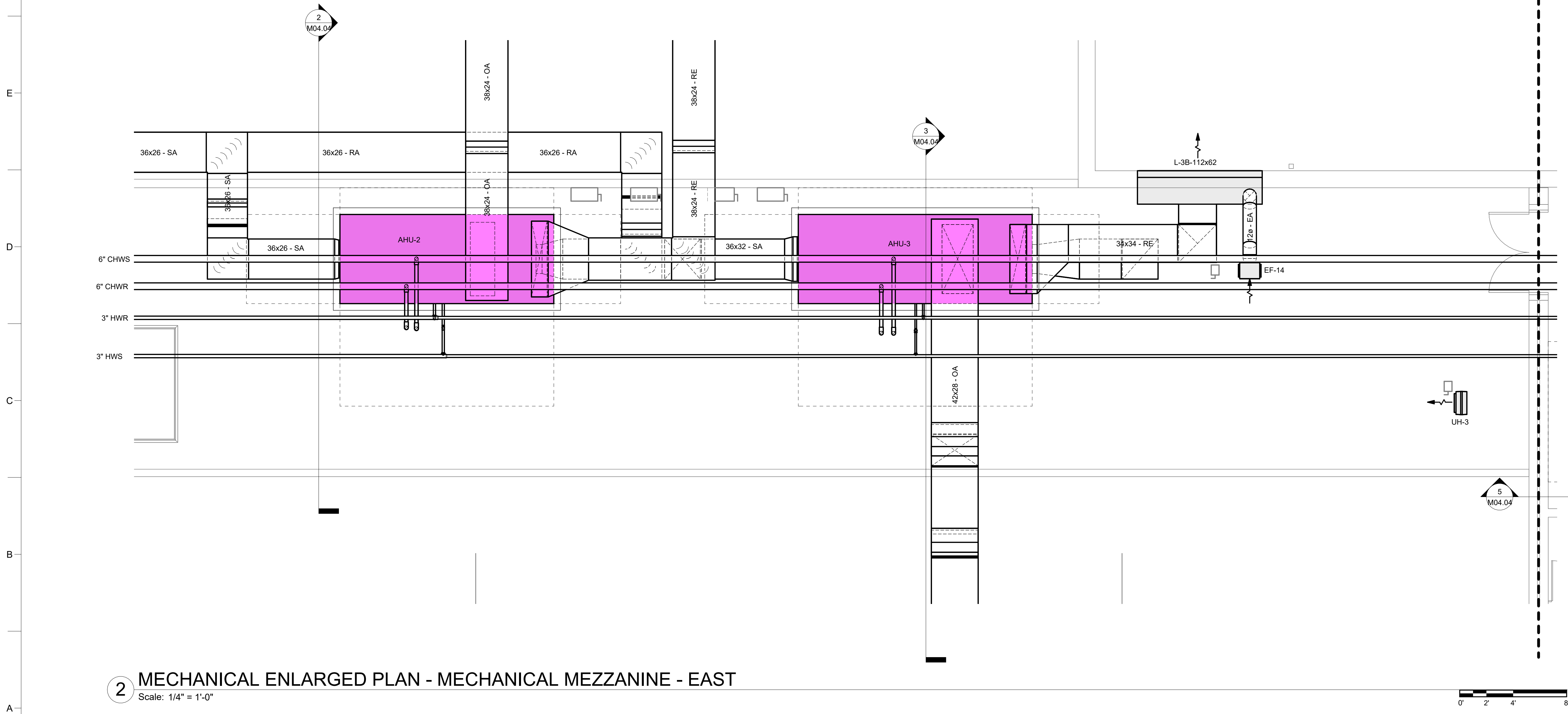
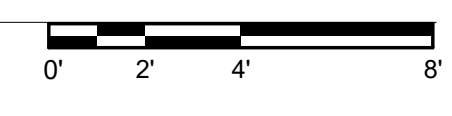
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SHEET TITLE
LARGE SCALE FLOOR PLANS

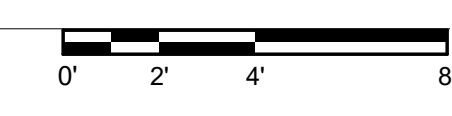
M04.01



1 MECHANICAL ENLARGED PLAN - MECHANICAL MEZZANINE - WEST
Scale: 1/4" = 1'-0"



2 MECHANICAL ENLARGED PLAN - MECHANICAL MEZZANINE - EAST
Scale: 1/4" = 1'-0"

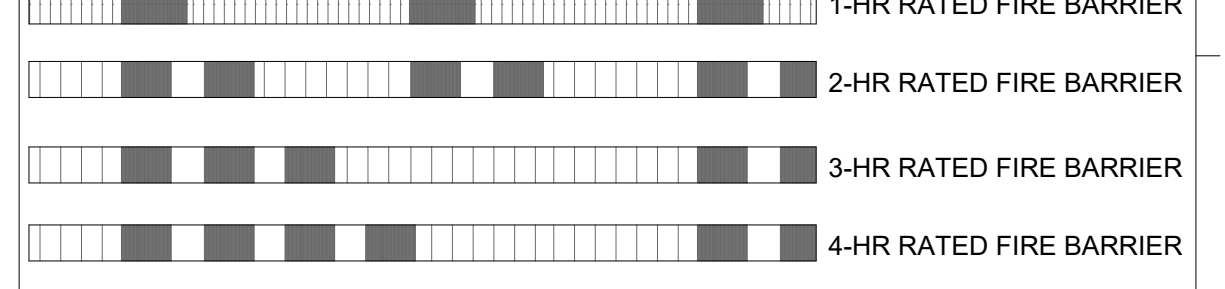


GENERAL NOTES:

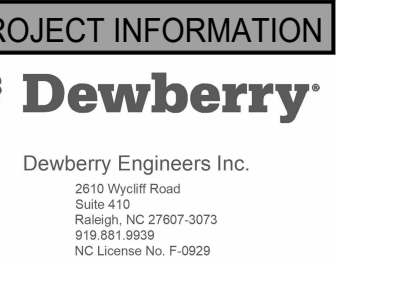
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KEYNOTES:

WALL RATING LEGEND:



KEYPLAN:



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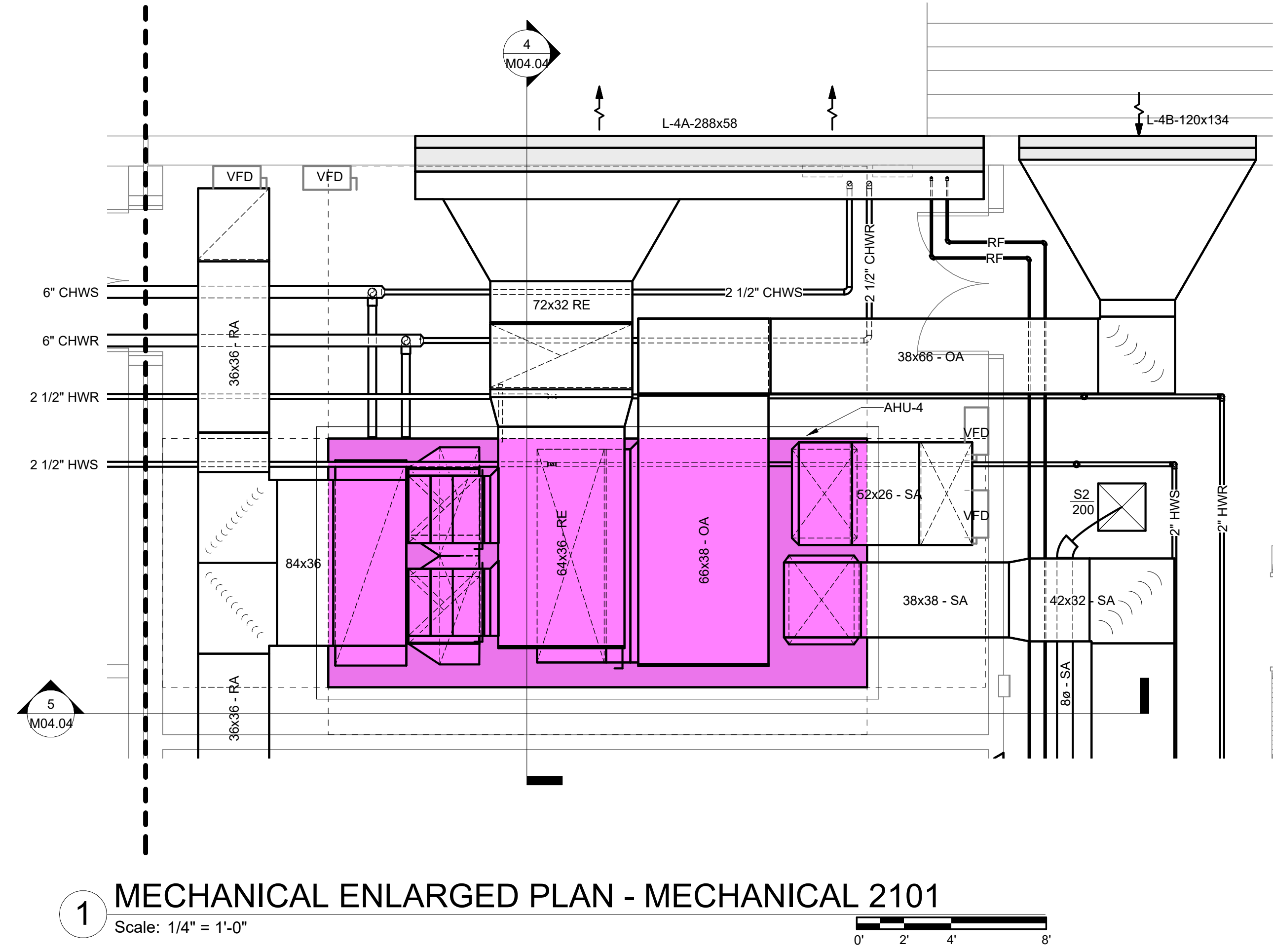
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SHEET TITLE
LARGE SCALE FLOOR PLANS

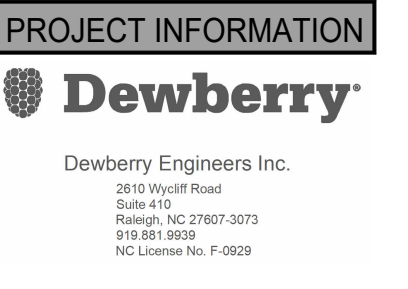
M04.02



GENERAL NOTES:

- SEE SHEET M00.01 FOR LEGEND AND GENERAL MECHANICAL PROJECT NOTES.
- REFER TO EQUIPMENT SCHEDULES FOR PIPING BRANCH SIZES FROM MAINS TO HEATING AND COOLING COILS.

KEYNOTES:



PROJECT INFORMATION

ROSEWOOD MIDDLE SCHOOL ADDITION
 WAYNE COUNTY PUBLIC SCHOOLS
 541 North Carolina 581 S. Goldsboro, NC 27530

SEALS

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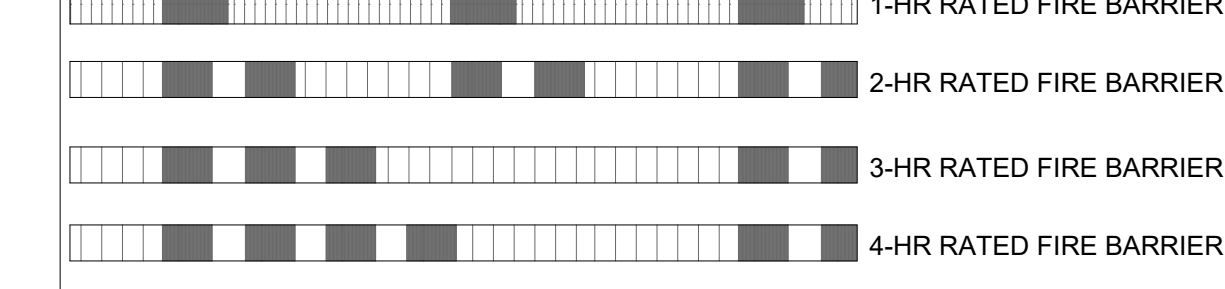
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REVISIONS

NO.	DESCRIPTION

WALL RATING LEGEND:



KEYPLAN:

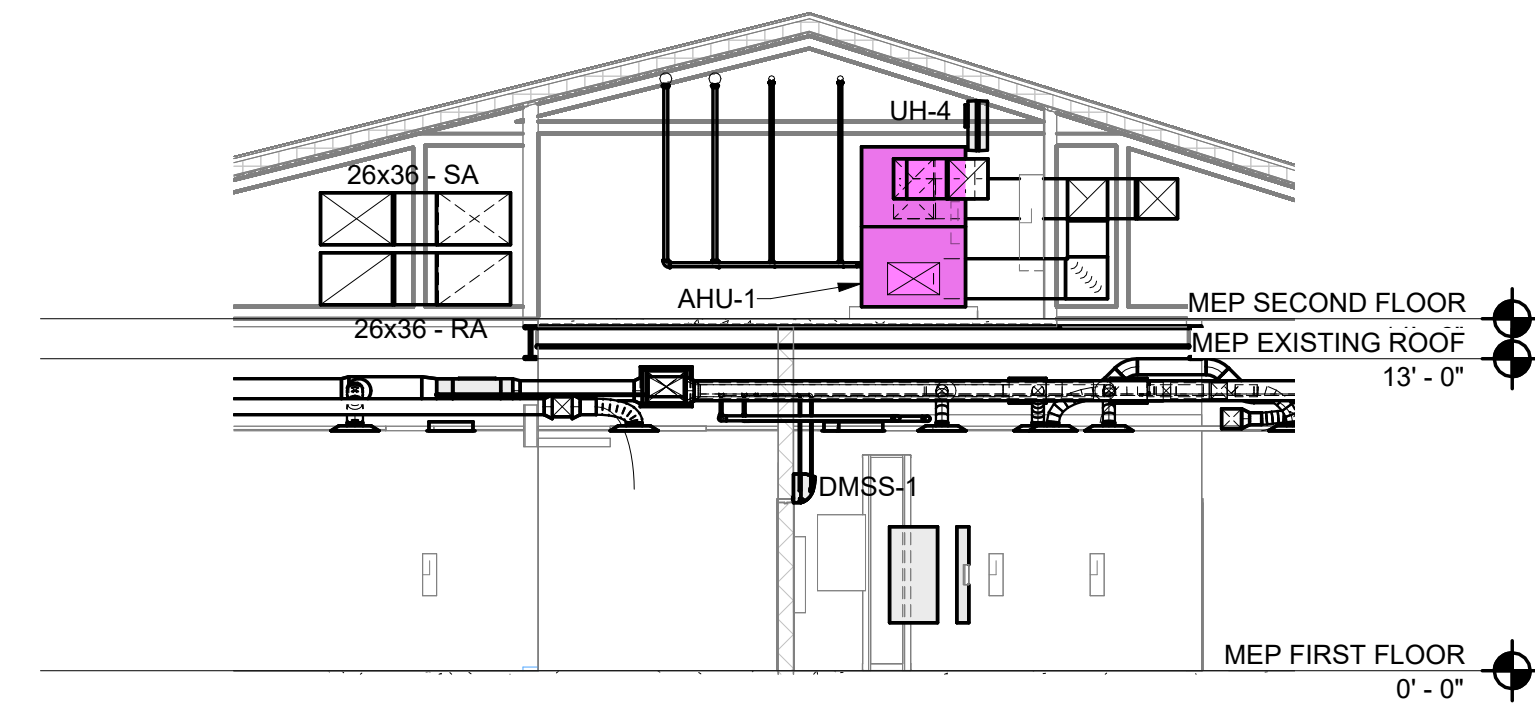
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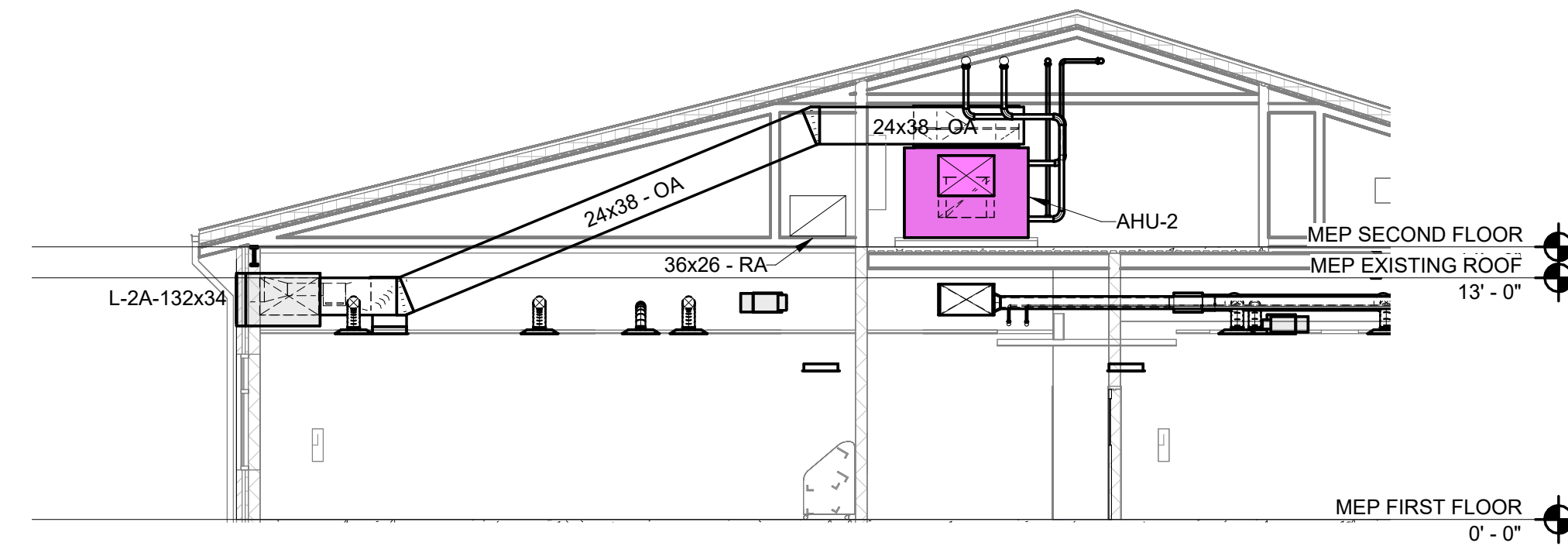
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SHEET TITLE
 LARGE SCALE FLOOR PLANS

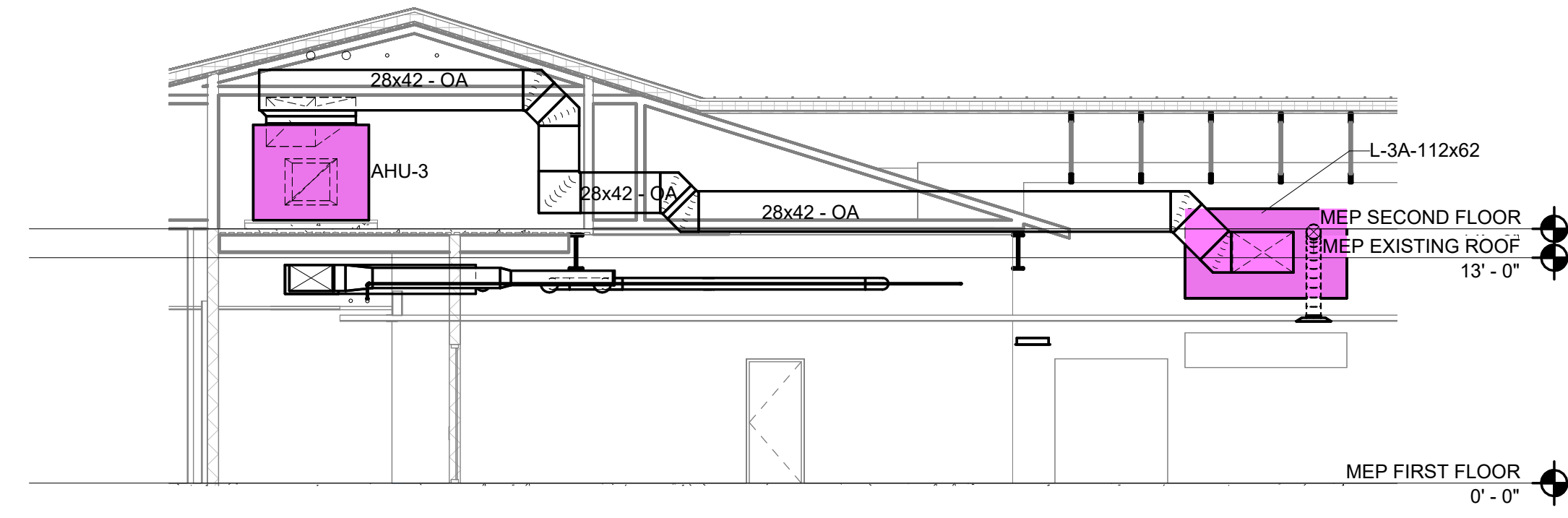
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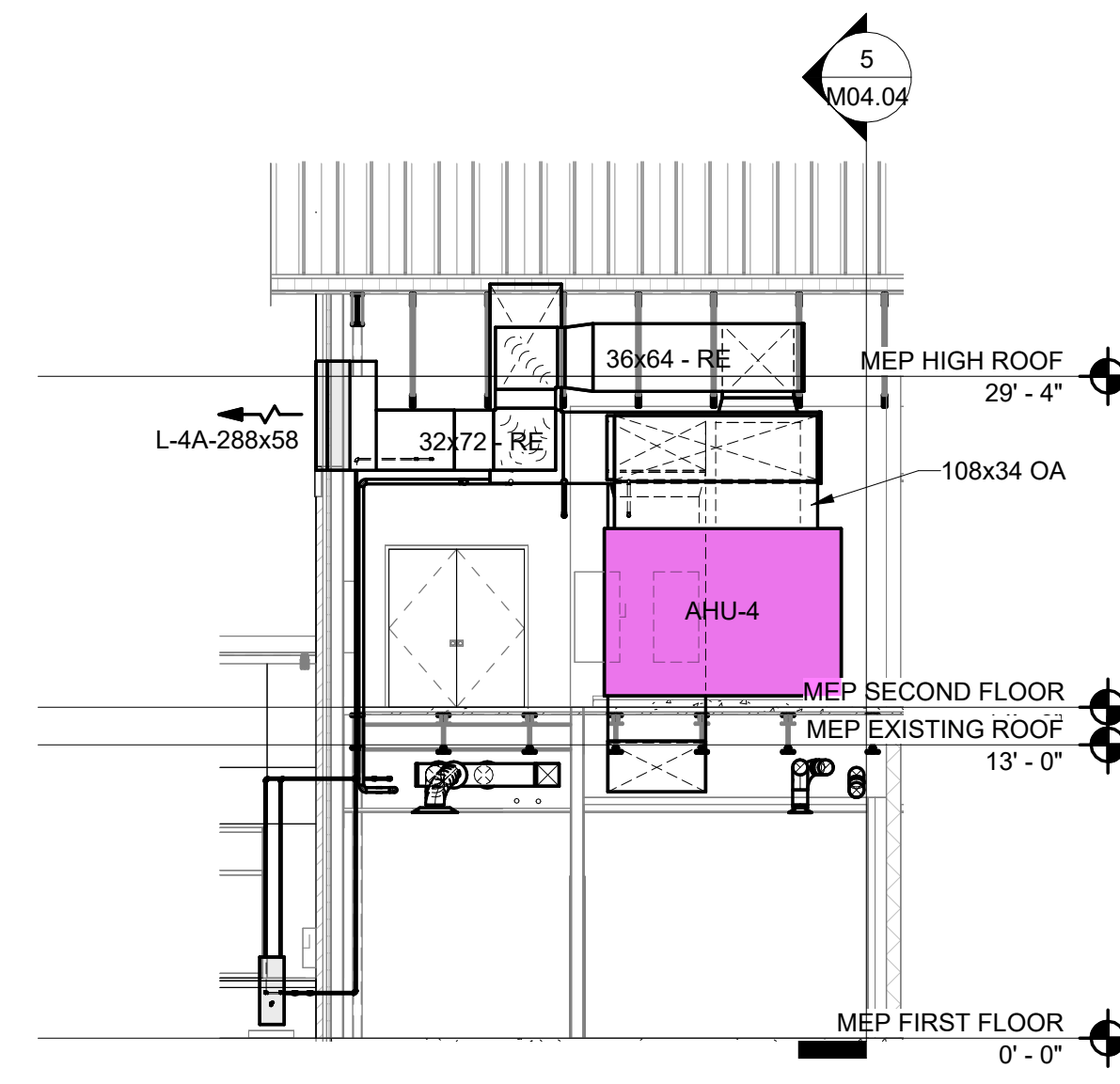
1 SECTION AT AHU-1 LOOKING EAST
Scale: 1/8" = 1'-0"



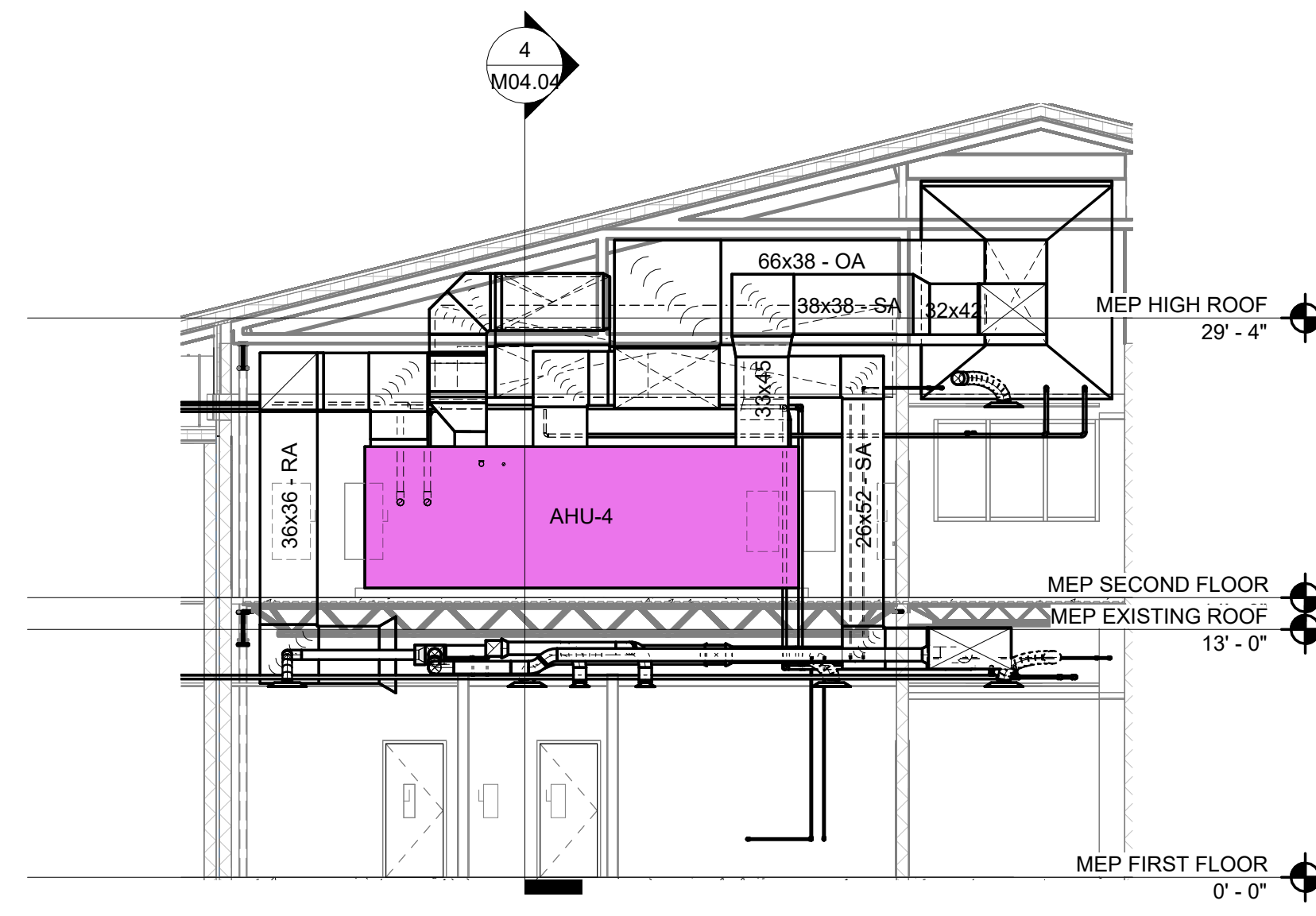
2 SECTION AT AHU-2 LOOKING EAST
Scale: 1/8" = 1'-0"



3 SECTION AT AHU-3 LOOKING EAST
Scale: 1/8" = 1'-0"



4 SECTION AT AHU-4 LOOKING EAST
Scale: 1/8" = 1'-0"



5 SECTION AT AHU-4 LOOKING NORTH
Scale: 1/8" = 1'-0"

GENERAL NOTES:

- SEE SHEET M00.01 FOR LEGEND AND GENERAL MECHANICAL PROJECT NOTES.
- REFER TO EQUIPMENT SCHEDULES FOR PIPING BRANCH SIZES FROM MAINS TO HEATING AND COOLING COILS.

KEYNOTES:



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PROJECT INFORMATION

ROSEWOOD MIDDLE SCHOOL ADDITION
WAYNE COUNTY PUBLIC SCHOOLS

541 North Carolina 561 S. Goldsboro, NC 27530

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KEYPLAN:

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SHEET TITLE

MECHANICAL SECTIONS

M04.04



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PROJECT INFORMATION

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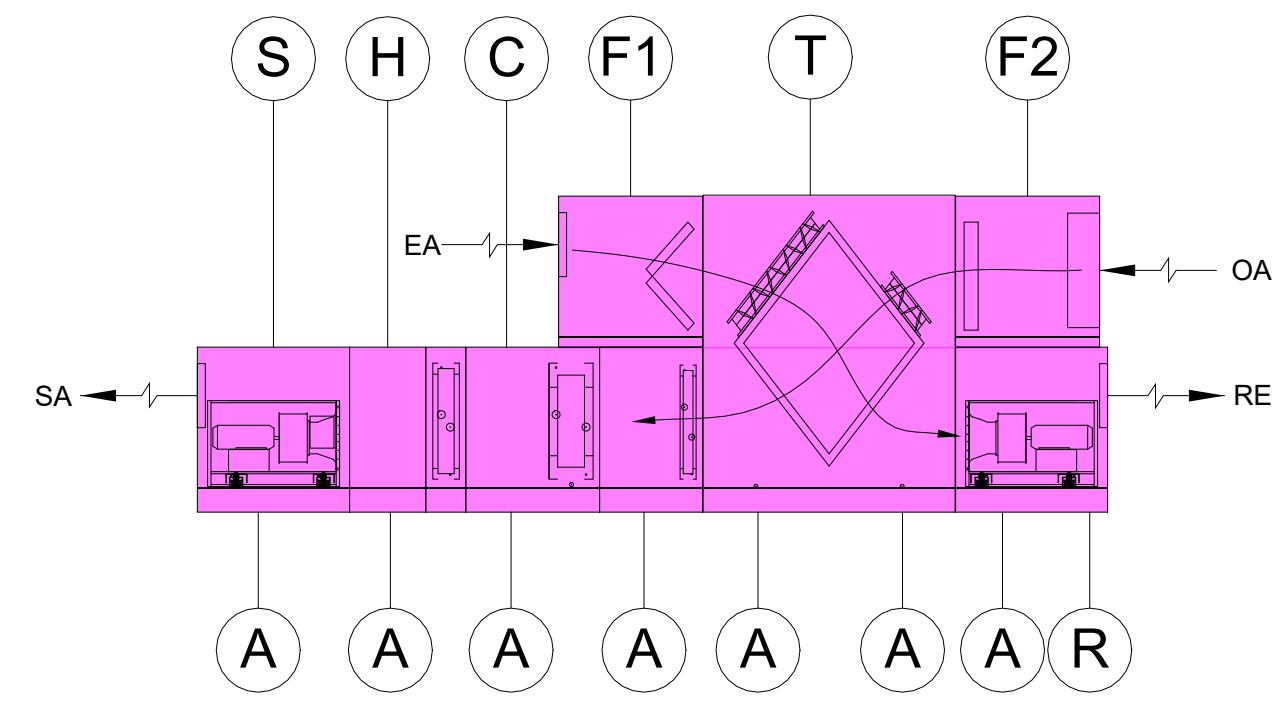
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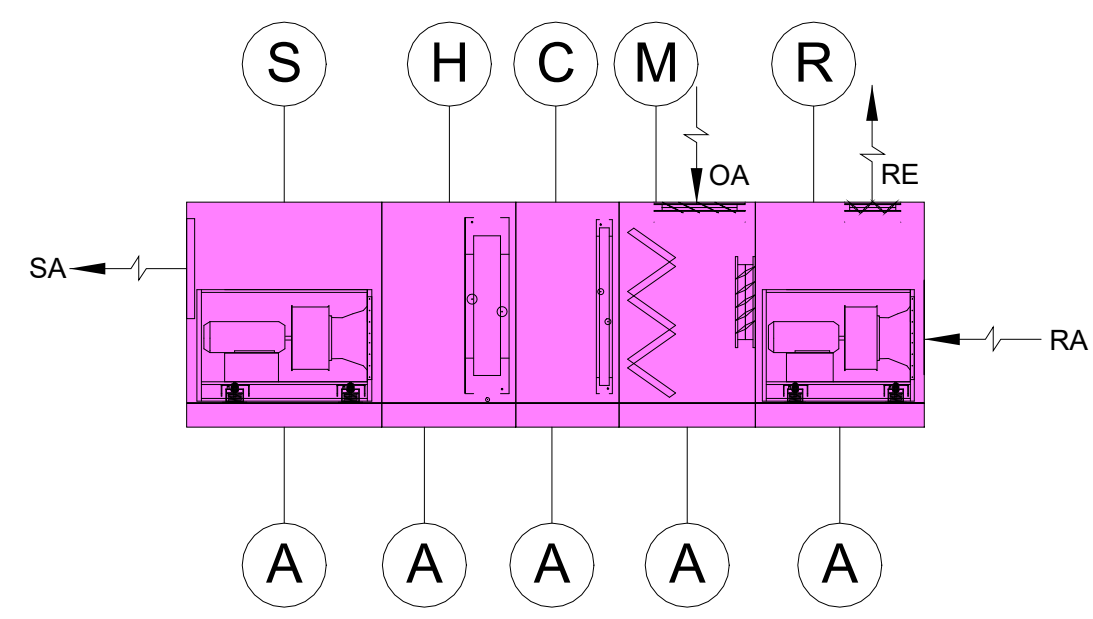
AHU GENERAL ARRANGEMENT DETAILS

M05.06

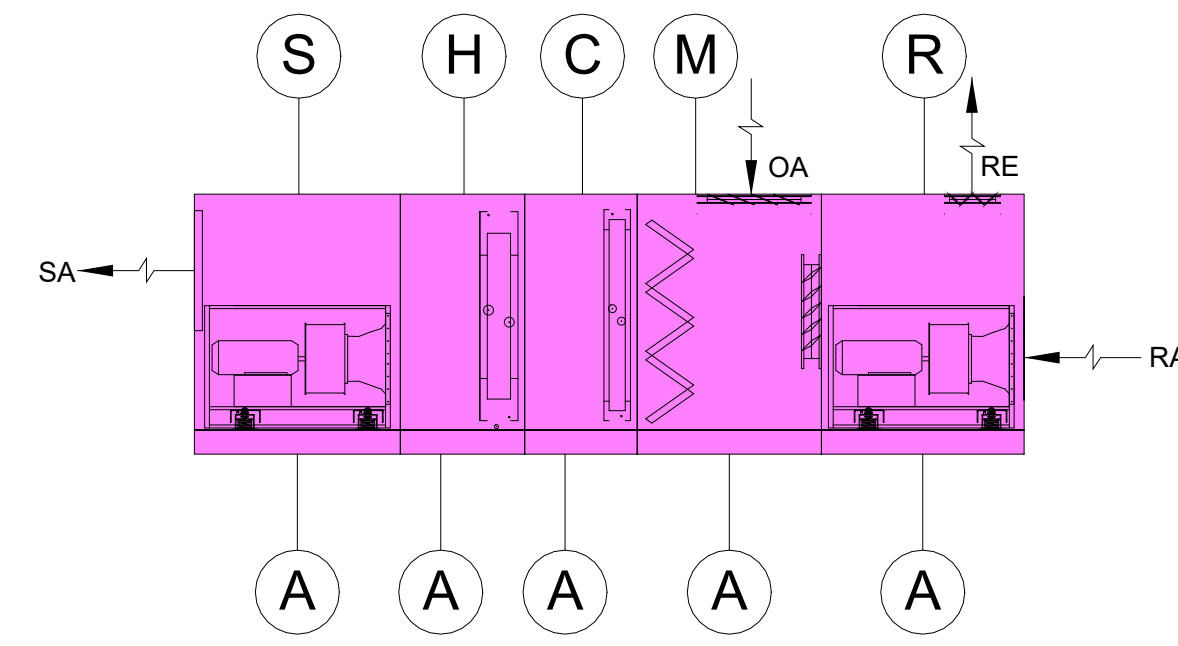
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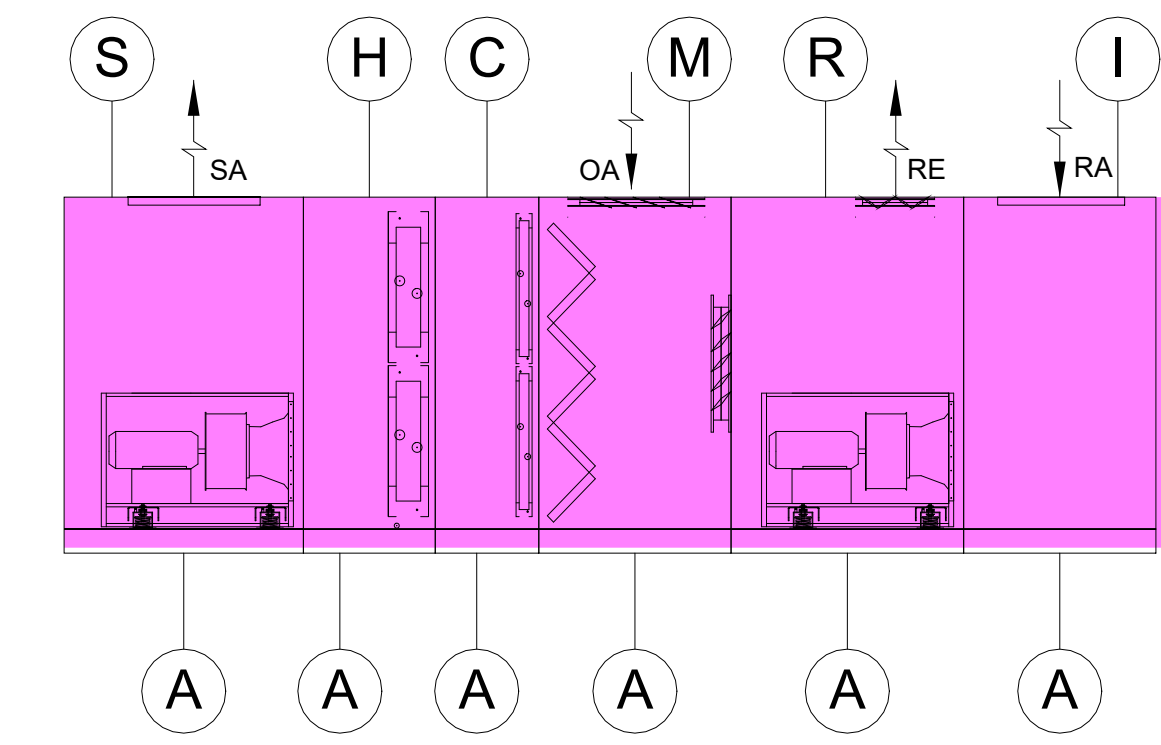
AHU-2



AHU-3



AHU-4



AHU COMPONENT LEGEND:

- (A) ACCESS
- (C) CHILLED WATER COOLING COIL
- (F1) ANGLED FILTER SECTION
- (F2) FLAT FILTER SECTION
- (H) HOT WATER HEATING COIL
- (I) INLET AIR PLENUM SECTION
- (M) MIXING SECTION WITH ANGLED FILTERS
- (R) RETURN / EXHAUST FAN SECTION
- (S) SUPPLY FAN SECTION
- (T) TOTAL ENTHALPHY FIXED MEMBRANE MODULE

NOTES:

1. ALL CONNECTIONS AND ACCESS DOORS SHALL BE SAME SIDE OF THE UNIT. REFER TO AHU ENLARGED VIEWS FOR ACCESS SIDE.
2. ALL ACCESS DOORS OPENING WIDTH SHALL BE MINIMUM 18" INSIDE CLEAR.
3. PROVIDE AIR HANDLING UNITS WITH MINIMUM 6" INTEGRAL BASE RAILS.
4. AIR HANDLING UNITS SHALL BE CONNECTED TO DUCTWORK WITH FLEXIBLE CONNECTIONS.
5. REFER TO AHU SCHEDULE AND SPECIFICATIONS FOR MORE INFORMATION.

AIR-COOLED CHILLER SCHEDULE																											
MARK	SERVICE	TYPE	MANUFACTURER / MODEL	REFRIGERANT		CHILLED WATER					PERFORMANCE					ELECTRICAL			EVAPORATOR HEATER		PIPING HEAT TRACE		DIMENSIONS AND WEIGHT			NOTES	
				TYPE	CHARGE (LBS)	CAPACITY (TONS)	FLOW (GPM)	MIN FLOW (GPM)	EWT (F)	LWT (F)	MAX WPD (FT H2O)	MIN. FL. EER @ AHRI (BTU/HW)	MIN. IPLV @ AHRI (BTU/HW)	MIN. NPLV @ DESIGN (BTU/HW)	AMB (F)	MAX. SOUND (dBA)	MCA (A)	MOCF (A)	VOLTAGE/ PHASE	REGD (Y OR N)	VOLTAGE/ PHASE	REGD (Y OR N)	VOLTAGE/ PHASE	FOOTPRINT (FT x FT)	HEIGHT (FT)		WEIGHT (LBS)
CH-1	BUILDING CHW LOOP	AIR-COOLED SCROLL	TRANE / CGAM 110	R-454B	148	110	190	154	58	44	10	10.16	15.68	15.68	95	65	227	300	480/3	YES	120/1	YES	120/1	7.5 x 14.1	7.7	7,000	1,2,3,4,5,6,7,8,9,10,11,12,13,14
CH-2	BUILDING CHW LOOP	AIR-COOLED SCROLL	TRANE / CGAM 110	R-454B	148	110	190	154	58	44	10	10.16	15.68	15.68	95	65	227	300	480/3	YES	120/1	YES	120/1	7.5 x 14.1	7.7	7,000	

NOTES:

- REFER TO SECTION 236426 FOR ADDITIONAL REQUIREMENTS FOR AIR-COOLED CHILLERS.
- PROVIDE HIGH EFFICIENCY CHILLER WITH MINIMUM SCHEDULED FULL LOAD EER & IPLV IN ACCORDANCE WITH AHRI 550/590. MINIMUM SCHEDULED NPLV AT DESIGN CONDITIONS INDICATED.
- CAPACITIES ARE BASED ON 0.00010 FOULING FACTORS FOR AIR-COOLED CHILLERS.
- SOUND PERFORMANCE IS BASED ON SOUND PRESSURE LEVELS MEASURED AT 30 FEET FROM UNIT AT FULL CAPACITY IN ACCORDANCE WITH AHRI 370.
- PROVIDE FACTORY INSTALLED CIRCUIT BREAKERS, ACROSS THE LINE START, AND SINGLE POINT ELECTRICAL CONNECTION.
- PROVIDE 20A DEDICATED CIRCUIT FOR EVAPORATOR HEATER FOR EACH CHILLER.
- PROVIDE 20A DEDICATED CIRCUIT FOR PIPING HEAT TAPE FOR EACH CHILLER.
- PROVIDE 20A DEDICATED CIRCUIT FOR CONTROLS FOR EACH CHILLER.
- PROVIDE WITH HEAT TRACING ON CHILLER BARREL AND PIPING.
- PROVIDE WIDE AMBIENT CONTROL, WATER STRAINER, REFRIGERANT ISOLATION VALVES, FREEZE PROTECTION PACKAGE, PROGRAMMABLE RELAYS, SUPER-QUIET SOUND PACKAGE.
- PROVIDE CONCRETE PAD FOR OUTDOOR CHILLERS THAT IS 6-INCHES LONGER AND WIDER THAN UNIT FOOTPRINT AND 6-INCHES THICK WITH DOWNTURNED EDGES, 4-INCH DEEP CRUSHED STONE BASE AND 1" FULL PERIMETER CHAMFER. REFER TO DETAILS FOR ADDITIONAL REQUIREMENTS.
- PROVIDE FACTORY INSTALLED WATER FLOW SWITCH AND EXTENDED 5 YR. COMPRESSOR WARRANTY.
- PROVIDE WITH OPEN PROTOCOL BACNET COMPLIANT CONTROLS INTERFACE FOR COMMUNICATION WITH BAS AS INDICATED ON CONTROLS DRAWINGS.
- PROVIDE WITH FULLY LOUVERED PANELS OVER ENTIRE UNIT.

CONDENSING WATER BOILER SCHEDULE																											
MARK	SERVICE	TYPE	MANUFACTURER / MODEL	HEATING WATER					BURNER				ELECTRICAL										DIMENSIONS AND WEIGHT				NOTES
				EWT (F)	LWT (F)	DESIGN FLOW (GPM)	MINIMUM FLOW (GPM)	WPD (FT H2O)	PRIMARY FUEL TYPE	PRESSURE (IN WC)	THERMAL EFF. (%)	FULL FIRE MIN. EFF. (%)	MIN. FIRE MIN. EFF. (%)	INPUT (MBH)	DESIGN OUTPUT (MBH)	MCA (A)	FLA (A)	VOLTAGE/ PHASE	FOOTPRINT (IN x IN)	HEIGHT (IN)	EXHAUST FLUE VENT (IN DIA)	COMBUST AIR DUCT (IN DIA)	WET WEIGHT (LBS)				
B-1	BUILDING HHW	S.S. FIRE-TUBE HX	LOCHINVAR / CREST FBN1501	110	140	100	36.0	10	NAT. GAS	4 to 14	96.2%	91.8%	94.1%	1,500.0	1412	13.0	10.0	120/1	68 x 30	78	8	8	2,400	1,2,3,4,5,6,7,8,9			
B-2	BUILDING HHW	S.S. FIRE-TUBE HX	LOCHINVAR / CREST FBN1501	110	140	100	36.0	10	NAT. GAS	4 to 14	96.2%	91.8%	94.1%	1,500.0	1412	13.0	10.0	120/1	68 x 30	78	8	8	2,400	1,2,3,4,5,6,7,8,9			

NOTES:

- REFER TO SECTION 235216 FOR ADDITIONAL REQUIREMENTS.
- PROVIDE MOTOR-RATED DISCONNECT SWITCH.
- SCHEDULED EFFICIENCIES AT FULL FIRE AND MINIMUM FIRE ARE BASED ON DESIGN ENTERING WATER TEMPERATURE AS SCHEDULED.
- CAPACITY AND PRESSURE DROP IS BASED ON DESIGN FLOW RATE. CONTROL / TAB SHALL NOT ALLOW FLOW BELOW MINIMUM FLOW RATE PLUS A 15% SAFETY FACTOR.
- PROVIDE 4-INCH DEEP CONCRETE PAD THAT IS 4-INCHES LONGER AND WIDER THAN UNIT FOOTPRINT.
- PROVIDE GAS REGULATOR AS REQUIRED FOR BOILER UTILIZATION PRESSURE. REGULATORS SHALL BE VENTED TO A SAFE LOCATION EXTERIOR TO THE BUILDING. VENTLESS REGULATORS WITH VENT LIMITERS ARE NOT ACCEPTABLE.
- PROVIDE BACNET COMPLIANT CONTROL INTERFACE.
- PROVIDE EACH BOILER WITH INDEPENDENT CONDENSATE DRAIN ACID NEUTRALIZATION SYSTEM. SYSTEM SIZING SHALL COMPLY WITH THE REQUIREMENTS AND RECOMMENDATIONS OF BOTH THE BOILER MANUFACTURER AND THE ACID NEUTRALIZATION SYSTEM MANUFACTURER.
- THERMAL EFFICIENCY IN ACCORDANCE WITH 10 CFR PART 431.

PUMP SCHEDULE														
MARK	SERVICE	TYPE	MANUFACTURER / MODEL	FLOW (GPM)	HEAD (FT H2O)	EFF. (%)	PUMP SPEED (RPM)	BRAKE MOTOR (HP)	NOMINAL MOTOR (HP)	VOLTAGE/ PHASE	STARTER/ DSCNNCT	NOTES		
PCHWP-1	PRIMARY CHW	SEPARATELY-COUPLED IN-LINE	BELL & GOSSETT / E80SC 3x3x9 5C	190	45	67%	1750	3.2	5	480/3	MS/D	1,2,3,4,5,6,7		
PCHWP-2	PRIMARY CHW	SEPARATELY-COUPLED IN-LINE	BELL & GOSSETT / E80SC 3x3x9 5C	190	45	67%	1750	3.2	5	480/3	MS/D	1,2,3,4,5,6,7		
SCHWP-1	SECONDARY CHW	SEPARATELY-COUPLED IN-LINE	BELL & GOSSETT / E80SC 4x4x11B	380	85	73%	1725	11.1	15	480/3	VFD	1,2,3,4,5,6,7		
SCHWP-2	SECONDARY CHW	SEPARATELY-COUPLED IN-LINE	BELL & GOSSETT / E80SC 4x4x11B	380	85	73%	1725	11.1	15	480/3	VFD	1,2,3,4,5,6,7		
PHWP-1	PRIMARY HW	CLOSE-COUPLED IN-LINE	BELL & GOSSETT / E80 2.5x2.5x7B	100	25	66%	1750	1.0	1.5	480/3	MS/D	1,2,3,4,5,6		
PHWP-2	PRIMARY HW	CLOSE-COUPLED IN-LINE	BELL & GOSSETT / E80 2.5x2.5x7B	100	25	66%	1750	1.0	1.5	480/3	MS/D	1,2,3,4,5,6		
SHWP-1	SECONDARY HW	SEPARATELY-COUPLED IN-LINE	BELL & GOSSETT / E80SC 3x3x11B	200	85	65%	1659	6.6	10	480/3	VFD	1,2,3,4,5,6,7		
SHWP-2	SECONDARY HW	SEPARATELY-COUPLED IN-LINE	BELL & GOSSETT / E80SC 3x3x11B	200	85	65%	1659	6.6	10	480/3	VFD	1,2,3,4,5,6,7		

NOTES:

- REFER TO SECTION 232123 FOR ADDITIONAL REQUIREMENTS.
- PUMPS OPERATING IN PARALLEL SHALL BE SELECTED FOR PARALLEL OPERATION.
- PROVIDE STARTING AND DISCONNECTING MEANS AS SCHEDULED. (MRS = MOTOR RATED SWITCH; MS/D = COMBINATION MOTOR-STARTER AND DISCONNECT; AND VFD = VARIABLE FREQUENCY DRIVE)
- PUMPS MOTOR SELECTION SHALL BE BASED ON NON-OVERLOADING SERVICE.
- PUMPS SUBMITTED BY MANUFACTURER OTHER THAN LISTED SHALL HAVE SIMILAR CURVES AS THOSE SPECIFIED.
- REFER TO DETAILS FOR ADDITIONAL INFORMATION.
- PROVIDE 4-INCH DEEP CONCRETE PAD.

LIFE-SAFETY PENETRATION SCHEDULE		
ASSEMBLY AND PENETRATION TYPE	F RATING (HR)	U. L. DETAIL SYSTEM NUMBER
CONCRETE FLOORS	INSULATED METAL PIPES	1 or 2 CAJ-5061, CAJ-5090, CAJ-5091, CAJ-5096, CAJ-5277
		3 CAJ-5061, CAJ-5090
	UNINSULATED METAL PIPES OR CONDUITS	1 or 2 CAJ-1226, CAJ-1155, CAJ-1380, CAJ-1575, FA-1028
		4 CBJ-1037
CONCRETE / MASONRY WALLS	UNINSULATED NON-METAL PIPES OR CONDUITS	1 or 2 CAJ-2109, CAJ-2407, CAJ-2567, CAJ-2831
	UNINSULATED METAL DUCTWORK WITHOUT DAMPERS	1 or 2 CAJ-7029, CAJ-7084
	CABLES	1 or 2 CAJ-3095, CAJ-3210, CAJ-3239
	CABLE TRAYS	1 or 2 CAJ-4034, CAJ-4035, CAJ-4083
CONCRETE / MASONRY WALLBOARD	INSULATED METAL PIPES	1 or 2 WL-5046, WL-5047, WL-5096
		4 WL-5073
	UNINSULATED METAL PIPES OR CONDUITS	1 or 2 WL-1164, WL-1205, WL-1465
	UNINSULATED NON-METAL PIPES OR CONDUITS	1 or 2 WL-2084, WL-2341, WL-2649
GYPSUM WALLBOARD	UNINSULATED METAL DUCTWORK WITHOUT DAMPERS	1 or 2 WL-7155, WL-7213, WL-7250
	UNINSULATED METAL DUCTWORK WITHOUT DAMPERS	1 or 2 WL-7155, WL-7213, WL-7250
	CABLES	1 or 2 WL-3065, WL-3111, WL-3161
	CABLE TRAYS	1 or 2 WL-4011, WL-4019, WL-4081

NOTES:

- REFER TO SECTION 230500 FOR MORE INFORMATION.
- SELECT U.L. LISTED PENETRATION DETAIL MATCHING THE PENETRATION CONDITIONS.
- SUBMIT AN APPROPRIATE DETAIL FOR ENGINEER REVIEW IF THE PROJECT CONDITIONS ARE NOT REPRESENTED ABOVE.

EXPANSION TANK SCHEDULE												
MARK	SERVICE	TYPE	MANUFACTURER / MODEL	EXPANSION TANK			HYDRONIC SYSTEM		DIMENSIONS AND WEIGHT			NOTES
				TOTAL VOLUME (GALLONS)	ACCEPT. VOLUME (GALLONS)	CHARGE PRESSURE (PSIG)	MAKEUP PRESSURE (PSIG)	RELIEF PRESSURE (PSIG)	INLET SIZE (IN DIA)	DIMENSIONS (IN DIA x IN)	WEIGHT (LBS)	
XT-1	CHILLED WATER	BLADDER	BELL & GOSSETT / B-200	53	53	21.0	22		1	24"Ø x 37"	629	1,2
XT-2	HEATING WATER	BLADDER	BELL & GOSSETT / B-600	158	158	21.0	22		1.5	30"Ø x 64"	1,814	1,2

NOTES:

- REFER TO SECTION 232116 FOR ADDITIONAL REQUIREMENTS.
- PROVIDE 4-INCH DEEP CONCRETE PAD.

AIR SEPARATOR SCHEDULE									
MARK	SERVICE	TYPE	MANUFACTURER / MODEL	WATER FLOW (GPM)	MAX. WPD (FT H2O)	DIMENSIONS (IN DIA x IN)	INLET SIZE (IN DIA)	OPERATING WEIGHT (LBS)	NOTES
AS-1	CHILLED WATER	TANGENTIAL	B&G ROLAIRTROL / R-6	550	2	18"Ø x 44"	6	580	1,2,3
AS-2	HEATING WATER	TANGENTIAL	B&G ROLAIRTROL / R-4	250	2	13"Ø x 32"	4	280	1,2,3

NOTES:

- REFER TO SECTION 232116 FOR ADDITIONAL REQUIREMENTS.
- PROVIDE MANUAL BLOWDOWN VALVE.
- PROVIDE AUTOMATIC AIR VENT.



PROJECT INFORMATION
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 WAYNE COUNTY PUBLIC SCHOOLS
 541 North Carolina 561 S. Goldsboro, NC 27530

SEALS

NOT FOR CONSTRUCTION

DKA JOB NUMBER
2401

DEWBERRY NUMBER
50171439

REVISIONS

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SHEET TITLE
SCHEDULES

M06.01

UNIT HEATER SCHEDULE table with columns: MARK, SERVICE, TYPE, MANUFACTURER / MODEL, FAN (AIR FLOW, MOTOR, VOLTAGE/PHASE), AIR (EAT, LAT, CAPACITY, EWT), HEATING WATER (LWT, FLOW, MAX. WPD, PIPE SIZE), CONTROL VALVE, ELECTRIC (MIN. CAP., DESIGN, VOLTAGE/PHASE), NOTES. Includes rows for horizontal and vertical unit heaters.

- NOTES: 1. REFER TO SECTION 238239 FOR ADDITIONAL REQUIREMENTS. 2. PROVIDE MOTOR-RATED DISCONNECT SWITCH. 3. PROVIDE WITH INTEGRAL THERMOSTAT. 4. PROVIDE SINGLE-STEP CONTROLLER FOR ELECTRIC COILS. 5. PROVIDE MANUFACTURER'S INTEGRAL LISTED DISCONNECT SWITCH. 6. PROVIDE FACTORY-FABRICATED WALL/CEILING SUPPORT. 7. PROVIDE RECESSED WALL INSTALLATION. 8. PROVIDE THERMOSTAT WITH FAN AUTO/OFF SELECTOR SWITCH. 9. PROVIDE FACTORY-FABRICATED SUPPORT. 10. PROVIDE WITH MANUFACTURER'S ADJUSTABLE LOUVER CONE DISCHARGE WITH PROTECTIVE WIRE GUARD.

FAN SCHEDULE table with columns: MARK, SERVICE, TYPE, MANUFACTURER / MODEL, AIR FLOW, ESP, MOTOR, DRIVE, SPEED, BRAKE MOTOR, NOMINAL MOTOR, MAX. SOUND, DAMPER TYPE, VOLTAGE/PHASE, DSCNNCT MEANS, CONTROL TYPE, NOTES. Lists various fan units for kitchen, mechanical, and riser.

- NOTES: 1. REFER TO SECTION 233400 FOR ADDITIONAL REQUIREMENTS. 2. PROVIDE STARTING AND DISCONNECTING MEANS AS SCHEDULED. 3. PROVIDE WITH SPRING ISOLATION MOUNTS. 4. PROVIDE WITH ELASTOMERIC ISOLATION MOUNTS. 5. PROVIDE METAL FAN WHEEL CONSTRUCTION. 6. PROVIDE WITH FAN INLET SAFETY SCREEN. 7. NON-EC MOTOR. 8. PROVIDE FACTORY-FABRICATED ROOF CURB.

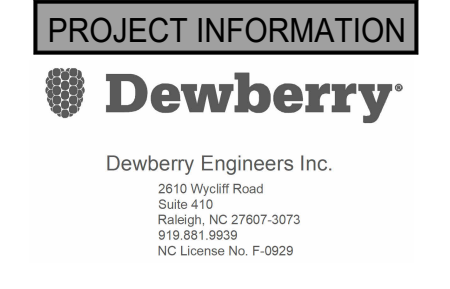
CONTROL TYPE (REFER TO CONTROLS DIAGRAMS): A. TIMECLOCK CONTROLLED BY BUILDING AUTOMATION SYSTEM. B. CONTROLLED BY BUILDING AUTOMATION SYSTEM. C. THERMOSTATICALLY CONTROLLED BY BUILDING AUTOMATION SYSTEM. D. THERMOSTATICALLY CONTROLLED BY LINE VOLTAGE THERMOSTAT. E. MANUAL WALL SWITCH FOR OCCUPANT CONTROL. F. MANUAL CONTROL. RE. MECHANICAL KITCHEN DETAILS & CONTROL DWGS.

AIR HANDLING UNIT SCHEDULE table with columns: MARK, SERVICE, TYPE, MANUFACTURER / MODEL, CONTROL DIAGRAM, SUPPLY AIR FAN, RETURN/EXHAUST AIR FAN, COOLING COIL, CHILLED WATER, PREHEAT COIL, HEATING WATER, REHEAT COIL, AIR, FILTERS, MAIN, ENERGY RECOVERY SYSTEM MARK, WEIGHT, NOTES. Detailed specifications for AHU-1 through AHU-4.

- NOTES: 1. REFER TO SECTION 237316 - MODULAR AHUS FOR ADDITIONAL REQUIREMENTS. 2. PROVIDE FAN STARTING AND DISCONNECTING MEANS AS SCHEDULED. 3. UNIT CASING, COIL CAPACITIES AND COMPONENT APD'S ARE BASED ON THE MAX. SUPPLY FAN AIRFLOW. 4. INTERNAL STATIC PRESSURE SHALL INCLUDE SCHEDULED PRESSURE DROP FOR DIRTY FILTERS. 5. VFD'S SHALL NOT EXCEED 80 HZ AND MOTORS SHALL NOT EXCEED 2400 RPM FOR DIRECT-DRIVE FANS. 6. UNIT SHALL BE PROVIDED WITH INTEGRAL 6-INCH HIGH CONTINUOUS PERIMETER AND INTERMEDIATE BASERAILS. 7. PROVIDE CONCRETE PAD THAT IS 6-INCHES LONGER AND WIDER THAN UNIT FOOTPRINT AND 6-INCHES OR TALLER AS NECESSARY FOR INSTALLATION OF CONDENSATE TRAP. 8. MOTORS SHALL BE STANDARD NEMA HP SIZES. 9. REFER TO 'KITCHEN HOOD AIR BALANCE SCHEDULE' THIS SHEET FOR AHU MINIMUM O&A SETPOINT WHEN KITCHEN HOOD FAN, KEF-1, IS OPERATING. 10. ERU-1 EQUIPPED WITH INTEGRAL FIXED MEMBRANE ENERGY RECOVERY MODULE.

ENERGY RECOVERY SCHEDULE table with columns: MARK, SERVICE, TYPE, MANUFACTURER / MODEL, COOLING PEAK RECOVERY PERFORMANCE (AIR FLOW, MAX APD, DEHUMIDIFICATION, COOLING), RETURN/EXHAUST AIRSTREAM, HEATING PEAK RECOVERY PERFORMANCE (AIR FLOW, MAX APD, HEATING), FILTRATION (TYPE & THICKNESS, VELOCITY, INITIAL APD, FINAL APD, EFF.).

- NOTES: 1. REFER TO SECTION 237200 FOR EFFECTIVENESS AND ADDITIONAL REQUIREMENTS. 2. ENERGY RECOVERY MODULE INTEGRAL TO AIR HANDLING UNIT. 3. REFER TO AHU SCHEDULE FOR PLATE SA FILTER REQUIREMENTS.



PROJECT INFORMATION

ROSEWOOD MIDDLE SCHOOL ADDITION WAYNE COUNTY PUBLIC SCHOOLS

541 North Carolina 561 S. Goldsboro, NC 27530

SEALS

NOT FOR CONSTRUCTION

DKA JOB NUMBER: 2401, DEWBERRY NUMBER: 50171439, REVISIONS

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SHEET TITLE SCHEDULES

M06.02

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PROJECT INFORMATION

ROSEWOOD MIDDLE SCHOOL ADDITION
WAYNE COUNTY PUBLIC SCHOOLS

541 North Carolina 581 S. Goldsboro, NC 27530

SEALS

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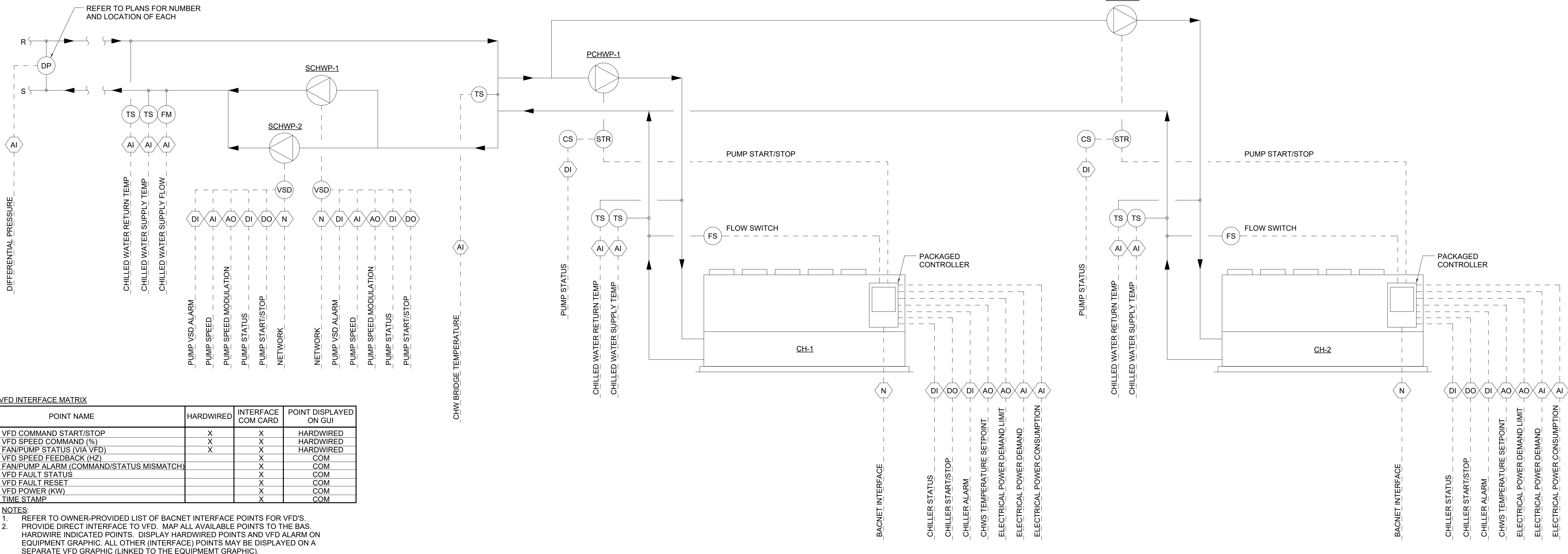
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MECHANICAL CONTROLS

M07.02



AIR COOLED CHILLER WITH PRIMARY SECONDARY PUMPING CONTROL DIAGRAM

AIR-COOLED CHILLED WATER SYSTEM CONTROL

DESCRIPTION: TWO EQUAL-CAPACITY AIR-COOLED CHILLERS WITH PRIMARY-SECONDARY PUMPING.

OPERATIONAL MODES

CHILLED WATER PLANT ENABLE: CHILLED WATER PLANT SHALL BE ENABLED WHENEVER (CHILLED WATER PLANT SHALL OPERATE FOR A MINIMUM OF 30 MINUTES (ADJ.))
1. OAT IS GREATER THAN 58F (ADJ.)
2. AND, ANY CHILLED WATER VALVE OPENS MORE THAN 20% CONTINUOUSLY FOR 5 MINUTES (ADJ.)
3. OR, MANUALLY SELECTED TO RUN BY BAS REMOTE OVERRIDE

CHILLED WATER PLANT DISABLE: CHILLED WATER PLANT SHALL BE DISABLED WHENEVER
1. ALL CHILLED WATER VALVES ARE LESS THAN 5% OPEN CONTINUOUSLY FOR 10 MINUTES (ADJ.)
2. OR, OAT IS LESS THAN 55F (ADJ.)
3. OR, MANUALLY DISABLED BY BAS REMOTE OVERRIDE

SHUTDOWN MODE: SWITCH TO SHUTDOWN MODE BASED ON AUTOMATIC SAFETY FUNCTION OR REMOTE OVERRIDE

VERRIDE MODES

REMOTE OVERRIDE MODE: SWITCH TO ENABLED OR DISABLED MODE BASED ON BAS OPERATOR COMMAND. SWITCH BACK TO ENABLED / DISABLED MODE WHEN OVERRIDE IS REMOVED.

CHILLER AND PRIMARY PUMP CONTROL: SECONDARY SUPPLY TEMPERATURE START LEAD PRIMARY CHILLED WATER PUMP. START LEAD CHILLER WITH PROOF OF PRIMARY WATER FLOW. PACKAGED CHILLER CONTROLS SHALL OPERATE CHILLER TO MAINTAIN SECONDARY CHILLED WATER SUPPLY TEMPERATURE SET POINT OF 44F (ADJ.). IF LEAD CHILLER CANNOT MAINTAIN CHILLED WATER SUPPLY TEMPERATURE SET POINT WITHIN 30 MINUTES THEN START LAG PRIMARY PUMP AND CHILLER. IF BOTH CHILLERS ARE ACTIVE AND OPERATING AT BELOW 50% OF THEIR RLA CAPACITY FOR 15 MINUTES THEN STOP LAG CHILLER AND PRIMARY PUMP.

CHILLER FREEZE PROTECTION: PACKAGED CHILLER CONTROL PANELS SHALL COMMAND ASSOCIATED PRIMARY PUMPS TO START TO PREVENT FREEZING DUE TO REFRIGERANT MIGRATION. CONTROL SHALL BE DIRECT FROM THE PANEL TO THE PUMP MOTOR-STARTER AND PARALLEL TO THE BAS START / STOP SIGNAL SUCH THAT EITHER SIGNAL WILL START THE PUMPS.

CHILLER FAILURES: START LAG PRIMARY PUMP AND CHILLER IF LEAD CHILLER / PUMP FAILS AS DETERMINED BY THE CHILLER CONTROL PANEL.

STOP PRIMARY PUMP IF CHILLER SAFETY SHUTDOWN CONTACT CLOSSES.
STOP PRIMARY PUMP IF CHILLER HAS BEEN COMMANDED TO START BUT INTERNAL SENSORS OF THE CHILLER INDICATE NO MOTOR AMPERAGE WITHIN 5 MINUTES.

CHILLER RUN TIME: ALTERNATE CHILLERS AND PUMPS LEAD/LAG ORDER BASED ON RUNTIME WEEKLY.

CHILLER BAS INTERFACE: PACKAGED CHILLER CONTROLS SHALL PROVIDE BACNET COMPATIBLE MONITORING POINTS INCLUDING CHILLER STATUS AND ALARMS.

SECONDARY CHILLED WATER PUMP CONTROL: REFER TO "SECONDARY PUMPING CONTROL" SEQUENCE.

MONITOR AND TREND (INCLUDED ON CHILLED WATER SYSTEM GRAPHIC):
ENTERING AND LEAVING CHILLED WATER TEMPERATURES OF EACH CHILLER (15 MINUTE INTERVALS)
PRIMARY AND SECONDARY CHILLED WATER SUPPLY AND RETURN TEMPERATURES (15 MINUTE INTERVALS)
PRIMARY CHILLED WATER SUPPLY TEMPERATURE SET POINT
PRIMARY AND SECONDARY CHILLED WATER PUMP STATUS (5 MINUTE INTERVALS) BY CURRENT SENSING RELAY
PRIMARY AND SECONDARY CHILLED WATER PUMP RUN TIMES
SECONDARY CHILLED WATER PUMP SPEEDS (5 MINUTE INTERVALS)
SECONDARY CHILLED WATER FLOW RATE (5 MINUTE INTERVALS)
DIFFERENTIAL PRESSURE SET POINT CHANGES (TIME AND VALUE)
DIFFERENTIAL PRESSURES (15 MINUTE INTERVALS)
CHILLER STATUS

ALARMS:
CHILLER ALARMS AND FAILURES
PRIMARY CHILLED WATER PUMP FAILURES
SECONDARY CHILLED WATER PUMP FAILURES

SECONDARY PUMPING CONTROL

DESCRIPTION: ACTIVE / STANDBY SECONDARY PUMPING CONFIGURATION AS PART OF THE CHILLED WATER SYSTEM. ACTIVE AND STANDBY PUMPS ARE EACH SIZED FOR 100% OF SYSTEM CAPACITY TO PROVIDE N-1 REDUNDANCY.

OPERATIONAL MODES

ENABLE / DISABLE MODES: ENABLE / DISABLE SECONDARY PUMPS BASED ON SYSTEM STATUS.

SHUTDOWN MODE: SWITCH TO SHUTDOWN MODE BASED ON AUTOMATIC SAFETY FUNCTION, REMOTE OVERRIDE, OR MANUAL OVERRIDE CONTROL.

VERRIDE MODES

EMERGENCY OVERRIDE MODE: SWITCH TO SHUTDOWN MODE BASED ON EMERGENCY SHUTDOWN SIGNAL FROM SYSTEM.

FREEZE PROTECTION: SWITCH TO ENABLED MODE BASED ON A CALL FROM THE BAS FOR COIL FREEZE PROTECTION.

REMOTE OVERRIDE MODE: SWITCH TO ENABLED OR DISABLED MODE BASED ON BAS OPERATOR COMMAND. SWITCH BACK TO ENABLED OR DISABLED MODE WHEN OVERRIDE IS REMOVED.

ARIABLE FREQUENCY DRIVE CONTROL

MINIMUM SPEEDS: RESET FACTORY DEFAULT VFD MINIMUM SPEED SETTINGS AS DETERMINED THE TAB CONTRACTOR WITH AN INITIAL SET POINT OF 20% (ADJ.)

SECONDARY PUMP CONTROL - ACTIVE / STANDBY: ASSIGN ONE SECONDARY PUMP 'ACTIVE' AND ONE PUMP 'STANDBY' STATUS. OPERATE SECONDARY PUMPS IN ACTIVE / STANDBY DUTY. ROTATE SECONDARY PUMPS ACTIVE / STANDBY ORDER BASED ON RUNTIME WEEKLY AT A SET TIME ON A SET DAY OF THE WEEK. START STANDBY PUMP IF ACTIVE PUMP FAILS.

PUMP ROTATION DEFAULT SCHEDULE

CHILLED WATER 12:00 PM TUESDAYS

PUMP START / STOP AND SPEED CONTROL: START ACTIVE SECONDARY PUMP BASED ON SYSTEM ENABLE / DISABLE STATUS. SECONDARY PUMP SHALL RUN ANYTIME A CHILLER PRIMARY PUMP IS RUNNING. MODULATE PUMP SPEED (20-100%) TO MAINTAIN BUILDING DIFFERENTIAL PRESSURE SET POINT(S). IF BAS LOSES COMMUNICATION WITH BUILDING DIFFERENTIAL PRESSURE SENSORS, MAINTAIN CONSTANT PUMP SPEED AT VALUE LAST READ UNTIL COMMUNICATION IS RE-ESTABLISHED.

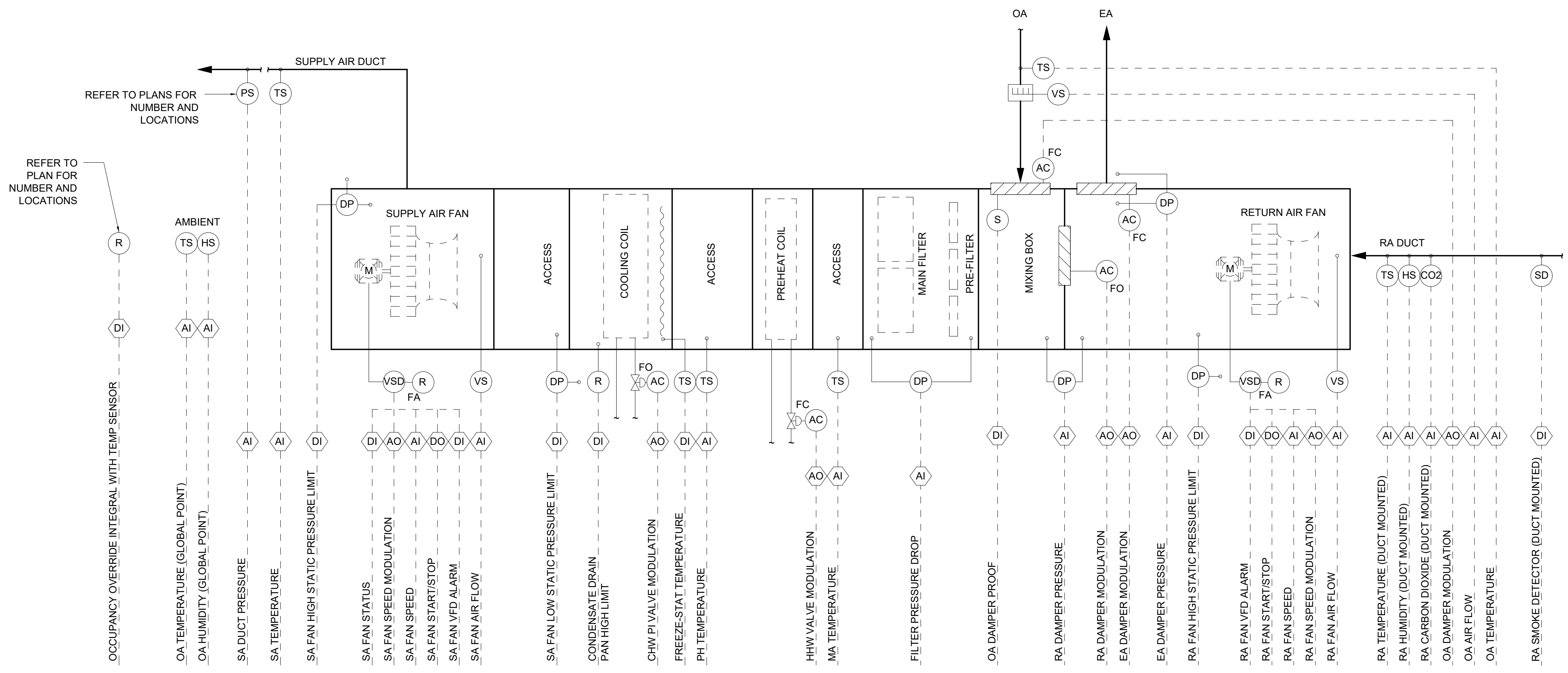
PUMP ACTIVE / STANDBY TRANSITION: WHEN A TRANSITION IS COMMANDED, THE STANDBY PUMP SHALL START AND RUN AT MINIMUM SPEED (20%). THE STANDBY PUMP SHALL SLOWLY MODULATE ITS SPEED UP AND THE ACTIVE PUMP INVERSELY MODULATE DOWN TILL THE ACTIVE PUMP IS AT MINIMUM SPEED (20%). UPON SATISFYING THE SYSTEM PRESSURE DIFFERENTIAL SET POINT(S), THE STANDBY PUMP SHALL BE ASSIGNED AS 'ACTIVE' AND THE ACTIVE PUMP SHALL BE 'STANDBY'. THE NEWLY ASSIGNED STANDBY PUMP SHALL SHUTDOWN.

CHILLED WATER SYSTEM GRAPHICAL DISPLAY: MINIMUM REQUIREMENTS INCLUDE:

COMPLETE SYSTEM GRAPHIC INCLUDING ALL CONTROL COMPONENTS
BUILDING PLAN GRAPHIC WITH CHILLER AND PUMP LOCATIONS
OPERATIONAL MODE STATUS, INCLUDING TIME OF DAY
OVERRIDE MODE STATUS
SECONDARY PUMP STATUS AND RUN TIMES
SECONDARY PUMP SPEEDS
SECONDARY FLOW RATE
DIFFERENTIAL PRESSURES

1 50136006 Chiller Controls

Scale: 1/8" = 1'-0"



VFD INTERFACE MATRIX

POINT NAME	HARDWIRED	INTERFACE COM CARD	POINT DISPLAYED ON GUI
VFD COMMAND START/STOP	X	X	HARDWIRED
VFD SPEED COMMAND (%)	X	X	HARDWIRED
FAN/PUMP STATUS (VIA VFD)	X	X	HARDWIRED
VFD SPEED FEEDBACK (HZ)	X	X	COM
FAN/PUMP ALARM (COMMAND/STATUS MISMATCH)	X	X	COM
VFD FAULT STATUS	X	X	COM
VFD FAULT RESET	X	X	COM
VFD POWER (KW)	X	X	COM
TIME STAMP	X	X	COM

- NOTES:**
- REFER TO OWNER-PROVIDED LIST OF BAGNET INTERFACE POINTS FOR VFD'S.
 - PROVIDE DIRECT INTERFACE TO VFD. MAP ALL AVAILABLE POINTS TO THE BAS. HARDWARE INDICATED POINTS. DISPLAY HARDWIRED POINTS AND VFD ALARM ON EQUIPMENT GRAPHIC. ALL OTHER (INTERFACE) POINTS MAY BE DISPLAYED ON A SEPARATE VFD GRAPHIC (LINKED TO THE EQUIPMENT GRAPHIC).

VAV AHU WITH RETURN FAN CONTROL DIAGRAM (AHU-1 & AHU-4 THRU 11)

- NOTES:**
- HARDWIRE FREEZESTAT TO SA AND RA FAN.
 - HARDWIRE FAN HIGH STATIC LIMIT SWITCHES TO ASSOCIATED BAS.

VAV AHU WITH RETURN AIR FAN CONTROL

DESCRIPTION: VARIABLE VOLUME AIR HANDLING UNITS WITH RETURN AIR FANS, CHILLED WATER COILS AND HEATING WATER COILS. THESE AIR HANDLING UNITS SERVING MULTIPLE TEMPERATURE CONTROL ZONES, EACH WITH A TERMINAL UNIT.

- A. OPERATIONAL MODES**
- OCCUPIED MODE:** SWITCH TO OCCUPIED MODE BASED ON OCCUPANCY SCHEDULE.
 - UNOCCUPIED MODE:** SWITCH TO UNOCCUPIED MODE BASED ON OCCUPANCY SCHEDULE. CYCLE ON BASED ON 10% REQUESTS FOR ZONE HEATING AND COOLING AND RUN FOR 30 MINUTES MINIMUM. CYCLE OFF BASED ON SATISFYING 95% OF ZONES.
 - PRE-OCCUPIED MODE:** SWITCH TO PRE-OCCUPIED (WARM-UP / COOL-DOWN) MODE BASED ON THE OCCUPANCY SCHEDULE AND AN INTERVAL DERIVED FROM BAS OPTIMIZATION LOGIC THAT USES THE SYSTEMS HISTORY OF OUTSIDE AIR TEMPERATURES VERSUS TIME NEEDED TO SATISFY 95% OF THE OCCUPIED ZONE TEMPERATURE SET POINTS. OPTIMIZATION LOGIC SHALL HAVE A DEFAULT VALUE OF 2 HOURS.
 - SHUTDOWN MODE:** SWITCH TO SHUTDOWN MODE BASED ON AUTOMATIC SAFETY FUNCTION, REMOTE OVERRIDE, OR MANUAL OVERRIDE CONTROL.
- B. OVERRIDE MODES**
- MANUAL OVERRIDE MODE:** SWITCH TO OCCUPIED MODE BASED ON MANUAL ACTIVATION OF ANY ONE OCCUPANT OVERRIDE SWITCH LOCATED ON SPACE TEMPERATURE SENSOR(S). SWITCH BACK TO OCCUPIED, UNOCCUPIED OR PRE-OCCUPIED MODE BASED ON OCCUPANCY SCHEDULE WHEN OVERRIDE TIME OF 60 MINUTES EXPIRES.
 - REMOTE OVERRIDE MODE:** SWITCH TO OCCUPIED, UNOCCUPIED OR PRE-OCCUPIED MODE BASED ON BAS OPERATOR COMMAND. SWITCH BACK TO OCCUPIED, UNOCCUPIED OR PRE-OCCUPIED MODE BASED ON OCCUPANCY SCHEDULE WHEN OVERRIDE IS REMOVED.
- C. VERIFICATION MODES**
- CHILLED WATER PLANT:** ENABLE ASSOCIATED COOLING SEQUENCES UPON VERIFICATION CHILLED WATER IS AVAILABLE.
 - HEATING WATER PLANT:** ENABLE ASSOCIATED HEATING SEQUENCES UPON VERIFICATION HEATING WATER IS AVAILABLE.
- D. TEMPERATURE CONTROL MODES**
- COOLING MODE:** WHEN AHU IS IN COOLING OR ECONOMIZER COOLING MODES, INITIATE AHU COOLING.
 - HEATING MODE:** WHEN AHU IS IN HEATING MODE, INITIATE AHU HEATING.
- E. DEHUMIDIFICATION MODE**
- UPON A RISE IN HUMIDITY LEVEL ABOVE 56% (ADJ.) AND UNTIL RELATIVE HUMIDITY DROPS TO 50% (ADJ.), AS SENSED BY THE RETURN DUCT HUMIDITY SENSOR, THE COOLING COIL CONTROL VALVE SHALL MODULATE TO PROVIDE 50F DISCHARGE AIR TEMPERATURE. THE UNIT FAN SPEED, TERMINAL BOX POSITION AND REHEAT COIL CONTROL VALVE SHALL BE MODULATED TO MAINTAIN SPACE TEMPERATURE 1 DEG LOWER THAN COOLING SETPOINT. IN UNOCCUPIED MODE, UPON A RISE IN HUMIDITY LEVEL ABOVE 60% (ADJ.) AT ANY ASSOCIATED ZONE SPACE SENSOR, AND UNTIL RELATIVE HUMIDITY DROPS TO 55% (ADJ.) AT ALL ASSOCIATED ZONE SPACE SENSORS, UNIT SHALL BE IN DEHUMIDIFICATION MODE.
- F. ENERGY CONSERVATION MODES**
- ECONOMIZER MODE:** IF OA ENTHALPY IS LESS THAN RA ENTHALPY AND OA TEMPERATURE IS LESS THAN 65F (ADJ.), ENABLE 'FREE COOLING'. DISABLE VENTILATION DEMAND CONTROL WHEN ECONOMIZER MODE IS ACTIVE. MONITOR MIXED AIR TEMP TO MAINTAIN A SET POINT OF 55F (ADJ.). IF MIXED AIR TEMP DROPS BELOW 55F (ADJ.) WHEN OUTSIDE AIR TEMPERATURE IS BELOW 55F (ADJ.), MODULATE OUTSIDE AIR DAMPER BACK TOWARD DEMAND CONTROL MINIMUM VENTILATION AIRFLOW. AT DEMAND CONTROL MINIMUM VENTILATION AIRFLOW, SWITCH OUT OF ECONOMIZER CONTROL. WHEN OUTSIDE AIR TEMP IS LESS THAN 60F (ADJ.), AND ECON DAMPERS ARE AT 100%, MECHANICAL COOLING SHALL BE ALLOWED TO OPERATE TO MAINTAIN LEAVING AIR TEMPERATURE SETPOINT. IF RA HUMIDITY RISES ABOVE SETPOINT, MODULATE OUTSIDE AIR DAMPER BACK TOWARD DEMAND CONTROL MINIMUM VENTILATION AIRFLOW. AT DEMAN CONTROL VENTILATION AIRFLOW, SWITCH OUT OF ECONOMIZER CONTROL.
 - DEMAND CONTROL VENTILATION (DOES NOT APPLY TO AHU-1):** MONITOR CO2 LEVELS IN RA. IF THE RETURN AIR CO2 RISES TO 900 PPM (500PPM ABOVE AMBIENT 400PPM), OA VENTILATION SHALL BE INCREASED FROM THE DEMAND CONTROL MINIMUM VENTILATION AIR FLOW IN 25% INCREMENTS (ADJ.) EVERY 15 MINUTES (ADJ.) TOWARD THE DESIGN MAX VENTILATION AIRFLOW UNTIL THE CO2 LEVEL DROPS BELOW THE SEPOINT.
- G. SUPPLY AIR FAN CONTROL**
- OCCUPANCY MODES:** START (TIME DELAY) UPON INITIATION OF PRE-OCCUPIED MODE AND CONTINUE TO RUN THROUGHOUT OCCUPIED MODE. SA FAN VFD SHALL MODULATE SPEED TO MAINTAIN DUCT STATIC PRESSURE SET POINT(S). STOP UPON INITIATION OF UNOCCUPIED MODE AND CYCLE ON (TIME DELAY) AND OFF THROUGHOUT UNOCCUPIED MODE BASED ON HEATING / COOLING DEMAND.
 - SHUTDOWN MODE:** STOP SUPPLY AND RETURN FANS UPON INITIATION OF SHUTDOWN.
- H. DUCT STATIC PRESSURE SET POINT RESET CONTROL**
- RESET DUCT STATIC PRESSURE SET POINT(S) HIGHER OR LOWER BETWEEN MAXIMUM AND MINIMUM SET POINTS BASED ON BAS OPTIMIZATION LOGIC THAT USES THE TERMINAL UNIT AIR DAMPER POSITIONS. SET POINT(S) SHALL BE INCREASED TO MAINTAIN ALL DAMPERS AT LESS THAN 95% OPEN. SET POINT(S) SHALL BE DECREASED TO MAINTAIN MINIMUM OF ONE DAMPER AT NO LESS THAN 90% OPEN. INITIAL AND MINIMUM SET POINTS SHALL BE RECOMMENDED BY THE TAB CONTRACTOR AND APPROVED BY THE ENGINEER. MAXIMUM SET POINTS SHALL BE EQUAL TO THE INITIAL SET POINTS PLUS 0.50 INCHES WG. RESET SET POINT IN 15 MINUTE INCREMENTS.

I. RETURN FAN CONTROL: WHENEVER THE FAN IS ENERGIZED AND THE UNIT IS OPERATING IN THE OCCUPIED MODE, BAS SHALL CONTROL THE SPEED OF THE VFD BASED ON A TRACKING ALGORITHM AS DEFINED BELOW.

- TAB CONTRACTOR SHALL DETERMINE THE FOLLOWING 4 VALUES**
 - SUPPLY FAN MAX:** THE SPEED AT WHICH THE SUPPLY FAN WILL TYPICALLY OPERATE WHEN ALL CONNECTED TERMINAL UNITS ARE AT THEIR MAXIMUM FLOW SETPOINTS
 - SUPPLY FAN MIN:** THE SPEED AT WHICH THE SUPPLY FAN WILL TYPICALLY OPERATE WHEN ALL CONNECTED TERMINAL UNITS ARE AT THEIR MINIMUM FLOW SETPOINTS
 - RETURN FAN MAX:** THE SPEED AT WHICH THE RETURN FAN WILL TYPICALLY NEED TO OPERATE WHEN ALL CONNECTED TERMINAL UNITS ARE AT THEIR MAXIMUM FLOW SETPOINTS
 - RETURN FAN MIN:** THE SPEED AT WHICH THE RETURN FAN WILL TYPICALLY NEED TO OPERATE WHEN ALL CONNECTED TERMINAL UNITS ARE AT THEIR MINIMUM FLOW SETPOINTS
- THE BAS SHALL MODULATE THE RETURN FAN SPEED AS FOLLOWS:
 - WHEN THE SPEED OF THE SUPPLY FAN IS LESS THAN THE SUPPLY FAN MIN VALUE, THE RETURN FAN SPEED SHALL BE THE OUTPUT OF A LINEAR RESET LOOP THAT IS RESET FROM 0% TO THE RETURN FAN MIN VALUE AS THE SUPPLY FAN SPEED INCREASES FROM 0% TO THE SUPPLY FAN MIN VALUE.
 - WHEN THE SPEED OF THE SUPPLY FAN IS GREATER THAN THE SUPPLY FAN MIN VALUE BUT NOT GREATER THAN THE SUPPLY FAN MAX VALUE, THE RETURN FAN SPEED SHALL BE THE OUTPUT OF A LINEAR RESET LOOP THAT IS RESET FROM THE RETURN FAN MIN VALUE TO THE RETURN FAN MAX VALUE AS THE SUPPLY FAN SPEED INCREASES FROM THE SUPPLY FAN MIN VALUE TO THE SUPPLY FAN MAX VALUE.
 - WHEN THE SPEED OF THE SUPPLY FAN IS GREATER THAN THE SUPPLY FAN MAX VALUE, THE RETURN FAN SPEED SHALL BE THE OUTPUT OF A LINEAR RESET LOOP THAT IS RESET FROM THE RETURN FAN MAX VALUE TO 100% AS THE SUPPLY FAN SPEED INCREASES FROM THE SUPPLY FAN MAX VALUE TO 100%. NOTE THAT THIS STAGE WILL NOT APPLY IF SUPPLY FAN MAX VALUE OR THE RETURN FAN MAX VALUE EQUALS 100%.
 - THE RETURN FAN SPEED SHALL BE LIMITED SO THAT IT IS NEVER COMMANDED TO A SPEED THAT IS ABOVE OR 20% (ADJ.) BELOW THE SPEED OF THE SUPPLY FAN.
- ON START AND STOP, THE VFD SHALL RAMP TO SPEED AND SLOW DOWN WITHIN ADJUSTABLE ACCELERATION AND DECELERATION LIMITS.
- DURING UNOCCUPIED MODE OF OPERATION, THE RETURN FAN SPEED SHALL BE SET TO THE SAME AS THE SUPPLY FAN SPEED.

J. DAMPER CONTROL:

- HEATING OR COOLING:**
 - MODULATE OA DAMPER TO MAINTAIN OA FLOW SET POINT AS SENSED BY AIRFLOW MONITORING STATION UPON INITIATION OF OCCUPIED MODE. OA DAMPER CONTROL SHALL NOT BE ENABLED UNTIL 5 MINUTES (ADJ.) AFTER SUPPLY FAN STATUS HAS BEEN PROVEN ON.
 - MODULATE RA DAMPER TO MAINTAIN PRESSURE DIFFERENTIAL SET POINT OF +0.050-INCHES WG AS SENSED BY THE DIFFERENTIAL PRESSURE SENSOR INSTALLED ACROSS THE RETURN DAMPER.
 - WHEN RELIEF AIR IS REQUIRED, MODULATE RELIEF AIR DAMPER BETWEEN 0% AND 100% OPEN TO MAINTAIN PRESSURE DIFFERENTIAL SET POINT RANGE +0.075 TO +0.125 INCHES WG AS SENSED BY THE DIFFERENTIAL PRESSURE SENSOR INSTALLED ACROSS THE RELIEF DAMPER.
- ECONOMIZER:**
 - MODULATE OA, RA & EA DAMPERS IN COORDINATION WITH A PID LOOP TO MAINTAIN MIXED AIR TEMPERATURE SETPOINT. ECONOMIZER LOGIC SHALL REMAIN ENABLED DURING SETBACK COOLING, WHERE APPLICABLE. THE DAMPERS SHALL MODULATE OPEN PER THE HIGHER OF THE ECONOMIZER PID LOOP OUTPUT AND:
 - MINIMUM OA FLOW CONTROL OUTPUT (FOR OA & RA DAMPERS ONLY)
 - RELIEF CONTROL OUTPUT (FOR EA DAMPER)
- DEMAND CONTROL VENTILATION:**
 - LINEARLY RESET THE ACTIVE OA AIRFLOW SETPOINT FROM DEMAND CONTROL MINIMUM VENTILATION AIRFLOW TO DESIGN MAXIMUM VENTILATION AIRFLOW BASED ON DIFFERENCE BETWEEN INDOOR AND BACKGROUND (400 PPM) CO2 LEVELS. WHEN ECONOMIZER IS ENABLED, IT SHALL HAVE PRIORITY OVER THE DAMPER POSITION AND CO2 CONTROL SHALL NOT BE ACTIVE.
 - THE MINIMUM OA REQUIREMENTS SHALL BE SPECIFIED BY THE ENGINEER (REFER TO AHU SCHEDULE). DAMPER POSITIONS ESTABLISHED BY THE AIR BALANCER, AND BAS PROGRAMMED BY THE BAS CONTRACTOR. ENGINEER SHALL ENSURE THAT SPECIFIED MINIMUM SETPOINTS ARE ADEQUATE TO MAINTAIN BUILDING PRESSURE SLIGHTLY POSITIVE AT ALL TIMES.
- UNOCCUPIED / PRE-OCCUPIED MODE:**
 - CLOSE OUTSIDE AIR DAMPER AND RELIEF AIR DAMPER AND OPEN RETURN AIR DAMPER TO 100%, UNLESS ECONOMIZER IS FAVORABLE.
- SHUTDOWN:**
 - SET DAMPERS TO THEIR NORMAL POSITION AS FOLLOWS:
 - RETURN DAMPER - OPEN
 - RELIEF DAMPER - FAIL IN PLACE
 - OUTSIDE DAMPER - CLOSED

K. CHILLED WATER COIL CONTROL (FAIL OPEN):

- ON A RISE IN DISCHARGE SUPPLY AIR TEMPERATURE ABOVE SETPOINT MODULATE COOLING COIL OPEN TO MAINTAIN SETPOINT OF 55F.
- IF OUTSIDE AIR TEMP IS BELOW 55F (ADJ.), DISABLE COOLING COIL.

L. HEATING WATER PREHEAT COIL CONTROL (FAIL OPEN):

- ON A DROP IN DISCHARGE SUPPLY AIR TEMPERATURE BELOW SETPOINT MODULATE HEATING COIL OPEN TO MAINTAIN SETPOINT OF 55F.
- IF OUTSIDE AIR TEMP IS ABOVE 50F (ADJ.), DISABLE PREHEAT COIL.

M. AIR FILTER STATUS CONTROL: ALARM BAS WHEN PRESSURE DROP ACROSS FILTER BANK IS GREATER THAN SET POINT OF 1.75-INCH W.G. (ADJ.)

N. TERMINAL BOX CONTROL:

- OCCUPANCY MODES:** ENABLE TERMINAL BOX CONTROL UPON INITIATION OF PRE-OCCUPIED MODE AND CONTINUE THROUGH OCCUPIED MODE. DISABLE UPON INITIATION OF UNOCCUPIED MODE AND ENABLE / DISABLE THROUGHOUT UNOCCUPIED MODE BASED ON HEATING / COOLING DEMAND.
- SHUTDOWN MODE:** DISABLE TERMINAL BOX CONTROL.

O. SAFETY & SHUTDOWN:

- SMOKE DETECTION CONTROL:** INITIATE AHU SHUTDOWN MODE AND ALARM BAS WHEN FIRE ALARM SYSTEM SENDS SIGNAL BASED ON SMOKE AT ANY ONE OF THE DUCT-MOUNTED SMOKE DETECTORS OR BASED ON A GENERAL BUILDING ALARM.
- FREEZE PROTECTION:** INITIATE FREEZE PROTECTION MODE AND ALARM BAS WHEN SA DISCHARGE TEMPERATURE DROPS BELOW 42F (ADJ.). AUTOMATICALLY RESET WHEN SA DISCHARGE TEMPERATURE RISES ABOVE 47F (ADJ.).
- FREEZE SHUTDOWN:** HARD-WIRE TO AHU FAN RELAYS. INITIATE AHU SHUTDOWN MODE, AND ALARM BAS WHEN ENTERING AIR TEMPERATURE AT CHILLED WATER COIL FACE DROPS BELOW 37F (ADJ.) AT ANY 12-INCH SECTION OF THE SENSOR PROBE. MANUALLY RESET. OPEN ALL COIL CONTROL VALVES.
- CONDENSATE LEVEL SHUTDOWN CONTROL:** INITIATE AHU SHUTDOWN MODE AND ALARM BAS WHEN CONDENSATE DRAIN PAN HIGH-LEVEL SWITCH INDICATES HIGH-LEVEL.
- FAN PROTECTION CONTROL:** STOP FANS, INITIATE AHU SHUTDOWN MODE, AND ALARM BAS WHEN ANY OF THE HIGH OR LOW PRESSURE SWITCHES ARE TRIPPED.
- GENERAL ALARMS CONTROL:** ALARM BAS OF THE FOLLOWING CONDITIONS:
 - FAN FAILURES
 - FAILURES TO MEET SET POINT TEMPERATURES WITHIN 15 MINUTES (ADJ.)