

CONTROLS SCOPE OVERVIEW NOTES:

THIS SCOPE OF WORK CONSISTS OF A COMPLETE REPLACEMENT OF THE (E) CONTROLS EQUIPMENT WITH A (N) DIRECT DIGITAL CONTROL (DDC) SYSTEM. ALL (E) PNEUMATIC AND ELECTRIC CONTROLS SHALL BE REMOVED AND REPLACED WITH (N) EQUIPMENT. DUE TO TIME CONSTRAINTS THIS PROJECT IS ANTICIPATED TO BE COMPLETED IN TWO SEPARATE PHASES. PHASE ONE WILL BE AREAS A, B, AND C BOTH LEVELS. PHASE TWO WILL BE AREAS D, E, F, AND G. THE EXISTING AIR COMPRESSOR AND PNEUMATIC CONTROLS SERVING AREAS D, E, F, AND G WILL NEED TO REMAIN ACTIVE UNTIL THE CONSTRUCTION FOR PHASE TWO IN THE SUMMER OF 2013 BEGINS. CONTRACTOR SHALL PLAN FOR TWO GAS SYSTEMS TO BE ACTIVE DURING THE TIME FRAME BETWEEN COMPLETION OF SUMMER 2012 CONSTRUCTION AND BEGINNING OF SUMMER 2013 CONSTRUCTION. CONTRACTOR SHALL ENSURE THAT ALL COMMUNICATION LINES FOR AREAS D, E, F, AND G REMAIN OPERATIONAL AND ARE NOT DISTURBED BY THE CONSTRUCTION IN AREAS A, B, AND C DURING SUMMER 2012 CONSTRUCTION.

FOR NEW ROOFTOP UNITS, FACTORY CONTROLS SHALL BE LIMITED TO PACKAGED COOLING EQUIPMENT STAGING. FACTORY CONTROLS SHALL INTERFACE WITH SUCCESSFUL BAS. CONTRACTOR AND THEIR SYSTEM SHALL IMPLEMENT SEQUENCE, ASIDE FROM PACKAGED COOLING STAGING SHALL BE FIELD INSTALLED BY SUCCESSFUL BAS CONTRACTOR.

FOR NEW THERMOSTAT, SPACE SENSOR INSTALLATION CONTRACTOR SHALL ASSUME UTILIZING WIREMOLD FOR CONCEALING CONTROL WIRE.

REFER TO SPECIFICATIONS FOR MORE COMPLETE TEMPERATURE CONTROL REQUIREMENTS.

- CONTROLLED DEVICES (VALVES AND DAMPERS)
1. ALL CONTROL VALVES AND THEIR ACTUATORS SHALL BE RELOCATED. ALL HEATING TERMINALS (COILS, FITRS, CUHS, ETC.) SHALL BE 2-WAY 1/4 TURN ANALOG CONTROL VALVES (BALL VALVES) UNLESS OTHERWISE NOTED. BALL VALVES SHALL BE CHARACTERIZED WITH DISC DESIGNED FOR EQUAL PERCENTAGE FLOW CHARACTERISTICS. LARGE HEATING TERMINALS SUCH AS HV & AHU COILS MAY BE SERVED WITH GLOBE TYPE CONTROL VALVES AT THE CONTRACTOR'S DISCRETION.
2. ALL ACTUATORS IN EXISTING RTUs AND HAVS TO REMAIN SHALL BE REPLACED.
3. ALL (E) 3-WAY HEATING WATER VALVES SHALL BE REPLACED WITH (N) 2-WAY MODULATING CONTROL VALVES. EXCEPTION: UNIT HEATERS AND CABINET UNIT HEATERS. REPLACE WITH BINARY 2-WAY CONTROL VALVE.
4. ALL FREEZESTATS SHALL BE AUTOMATIC RESET.
5. ALL UNITS SHALL HAVE INDIVIDUAL SCHEDULES. GLOBAL SCHEDULES FOR RTUs, HAVS, ETC ARE NOT ALLOWED.

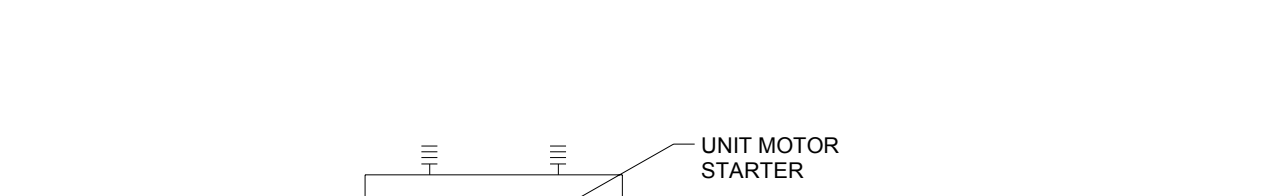
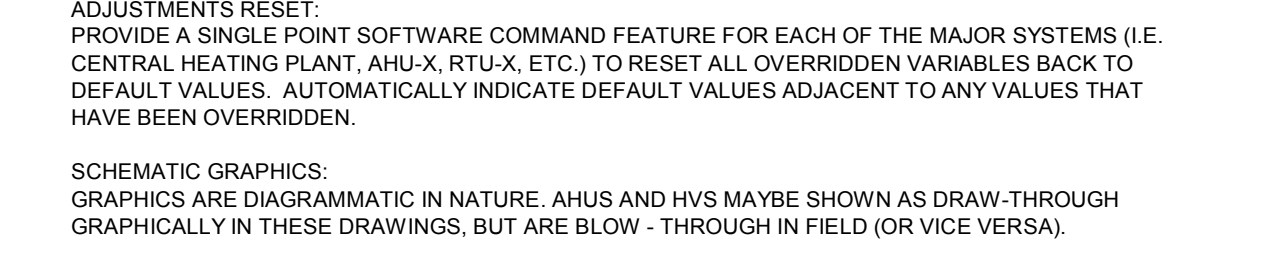
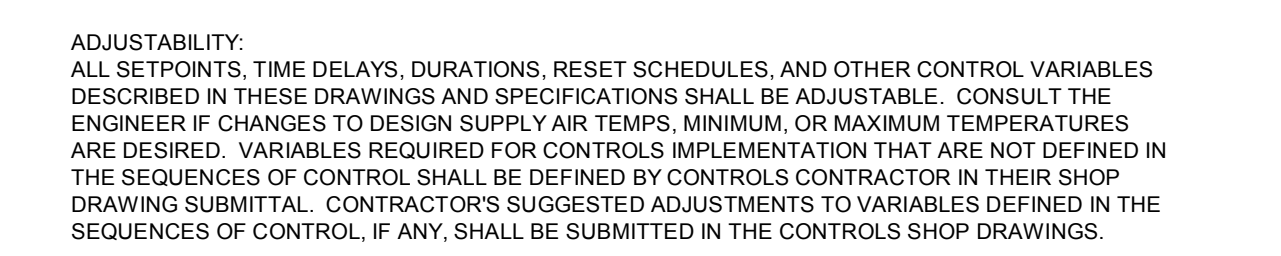
EQUIPMENT NOT ON DDC: THE FOLLOWING EQUIPMENT WILL NOT BE CONNECTED TO THE DDC SYSTEM. THIS EQUIPMENT WILL BE PROVIDED WITH NEW STAND-ALONE ELECTRIC CONTROLS.
1. CABINET UNIT HEATER
2. UNIT HEATERS
3. INDIVIDUAL EXHAUST FANS AS NOTED IN THESE DRAWINGS.

GRAPHICS: AS INDICATED IN THE POINTS LISTS, ALL BAS POINTS SHALL BE REPRESENTED BY GRAPHIC DISPLAY ON THE WEB BASED INTERFACE. ITEMS SUCH AS PUMPS, FANS, BOILERS, CONTROL VALVES, AND DAMPER MOTORS SHALL BE REPRESENTED BY ANIMATED GRAPHIC DISPLAYS. GRAPHICAL FLOOR PLANS SHALL INDICATE HEATING ZONE DESIGNATIONS AS WELL AS THEIR SPACE TEMPERATURE SETPOINT, SPACE TEMPERATURE, BACKGROUND COLOR OF ZONES SHALL BE CHANGED AS FOLLOWS:
1. NONE - SPACE TEMPERATURE WITHIN 3°F OF SETPOINT.
2. RED - SPACE TEMPERATURE GREATER THAN 4°F ABOVE SETPOINT.
3. BLUE - SPACE TEMPERATURE LOWER THAN 4°F BELOW SETPOINT.

ADJUSTABILITY: ALL SETPOINTS, TIME DELAYS, DURATIONS, RESET SCHEDULES, AND OTHER CONTROL VARIABLES DESCRIBED IN THESE DRAWINGS AND SPECIFICATIONS SHALL BE ADJUSTABLE. CONSULT THE ENGINEER IF CHANGES TO DESIGN SUPPLY AIR TEMPS, MINIMUM OR MAXIMUM TEMPERATURES ARE DESIRED. VARIABLES REQUIRED FOR CONTROLS IMPLEMENTATION THAT ARE NOT DEFINED IN THE SEQUENCES OF CONTROL SHALL BE DEFINED BY CONTROLS CONTRACTOR IN THEIR SHOP DRAWINGS SUBMITTED. CONTRACTOR'S SUGGESTED ADJUSTMENTS TO VARIABLES DEFINED IN THE SEQUENCES OF CONTROL, IF ANY, SHALL BE SUBMITTED IN THE CONTROLS SHOP DRAWINGS.

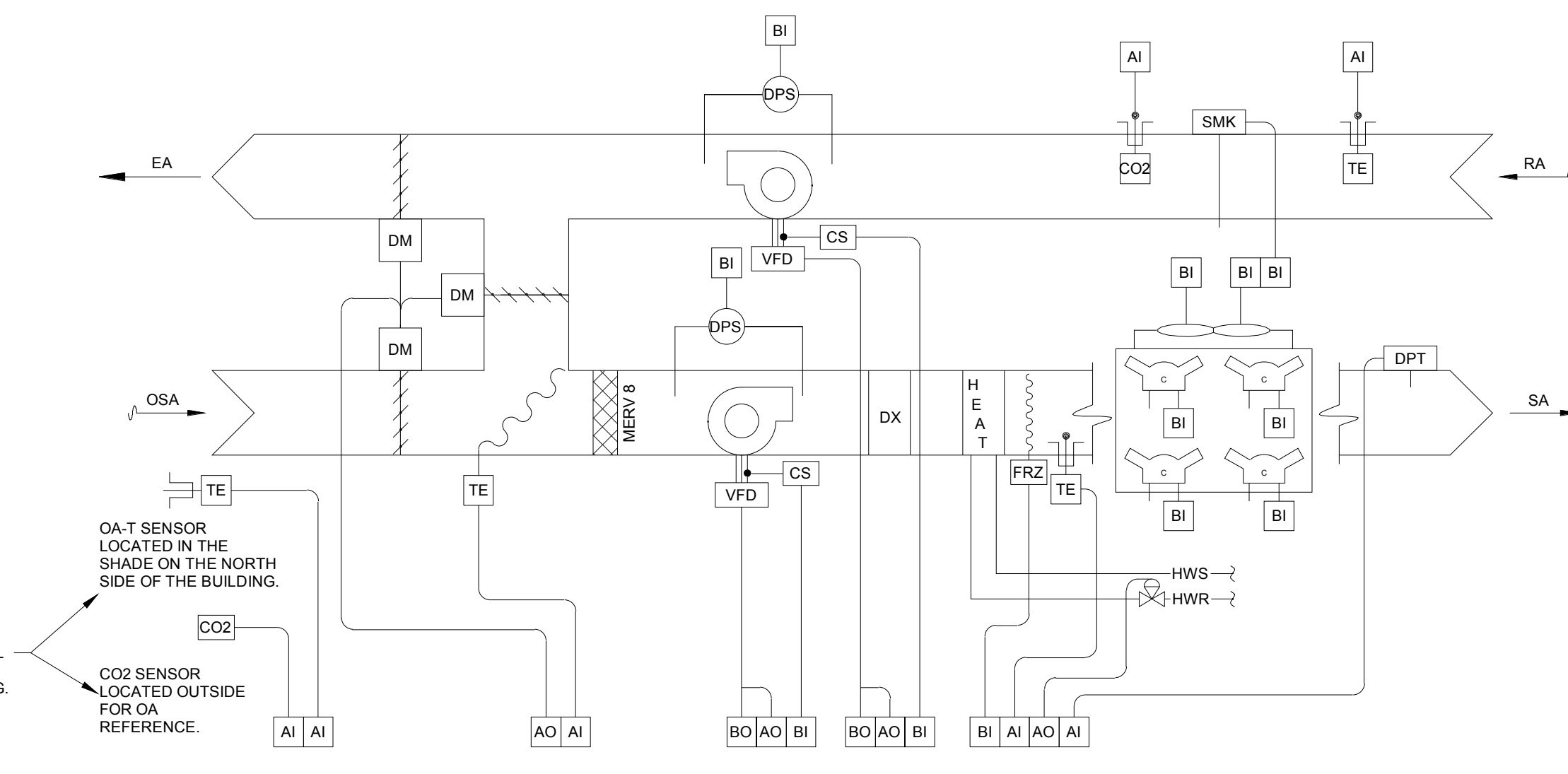
ADJUSTMENTS RESET: PROVIDE A SINGLE POINT SOFTWARE COMMAND FEATURE FOR EACH OF THE MAJOR SYSTEMS (I.E. CENTRAL HEATING PLANT, AHU's, RTU's, ETC.) TO RESET ALL OVERIDDEN VARIABLES BACK TO DEFAULT VALUES. AUTOMATICALLY INDICATE DEFAULT VALUES ADJACENT TO ANY SYSTEMS THAT HAVE BEEN OVERRIDDEN.

SCHEMATIC GRAPHICS: GRAPHICS ARE DIAGRAMMATIC IN NATURE. AHUS AND HVS MAYBE SHOWN AS DRAW THROUGH GRAPHICALLY IN THESE DRAWINGS, BUT ARE BLOW THROUGH IN FIELD (OR VICE VERSA).



SYSTEM POINTS LIST - VAV AIR HANDLING UNIT. Table with columns for ANALOG INPUT, ANALOG OUTPUT, BINARY INPUT, BINARY OUTPUT, ALARMS, and PROGRAMS. Rows include RETURN AIR CO2, OUTSIDE TEMP, MIXING DAMPERS, etc.

OVERVIEW: VARIABLE VOLUME, DX COOLING, HW HEAT. APPLIES TO: RTU-1, 2, 4, 5, 6, 8, 9, 12, 13, 14, 15, 17.



SEQUENCE OF CONTROL: PACKAGED VAV ROOFTOP

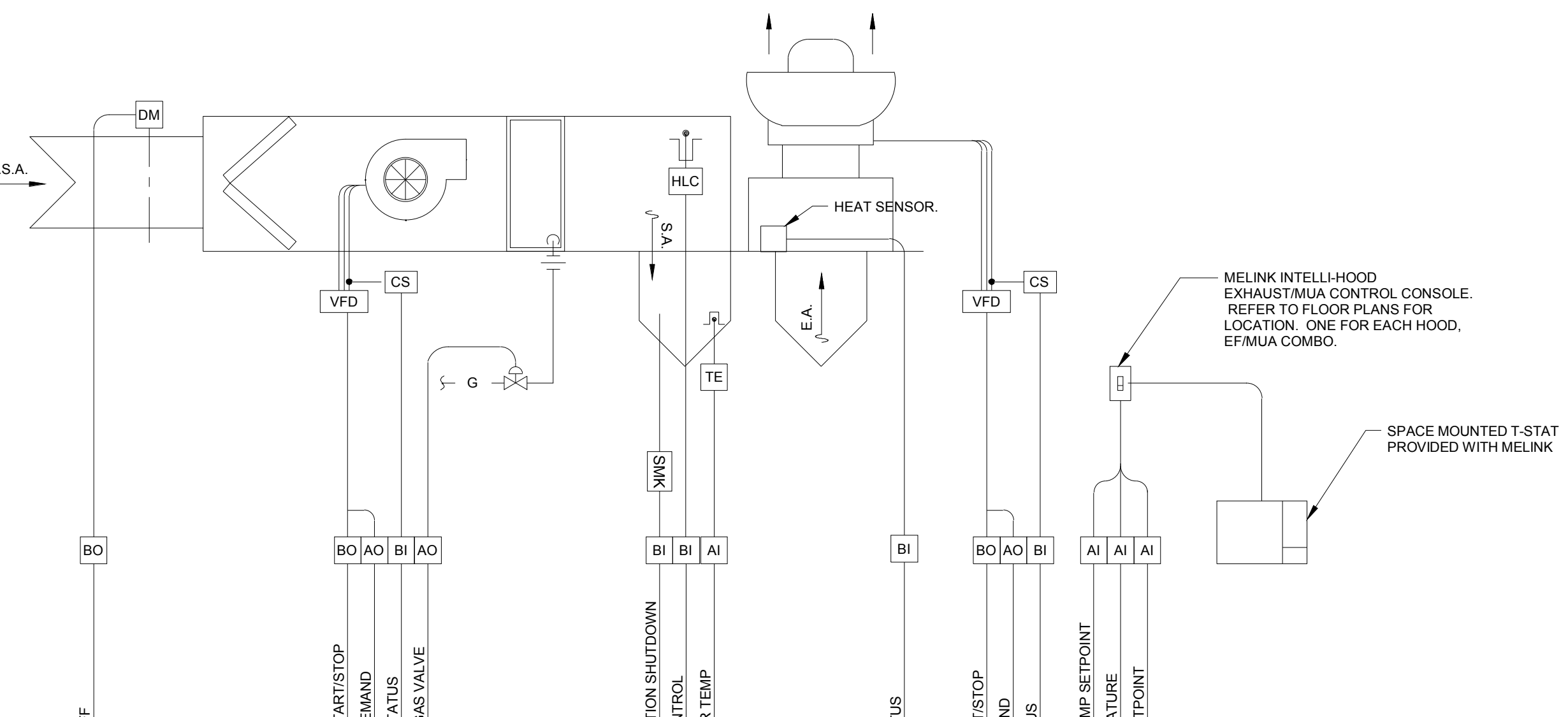
THE SYSTEM CONSIST OF A BUILT UP AIR HANDLING UNIT COMPLETE WITH MIXING BOX, FILTER SECTION, HOT WATER COIL, DX COOLING COIL, AIR COOLED CONDENSING SECTION, SUPPLY FAN, RETURN FAN, AND VARIABLE FREQUENCY DRIVES, DAMPERS ON EA, RA, AND OA TO BE BY UNIT MANUFACTURER. PACKAGED COOLING CONTROLS TO BE BY MANUFACTURER. MANUFACTURER AND CONTROLS CONTRACTOR SHALL COORDINATE TO REPORT STATUS AND ALARMS OF PACKAGED COOLING CONTROLS TO BAS. ACTUATORS FOR DAMPERS, SENSORS AND ALL OTHER DEVICES TO BE SUPPLIED BY TEMPERATURE CONTROLS CONTRACTOR. DEVICES AND WIRING TO BE INSTALLED IN FIELD BY TEMPERATURE CONTROLS CONTRACTOR. COMPRESSOR AND CONDENSER FAN COUNT WILL VARY WITH EACH UNIT. CONTROLS CONTRACTOR TO COORDINATE WITH SUCCESSFUL MANUFACTURER FOR EXACT COUNT. SCHEDULING: THE AIR HANDLING UNIT SHALL BE SCHEDULE THROUGH THE OPERATOR WORKSTATION INTERFACE WHEN SCHEDULED TO BE IN OCCUPIED MODE. BOTH FANS SHALL OPERATE AND CONTROLLED DEVICES SHALL POSITION WITH RESPECT TO THEIR PI CONTROL LOOP. UNOCCUPIED MODE: FANS SHALL SHUT OFF RETURN DAMPER FULL OPEN, RELIEF AND OUTSIDE AIR DAMPERS CLOSED. HOT WATER VALVE OPEN TO COIL. UNIT SHALL CYCLE TO MEET NIGHT SETBACK TEMPERATURE. UNIT SHALL RUN UNTIL THE COLDEST ZONE HAS REACHED 65 DEG F. OCCUPIED / UNOCCUPIED SCHEDULE TBD BY OWNER. MORNING WARM-UP: MORNING WARM-UP SHALL BE BASED ON OPTIMUM START PROGRAMMING. SUPPLY FAN VFD SHALL CONTROL OFF STATIC PRESSURE. ALL VAV BOXES SHALL GO FULL OPEN. VAV BOX HEATING CONTROL VALVE SHALL BE OPEN. AIR HANDLING UNIT SHALL SUPPLY 70° (ADJ) AIR TO VAV BOXES. OA DAMPER SHALL BE CLOSED. RA DAMPER SHALL BE OPEN. AS EACH VAV BOX ZONE REACHES OCCUPIED SETPOINT THE VAV BOX HEATING COIL SHALL CLOSE AND THE VAV BOX AIRFLOW SHALL GO TO MINIMUM POSITION. MORNING WARMUP DISABLEABLE SHALL BE ON GRAPHICS. TIME OF MORNING LIMIT SHALL ALSO BE ON GRAPHICS. OCCUPIED MODE: RETURN FAN SHALL START AT MINIMUM VFD SPEED. UPON PROOF OF OPERATION FOR ONE MINUTE (ADJUSTABLE) THE SUPPLY FAN SHALL START. IF ANY ZONE TEMPERATURE IS BELOW THE OCCUPIED HEATING SETPOINT THEN OPTIMUM START MORNING WARM-UP CYCLE ABOVE SHALL APPLY. IF MORNING WARMUP IS NOT REQUIRED THE UNIT SHALL GO TO OCCUPIED CYCLE.

1. PACKAGED VAV ROOFTOP UNIT CONTROLS SCHEMATIC NONE

2. MAKE UP AIR UNIT CONTROLS NONE

SYSTEM POINTS LIST - 100% OA MAU-1&2 AND EF-4&4S. Table with columns for ANALOG INPUT, ANALOG OUTPUT, BINARY INPUT, BINARY OUTPUT, ALARMS, and PROGRAMS. Rows include EXHAUST FAN STATUS, FIRE SUPPRESSION SHUT OFF, OA VALVE, MELINK SYSTEM ALARM, etc.

OVERVIEW: VARIABLE VOLUME, 100% O.S.A. AND EXHAUST UNIT W/ VAV HEAT. APPLIES TO: MAU-1 & EF-4; TYPE I HOOD MAU-2 & EF-4B; TYPE II HOOD

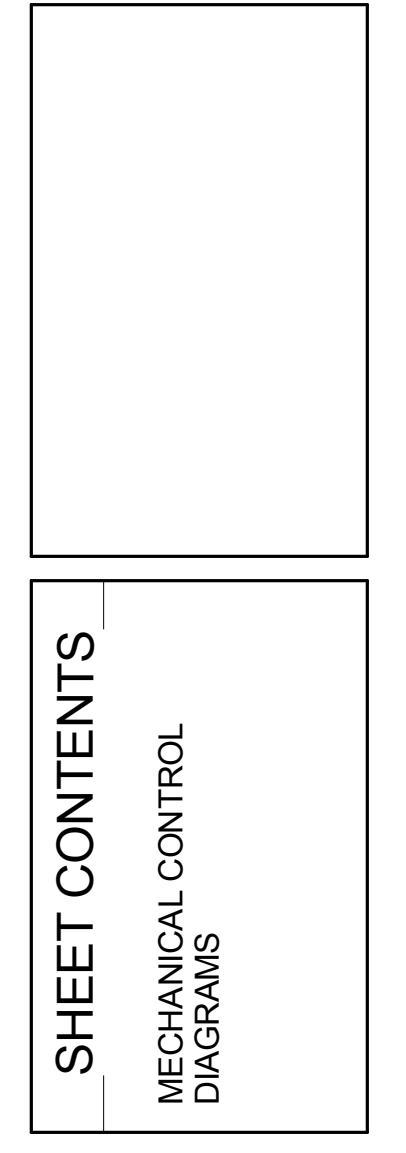
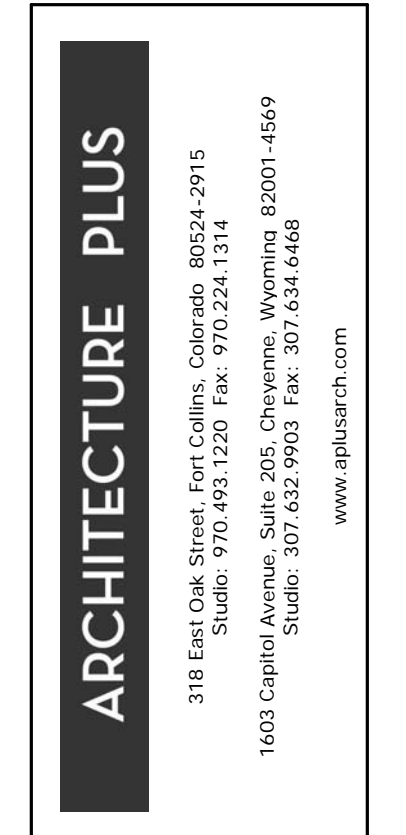


SEQUENCE OF CONTROL: KITCHEN MUA AND EF UNIT

EDDESCRIPTION - MAKEUP AIR HANDLING UNIT AND EXHAUST FAN COMPLETE WITH FILTER SECTION, INDIRECT FIRED GAS FURNACE, VARIABLE VOLUME EXHAUST FAN AND VARIABLE VOLUME SUPPLY FAN DAMPERS, MODULATING GAS CONTROL VALVES, AND THEIR ACTUATORS SHALL BE FACTORY PROVIDED. VFD'S, SENSORS FOR HOOD HEAT AND PARTICULATES AND SPACE THERMOSTAT SHALL BE BY MELINK INTELLIHOOD. REFER TO MELINK SPECIFICATION FOR SCOPE REQUIRED OF TEMPERATURE CONTROLS CONTRACTOR. A SEPARATE MELINK INTELLIHOOD SYSTEM SHALL BE PROVIDED FOR EACH HOOD. THE RELOCATED TYPE I HOOD AND THE NEW TYPE II HOODS SHALL HAVE HEAT AND OPTIC SENSORS INSTALLED IN EXISTING HOOD. TYPE II HOOD SHALL HAVE HEAT SENSOR INSTALLED IN NEW HOOD. BOTH FACTORY CONTROLLER AND MELINK INTELLIHOOD SHALL BE CAPABLE OF COMMUNICATING TO THE BAS. SCHEDULING - THIS UNIT IS NOT SCHEDULED AND SHALL BE INTERLOCKED WITH THE KITCHEN HOOD EXHAUST SYSTEM TO PROVIDE CONDITIONED MAKEUP AIR. WHENEVER THE KITCHEN HOOD EXHAUST SYSTEM IS OPERATING, OA DAMPERS SHALL OPEN WHEN EXHAUST FAN IS ACTIVATED. OA DAMPERS SHALL BE CLOSED WHEN EXHAUST FAN IS DE-ENERGIZED. EXHAUST FAN SHALL BE ENERGIZED BY HEAT AND/OR OPTIC SENSORS. DISCHARGE AIR CONTROL: PROVIDE A WALL MOUNTED TEMPERATURE SENSOR FROM MELINK FOR SPACE TEMPERATURE AND DISCHARGE AIR SETPOINT CONTROL. MELINK CONTROLLER SHALL SEND SIGNAL TO MUA/FA FACTORY CONTROLLER TO RESET DISCHARGE AIR TEMPERATURE BETWEEN 55 AND 85 DEGREES. FACTORY CONTROLLER SHALL MODULATE GAS VALVE TO MAINTAIN DAT SETPOINT. FAN SPEED CONTROL: MELINK SHALL VARY FAN SPEED BETWEEN 50% AND 100% DEPENDING ON HEAT AND OPTIC SENSOR REQUIREMENTS. MELINK SHALL REPORT FAN STATUS AND ANY ALARM CONDITION BACK TO BAS. MELINK SHALL INTEGRATE WITH THE EXISTING, RELOCATED FIRE SUPPRESSION SYSTEM FOR TYPE I HOOD TO TURN MAKEUP AIR UNIT OFF AND ACTIVATE EXHAUST TO 100% UPON FIRE DETECTION. MUA FACTORY CONTROLS SHALL REPORT FREEZE/STAT BACK TO BAS AND SHALL BE CAPABLE OF HAVING AUTOMATIC RESET ON FREEZE/STAT FROM THE BAS. TEMPERATURE CONTROL: CONTRACTOR SHALL CONNECT TO FACTORY INSTALLED DPT FOR DIRTY FILTER ALARM. SCHEDULING - THIS UNIT IS NOT SCHEDULED AND SHALL BE INTERLOCKED WITH THE KITCHEN HOOD EXHAUST SYSTEM TO PROVIDE CONDITIONED MAKEUP AIR. WHENEVER THE KITCHEN HOOD EXHAUST SYSTEM IS OPERATING, OA DAMPERS SHALL OPEN WHEN EXHAUST FAN IS ACTIVATED. OA DAMPERS SHALL BE CLOSED WHEN EXHAUST FAN IS DE-ENERGIZED. EXHAUST FAN SHALL BE ENERGIZED BY HEAT AND/OR OPTIC SENSORS. DISCHARGE AIR CONTROL: PROVIDE A WALL MOUNTED TEMPERATURE SENSOR FROM MELINK FOR SPACE TEMPERATURE AND DISCHARGE AIR SETPOINT CONTROL. MELINK CONTROLLER SHALL SEND SIGNAL TO MUA/FA FACTORY CONTROLLER TO RESET DISCHARGE AIR TEMPERATURE BETWEEN 55 AND 85 DEGREES. FACTORY CONTROLLER SHALL MODULATE GAS VALVE TO MAINTAIN DAT SETPOINT. FAN SPEED CONTROL: MELINK SHALL VARY FAN SPEED BETWEEN 50% AND 100% DEPENDING ON HEAT AND OPTIC SENSOR REQUIREMENTS. MELINK SHALL REPORT FAN STATUS AND ANY ALARM CONDITION BACK TO BAS. MELINK SHALL INTEGRATE WITH THE EXISTING, RELOCATED FIRE SUPPRESSION SYSTEM FOR TYPE I HOOD TO TURN MAKEUP AIR UNIT OFF AND ACTIVATE EXHAUST TO 100% UPON FIRE DETECTION. MUA FACTORY CONTROLS SHALL REPORT FREEZE/STAT BACK TO BAS AND SHALL BE CAPABLE OF HAVING AUTOMATIC RESET ON FREEZE/STAT FROM THE BAS. TEMPERATURE CONTROL: CONTRACTOR SHALL CONNECT TO FACTORY INSTALLED DPT FOR DIRTY FILTER ALARM. SCHEDULING - THIS UNIT IS NOT SCHEDULED AND SHALL BE INTERLOCKED WITH THE KITCHEN HOOD EXHAUST SYSTEM TO PROVIDE CONDITIONED MAKEUP AIR. WHENEVER THE KITCHEN HOOD EXHAUST SYSTEM IS OPERATING, OA DAMPERS SHALL OPEN WHEN EXHAUST FAN IS ACTIVATED. OA DAMPERS SHALL BE CLOSED WHEN EXHAUST FAN IS DE-ENERGIZED. EXHAUST FAN SHALL BE ENERGIZED BY HEAT AND/OR OPTIC SENSORS. DISCHARGE AIR CONTROL: PROVIDE A WALL MOUNTED TEMPERATURE SENSOR FROM MELINK FOR SPACE TEMPERATURE AND DISCHARGE AIR SETPOINT CONTROL. MELINK CONTROLLER SHALL SEND SIGNAL TO MUA/FA FACTORY CONTROLLER TO RESET DISCHARGE AIR TEMPERATURE BETWEEN 55 AND 85 DEGREES. FACTORY CONTROLLER SHALL MODULATE GAS VALVE TO MAINTAIN DAT SETPOINT. FAN SPEED CONTROL: MELINK SHALL VARY FAN SPEED BETWEEN 50% AND 100% DEPENDING ON HEAT AND OPTIC SENSOR REQUIREMENTS. MELINK SHALL REPORT FAN STATUS AND ANY ALARM CONDITION BACK TO BAS. MELINK SHALL INTEGRATE WITH THE EXISTING, RELOCATED FIRE SUPPRESSION SYSTEM FOR TYPE I HOOD TO TURN MAKEUP AIR UNIT OFF AND ACTIVATE EXHAUST TO 100% UPON FIRE DETECTION. MUA FACTORY CONTROLS SHALL REPORT FREEZE/STAT BACK TO BAS AND SHALL BE CAPABLE OF HAVING AUTOMATIC RESET ON FREEZE/STAT FROM THE BAS. TEMPERATURE CONTROL: CONTRACTOR SHALL CONNECT TO FACTORY INSTALLED DPT FOR DIRTY FILTER ALARM.

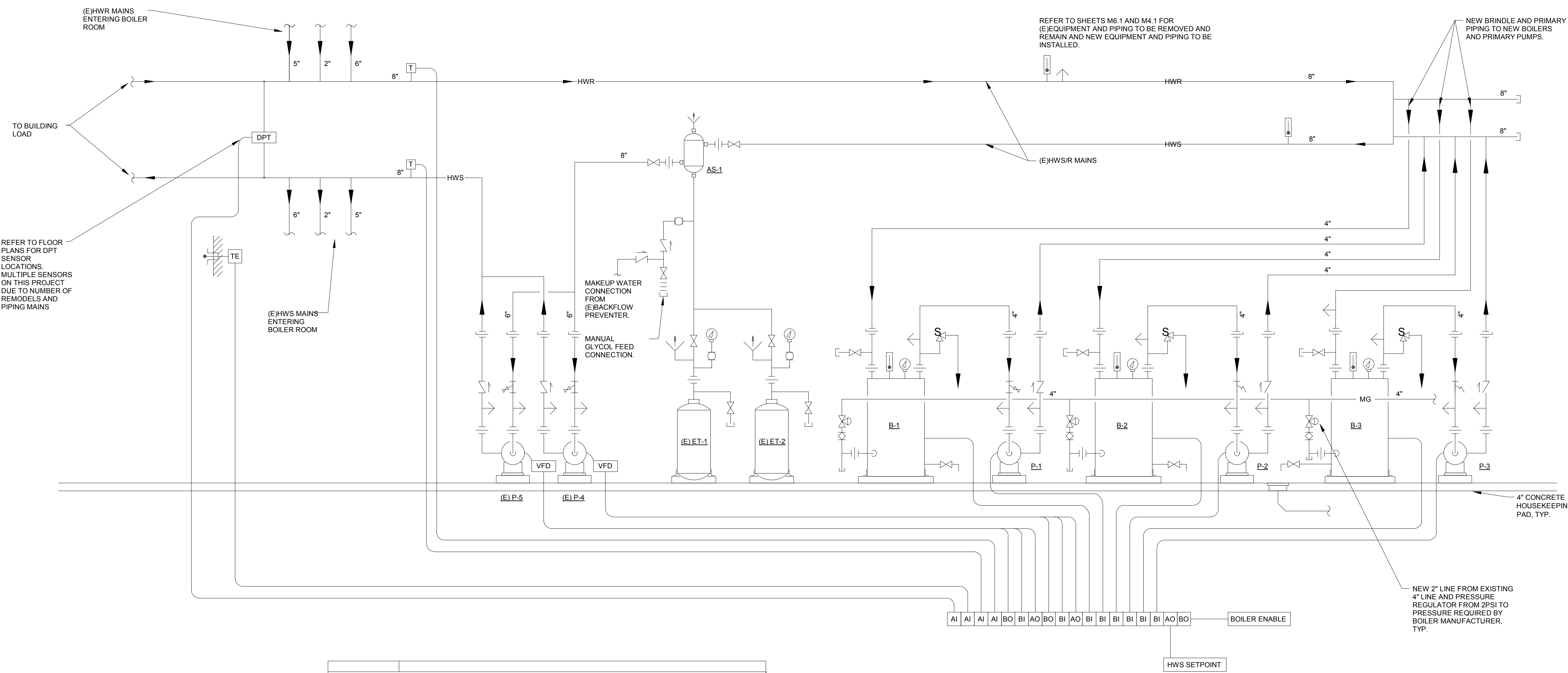


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ISSUE FOR BIDDING
Date: 1/26/12
Description: Addendum #1
Project: M5.1



SEQUENCE OF CONTROLS:

SEQUENCE OF OPERATION - CENTRAL HOT WATER

THE SYSTEM CONSIST OF THREE CONDENSING BOILERS WITH ASSOCIATED CIRCULATING PUMPS, AND TWO EXISTING SECONDARY LOOP HOT WATER SUPPLY PUMPS. REFER TO BOILER ROOM FLOOR PLANS AND MECHANICAL DIAGRAM SHEET FOR EXISTING PIPING AND EQUIPMENT CONNECTIONS.

A HEAT TIMER MULTI-MOD PLATINUM CONTROL PANEL SHALL ACTIVATE AND CONTROL BOILER STAGING AND ASSOCIATED PRIMARY CIRCULATING PUMPS.

BAS SHALL CONTROL EXISTING SECONDARY PUMPS.

ENABLING:
HOT WATER GENERATION SHALL BE ENABLED BY THE BAS UPON A FALL IN OUTDOOR AIR TEMPERATURE BELOW HOT WATER GENERATION SETPOINT (INITIALLY SET TO 60 DEG F ADJUSTABLE).

LOOP PRESSURE CONTROL:
ONCE ENABLED, HOT WATER LOOP DIFFERENTIAL PRESSURE SHALL BE MAINTAINED AT SETPOINT. 10 PSI INITIAL, ADJUSTABLE, TO BE COMPLETED WITH BALANCING CONTRACTOR AND COMMISSIONING PROCESS) BY FIRST STARTING THE LEAD HOT WATER PUMP AND MODULATING THE ASSOCIATED VFD. DUE TO MULTIPLE PIPING LOOPS IN THIS BUILDING, MULTIPLE DPT SENSORS WILL BE REQUIRED. WORST CASE DPT SENSOR SHALL CONTROL PUMP SPEED WHEN LEAD HOT WATER PUMP IS AT 100% AND LOOP PRESSURE IS 2 PSI BELOW SETPOINT FOR MORE THAN 15 MINUTES THE LAG PUMP SHALL BE STAGED ON AT 80% AND THE LEAD PUMP SHALL REDUCE TO 60%. PUMPS SHALL THEN STAGE UP AND DOWN IN CONCERT TO MAINTAIN LOOP PRESSURE. WHEN BOTH PUMPS ARE BELOW 40% THE LAG PUMP SHALL STAGE OFF. THE LEAD AND LAG POSITIONS OF HOT WATER PUMPS ARE TO ALTERNATE WEEKLY. ALL PARAMETERS SHALL BE ADJUSTABLE.

TEMPERATURE CONTROL:
SHOULD HOT WATER SUPPLY TEMPERATURE FALL BELOW SETPOINT PLUS DIFFERENTIAL, INITIATE OPERATION. LEAD BOILER AND ASSOCIATED BOILER CIRCULATING PUMP SHALL BE ENERGIZED. BAS SHALL ENERGIZE PUMP/BOILER CONTROLLER SHALL SEND SIGNAL TO BAS FOR SECOND AND THIRD PUMP TO BE ENERGIZED. HOT WATER PUMP SHALL INITIATE FIRST AND AFTER A 2 MINUTE (ADJUSTABLE) DELAY UPON PROOF OF FLOW ENABLE LEAD HOT WATER BOILER. BOILERS HAVE A 5:1 TURNDOWN. BOILERS SHALL INITIATE AT 20% FIRE.

WHEN LEAD BOILER IS AT 40% FIRE THEN ADDITIONAL BOILER SHALL BE STAGED ON. THE SECOND BOILER AND ASSOCIATED BOILER CIRCULATING PUMP SHALL BE ENERGIZED TO PROVIDE ADDITIONAL HEAT TO MAINTAIN HOT WATER SUPPLY TEMPERATURE AT SETPOINT. HOT WATER PUMP SHALL INITIATE FIRST AND AFTER A 2 MINUTE (ADJUSTABLE) DELAY UPON PROOF OF FLOW ENABLE HOT WATER BOILER. BOILER CONTROL PANEL SHALL MODULATE FIRING RATE OF BOTH BOILERS TO PROVIDE OPTIMUM EFFICIENCY AND STAGE THIRD BOILER IN THE SAME FASHION AS THE SECOND BOILER HEATING WATER SETPOINT IS STILL NOT MET WITH TWO BOILERS AT 40% FIRE. THE BOILER CONTROL PANEL SHALL THEN OPTIMIZE FIRING RATE OF ALL THREE BOILERS TO PROVIDE OPTIMUM EFFICIENCY BY STAGING THEM UP 20% AT A TIME. WHEN HOT WATER SUPPLY TEMPERATURE EXCEEDS HOT WATER SUPPLY TEMPERATURE SETPOINT BY 4 DEGREES, THEN FIRING RATE STAGES SHALL BE REDUCED TO MAINTAIN HOT WATER SUPPLY TEMPERATURE SETPOINT. THE LEAD AND LAG POSITIONS FOR BOILERS ARE TO ALTERNATE WEEKLY.

BAS SHALL SEND A RESET SIGNAL TO BOILER CONTROL PANEL. HOT WATER TEMPERATURE SETPOINT IS TO BE RESET FROM 110 DEG (ADJUSTABLE) TO 140 DEG F (ADJUSTABLE) AS OUTSIDE AIR TEMPERATURE FALLS FROM 60 DEG F (ADJUSTABLE) TO 20 DEG F (ADJUSTABLE).

HEAT TIMER CONTROL PANEL SHALL SEND BOILER AND PUMP STATUS AS WELL AS BOILER ALARM STATUS BACK TO BAS FOR REPORTING.

FREEZE PROTECTION MODE:
IF DURING UNOCCUPIED HOURS THE OAT IS BELOW 40 DEGREES THE LEAD SECONDARY LOOP PUMP SHALL ENERGIZE AT MINIMUM SPEED AND MODULATE TO MAINTAIN DPT SETPOINT.

FEATURES:
SHOULD ANY PUMP STATUS NOT MATCH PUMP COMMAND, GENERATE AN ALARM TO THE BAS.
SHOULD HOT WATER SUPPLY TEMPERATURE FALL 10 OR MORE DEGREES AWAY FROM SETPOINT WHILE HOT WATER SYSTEM IS ENABLED, GENERATE AN ALARM THROUGH TO THE BAS.

SYSTEM POINTS LIST - HEATING WATER SYSTEM

SYSTEM POINT DESCRIPTION	ANALOG		BINARY		ALARMS	PROGRAMS	NOTES
	INPUT	OUTPUT	INPUT	OUTPUT			
OUTSIDE AIR TEMP	X						
HW LOOP DIFF PRESS	X						
HW TEMP	X						
HW PUMP P-1 STAT	X	X					
HW PUMP P-2 STAT	X	X					
HW PUMP P-3 STAT	X	X					
HW PUMP 4 DS	X						
HW PUMP 4 ST	X						
HW PUMP 5 DS	X						
HW PUMP 5 ST	X						
HW PUMP 5 VFD	X						
BOILER PLANT ENABLE	X						
BOILER 1 ALARM	X						
HW TEMP RESET SP	X						
BOILER 1 ALARM	X						
BOILER 2 ALARM	X						

1 HEATING WATER SYSTEM DDC CONTROLS SCHEMATIC
NONE

SEQUENCE OF CONTROLS:

SEQUENCE OF OPERATION - VAV SINGLE ZONE PACKAGED ROOF TOP UNIT.

THE SYSTEM CONSIST OF A ROOF TOP UNIT (RTU) COMPLETE WITH VFD SUPPLY FAN, VFD POWER EXHAUST FAN/RETURN FAN, DIGITAL SCROLL COMPRESSOR OR MULTIPLE COMPRESSORS, AND HOT WATER COIL.

SCHEDULING:
THE BUILDING SCHEDULING SHALL OCCUR THROUGH THE OPERATOR WORKSTATION INTERFACE AT THE GLOBAL CONTROLLER.

CONTROL:
RTU SHALL INCLUDE PACKAGED COMPRESSOR CONTROLS FOR COOLING DAT CONTROL FROM FACTORY. ENABLE SIGNAL AND DAT RESET SIGNAL TO BE SENT FROM BUILDING BAS TO FACTORY COMPRESSOR CONTROLS. RTU FACTORY DX COOLING CONTROL SHALL REPORT CONDENSER FAN STATUS, COMPRESSOR STATUS AND ALARM CONDITION BACK TO BAS. DAMPERS SHALL BE FURNISHED AND INSTALLED BY RTU MANUFACTURER. ALSO INCLUDE TERMINAL STRIP/FIELD INSTALLED CONTROLS. TOC SHALL PROVIDE CONTROL VALVES, ACTUATORS, SENSORS AND ALL CONTROL WIRING AND INSTALL IN FIELD TO ACHIEVE SEQUENCE AND POINTS LIST AS OUTLINED.

OCCUPIED MODE:
MIXED AIR CONTROL:
WHEN OUTSIDE AIR TEMPERATURE FALLS BELOW DISCHARGE AIR SETPOINT BY 2 DEGREES, MIXING DAMPERS SHALL MODULATE TO MAINTAIN DISCHARGE AIR TEMPERATURE AT SETPOINT. MINIMUM OUTSIDE AIR DAMPER POSITION SHALL NOT BE ALLOWED TO GO BELOW 10% AIRFLOW. DAMPER POSITION TO BE COORDINATED WITH TAB CONTRACTOR DURING COMMISSIONING. RA CARBON DIOXIDE LEVELS SHALL BE MONITORED TO MODULATE OUTSIDE AIR DAMPERS TO MAINTAIN CARBON DIOXIDE LEVELS AT SETPOINT (500 PPM ABOVE THE OUTDOOR REFERENCE POINT). A SENSOR SHALL BE LOCATED IN RETURN DUCT MAIN WHEN THE OUTSIDE AIR TEMPERATURE IS GREATER THAN DISCHARGE AIR TEMPERATURE SETPOINT. THE OUTSIDE AIR DAMPERS SHALL BE OPEN 100% UNTIL OAT TEMPERATURE IS WITHIN 2 DEGREES OF RA TEMPERATURE.

CO2 RESET SCHEDULE:
OAT DAMPER POSITION SHALL BE RESET BASED ON THE FOLLOWING SCHEDULE: 100 PPM ABOVE OAT REFERENCE CO2 LEVEL. OAT DAMPERS SHALL BE AT 10% OPEN. 500 PPM ABOVE OAT REFERENCE CO2 LEVEL. OAT DAMPERS SHALL BE OPEN TO MINIMUM OUTSIDE AIR LISTED IN EQUIPMENT SCHEDULES. CONTROLS CONTRACTOR, TAB CONTRACTOR AND COMMISSIONING AGENT TO VERIFY THIS DAMPER POSITION IN FIELD.

DISCHARGE AIR CONTROL:
ECONOMIZER MODE SHALL BE ENABLED WHENEVER OAT IS 2 DEGREES LESS THAN RAT. WHEN OAT EXCEEDS RAT, UNIT SHALL GO TO MINIMUM OAT BASED ON CO2 SENSOR. WHEN ECONOMIZER MODE (100% OUTSIDE AIR) IS NO LONGER ABLE TO MAINTAIN DISCHARGE AIR TEMP (RA) (SETPOINT), THE DX COOLING SHALL STAGE ON TO MAINTAIN DAT SETPOINT. IF THE OAT DAMPERS ARE IN MINIMUM POSITION AND THE MIXED AIR TEMPERATURE IS BELOW DAT SETPOINT THE HOT WATER CONTROL VALVE SHALL MODULATE TO MAINTAIN DAT SETPOINT.

DISCHARGE AIR TEMPERATURE SHALL BE 55 DEGREES. MODULATE SUPPLY FAN VFD TO MAINTAIN SPACE TEMPERATURE SETPOINT. VFD SHALL NOT GO BELOW 50%. IF VFD IS AT 50% AND SPACE TEMPERATURE IS BELOW SETPOINT, DISCHARGE AIR TEMPERATURE SHALL BE RESET UPWARD.

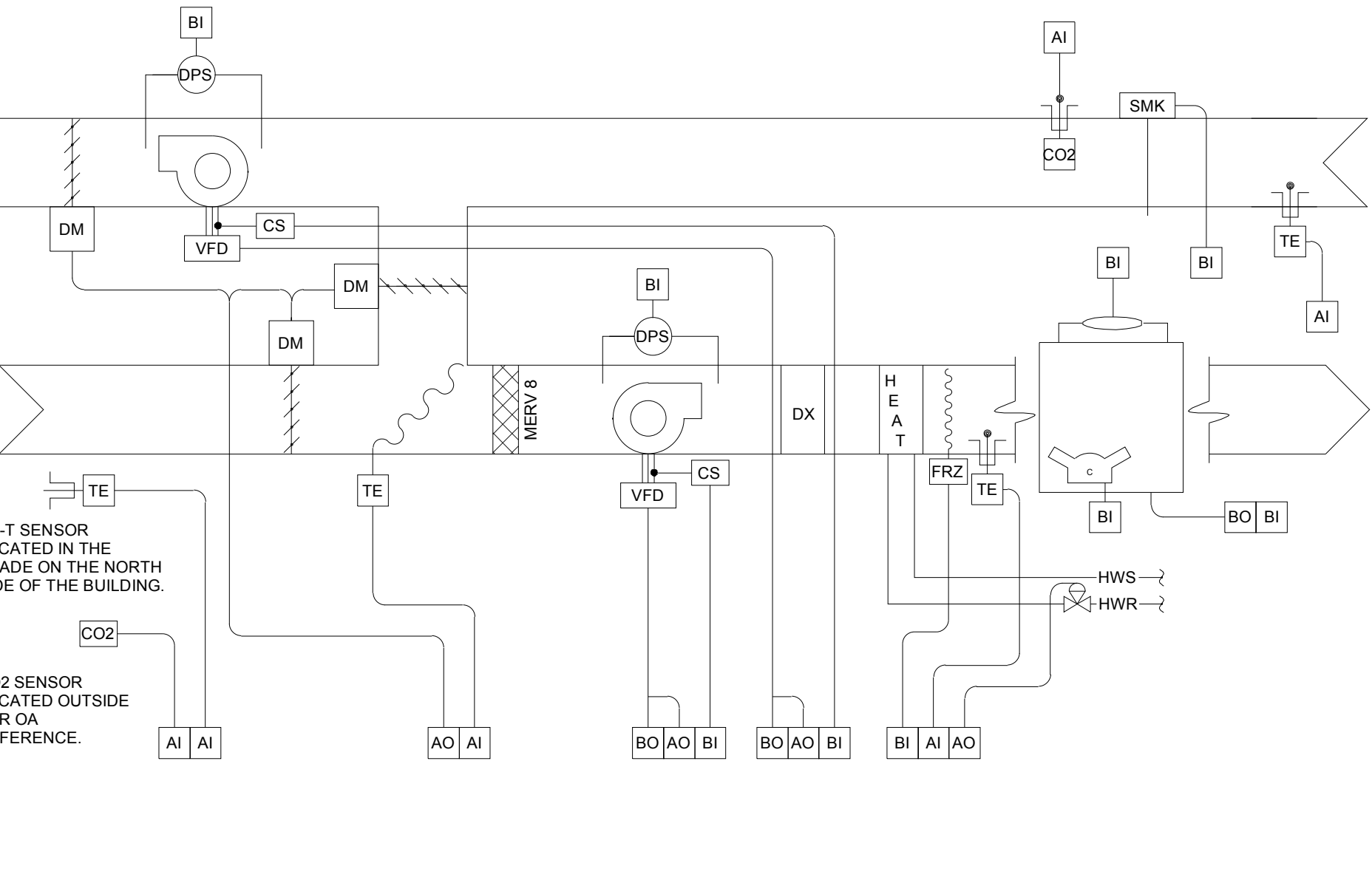
DISCHARGE AIR TO BE RESET FROM 55 TO 65 DEGREES BASED ON SPACE SENSOR REVISION FROM SETPOINT. IF DAT IS AT 55 DEGREES FOR 15 MIN AND SPACE IS STILL BELOW SETPOINT, SUPPLY VFD SHALL INCREASE SPEED TO MEET SETPOINT.

RETURN FAN CONTROL:
RETURN FAN SHALL TRACK SUPPLY FAN BY A DIFFERENTIAL TO PROVIDE A SLIGHTLY POSITIVE (0.01-0.05") MIXING BOX PRESSURE. TAB CONTRACTOR, CONTROL CONTRACTOR AND COMMISSIONING AGENT TO CREATE A TRACKING CURVE BASED ON SUPPLY FAN SPEED OF 50-100% TO MAINTAIN POSITIVE MIXING BOX THROUGHOUT RANGE.

UNOCCUPIED MODE: SUPPLY FAN SHALL ENERGIZE 100%. HEATING VALVE SHALL MODULATE TO ACHIEVE NIGHT SETBACK SETPOINT. OUTSIDE AIR DAMPERS SHALL BE CLOSED. RETURN AIR DAMPERS SHALL BE OPEN. WHEN OAT IS BELOW 40 DEGREES THE HEATING VALVE SHALL MODULATE TO MAINTAIN MAT AT 55 DEGREES.

MORNING WARM-UP: SUPPLY FAN SHALL ENERGIZE 100% AND HEATING VALVE SHALL OPEN. OPTIMUM START PROGRAMMING SHALL BE PROVIDED.

FEATURES:
SPACE TEMPERATURE SHALL BE TRENDED HOURLY
ALARM SHALL ANY STATUS NOT MATCH COMMAND
ALARM IF DISCHARGE AIR TEMPERATURE STRAYS MORE THAN 5 DEGREES FROM SETPOINT
ALARM IF SPACE TEMPERATURE STRAYS MORE THAN 5 DEGREES FROM SETPOINT
SHUTDOWN SUPPLY FAN IF SUPPLY SMOKE DETECTOR IS ACTIVATED

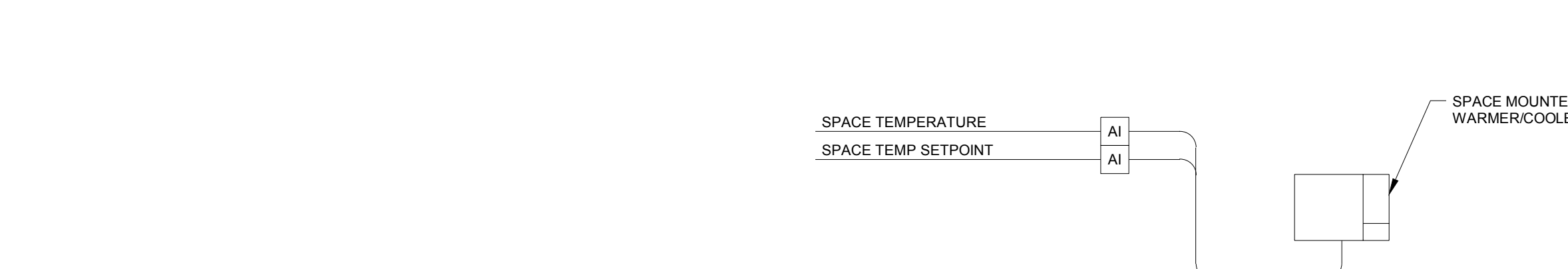


2 VAV SINGLE ZONE PACKAGED RTU CONTROLS SCHEMATIC
NONE

OVERVIEW:
SINGLE ZONE VARIABLE VOLUME, DX COOLING, HW HEAT
APPLIES TO:
- RTU: 3.7, 16, 18

SYSTEM POINTS LIST - VAV AIR HANDLING UNIT

SYSTEM POINT DESCRIPTION	ANALOG		BINARY		ALARMS	PROGRAMS	NOTES
	INPUT	OUTPUT	INPUT	OUTPUT			
RETURN AIR CO2	X						
OUTSIDE TEMP	X						
MIXING DAMPERS	X	X					
MIXED AIR TEMP	X						
RETURN AIR TEMP	X						
HOT WATER VLV	X						
FREESTAT	X						
SUPPLY FAN VFD	X						
SUPPLY FAN STATUS	X	X					
EXHAUST FAN VFD	X						
EXHAUST FAN STATUS	X	X					
SMOKE DETECTORS	X						
SUPPLY AIR TEMP	X						
RTU FACTORY CONTROL/DC INTERFACE FOR COMPRESSOR CONTROL	X						
COOLING ENABLE	X						
COMP FAN STATUS	X						
COMP FAN ALARM	X						
COMP FAN STATUS	X						
EXHAUST FAN SWITC	X						
SUPPLY FAN SWITC	X						



ARCHITECTURE PLUS

SHEET CONTENTS

MECHANICAL CONTROL DIAGRAMS

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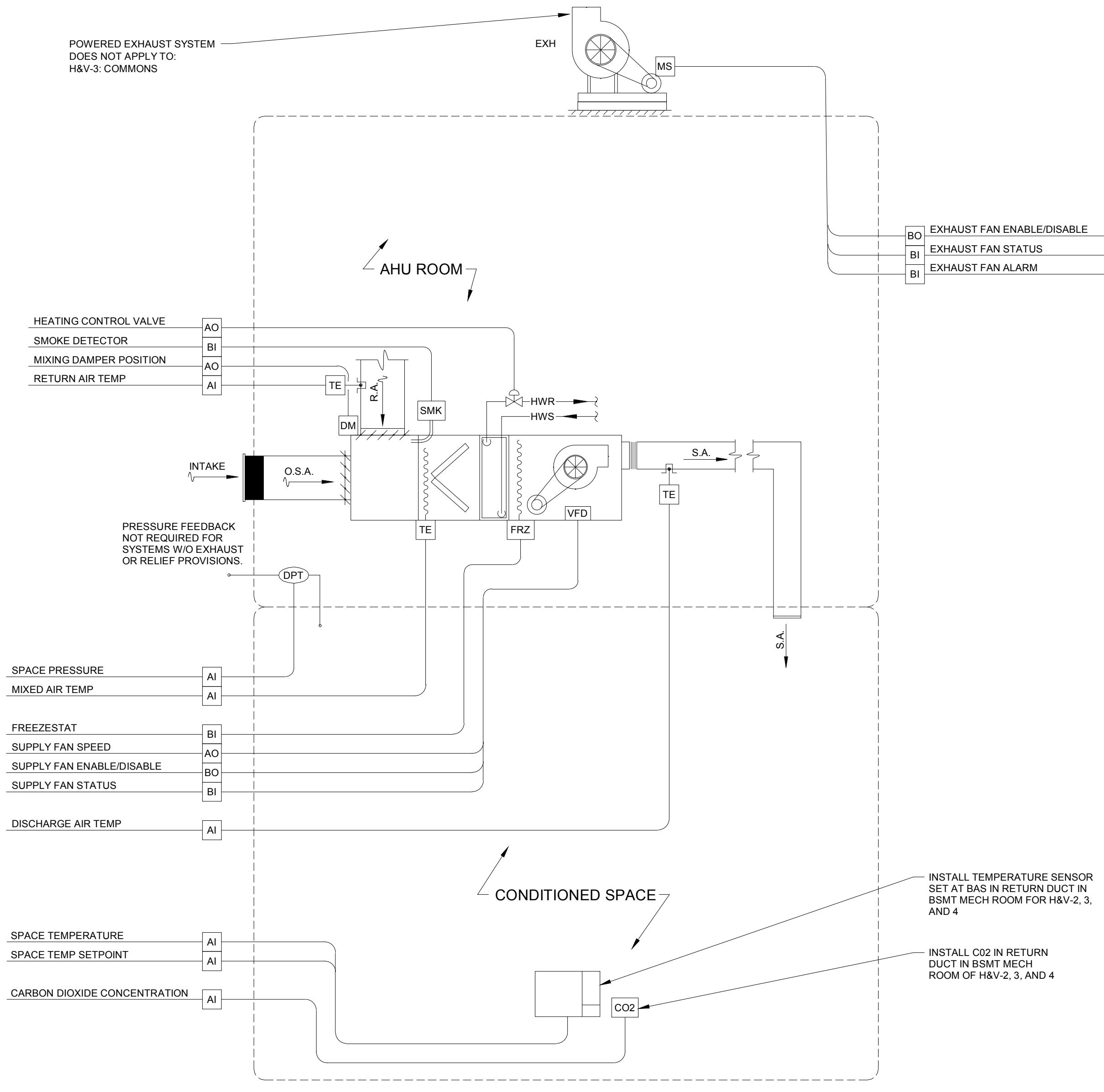
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SYSTEM POINTS LIST -- VAV SINGLE ZONE HEATING AND VENTILATING AIR HANDLING UNIT						
SYSTEM POINT DESCRIPTION	ANALOG		BINARY		SYSTEM FEATURE	
	INPUT	OUTPUT	INPUT	OUTPUT	ALARMS	PROGRAMS
DISCHARGE AIR TEMP	X					
DISCHARGE AIR TEMP SETPOINT		X				
MIXING DAMPERS	X	X			X	
MIXED AIR TEMP	X				X	
RETURN AIR TEMP	X				X	
HOT WATER VLV	X		X		X	
FREEZE/STAT	X				X	
SUPPLY FAN VFD	X		X		X	
SUPPLY FAN VFD STATUS	X	X			X	
EXHAUST FAN VFD	X		X		X	
EXHAUST FAN VFD STATUS	X	X			X	
SMOKE DETECTOR	X		X		X	
MIXING DAMPER POSITION	X		X		X	
SPACE PRESSURE	X		X		X	
SPACE TEMP	X		X		X	
SPACE TEMP SETPOINT		X			X	
DISCHARGE AIR TEMP SETPOINT		X			X	
GENERAL NOTES:						

OVERVIEW:
 SINGLE ZONE HEATING ONLY VARIABLE VOLUME UNIT WITH MIXING BOX
 - POWERED RELIEF (EXCEPT HV-3)
 - DEMAND CONTROLLED VENTILATION
 - NIGHT VENT COOLING
 - MORNING WARMUP
 - ECONOMIZER COOLING

APPLIES TO:
 HV-4 & EF-23, 24, 25 - AUDITORIUM
 HV-2 & EF - GYMNASIUM 400
 HV-3 - COMMONS

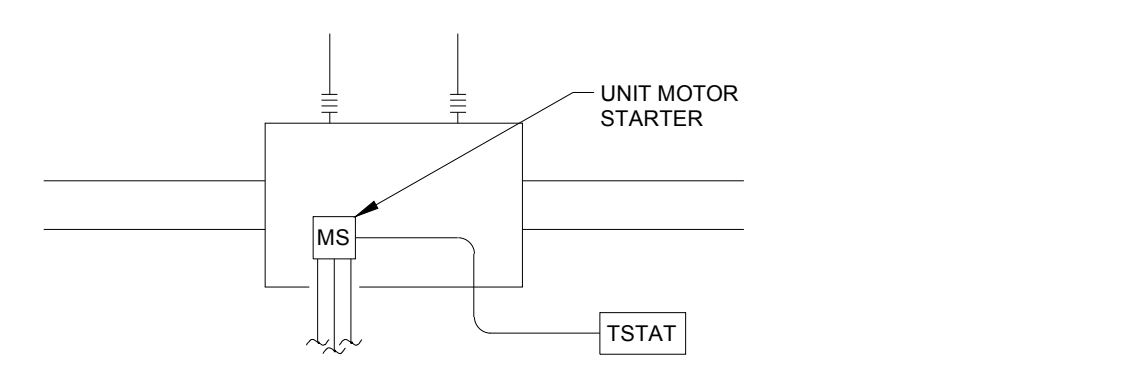


1 INDOOR H&V SINGLE ZONE VAV CONTROLS
 NONE

SEQUENCE OF OPERATION:
 KITCHEN DOMESTIC HOT WATER CIRCULATION PUMP, EXISTING IN WATER HEATER CLOSET WHERE NEW WH-1 SHALL BE INSTALLED. REFER TO FLOOR PLANS

SCHEDULING:
 THE PUMP SHALL BE SCHEDULED THROUGH THE BAS SYSTEM TO RUN DURING OCCUPIED MODE AND BE OFF IN UNOCCUPIED MODE. COORDINATE WITH OWNER FOR KITCHEN STAFF OCCUPANCY HOURS AND DAYS

2 DOMESTIC HOT WATER PUMP OCCUPIED/UNOCCUPIED
 NONE



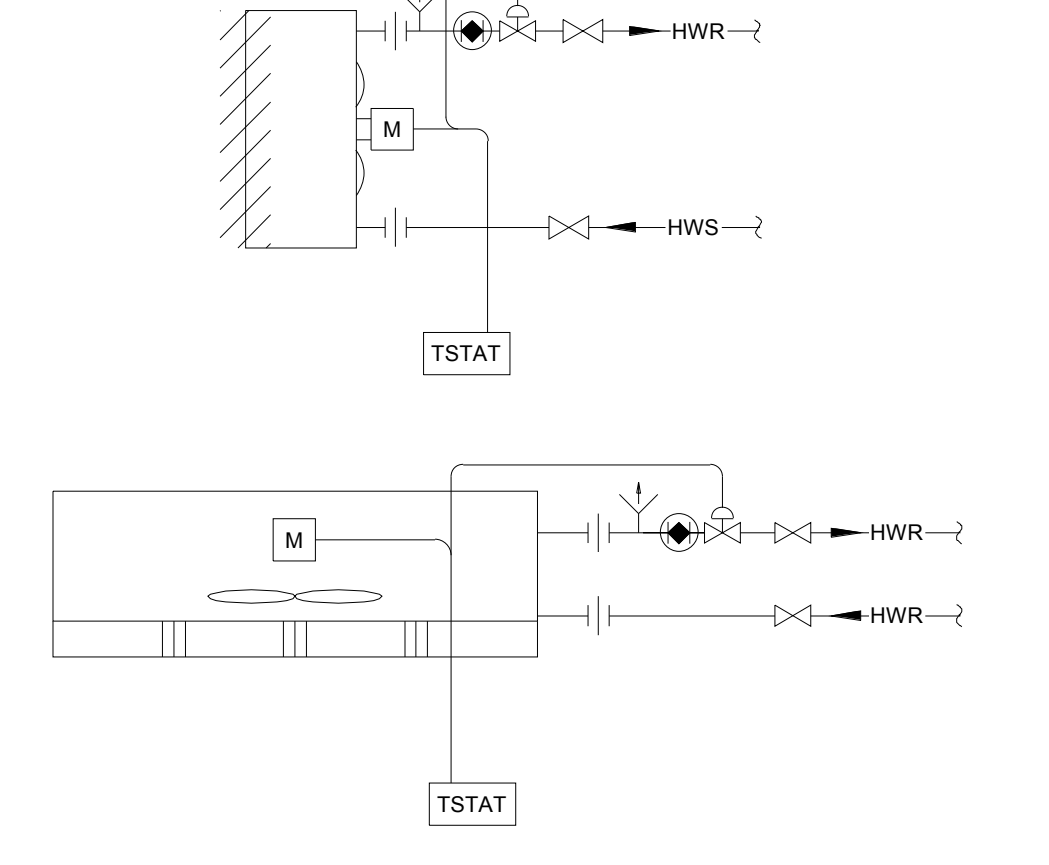
SEQUENCE PERTAINS TO THE FOLLOWING EXHAUST FANS, WHICH ARE NOT INTENDED TO BE ON THE DDC SYSTEM:
 EXH FANS SERVING ELECTRICAL ROOM

EXHAUST FANS SHALL BE CONTROLLED BY INDIVIDUAL SPACE MOUNTED COOLING THERMOSTAT SET AT 80°F (ADJ). UPON A RISE IN SPACE TEMPERATURE ABOVE SETPOINT PLUS DIFFERENTIAL, EXHAUST FANS SHALL ENABLE. CONVERSELY, UPON A DECREASE IN SPACE TEMPERATURE BELOW SETPOINT PLUS DIFFERENTIAL, EXHAUST FANS SHALL DISABLE.

3 EXHAUST FAN THERMOSTAT CONTROL SCHEMATIC
 NONE

SYSTEM POINTS LIST -- EXHAUST FANS OCCUPIED/UNOCCUPIED						
SYSTEM POINT DESCRIPTION	ANALOG		BINARY		SYSTEM FEATURE	
	INPUT	OUTPUT	INPUT	OUTPUT	ALARMS	PROGRAMS
FAN ENABLE/DISABLE	X					
FAN STATUS		X				
FAN ALARM			X		X	
GENERAL NOTES:						

4 EXHAUST FAN OCCUPIED/UNOCCUPIED CONTROL SCHEMATIC
 NONE

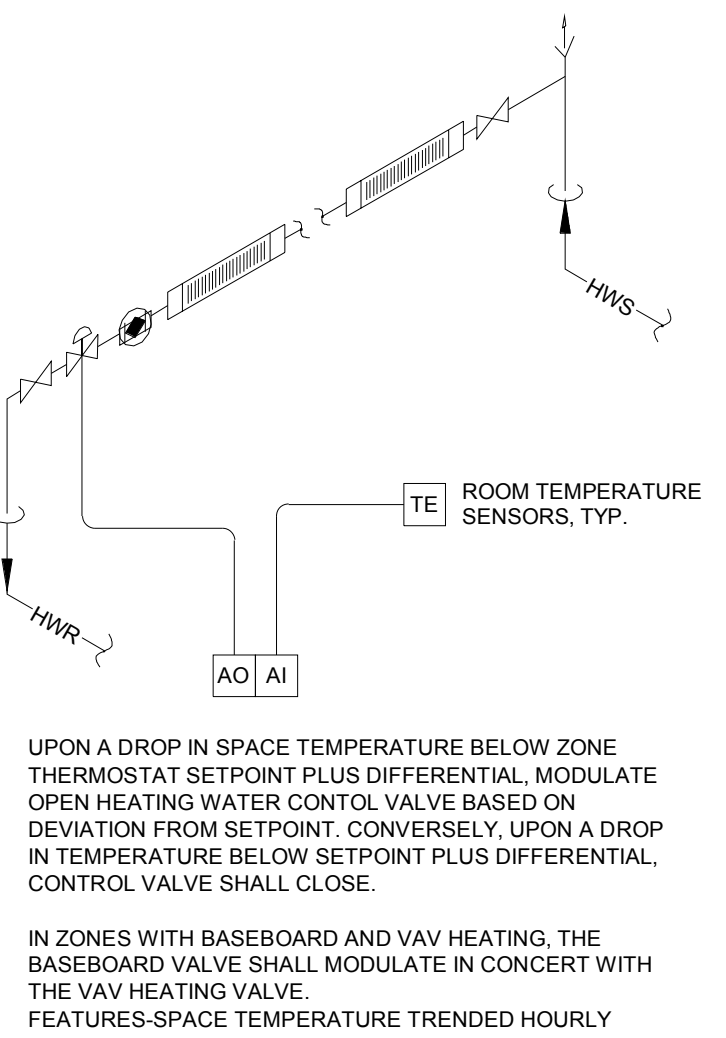


UPON A DROP IN TEMPERATURE BELOW SETPOINT PLUS DIFFERENTIAL, FAN SHALL ENERGIZE AND HEATING WATER CONTROL VALVE SHALL OPEN. CONVERSELY, UPON A RISE IN TEMPERATURE ABOVE SETPOINT PLUS DIFFERENTIAL, FAN SHALL BE DE-ENERGIZED AND HEATING WATER CONTROL VALVE SHALL CLOSE.

CABINET UNIT HEATERS AND UNIT HEATERS ARE NOT INTENDED TO BE ON THE DDC SYSTEM.

5 CUH AND UH CONTROL SCHEMATIC
 NONE

OVERVIEW:
 REFER TO EXISTING MECHANICAL PLANS FOR LOCATIONS OF EXISTING BASEBOARD HEATERS TO REMAIN TO RECEIVE NEW DDC CONTROL VALVE AND INTERFACE WITH NEW VAV BOXES OR BE STAND ALONE.



UPON A DROP IN SPACE TEMPERATURE BELOW ZONE THERMOSTAT SETPOINT PLUS DIFFERENTIAL, MODULATE OPEN HEATING WATER CONTROL VALVE BASED ON DEVIATION FROM SETPOINT. CONVERSELY, UPON A DROP IN TEMPERATURE BELOW SETPOINT PLUS DIFFERENTIAL, CONTROL VALVE SHALL CLOSE.

IN ZONES WITH BASEBOARD AND VAV HEATING, THE BASEBOARD VALVE SHALL MODULATE IN CONCERT WITH THE VAV HEATING VALVE.
 FEATURES-SPACE TEMPERATURE TRENDED HOURLY

6 BASEBOARD HEATING CONTROL
 NONE

OVERVIEW:
 REFER TO EXISTING AND NEW MECHANICAL PLANS FOR LOCATIONS OF EXISTING BASEBOARD HEATERS TO REMAIN TO RECEIVE NEW DDC CONTROL VALVE AND INTERFACE WITH NEW VAV BOXES OR BE STAND ALONE.

SEQUENCE OF CONTROL: SINGLE ZONE VAV, HEATING AND VENTILATION ONLY

DESCRIPTION - THE SYSTEM CONSISTS OF AN EXISTING AIR HANDLING UNIT COMPLETE WITH MIXING BOX, FILTER SECTION, HOT WATER COIL, AND SUPPLY FAN TO BE PROVIDED WITH NEW MOTOR AND VARIABLE FREQUENCY DRIVE. SEPARATE EXHAUST FAN SERVES BUILDING PRESSURE RELIEF. CONTRACTOR TO VERIFY ALL EXISTING EXHAUST FANS WITHIN PROJECT ARE CONTROLLED AND NOTIFY ENGINEER IMMEDIATELY IF UNCONTROLLED FANS ARE FOUND. DAMPERS, CONTROL VALVES, AND THEIR ACTUATORS, AS WELL AS ALL OTHER CONTROLS REQUIRED SHALL BE NEW EQUIPMENT FURNISHED AND INSTALLED BY THE TEMPERATURE CONTROLS CONTRACTOR.

SCHEDULING - OCCUPIED/UNOCCUPIED SCHEDULING APPLIES TO THESE SYSTEMS SCHEDULES TO BE DETERMINED BY OWNER AND SHALL BE AVAILABLE THROUGH THE OPERATOR WORKSTATION INTERFACE.

SCHEDULING CONTROLS SPACE SETPOINT TEMPERATURE, DURING OCCUPIED MODE, AHU SHALL MAINTAIN SPACE TEMPERATURE AT SETPOINT DICTATED BY SPACE MOUNTED THERMOSTAT (I.E. 68-72°F HEATING, 76-80°F COOLING). DURING UNOCCUPIED MODE, AHU SHALL MAINTAIN SPACE TEMPERATURE AT SETBACK TEMPERATURE SETPOINT (I.E. 60°F HEATING, 54°F COOLING UNLESS MORNING COOL-DOWN IS ENABLED, FURTHER DESCRIPTION BELOW)

OCCUPIED/UNOCCUPIED SCHEDULING ALSO CONTROLS VENTILATION, WHEN SCHEDULED IN THE OCCUPIED MODE, SUPPLY FAN SHALL OPERATE AND CONTROLLED DEVICES SHALL POSITION WITH RESPECT TO THEIR P CONTROL LOOP. WHEN SCHEDULED IN THE UNOCCUPIED MODE, FANS SHALL BE SHUT-OFF. RETURN DAMPER FULL OPEN, OUTSIDE AIR DAMPERS CLOSED, AND HEATING WATER VALVE SHALL BE 100% OPEN. SUPPLY FAN SHALL BE PERMITTED TO OPERATE ON DEMAND FOR HEATING.

MORNING WARM-UP: MORNING WARM-UP SHALL BE BASED ON OPTIMUM START PROGRAMMING. SUPPLY FAN VFD SHALL CONTROL OFF STATIC PRESSURE. ALL VAV BOXES SHALL GO FULL OPEN. VAV BOX HEATING CONTROL VALVE SHALL BE OPEN. AIR HANDLING UNIT SHALL SUPPLY 70% (ADJ) AIR TO VAV BOXES. DA DAMPER SHALL BE CLOSED, RA DAMPER SHALL BE OPEN AS EACH VAV BOX ZONE REACHES OCCUPIED SETPOINT THE VAV BOX HEATING COIL SHALL CLOSE AND THE VAV BOX AIRFLOW SHALL GO TO MINIMUM POSITION. MORNING WARMUP DISABLE/ENABLE SHALL BE ON GRAPHICS. TIME OF MORNING LIMIT SHALL ALSO BE ON GRAPHICS.

MORNING WARM-UP: MORNING WARM-UP SHALL BE BASED ON OPTIMUM START PROGRAMMING DURING MORNING WARMUP. SUPPLY FAN VFD SHALL BE AT MAXIMUM SPEED (AS DETERMINED BY BALANCE CONTRACTOR). AIR HANDLING UNIT SHALL SUPPLY 80°F (ADJ) AIR. OSA DAMPER SHALL BE CLOSED. RA DAMPER SHALL BE OPEN. ZONE REACHES OCCUPIED SETPOINT, THE AHU HEATING COIL CONTROL VALVE SHALL CLOSE AND THE AHU FAN SPEED SHALL GO TO MINIMUM. MORNING WARMUP DISABLE/ENABLE SHALL BE ON GRAPHICS. TIME OF MORNING LIMIT SHALL ALSO BE ON GRAPHICS.

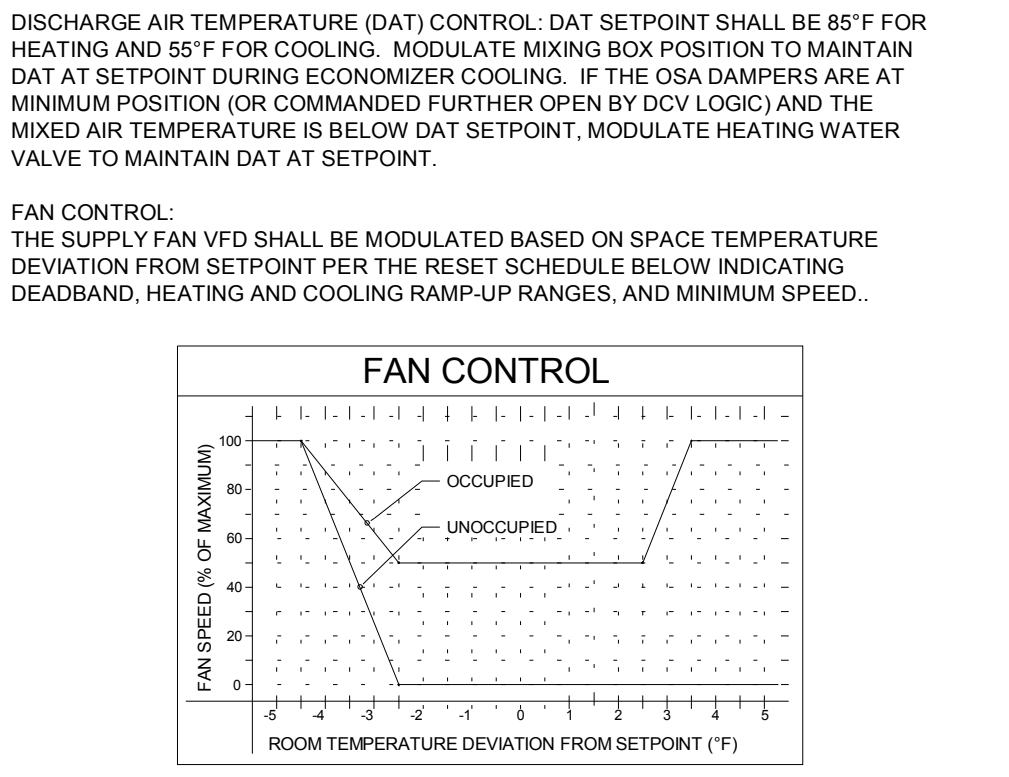
MORNING COOLDOWN: SHALL BE BASED UPON TRENDED DATA COLLECTED OVER THE PREVIOUS 7 DAYS (ADJ) TO DETERMINE WHETHER OR NOT MORNING COOLDOWN IS WARRANTED. MORNING COOLDOWN SHALL BE DEEMED WARRANTED IF:

1. DEMAND FOR COOLING OCCURRED ON THE MAJORITY OF THE DAYS IN PREVIOUS PERIOD POLLED.
2. -OR- DAILY MAXIMUM OUTSIDE AIR TEMPERATURE EXCEEDED SPACE TEMPERATURE SETPOINT FOR A MAJORITY OF THE DAYS IN THE PREVIOUS PERIOD POLLED.

WHEN DEEMED WARRANTED, MORNING COOLDOWN SHALL BE EXECUTED IN LIEU OF MORNING WARM-UP ROUTINE. THE MORNING COOLDOWN ROUTINE SHALL BE SCHEDULED TO OCCUR PRIOR TO OCCUPANCY. PROVIDE ADJUSTABLE DURATION TO PERMIT BUILDING OPERATOR TO TUNE TIME PERIOD REQUIRED TO FULLY EXECUTE COOLDOWN EXERCISE PRIOR TO OCCUPANCY. DURING MORNING COOLDOWN, HEATING WATER VALVE SHALL BE CLOSED AND BAS SHALL MODULATE MIXING BOX POSITION TO ACHIEVE COOLING DISCHARGE AIR TEMPERATURE. SUPPLY FAN SHALL STOP AND OSA DAMPER SHALL SHUT ONCE THE SPACE TEMPERATURE REACHES THE MORNING COOLDOWN SETPOINT (USER ADJ 60°F TO 68°F). MORNING COOLDOWN DISABLE/ENABLE SHALL BE ON GRAPHICS.

MIXED AIR CONTROL: MIXING BOX CONTROL IS CONTROLLED BY MULTIPLE CONTROL LOOPS. BCS SHALL HIGH SELECT CONTROL POSITION AMONGST THE FOLLOWING LOOPS:

- OCCUPIED/UNOCCUPIED: DAMPER CLOSED DURING UNOCCUPIED AND OPEN TO MINIMUM POSITION DURING OCCUPIED. MINIMUM OUTSIDE AIR POSITIONS SHALL NOT BE LESS THAN 10% OSA DURING OCCUPIED PERIODS.
- MIXED AIR TEMPERATURE CONTROL LOOP: WHEN OUTSIDE AIR TEMPERATURE FALLS BELOW DISCHARGE AIR SETPOINT BY 2 DEGREE, MIXING DAMPERS SHALL MODULATE TO MAINTAIN DISCHARGE AIR TEMPERATURE AT SETPOINT.
- DEMAND CONTROLLED VENTILATION LOOP: CARBON DIOXIDE LEVEL SHALL BE MONITORED TO MODULATE OUTSIDE AIR DAMPERS TO MAINTAIN CARBON DIOXIDE LEVELS AT SETPOINT (800 PPM ABOVE THE OUTDOOR REFERENCE POINT).
- ECONOMIZER CONTROL LOOP: OPEN OUTSIDE AIR DAMPER, CLOSE RETURN AIR DAMPER DURING ECONOMIZER MODE. COOLING IS VIA ECONOMIZER MODE ONLY, DISABLE ECONOMIZER COOLING WHEN OUTSIDE AIR TEMPERATURES ARE GREATER THAN INDOOR SPACE TEMPERATURE SETPOINT.



RELIEF SYSTEMS CONTROL: THE BUILDING RELIEF SYSTEMS SHALL BE CONTROLLED BASED ON SPACE PRESSURE REFERENCED AGAINST OUTSIDE AIR PRESSURE. VALUES INDICATED BELOW ARE DIFFERENTIAL PRESSURES BETWEEN THE TWO MEASUREMENTS.

EXISTING HV-2: EXISTING EXHAUST FAN IS LOCATED IN THE TRIANGULAR STRUCTURE UP HIGH IN THE ORIGINAL 1962 GYM, GYMNASIUM 400. ACCORDING TO PSD MAINTENANCE PERSONNEL IT IS ON NORTH SIDE OF THE GYM NEAR GRS 18-19. FAN SHALL BE INTERLOCKED TO RUN WHEN HV-2 OSA DAMPER IS 100% OPEN. UPDATE (E) PNEUMATICS TO DDC CONTROL COORDINATE WITH PSD FOR ACCESS TO FAN.

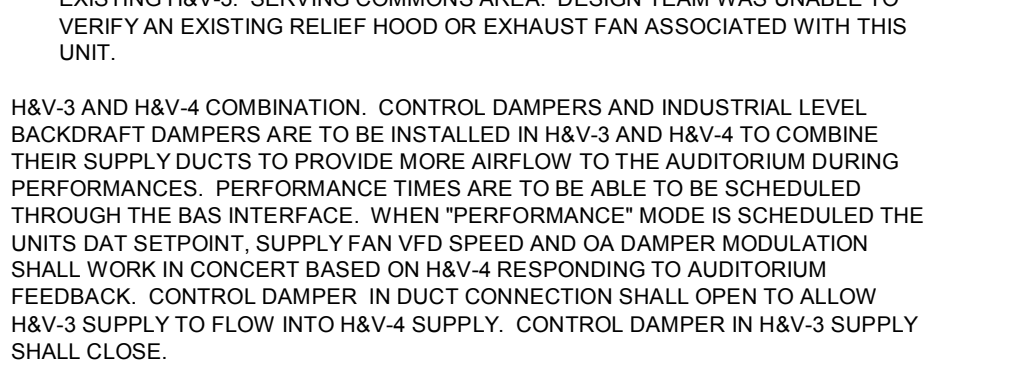
EXISTING HV-4: UNIT SERVES AUDITORIUM. THREE NEW EXHAUST FANS ARE BEING INSTALLED, EF-23, 24, AND 25. THESE SHALL STAGE ON IN CORRELATION WITH OSA DAMPER POSITION CONTROLS CONTRACTOR, TAB CONTRACTOR AND COMMISSIONING AGENT TO DETERMINE STAGING VERSUS POSITION IN FIELD. LEAD EF SHALL ROTATE WEEKLY.

EXISTING HV-3: SERVING COMMONS AREA. DESIGN TEAM WAS UNABLE TO VERIFY AN EXISTING RELIEF HOOD OR EXHAUST FAN ASSOCIATED WITH THIS UNIT.

EXISTING HV-3 AND HV-4 COMBINATION: CONTROL DAMPERS AND INDUSTRIAL LEVEL BACKDRAFT DAMPERS ARE TO BE INSTALLED IN HV-3 AND HV-4 TO COMBINE THEIR SUPPLY DUCTS TO PROVIDE MORE AIRFLOW TO THE AUDITORIUM DURING PERFORMANCES. PERFORMANCE TIMES ARE TO BE ABLE TO BE SCHEDULED THROUGH THE BAS INTERFACE. WHEN 'PERFORMANCE' MODE IS SCHEDULED THE UNITS DAT SETPOINT, SUPPLY FAN VFD SPEED AND OSA DAMPER MODULATION SHALL WORK IN CONCERT BASED ON HV-4 RESPONDING TO AUDITORIUM FEEDBACK. CONTROL DAMPER IN DUCT CONNECTION SHALL OPEN TO ALLOW HV-3 SUPPLY TO FLOW INTO HV-4 SUPPLY. CONTROL DAMPER IN HV-3 SUPPLY SHALL CLOSE.

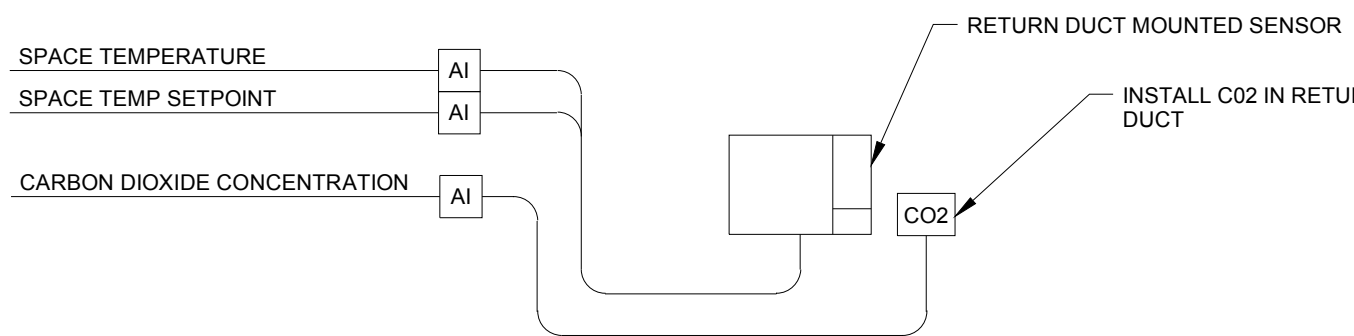
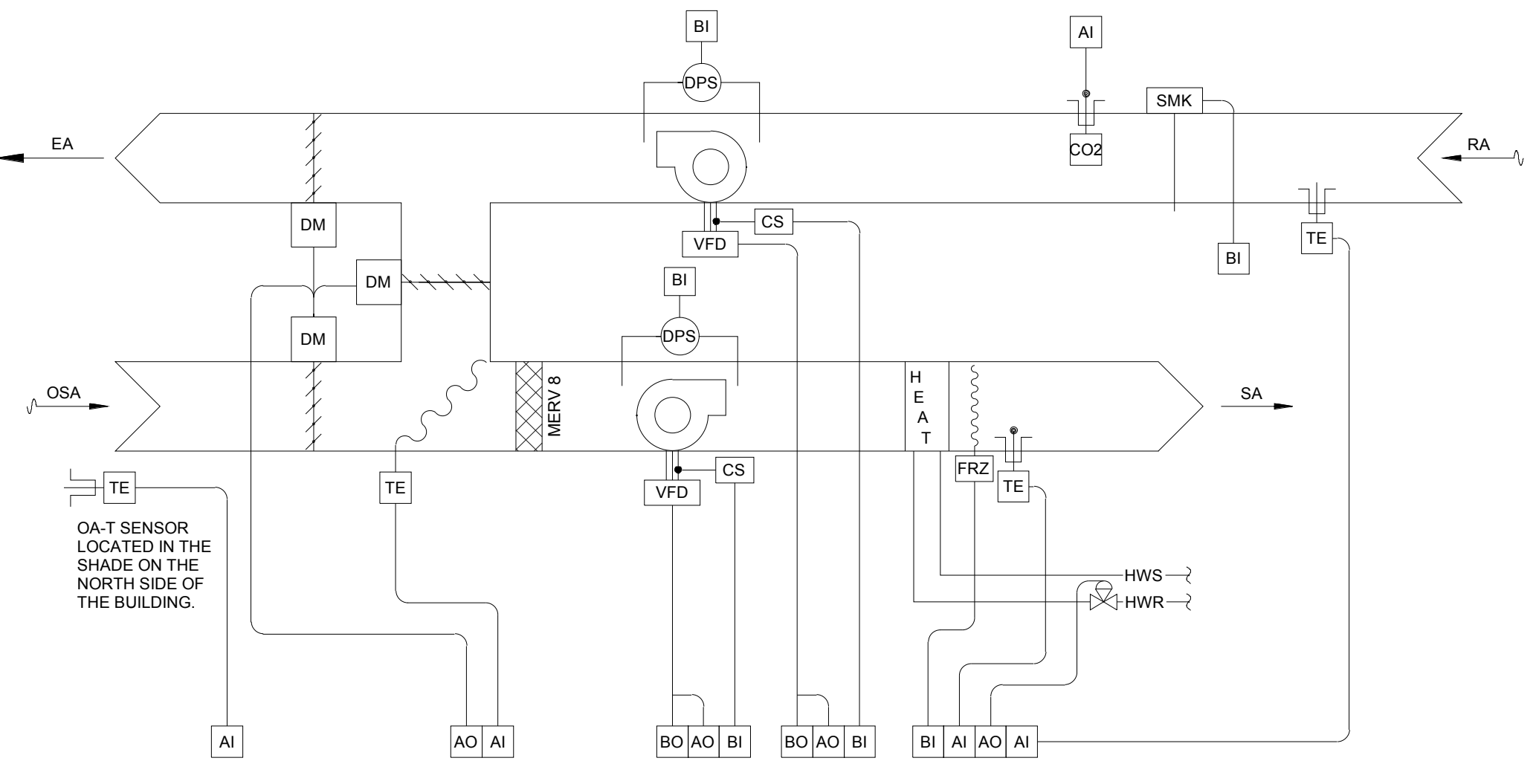
FEATURES -

1. DISCHARGE AIR TEMPERATURE SHALL BE TRENDED HOURLY.
2. GENERATE AN ALARM SHOULD DISCHARGE AIR TEMPERATURE STRAY BELOW DISCHARGE AIR TEMPERATURE SETPOINT BY 2 DEG OR MORE.
3. GENERATE AN ALARM SHOULD ANY FAN STATUS NOT MATCH FAN COMMAND.
4. GENERATE AN ALARM AND OPEN HEATING VALVE TO 100% SHOULD FREEZE-STAT TRIP AND DAMPERS SHALL GO TO UNOCCUPIED MODE POSITION.
5. GENERATE AN ALARM SHOULD SMOKE DETECTOR TRIP AND SHUT UNIT DOWN. VALVES AND DAMPERS SHALL GO TO UNOCCUPIED MODE.
6. HOURLY TRENDED ITEMS INDICATED IN THE POINTS LIST TO BE TRENDED. STORE DATA FOR 1 YEAR PRIOR TO PURGING.
7. GENERATE ALARMS AS INDICATED IN THE POINTS LIST AND IN THE SEQUENCE OF CONTROL ABOVE.



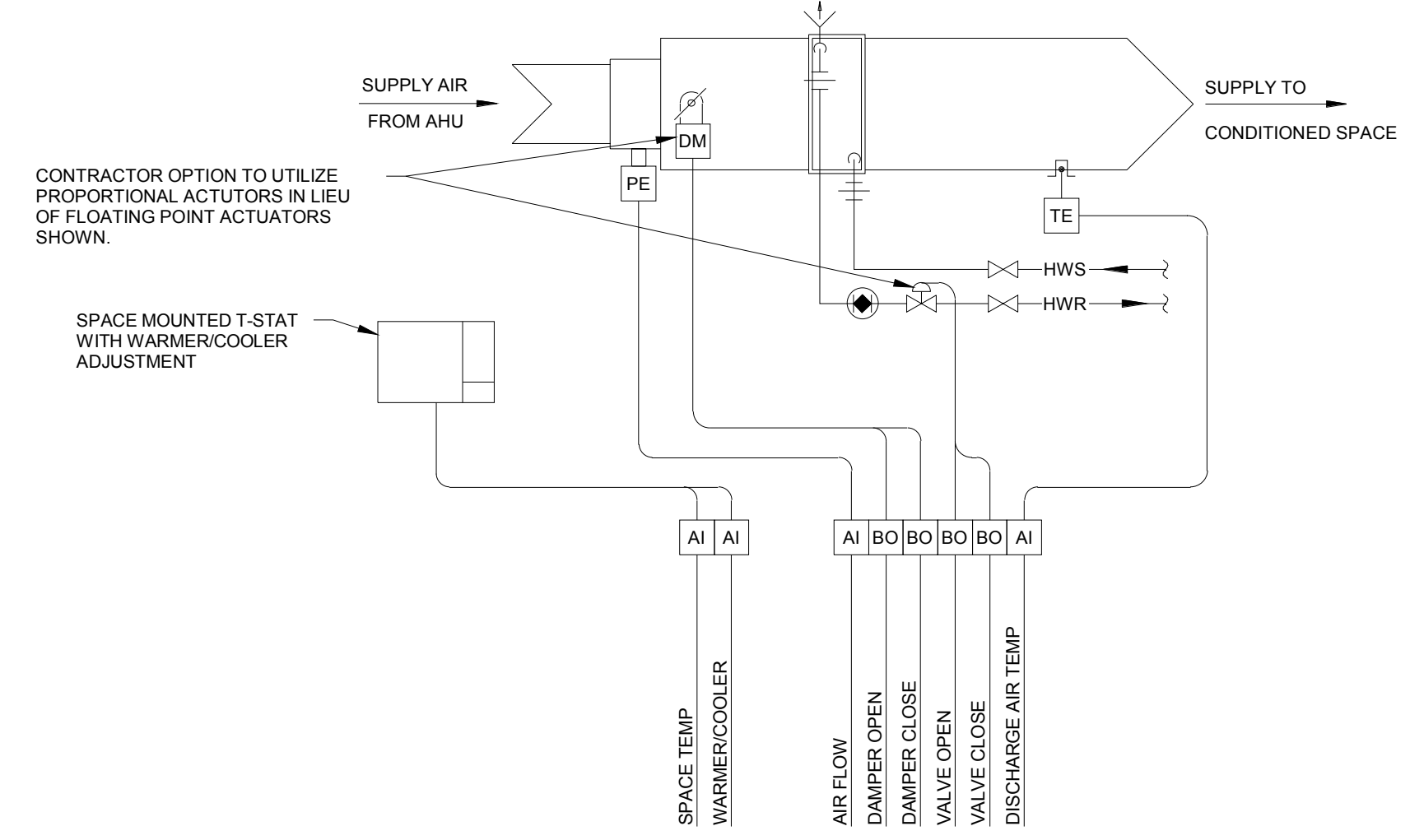
DCV CONTROL:

SYSTEM POINTS LIST - VAV SINGLE ZONE HEATING AND VENTILATING AIR HANDLING UNIT						
SYSTEM POINT DESCRIPTION	ANALOG		BINARY		SYSTEM FEATURE	
	INPUT	OUTPUT	INPUT	OUTPUT	ALARMS	PROGRAMS
RETURN AIR CO2	X					
OUTSIDE TEMP	X					
MIXING DAMPERS	X	X				
MIXED AIR TEMP	X					
RETURN AIR TEMP	X					
HOT WATER VLV	X					
FREESTAT	X					
SUPPLY FAN SB	X		X			
SUPPLY FAN VFD	X		X			
SUPPLY FAN STATUS	X					
RETURN FAN SB	X		X			
RETURN FAN VFD	X		X			
RETURN FAN STATUS	X					
SMOKE DETECTORS	X		X			
SUPPLY AIR TEMP	X					
SPACE PRESSURE	X	X				
SPACE CO2	X					
SPACE TEMP	X	X				
SPACE TEMP SETPOINT	X					
SUPPLY FAN OF SWITCH	X		X			
RETURN FAN OF SWITCH	X		X			
COOLING ENABLE	X					
WARMUP ENABLE	X					
GENERAL NOTES:						



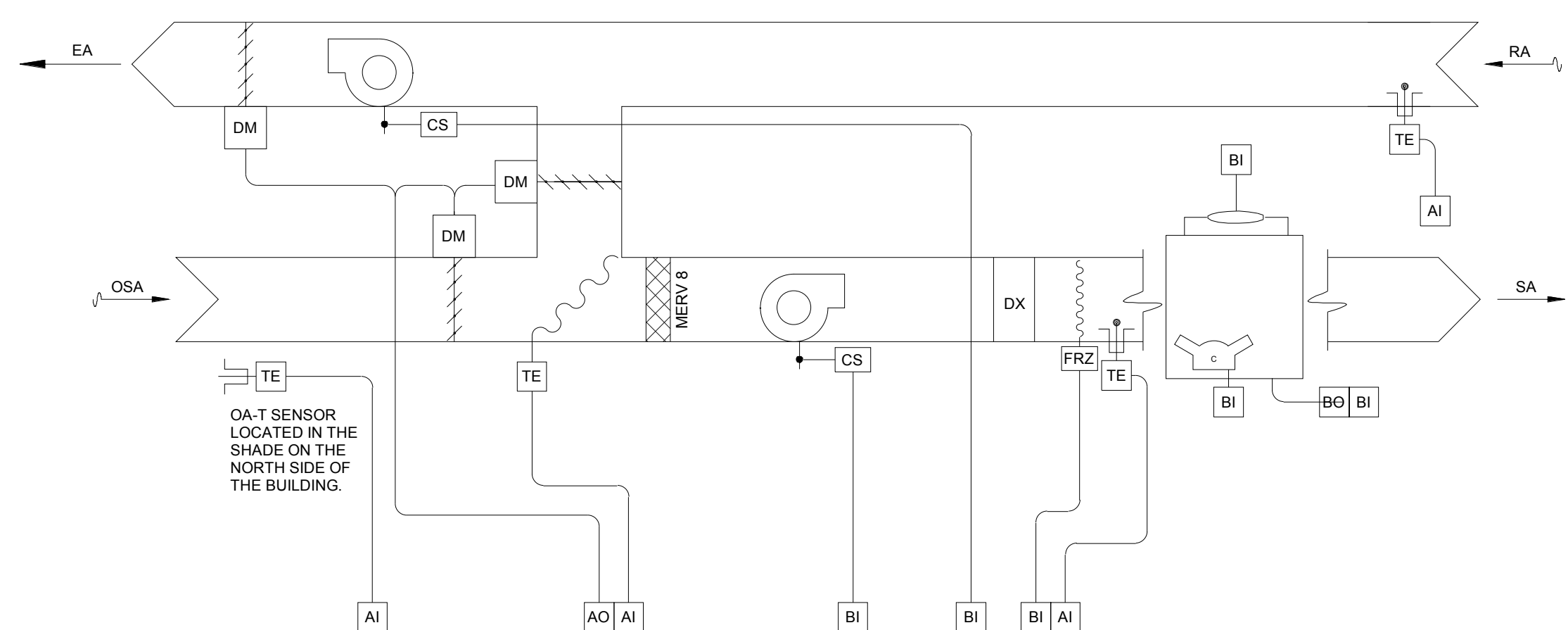
1 VAV SINGLE ZONE HEATING AND VENTILATING CONTROLS SCHEMATIC NONE

SYSTEM POINTS LIST - VAV BOX WITH HW REHEAT						
SYSTEM POINT DESCRIPTION	ANALOG		BINARY		SYSTEM FEATURE	
	INPUT	OUTPUT	INPUT	OUTPUT	ALARMS	PROGRAMS
SPACE TEMP	X					
WARMECOOLER	X					
AIRFLOW	X					
DAMPER OPEN	X					
DAMPER CLOSE	X					
VALVE OPEN	X					
VALVE CLOSE	X					
DISCHD AIR TEMP	X					
GENERAL NOTES:						



2 VAV w/ REHEAT (NEW TERMINAL BOX) CONTROLS NONE

SYSTEM POINTS LIST - CV COOLING ONLY ROOFTOP UNIT						
SYSTEM POINT DESCRIPTION	ANALOG		BINARY		SYSTEM FEATURE	
	INPUT	OUTPUT	INPUT	OUTPUT	ALARMS	PROGRAMS
OUTSIDE TEMP	X					
MIXING DAMPERS	X					
MIXED AIR TEMP	X					
RETURN AIR TEMP	X					
FREESTAT	X					
SUPPLY FAN STATUS	X		X			
SPACE TEMP	X					
SPACE TEMP SETPOINT	X					
EXHAUST FAN STATUS	X		X			
SUPPLY AIR TEMP	X					
RTU FACTORY CONTROL/DCI INTERFACE FOR COMPRESSOR CONTROL	X					
COOLING ENABLE	X		X			
COMP # STATUS	X		X			
COMP# ALARM	X		X			
COMP# FAN # STATUS	X		X			
GENERAL NOTES:						



3 CV SINGLE ZONE COOLING ONLY PACKAGED RTU CONTROLS SCHEMATIC NONE

SEQUENCE OF CONTROL: SINGLE ZONE VAV ROOFTOP, HEATING AND VENTILATION ONLY

DESCRIPTION - THE SYSTEM CONSISTS OF AN AIR HANDLING UNIT COMPLETE WITH MIXING BOX, FILTER SECTION, HOT WATER COIL, SUPPLY FAN WITH VARIABLE FREQUENCY DRIVE AND AN EXHAUST RETURN FAN WITH VARIABLE FREQUENCY DRIVE.

CONTROL SEQUENCE APPLIES TO NEW RTUS 10 AND 11 AND EXISTING RTU-21. ALL SERVING CYMBASUUM TYPE OCCUPANCIES.

SCHEDULING - OCCUPIED/UNOCCUPIED SCHEDULING APPLIES TO THESE SYSTEMS. SCHEDULES TO BE DETERMINED BY OWNER AND SHALL BE AVAILABLE THROUGH THE OPERATOR WORKSTATION INTERFACE.

SCHEDULING CONTROLS SPACE SETPOINT TEMPERATURE. DURING OCCUPIED MODE, AHU SHALL MAINTAIN SPACE TEMPERATURE AT SETPOINT DICTATED BY SPACE MOUNTED THERMOSTAT (I.E. 68-72°F HEATING, 74-76°F COOLING). DURING UNOCCUPIED MODE, AHU SHALL MAINTAIN SPACE TEMPERATURE AT SETBACK TEMPERATURE SETPOINT (I.E. 60°F HEATING, N/A COOLING UNLESS MORNING COOL-DOWN IS ENABLED, FURTHER DESCRIPTION BELOW).

OCCUPIED/UNOCCUPIED SCHEDULING ALSO CONTROLS VENTILATION. WHEN SCHEDULED IN THE OCCUPIED MODE, SUPPLY FAN SHALL OPERATE AND CONTROLLED DEVICES SHALL POSITION WITH RESPECT TO THEIR PI CONTROL LOOP. WHEN SCHEDULED IN THE UNOCCUPIED MODE, FANS SHALL BE SHUT-OFF, RETURN DAMPERS FULL OPEN, RELIEF AND OUTSIDE AIR DAMPERS CLOSED, AND HEATING WATER VALVE SHALL BE 100% OPEN. SUPPLY FAN SHALL BE PERMITTED TO OPERATE ON DEMAND FOR HEATING.

MORNING WARM-UP - SHALL BE SCHEDULED TO OCCUR PRIOR TO OCCUPANCY. PROVIDE ADJUSTABLE DURATION TO PERMIT BUILDING OPERATOR TO TUNE TIME PERIOD REQUIRED TO FULLY EXECUTE WARM UP EXERCISES PRIOR TO OCCUPANCY. DURING MORNING WARM-UP, SUPPLY FAN VFD SHALL BE AT MAXIMUM SPEED (AS DETERMINED BY BALANCE CONTRACTOR). AIR HANDLING UNIT SHALL SUPPLY 85°F (ADJ) AIR. OSA DAMPER SHALL BE CLOSED, RA DAMPER SHALL BE OPEN, RETURN FAN SHALL AT MINIMUM SPEED. AS ZONE REACHES OCCUPIED SETPOINT, THE AHU HEATING COIL CONTROL VALVE SHALL CLOSE AND THE AHU SUPPLY FAN SPEED SHALL GO TO MINIMUM. MORNING WARM-UP SHALL BE ABLE TO BE DISABLED/VIA GRAPHICS.

MORNING COOL-DOWN SHALL BE BASED UPON TREND DATA COLLECTED OVER THE PREVIOUS 7 DAYS (ADJ) TO DETERMINE WHETHER OR NOT MORNING COOL-DOWN IS WARRANTED. MORNING COOL-DOWN SHALL BE DEEMED WARRANTED IF:

1. DEMAND FOR COOLING OCCURRED ON THE MAJORITY OF THE DAYS IN PREVIOUS PERIOD POLLED.
2. OR, DAILY MAXIMUM OUTSIDE AIR TEMPERATURE EXCEEDED SPACE TEMPERATURE SETPOINT FOR A MAJORITY OF THE DAYS IN THE PREVIOUS PERIOD POLLED.

WHEN DEEMED WARRANTED, MORNING COOL-DOWN SHALL BE EXECUTED IN LIEU OF MORNING WARM-UP ROUTINE. THE MORNING COOL-DOWN ROUTINE SHALL BE SCHEDULED TO OCCUR PRIOR TO OCCUPANCY. PROVIDE ADJUSTABLE DURATION TO PERMIT BUILDING OPERATOR TO TUNE TIME PERIOD REQUIRED TO FULLY EXECUTE COOL-DOWN EXERCISE PRIOR TO OCCUPANCY. DURING MORNING COOL-DOWN, HEATING WATER VALVE SHALL BE CLOSED AND BCS SHALL MODULATE MIXING BOX POSITION TO ACHIEVE COOLING DISCHARGE AIR TEMPERATURE. SUPPLY FAN SHALL STOP AND OSA DAMPER SHALL SHUT ONCE THE SPACE TEMPERATURE REACHES THE MORNING COOL-DOWN SETPOINT (USER ADJ 60°F TO 68°F). MORNING COOL-DOWN SHALL BE ABLE TO BE DISABLED/ENABLED AT GRAPHICS.

MIXED AIR CONTROL: MIXING BOX CONTROL IS CONTROLLED BY MULTIPLE CONTROL LOOPS. BAS SHALL HIGH SELECT CONTROL POSITION AMONGST THE FOLLOWING LOGIC:

OCCUPIED/UNOCCUPIED: DAMPER CLOSED DURING UNOCCUPIED AND OPEN TO MINIMUM POSITION DURING OCCUPIED. MINIMUM OUTSIDE AIR POSITIONS SHALL NOT BE LESS THAN 10% OSA DURING OCCUPIED PERIODS.

MIXED AIR TEMPERATURE CONTROL LOOP: WHEN OUTSIDE AIR TEMPERATURE FALLS BELOW DISCHARGE AIR SETPOINT BY 2 DEGREE, MIXING DAMPERS SHALL MODULATE TO MAINTAIN DISCHARGE AIR TEMPERATURE AT SETPOINT.

DEMAND CONTROLLED VENTILATION LOOP: CARBON DIOXIDE LEVEL SHALL BE MONITORED TO MODULATE OUTSIDE AIR DAMPERS TO MAINTAIN CARBON DIOXIDE LEVELS AT SETPOINT (500 PPM ABOVE THE OUTDOOR REFERENCE POINT).

CO2 RESET SCHEDULE: OSA DAMPER POSITION SHALL BE RESET BASED ON THE FOLLOWING SCHEDULE. 100 PPM ABOVE OR REFERENCE CO2 LEVEL OSA DAMPERS SHALL BE AT 10% OPEN. 500 PPM ABOVE OR REFERENCE CO2 LEVEL OSA DAMPERS SHALL BE OPEN TO MINIMUM OUTDOOR AIR LISTED IN EQUIPMENT SCHEDULES. CONTROLS CONTRACTOR, TAB CONTRACTOR AND COMMISSIONING AGENT TO VERIFY THIS DAMPER POSITION IN FIELD.

ECONOMIZER CONTROL LOOP: OPEN OUTSIDE AIR DAMPER, CLOSE RETURN AIR DAMPER, AND OPEN RELIEF DAMPER (WHERE APPLICABLE), DURING ECONOMIZER MODE. COOLING IS VIA ECONOMIZER MODE ONLY. DISABLE ECONOMIZER COOLING WHEN OUTSIDE AIR TEMPERATURES ARE GREATER THAN INDOOR SPACE TEMPERATURE SETPOINT.

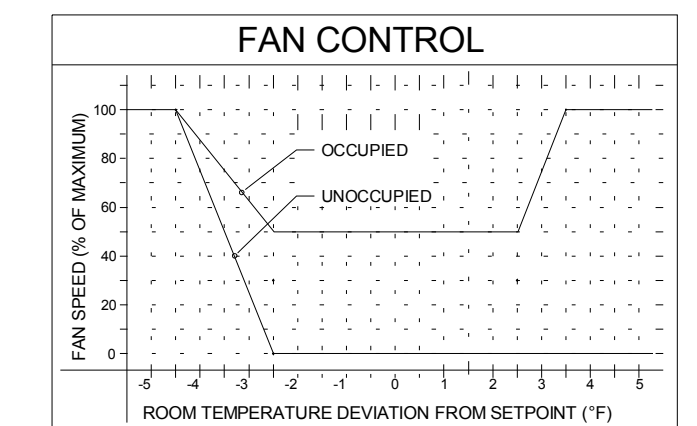
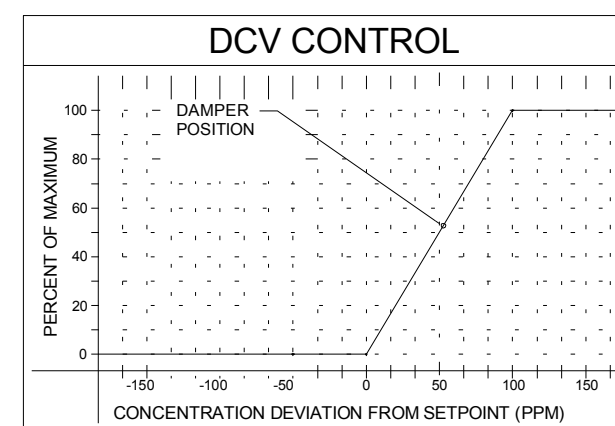
DISCHARGE AIR TEMPERATURE (DAT) CONTROL: DAT SETPOINT SHALL BE 80°F FOR HEATING AND 55°F FOR COOLING. MODULATE MIXING BOX POSITION TO MAINTAIN DAT AT SETPOINT DURING ECONOMIZER COOLING. IF THE OSA DAMPERS ARE AT MINIMUM POSITION (OR COMMANDED FURTHER OPEN BY DCV LOGIC) AND THE MIXED AIR TEMPERATURE IS BELOW DAT SETPOINT, MODULATE HEATING WATER VALVE TO MAINTAIN DAT AT SETPOINT. EXISTING RTU-21 FACE BYPASS DAMPER TO HAVE THE BYPASS LOCKED CLOSED.

FAN CONTROL: THE SUPPLY FAN VFD SHALL BE MODULATED BASED ON SPACE TEMPERATURE DEVIATION FROM SETPOINT PER THE RESET SCHEDULE BELOW INDICATING DEADBAND, HEATING AND COOLING RAMP-UP RANGES, AND MINIMUM SPEED.

RETURN FAN CONTROL: RETURN FAN SHALL TRACK SUPPLY FAN BY A DIFFERENTIAL TO PROVIDE A SLIGHTLY POSITIVE (0.1-0.05") MIXING BOX PRESSURE. TAB CONTRACTOR, CONTROL CONTRACTOR AND COMMISSIONING AGENT TO CREATE A TRACKING CURVE BASED ON SUPPLY FAN SPEED OF 50-100% TO MAINTAIN POSITIVE MIXING BOX THROUGHOUT RANGE.

FREEZE PROTECTION MODE: DURING UNOCCUPIED HOURS IF DAT IS BELOW 40 DEGREES MODULATE HEATING VALVE TO MAINTAIN MAT AT 55 DEGREES.

- FEATURES -
1. DISCHARGE AIR TEMPERATURE SHALL BE TRENDED HOURLY.
 2. GENERATE AN ALARM SHOULD DISCHARGE AIR TEMPERATURE STRAY FROM DISCHARGE AIR TEMPERATURE SETPOINT BY 5 DEG OR MORE WHEN SPACE IS IN HEATING MODE.
 3. GENERATE AN ALARM SHOULD ANY FAN STATUS NOT MATCH FAN COMMAND.
 4. GENERATE AN ALARM AND OPEN HEATING VALVE TO 100% SHOULD FREEZE STAT TRIP AND DAMPERS SHALL GO TO UNOCCUPIED MODE POSITION.
 5. GENERATE AN ALARM SHOULD SMOKE DETECTOR TRIP AND SHUT UNIT DOWN.
 6. VALVES AND DAMPERS SHALL GO TO UNOCCUPIED MODE.
 7. HOURLY TREND ITEMS INDICATED IN THE POINTS LIST TO BE TRENDED. STORE DATA FOR 1 YEAR PRIOR TO PURGING.
 8. GENERATE ALARMS AS INDICATED IN THE POINTS LIST AND IN THE SEQUENCE OF CONTROL ABOVE.



SEQUENCE OF CONTROL: VAV w/ REHEAT

DESCRIPTION - CONSIST OF A PRESSURE INDEPENDENT VARIABLE AIR VOLUME BOX COMPLETE WITH MOTORIZED DAMPER, HOT WATER REHEAT COIL, FLOATING POINT OR PROPORTIONAL CONTROL VALVE, AND AIR FLOW PRESSURE TRANSDUCER.

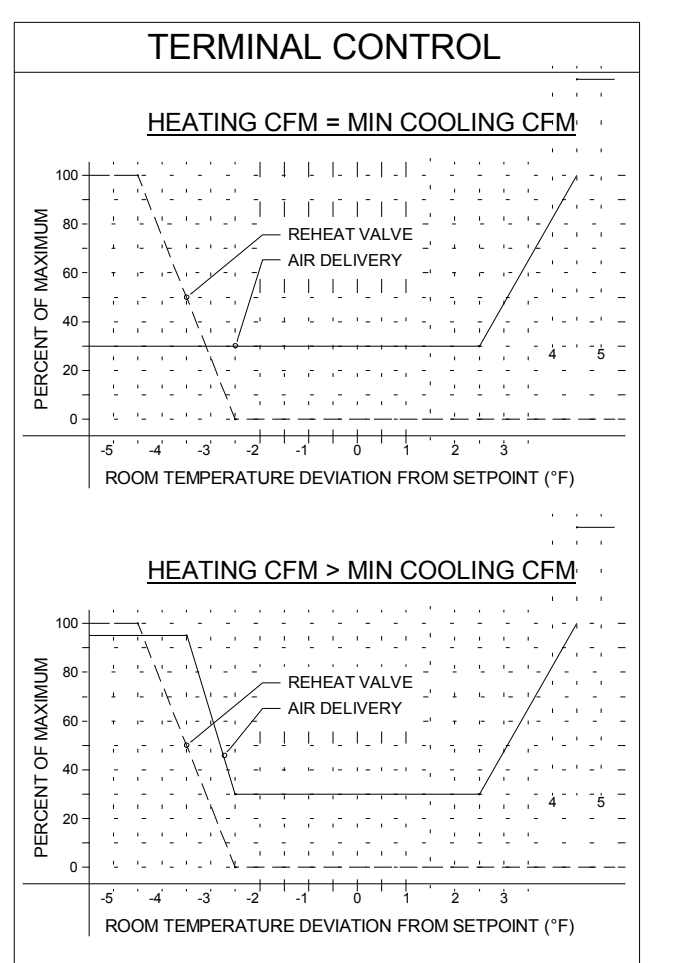
SCHEDULING - OCCUPIED/UNOCCUPIED SCHEDULING APPLIES TO THESE SYSTEMS. SCHEDULES TO BE DETERMINED BY OWNER AND SHALL BE AVAILABLE THROUGH THE OPERATOR WORKSTATION INTERFACE.

SCHEDULING CONTROLS SPACE SETPOINT TEMPERATURE. DURING OCCUPIED MODE, TERMINAL UNIT SHALL MAINTAIN SPACE TEMPERATURE AT SETPOINT DICTATED BY SPACE MOUNTED THERMOSTAT (I.E. 70°F HEATING, 75°F COOLING). DURING UNOCCUPIED MODE, TERMINAL UNIT SHALL MAINTAIN SPACE TEMPERATURE AT SETBACK TEMPERATURE SETPOINT (I.E. 62°F HEATING, N/A COOLING).

TERMINAL BOX SHALL BE GO FULL OPEN ON A CALL FOR NIGHT SETBACK HEATING DURING UNOCCUPIED PERIODS. ONCE SETBACK TEMPERATURE IS MET, DAMPER SHALL CLOSE.

CONTROL - THE AIRFLOW PRESSURE TRANSDUCER SHALL INDICATE TO THE UNIT MOUNTED DDC CONTROLLER MEASURED AIRFLOW. THE DDC CONTROLLER SHALL MODULATE THE VAV BOX DAMPER TO MAINTAIN AIRFLOW AT SETPOINT. AIRFLOW SETPOINT AND REHEAT VALVE SHALL BE MODULATED BASED ON SPACE TEMPERATURE DEVIATION FROM SETPOINT PER THE SAMPLE RESET SCHEDULES BELOW INDICATING DEADBAND, HEATING AND COOLING RAMP-UP RANGES, AND MINIMUM AIRFLOWS.

- NOTES:
1. THE GRAPHICS ARE PROVIDED FOR REFERENCE ONLY.
 2. EACH TERMINAL BOX IS UNIQUE AND MAY HAVE REQMS THAT VARY FROM THOSE DEPICTED ABOVE.
 3. INCLUDE LOGIC TO OPERATE REHEAT VALVE AND AIRFLOW RATE IN CONCERT TO MAINTAIN DISCHARGE AIR TEMPERATURE AT SETPOINT WHEN IN HEATING MODE (I.E. 80°F MAX AT -2°F AND GREATER DEVIATION FROM SETPOINT) REFER TO VAV EQUIPMENT SCHEDULE FOR DAT SETPOINT.
 4. REFER TO EQUIPMENT SCHEDULES FOR INITIAL AIR DELIVERY (CFM) SETTINGS FOR HEATING, MINIMUM COOLING, AND COOLING MODES OF OPERATION.



SEQUENCE OF CONTROL: CV PACKAGED RTU

THE SYSTEM CONSIST OF A SMALL TONAGE ROOF TOP UNIT (RTU) COMPLETE WITH SUPPLY FAN, POWER EXHAUST FAN, ECONOMIZER, AND DX COMPRESSOR - COMMUNICATIONS ROOM - RTU-19

SCHEDULING: UNIT SHALL BE ENABLED 24/7

CONTROL: RTU SHALL INCLUDE PACKAGED COMPRESSOR CONTROLS FOR COOLING DAT CONTROL FROM FACTORY. ENABLE SIGNAL AND DAT RESET SIGNAL TO BE SENT FROM BUILDING BAS. RTU FACTORY DX COOLING CONTROL SHALL REPORT CONDENSER FAN STATUS, COMPRESSOR STATUS AND ALARM CONDITION BACK TO BAS. DAMPERS SHALL BE FURNISHED AND INSTALLED BY RTU MANUFACTURER. ALSO INCLUDE TERMINAL STRIP FOR FIELD IN-PLACE CONTROL. CONTROL ACTUATORS, SENSORS AND ALL CONTROL WIRING AND INSTALL IN FIELD TO ACHIEVE SEQUENCE AND POINTS LIST AS OUTLINED.

MIXED AIR CONTROL: WHEN OUTSIDE AIR TEMPERATURE FALLS BELOW DISCHARGE AIR SETPOINT BY 2 DEGREES, MIXING DAMPERS SHALL MODULATE TO MAINTAIN DISCHARGE AIR TEMPERATURE AT SETPOINT. THERE SHALL BE NO MINIMUM OUTSIDE AIR DAMPER POSITION, THE SPACE IS UNOCCUPIED AND MAY BE ALLOWED TO GO TO ZERO. WHEN THE OUTSIDE AIR TEMPERATURE IS GREATER THAN DISCHARGE AIR TEMPERATURE SETPOINT, THE OUTSIDE AIR DAMPERS SHALL BE OPEN 100% UNTIL OSA TEMPERATURE IS WITHIN 2 DEGREES OF RA TEMPERATURE.

SPACE TEMPERATURE CONTROL: UPON A RISE IN SPACE TEMPERATURE TO 2 DEGREES ABOVE SETPOINT THE SUPPLY FAN SHALL ENERGIZE. WHEN ECONOMIZER MODE (100% OUTSIDE AIR) IS NO LONGER ABLE TO MAINTAIN SPACE TEMPERATURE SETPOINT THE DX COOLING SHALL STAGE ON TO MAINTAIN SPACE SETPOINT AND THE OSA DAMPERS SHALL CLOSE IF OSA TEMPERATURE IS WITHIN 2 DEGREES OF RA TEMPERATURE. WHEN SPACE TEMPERATURE FALLS 2 DEGREES BELOW SETPOINT DX COOLING SHALL BE TURNED OFF AND SUPPLY FAN SHALL TURNED OFF.

DISCHARGE AIR TO BE RESET FROM 55 TO 75 DEGREES BASED ON SPACE SENSOR DEVIATION FROM SETPOINT.

POWER EXHAUST SHALL ENERGIZE WHEN UNIT IS IN ECONOMIZER MODE, AND OSA DAMPERS IS GREATER THAN 50%.

ANTI-SHORT CYCLING FOR FAN AND COMPRESSORS SHALL BE INCORPORATED. BAS CONTRACTOR TO COORDINATE WITH RTU MANUFACTURER FOR APPROPRIATE TIME FRAMES.

FEATURES: SPACE TEMPERATURE SHALL BE TRENDED HOURLY. ALARM SHALL ANY STATUS NOT MATCH COMMAND. ALARM IF SPACE TEMPERATURE IS MORE THAN 5 DEGREES ABOVE SETPOINT OR IS BELOW 55 DEGREES.

SEQUENCE OF CONTROLS:

100% OA INDOOR AIR HANDLING UNIT WITH ENERGY RECOVERY VENTILATOR

HEAT EXCHANGER FROST PROTECTION: FACTORY HEAT PIPE CONTROLLER SHALL TILT HEAT PIPE TO PREVENT FROST BUILD UP ON THE HEAT EXCHANGER.

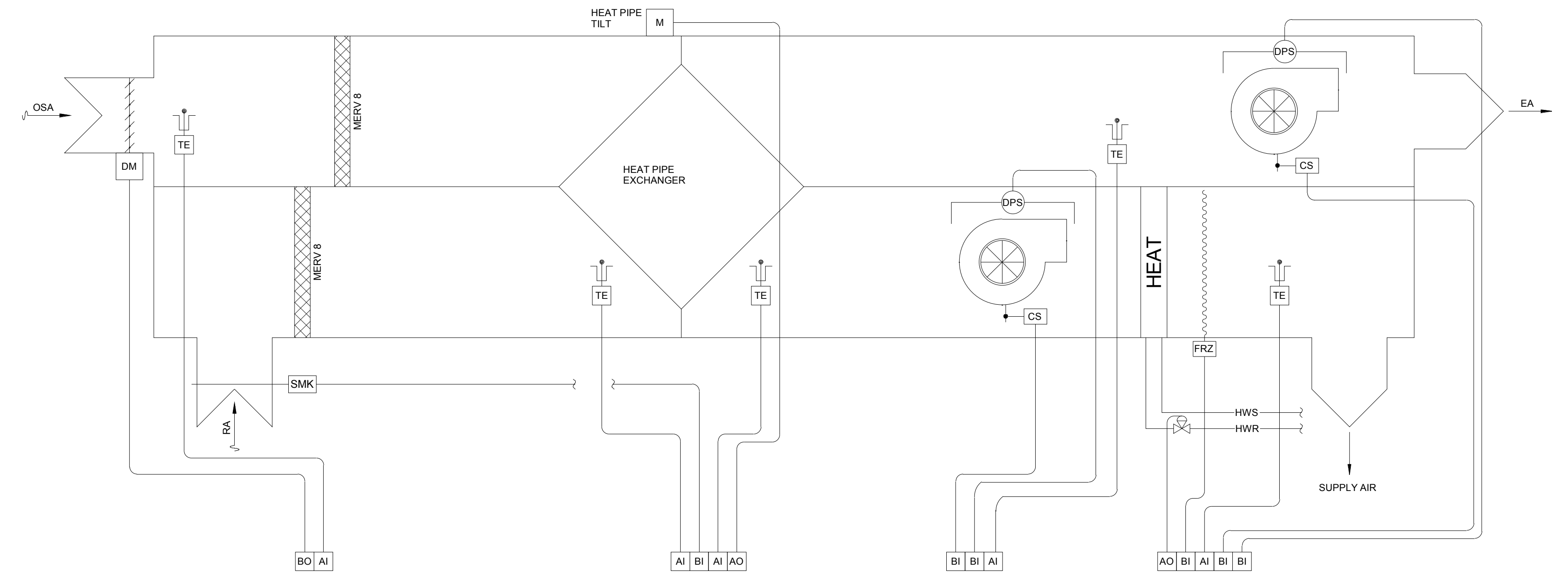
THE SYSTEM CONSIST OF AN INDOOR AIR HANDLING UNIT COMPLETE WITH SUPPLY FAN, RETURN FAN, ENERGY RECOVERY HEAT PIPE, ECONOMIZER, HYDRONIC HEATING COILS, PRE FILTER AND FINAL FILTER. CONTROLS SHALL BE FIELD INSTALLED BY TCC, WITH THE EXCEPTION OF ERV MANUFACTURER PROVIDED FACTORY HEAT PIPE CONTROLLER. ERV MANUFACTURER SHALL PROVIDE AN INTERFACE TO TEMPERATURE CONTROLS CONTRACTOR TO ALLOW FULL COMMUNICATION OF POINTS BETWEEN HEAT PIPE CONTROLLER AND BAS. COORDINATION BETWEEN TEMPERATURE CONTROLS CONTRACTOR AND ERV MANUFACTURER IS IMPERATIVE.

SCHEDULING: SCHEDULING SHALL BE PER OWNER.

DISCHARGE AIR CONTROL: DISCHARGE AIR TEMPERATURE IS TO BE MAINTAINED AT SETPOINT BY TILTING THE HEAT PIPE AND MODULATING THE HOT WATER CONTROL VALVE. DISCHARGE AIR SETPOINT SHALL VARY BASED ON TOLLING OF THE REHEAT COIL ZONES SERVED BY THIS UNIT. IF MAJORITY OF ZONES ARE ABOVE SETPOINT DAT SHALL BE 60 DEGREES (ADJUSTABLE), AS MAJORITY OF ZONES REACH SETPOINT THE DAT RESET UP TO 70 DEGREES (ADJUSTABLE). IF MAJORITY OF ZONES ARE BELOW SETPOINT, DAT SHALL BE 85 DEGREES (ADJUSTABLE), AS MAJORITY OF ZONES REACH SETPOINT DAT SHALL RESET DOWN TO 75 DEGREES (ADJUSTABLE). BAS SHALL SEND FACTORY HEAT PIPE CONTROLLER DAT RESET SIGNAL.

FEATURES: GENERATE AN ALARM SHOULD DISCHARGE AIR TEMPERATURE STRAY BELOW DISCHARGE AIR TEMPERATURE SETPOINT BY 10 DEG OR MORE. GENERATE AN ALARM SHOULD FAN STATUS NOT MATCH FAN COMMAND. GENERATE AN ALARM AND OPEN HEATING VALVE TO 100% SHOULD FREEZE STAT TRIP. GENERATE AN ALARM SHOULD SMOKE DETECTOR TRIP AND SHUT UNIT DOWN.

SYSTEM POINT DESCRIPTION	ANALOG				BINARY				ALARMS		PROGRAMS		NOTES
	INPUT	OUTPUT	INPUT	OUTPUT	INPUT	OUTPUT	INPUT	OUTPUT	ALARM	PROGRAM	ALARM	PROGRAM	
OUTSIDE TEMP	X												
OUTSIDE AIR DAMPERS		X											
HX LEAVING AIR TEMP- OA	X	X											
RETURN AIR TEMP	X	X											
HOT WATER VLV			X										
HX LEAVING AIR TEMP- EA	X	X											
FREEDSTAT	X												
SUPPLY FAN SIS				X					X		X		
SUPPLY FAN STATUS	X	X			X					X		X	
RETURN FAN SIS					X					X		X	
RETURN FAN STATUS	X	X			X				X		X		
SMOKE DETECTOR	X				X								
SUPPLY AIR TEMP	X	X							X	X		X	
RET FAN OP SWITCH	X				X								
SUPPLY FAN OP SWITCH	X				X								



① 100% OA AHU WITH ENERGY RECOVERY VENTILATOR
NONE

THIS SHEET ADDED IN ITS ENTIRETY.



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SHEET CONTENTS
MECHANICAL CONTROL DIAGRAMS

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BEAUDIN GANZE
Consulting Engineers, Inc.
Fort Collins, CO
19 Jan 2012

No.	Description	Date
1	Addendum #3	2/9/12

ISSUE FOR BIDDING
M5.5

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