

CENTRAL AIR HANDLING UNIT SCHEDULE. Table with columns: MARK, LOCATION, SERVES, MANUFACTURER, TYPE, SUPPLY FAN, RETURN / RELIEF FAN, FILTERS, DIMENSIONS, WEIGHT, NOTES.

CENTRAL AIR HANDLING UNIT - SOUND ATTENUATOR SCHEDULE. Table with columns: MARK, AHU MARK, LOCATION, SERVICE, MANUFACTURERS, TYPE, AIRFLOW, MAX VEL, MAX LENGTH, MAX APD, DYNAMIC INSERTION LOSS (dB), NOTES.

CENTRAL AIR HANDLING UNIT - HYDRONIC COOLING COIL SCHEDULE. Table with columns: MARK, LOCATION, SERVICE, MANUFACTURERS, CFM, TH, SH, EAT, LAT, FLOW, EWT, LWT, MAX. APD, MAX. WPD, MAX. VEL., MAX. ROWS, MAX. FINS PER IN., NOTES.

CENTRAL AIR HANDLING UNIT - ACOUSTICS SCHEDULE. Table with columns: AHU MARK, LOCATION, SERVICE, AIRFLOW, SUPPLY FAN OUTLET SOUND POWER (dB), NOTES.

CENTRAL AIR HANDLING UNIT - HYDRONIC HEATING COIL SCHEDULE. Table with columns: MARK, LOCATION, SERVICE, TYPE, MANUFACTURERS, CFM, CAP, EAT, DB, F, FLOW, EWT, LWT, IN. W.C., MAX. WPD, FPM, ROWS, MAX. FINS PER IN., NOTES.

HUMIDIFIER SCHEDULE - ELECTRIC. Table with columns: MARK, LOCATION, SERVICE, MANUFACTURER, MODEL, TYPE, CAPACITY, AIRFLOW TOTAL, HUMIDIFIER SIZING CONDITIONS, ROOM AIR CONDITIONS, ELECTRICAL, NOTES.

ENERGY RECOVERY VENTILATION UNIT SCHEDULE. Table with columns: MARK, LOCATION, SERVICE, MANUFACTURERS, MODEL, SUPPLY FAN, EXHAUST FAN, SUMMER EXHAUST, SUMMER SUPPLY, WINTER EXHAUST, WINTER SUPPLY, WEIGHT, DISC., STARTER, V/PH, NOTES.

ELECTRIC DUCT HEATER SCHEDULE. Table with columns: MARK, LOCATION, SERVICE, MANUFACTURERS, EDH CONDITIONS, CAP., INPUT, MIN. STAGES, SIZE, DEPTH, MAX. APD, MAX. TEMP. RISE, ELECTRICAL, NOTES.

CONTROL VALVE SCHEDULE. Table with columns: MARK, LOCATION, SERVICE, MANUFACTURERS, MODEL, TYPE, APPLICATION, NORMAL POSITION, FLOW, BRANCH LINE, INLET TEMP, PRESSURE DROP, MAX. SHUTOFF PRESSURE, NOTES.

FAN COIL UNIT SCHEDULE (HYDRONIC COILS). Table with columns: MARK, LOCATION, MANUFACTURER, TYPE, SUPPLY FAN, COOLING COIL, HEATING COIL, NOTES.

AIR SEPARATOR SCHEDULE. Table with columns: MARK, LOCATION, SERVICE, MANUFACTURERS, MODEL, MAX FLOW, PRESS. LOSS, NOTES.

CONSULTANT INFORMATION. Includes Structural/Civil Engineer, Mechanical/Electrical/Plumbing/Technical Engineer, Fire Protection Engineer, and Stand Structural Engineering.

ARCHITECT. Includes SPUR DESIGN logo and contact information for POOLE FIRE PROTECTION, INC.

Office of Construction and Facilities Management. U.S. Department of Veteran Affairs logo.

SHEET TITLE: MECHANICAL SCHEDULES I. PROJECT PHASE: BID DOCUMENTS. APPROVED: PROJECT DIRECTOR.

FULLY SPRINKLERED. PROJECT TITLE: RENOVATE A & B WING BUILDING 6. BUILDING NUMBER: 6.

DATE: 07/10/19. CHECKED BY: JES. DRAWN BY: JAD. Dwg. 114 OF 160.

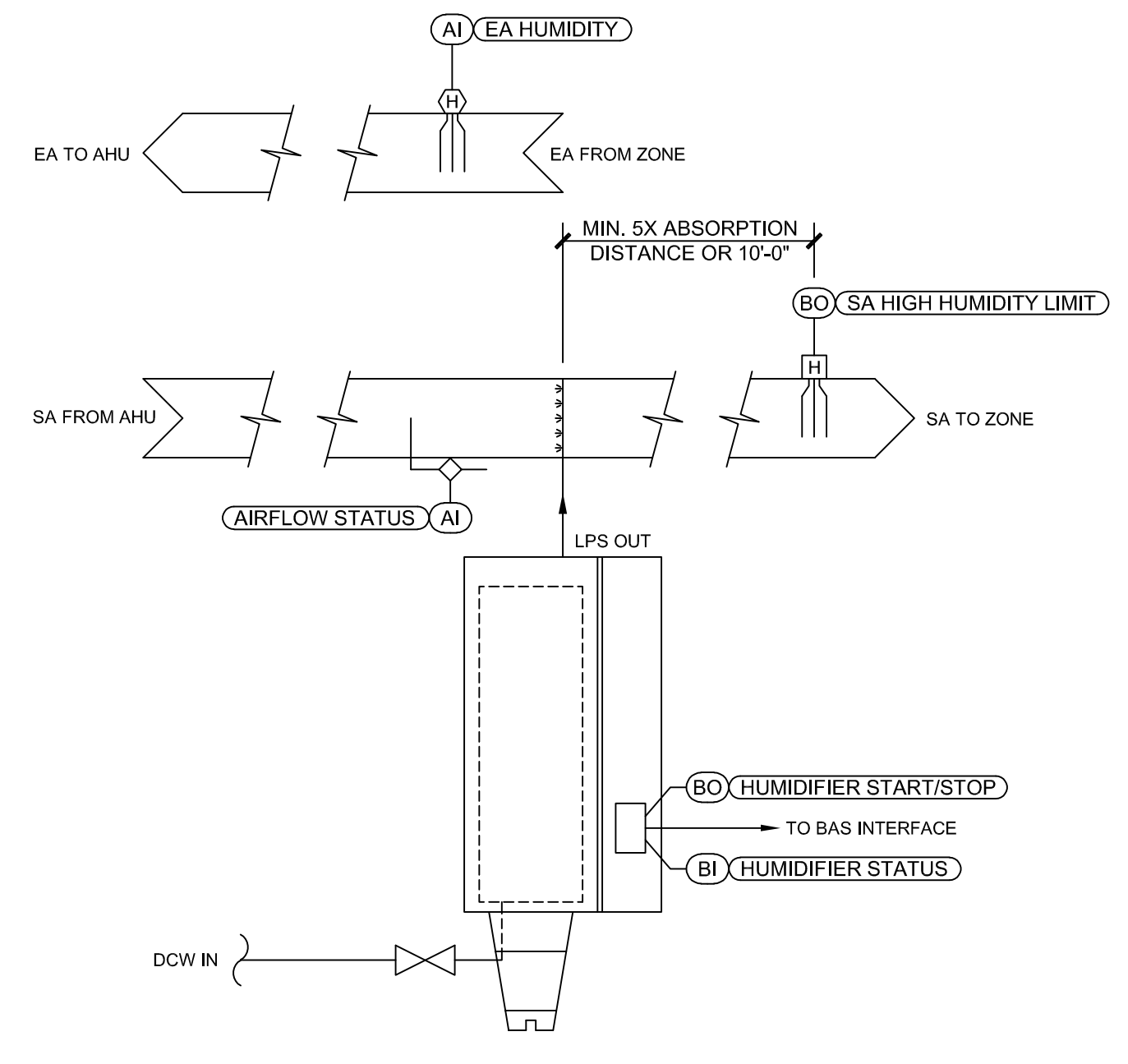
VA PROJECT NUMBER: 589A5-19-116. DRAWING NUMBER: 6-M-601.

PROJECT DESIGN CONDITIONS								
CLIMATE CONDITIONS								
WEATHER STATION: 2017 ASHRAE CLIMATE DATA / FORBES FIELD, KS								
ASHRAE CLIMATE ZONE: 4A								
HEATING 99.5% (F DB): 3.5 F (99.6% H DB)								
HUMIDIFICATION 99.6% (DPI HR / MCDB): -5.0 F / 4.4 / 6.1 F								
COOLING 0.4% (DB / MCVB): 99.0 FDB / 76.0 FWB								
DEHUMIDIFICATION 0.4% (DP / HR / MCDB): 75.2 FDB / 137.7 / 85.8 FWB								
MAX. AMBIENT DB TEMP (50 YRS): 114.0 F								
MIN. AMBIENT DB TEMP (50 YRS): -17.5 F								
BUILDING OPERATING HOURS (VERIFY WITH STATION):								
MONDAY - FRIDAY: 7:00 AM - 6:00 PM								
SATURDAY: 7:00 AM - 6:00 PM								
SUNDAY: 7:00 AM - 6:00 PM								
SPACE / UNIT DESCRIPTIONS	COOLING		HEATING		HUMIDIFICATION		ROOM AIR BALANCE (g) (+) (-) (-) (+)	NOTES
	OCC.	UNOCC.	OCC.	UNOCC.	Max.	Min.		
	F DB	F DB	F DB	F DB	%RH	%RH		
HVAC DESIGN MANUAL								
AMBULATORY CARE (HOSPITAL BASED)								
CLEAN SUPPLY ROOM	75	NA	70	NA	50%	30%	(+)	
HOUSEKEEPING AIDS CLOSET	NA	NA	NA	NA	NA	NA	(-)	
OFFICE	75	NA	70	NA	50%	30%	(g)	
RECEPTION	75	NA	70	NA	50%	30%	(g)	
SOILED UTILITY ROOM	NA	NA	NA	NA	NA	NA	(-)	
TOILET/SHOWER, WHEELCHAIR	NA	NA	68	NA	NA	NA	(-)	
EMERGENCY CARE UNIT								
NURSES STATION	75	78	70	68	50%	30%	(g)	1-4
IMAGING SERIES (RADIATION SERVICES)								
PATIENT AREA - ULTRASOUND ROOM	75	78	70	68	60%	20%	(+)	1-4
PATIENT EXAMINATION, TREATMENT, AND PROCEDURE ROOMS								
EXAMINATION ROOMS	75	78	70	68	60%	20%	(g)	1-4
THERAPY ROOMS								
PT/OT/KT OCCUPATIONAL THERAPY	72	78	82	68	60%	20%	(g)	1-4
REC THERAPY	NA	NA	NA	NA	NA	NA	NA	
PHYSICAL THERAPY	75	78	70	68	60%	20%	(-)	1-4
NON PATIENT ROOMS - MISCELLANEOUS AREAS								
GENERAL OFFICE SPACE	75	78	70	68	60%	20%	(+)	1-3
GENERAL STORAGE	75	78	70	68	60%	20%	(-)	1-3
CLEAN UTILITY/STORAGE ROOM	NA	NA	NA	NA	NA	NA	(-)	1-6
COMPUTER LAB ROOM	75	78	70	68	60%	20%	(g)	1-7
IT EQUIPMENT ROOM	81	NA	64	NA	60%	30%	(+)	
RESTROOMS	75	78	70	68	60%	20%	(-)	1-3
CORRIDORS	75	NA	70	NA	60%	20%	(+)	
LOUNGE	75	NA	70	NA	60%	20%	(-)	
ELECTRICAL ROOM W/ HEAT GAIN	86	NA	40	NA	NA	NA	(g)	
MEDICATION ROOM	75	NA	70	NA	60%	20%	(+)	
LOBBY	75	NA	70	NA	60%	20%	(+)	
COMMUNITY LIVING CENTER (CLC)								
DINING ROOM	75	NA	70	NA	60%	20%	(-)	1-4
PANTRY	NA	NA	NA	NA	NA	NA	NA	
KITCHEN HOUSEKEEPING CLOSET	NA	NA	NA	NA	NA	NA	(-)	
RESIDENT BEDROOM	75	NA	70	NA	60%	20%	(g)	
RESIDENT BATHROOM	NA	NA	70	NA	NA	NA	(-)	
LAUNDRY	78	NA	70	NA	60	NA	(-)	
PHARMACY	75	NA	70	NA	60	20	(g)	
NOTES:								
1. ZONE LEVEL OCCUPANCY HOUR SCHEDULE SHALL BE PER BUILDING OPERATING HOURS UNLESS OTHERWISE SCHEDULED.								
2. ZONE LEVEL SET POINT CONDITIONS SHALL BE AS SCHEDULED UNLESS OTHERWISE SCHEDULED OR NOTED FOR ROOM SPECIFIC SPACE CONDITIONS.								
4. DIVISION 23 CONTRACTOR TO PROVIDE ROOM AIR BALANCE AS SHOWN. AIR BALANCE SHALL BE NEUTRAL FOR NON-CRITICAL SPACES NOT SHOWN IN SCHEDULE.								

MECHANICAL CONTROLS LEGEND		
ABBREVIATIONS	SYMBOLS	SENSORS & DEVICES
A AI ANOLOG INPUT AO ANOLOG OUTPUT AV ANOLOG VIRTUAL AFS AIRFLOW STATION AF AFTER FILTER ACV AIRFLOW CONTROL VALVE AHU AIR HANDLING UNIT B BAC BUILDING AUTOMATION CONTROL BI BINARY INPUT BO BINARY OUTPUT BV BINARY VIRTUAL BP BUILDING PRESSURE BPC BUILDING PRESSURE CONTROL C CC COOLING COIL CHW CHILLED WATER CP CIRCULATING PUMP CT CURRENT TRANSMITTER D DD DIRECT DRIVE DX DIRECT EXPANSION DP DIFFERENTIAL PRESSURE E EA EXHAUST AIR EAT ENTERING AIR TEMPERATURE ECM ELECTRONICALLY COMMUTATED MOTOR EF EXHAUST FAN ER ENERGY RECOVERY EWV ENTERING WATER TEMPERATURE F FF FINAL FILTER FSD FIRE SMOKE DAMPER G GF GAS FURNACE H HC HEATING COIL HGB HOT GAS BYPASS HW HOT WATER I IFB INTEGRAL FACE AND BYPASS L LAT LEAVING AIR TEMPERATURE HGB HOT GAS BYPASS LWT LEAVING WATER TEMPERATURE M MAT MIXED AIR TEMPERATURE MOA MINIMUM OUTSIDE AIR N NG NATURAL GAS O OA OUTSIDE AIR OCC OCCUPANCY OX OXYGEN OX2 OXYGEN SENSOR P PCC PRECOOLING COIL PF PREFILTER PHC PREHEAT COIL R RA RETURN AIR RF RETURN FAN RHG REHEAT COIL RE RETURN/EXHAUST R/R RETURN/RELIEF S SA SUPPLY AIR SF SUPPLY FAN SD SMOKE DAMPER T TCP TEMPERATURE CONTROL PANEL TA TRANSFER AIR TMV THERMOSTATIC MIXING VALVE TCV TEMPERATURE CONTROL VALVE U UV ULTRAVIOLET V VFD VARIABLE FREQUENCY DRIVE VOC VOLITILE ORGANIC COMPOUND VOC VOLITILE ORGANIC COMPOUND	EQUIPMENT CHILLED WATER COIL DIRECT EXPANSION COIL HOT WATER COIL HOT WATER INTEGRAL FACE-AND-BYPASS COIL ELECTRIC HEATING COIL GAS FURNACE HUMIDIFIER DISPERSION GRID MODULATING OPPOSED BLADE DAMPER MODULATING PARALLEL BLADE DAMPER SMOKE DAMPER BACKDRAFT DAMPER VAV ATU MODULATING DAMPER 2-POSITION OPPOSED BLADE DAMPER 2-POSITION PARALLEL BLADE DAMPER FILTER BLOWER FAN PLENUM FAN PUMP CURRENT TRANSMITTER 2-WAY MODULATING CONTROL VALVE 3-WAY MODULATING CONTROL VALVE THERMOSTATIC MIXING VALVE POINT TYPE POINT NAME	DUCTWORK AIRFLOW STATION AIRFLOW SENSOR SMOKE DETECTOR TEMPERATURE SENSOR FREEZESTAT HUMIDITY SENSOR DAMPER POSITION INDICATOR DIFFERENTIAL PRESSURE SENSOR RETURN/EXHAUST AIR DUCT STATIC PRESSURE SENSOR SUPPLY AIR DUCT STATIC PRESSURE SENSOR PIPING TEMPERATURE SENSOR PRESSURE SENSOR FLOW METER AQUASTAT ZONE ZONE TEMPERATURE SENSOR ZONE HUMIDITY SENSOR ZONE OCCUPANCY SENSOR POSITIVE SPACE DIFFERENTIAL PRESSURE SENSOR NEGATIVE SPACE DIFFERENTIAL PRESSURE SENSOR

POINTS LIST - BUILDING MONITORING													
POINT ID	POINT DESCRIPTION	HARDWARE POINT				SOFTWARE POINTS			DISPLAY	DEFAULT	TRENDING/TRENDING INTERVAL	ALARM	NOTES
		AI	AO	BI	BO	AV	BV	LOOP					
ADVANCED UTILITY METERING													
	ELECTRICITY	X							X			X	A.B
	STEAM	X							X			X	A.B
	CONDENSATE	X							X			X	A.B
	DOMESTIC WATER FLOW	X							X			X	A.B
	HEATING WATER											X	A.B
	CHILLED WATER	X							X			X	A.B
	OUTSIDE AIR TEMPERATURE					X			X			X	A.B
	OUTSIDE AIR RELATIVE HUMIDITY					X			X			X	A.B
WEATHER STATION													
	BDP BUILDING DIFFERENTIAL PRESSURE	X							X	0.03 INWG	15 MIN.	X	X
	OAT OUTSIDE AIR TEMPERATURE	X							X	-	15 MIN.	X	A.B
	OAH OUTSIDE AIR HUMIDITY	X							X	-	15 MIN.	X	A.B
	OADP OUTSIDE AIR DEWPOINT					X			X	-	15 MIN.	X	A.B
ALARM MONITORING													
	STEAM CONDENSATE PUMP - COMMON ALARM			X					X				X
NOTES:													
A. SEE SPECIFICATION SECTION 251010 - ADVANCED UTILITY METERING SYSTEM													
B. TCC SHALL COORDINATE ENERGY MONITORING POINTS WITH SECTION 251010.													

CONSULTANT INFORMATION STRUCTURAL / CIVIL ENGINEER MECHANICAL / ELECTRICAL / PLUMBING / TECHNICAL ENGINEER FIRE PROTECTION ENGINEER STAND STRUCTURAL ENGINEERING 11827 W. 112TH STREET, SUITE 200 OVERLAND PARK, KS 66210 (913) 214-2169 SPUR DESIGN 11020 KING STREET, SUITE 350 OVERLAND PARK, KS 66210 (405) 842-6100 POOLE FIRE PROTECTION, INC. 19910 W. 161ST STREET OLATH, KS 66062 (913) 829-8650			ARCHITECT 332 SW 20th Street Overland Park, KS 66209 (913) 214-2169 11020 King Street, Suite 350 Overland Park, KS 66210 (405) 842-6100 KS ARCH REG. NO. A-1139, EXP. 12/31/2019 KS ENGR REG. NO. E-2586, EXP. 12/31/2019		Office of Construction and Facilities Management VA U.S. Department of Veteran Affairs KS ARCH REG. NO. A-1139, EXP. 12/31/2019 KS ENGR REG. NO. E-2586, EXP. 12/31/2019		SHEET TITLE MECHANICAL CONTROLS I APPROVED: PROJECT DIRECTOR		PROJECT PHASE BID DOCUMENTS FULLY SPRINKLERED		PROJECT TITLE RENOVATE A & B WING BUILDING 6 PROJECT LOCATION 2200 SW GAGE BLVD TOPEKA, KS 66622 DATE 07/10/19 CHECKED BY JES DRAWN BY JAD		VA PROJECT NUMBER 589A5-19-116 BUILDING NUMBER 6 DRAWING NUMBER 6-M-701 Dwg. 116 OF 160	
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SEQUENCE OF OPERATIONS
RESISTIVE ELEMENT
STEAM HUMIDIFIER (HU-X)

GENERAL DESCRIPTION
The resistive element humidifier with scale collector tank and touch screen controller provide precise humidification control to the zones as shown on the drawings.

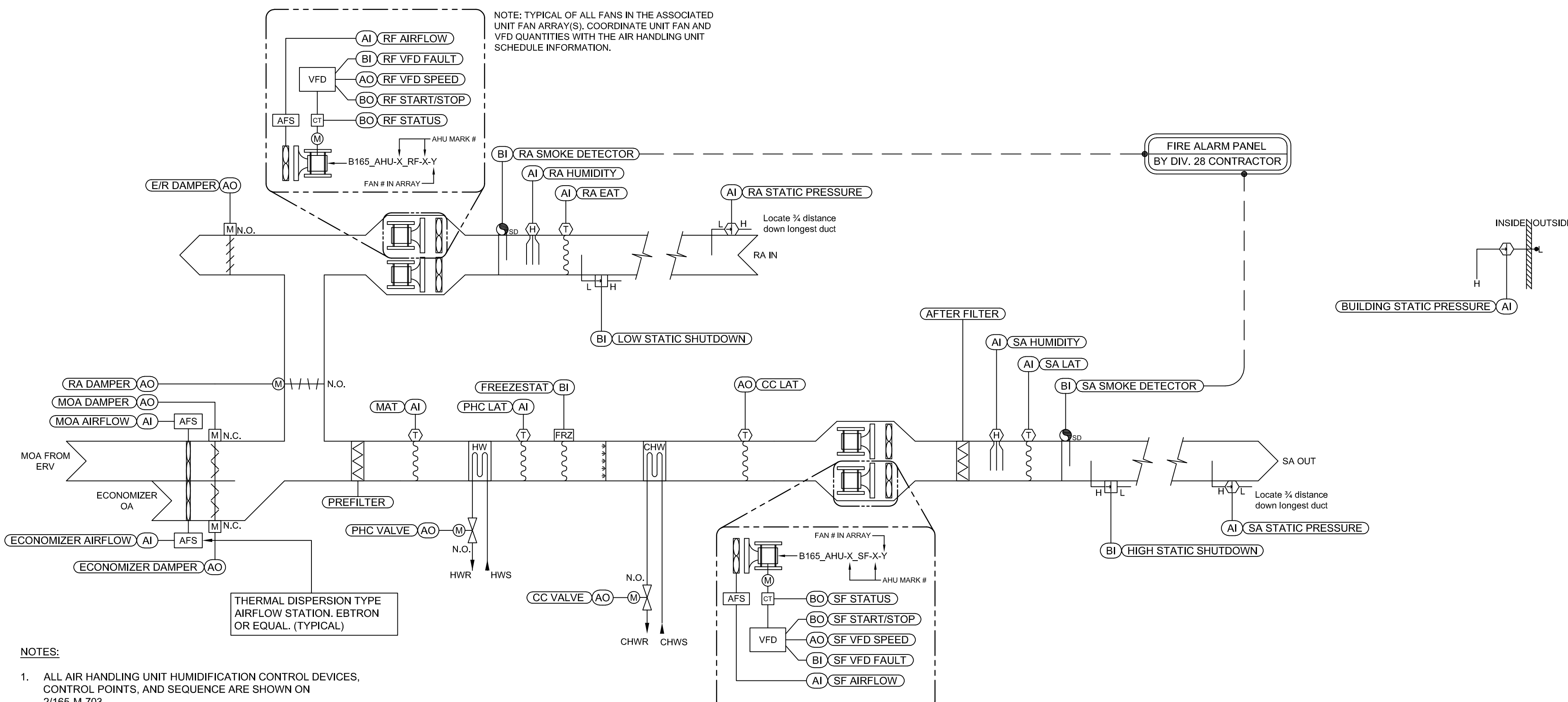
OPERATING MODES
OCCUPIED MODE
The humidifier shall be in occupied mode when the associated space is within occupied hours as defined by the project design conditions schedule.

UNOCCUPIED MODE
The humidifier shall be in unoccupied mode when the associated space is outside of the occupied hours as defined by the project design conditions schedule.

COMPONENT CONTROLS
HUMIDIFIER
OCCUPIED MODE:
The humidifier shall modulate (subject to the unit manufacturer's standard unitary safeties and controls) to maintain the RA humidity setpoint or zone humidity setpoint (where applicable).

UNOCCUPIED MODE:
The humidifier shall be off.
On a call for cooling/heating or override signal from the zone level, the humidifier shall operate as if in occupied mode until the call is cleared or the override is removed.

RESISTIVE ELEMENT HUMIDIFIER
TYPICAL CONTROL DIAGRAM (HU-X)
NOT TO SCALE



AIR HANDLING UNIT
CONTROL DIAGRAM (AHU-1)
NOT TO SCALE

SEQUENCE OF OPERATIONS
VARIABLE AIR VOLUME
AIR HANDLING UNIT (AHU-X)
GENERAL DESCRIPTION

The variable air volume (VAV) air handling unit, AHU-1, described by this sequence of operations consists of a variable speed supply fan array, variable speed Return/Relief fan, hot water IPB preheating coil, and chilled water cooling coil, which provides ventilation and air-conditioning, for the conditioned space as shown on the drawings.

OPERATING MODES
The following operating modes describe the criteria for component control for the various modes of operation. If a mode of operation is not described in a component's control sequence, then the applicable mode of operation has no direct influence on the operation of that component and that component shall revert to the last known mode of operation.

OCCUPIED MODE
The AHU shall be in occupied mode per the project design conditions schedule shown on 165-M-701.

UNOCCUPIED MODE
The AHU shall be in unoccupied mode for all periods not included in the occupied hours of operation. Overrides of the unoccupied schedule are defined at the zone level control.

ECONOMIZER MODE - OUTSIDE AIR TEMPERATURE ENABLED
The unit shall be in economizer mode when:
The supply fan status is on;
AND the AHU is not in freeze protection mode;
AND the outside air temperature is less than 65 F (adj.)
AND the outside air temperature is less than the return air temperature.

FREEZE PROTECTION MODE
The unit shall be in freeze protection mode when the mixed air temperature sensor senses a mixed air temperature of 40 F (adj.) or less. The unit and associated components shall be disabled if the mixed air temperature continues to fall below 36 F.

CONTROL SETPOINT RESETS
SUPPLY AIR TEMPERATURE RESET - TRIM AND RESPOND - COOLING ONLY
Supply Air Temperature Reset: When the zone temperature is within its setpoints, the supply air temperature setpoint shall reset to 60°F.

SAFETIES, OVERRIDES AND INTERLOCKS
SMOKE DETECTOR INTERLOCK
The unit shall be disabled via hard wired interlock at the fan start circuit on activation of a system smoke detector.

FIRE ALARM CONTROL PANEL INTERLOCK
The unit shall be disabled via hard wired interlock at the fan start circuit upon receipt of signal from the fire alarm control panel.

HIGH SUPPLY AIR STATIC PRESSURE INTERLOCK
The unit shall be disabled via hard wired interlock at the fan start circuit upon activation of duct high static pressure controller.

LOW RETURN AIR STATIC PRESSURE INTERLOCK
The unit shall be disabled via hard wired interlock at the fan start circuit upon activation of duct low static pressure controller.

SUPPLY FAN INTERLOCK
The Return/Relief Fan shall be interlocked to be OFF with the associated unit supply fan.

SMOKE DAMPER INTERLOCK
Associated system smoke dampers shall be closed whenever the supply fan is OFF.

COMPONENT CONTROL LOOPS
SUPPLY FAN CONTROL - VFD
When the HOA switch is in hand position, the variable speed supply fan shall operate at a speed set manually by the operator at the user interface of the drive.
When the HOA switch is in auto position, the fan shall be off.
When the HOA switch is in auto position, the variable speed supply fan shall operate subject to the unit enable signal, and unit operating modes.

OCCUPIED MODE:
At fan startup, the fan shall energize and slowly ramp to the initial minimum fan speed determined during system startup.
The controller shall measure the zone temperature and modulate the supply fan VFD speed to maintain the zone temperature setpoint. The minimum fan speed setting shall be coordinated with the minimum turndown of the unit's associated backup dx condensing units

UNOCCUPIED MODE:
The fan shall be OFF.
On a call for cooling/heating or override signal from the zone level, the fan shall operate as if in occupied mode until the call is cleared or the override is removed.

FREEZE PROTECTION MODE:
The supply fan shall be OFF.

RETURN/RELIEF FAN - BLDG PRESSURE CONTROL

The Return/Relief Fan operates with a VFD subject to the building static pressure.

NORMAL OPERATION MODE:
The return/relief fan VFD shall modulate to maintain the building static pressure setpoint.

ECONOMIZER MODE:
The return/relief fan VFD shall modulate to maintain the building static pressure setpoint.

FREEZE PROTECTION MODE:
The return/relief fan shall be OFF.

MIXED AIR DAMPERS WITH ECONOMIZER
The mixed air damper assembly consists of a minimum outside air (MOA) damper, a return air (RA) damper, and an economizer damper.

OCCUPIED MODE:
The MOA Damper shall be open, the RA damper is open, and the Economizer damper is closed.

UNOCCUPIED MODE:
MOA Active Control - The MOA damper shall modulate with the RA damper to satisfy the minimum outside airflow setpoint as indicated by the minimum OA airflow measuring station.

UNOCCUPIED MODE:
The MOA damper and Economizer damper shall be fully closed and the RA damper shall be fully open.

On a call for cooling/heating or override signal, the dampers shall operate as if in occupied mode, except that the minimum outside air setpoint shall be 0 CFM.

ECONOMIZER MODE:
The MOA damper, RA damper, and economizer damper shall modulate in opposing directions to maintain the mixed air temperature setpoint.

FREEZE PROTECTION MODE:
The outside air dampers shall remain fully closed and the return air damper shall remain fully open.

RELIEF/EXHAUST AIR DAMPERS
The relief/exhaust air dampers shall operate with the unit relief/exhaust fan, subject to the Outside Air Economizer airflow.

OCCUPIED MODE:
The relief/exhaust air damper is enabled and operates subject to the building pressure controller to maintain the building differential pressure setpoint.

UNOCCUPIED MODE:
The relief/exhaust damper shall be enabled.
On a call for building relief/exhaust, the damper shall modulate per the occupied sequence.

ECONOMIZER MODE:
The relief/exhaust air damper shall modulate subject to the building differential pressure setpoint.

FREEZE PROTECTION MODE:
The relief/exhaust air damper shall be closed.

FILTER MONITORING - HOURS
The unit filters shall be monitored for preventative maintenance and diagnostic purposes.

ALL MODES:
The controller shall monitor the fan runtime to provide maintenance reminder at 50% of filter elapsed time (1100 hours) and an alarm at 100% elapsed time (2200 hours).

PREHEAT COIL - HOT WATER VALVE - MODULATING
OCCUPIED MODE:
The controller shall modulate the PHC valve to maintain the preheat coil leaving air temperature (PHC LAT) setpoint.

UNOCCUPIED MODE:
The heating valve shall close.

On a call for cooling/heating or override signal from the zone level, the coil shall operate as if in occupied mode until the call is cleared or the override is removed.

FREEZE PROTECTION MODE:
The PHC valve shall be fully open.

COOLING COIL - CHILLED WATER VALVE - MODULATING
OCCUPIED MODE:
The cooling coil valve shall modulate to maintain the cooling coil leaving air temperature (CC LAT) setpoint.

UNOCCUPIED MODE:
The CC valve shall close.

On a call for cooling/heating or override signal from the zone level, the coil shall operate as if in occupied mode until the call is cleared or the override is removed.

FREEZE PROTECTION MODE:
The chilled water plant freeze protection mode shall be enabled and the chilled water supply pumps shall be on.

POINTS LIST - RESISTIVE ELEMENT HUMIDIFIER

POINT NAME	HARDWARE POINTS			SOFTWARE POINTS				SHOWN ON GRAPHIC
	AI	AO	BI	BO	SETPPOINT	AV	BV	
DUCT								
EA HUMIDITY								X
AIRFLOW STATUS	X							X
SA HIGH HUMIDITY LIMIT				X				X
HUMIDIFIER								
HUMIDIFIER STATUS			X					X
HUMIDIFIER START/STOP				X				X
SETPOINTS								
ZONE HUMIDITY SETPOINT					NOTE 1	X		X
RA HUMIDITY SETPOINT					35%	X		X
SA HIGH HUMIDITY LIMIT SETPOINT					85%	X		X
ALARMS								
COMMON ALARMS								X
HIGH ZONE HUMIDITY								X
LOW ZONE HUMIDITY								X

NOTES:
1 SEE PROJECT DESIGN CONDITIONS SCHEDULE FOR SPACE HUMIDITY REQUIREMENTS

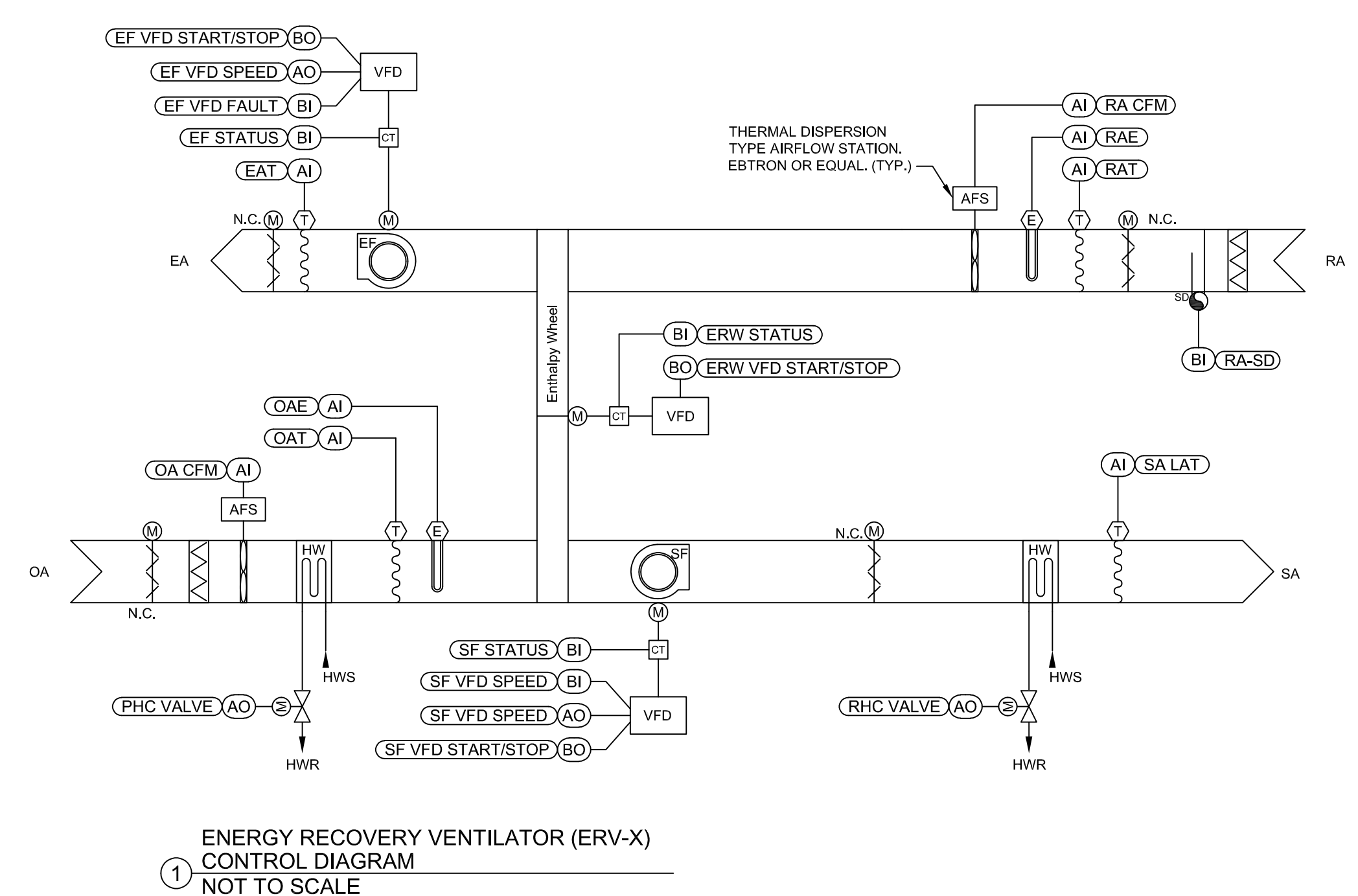
POINTS LIST - AHU-1

POINT NAME	HARDWARE POINTS			SOFTWARE POINTS				SHOWN ON GRAPHIC
	AI	AO	BI	BO	SETPPOINT	AV	BV	
SUPPLY AIR								
BUILDING STATIC PRESSURE	X							X
MAT	X							X
PHC VALVE	X	X						X
PHC LAT	X							X
FREEZE STAT			X					X
HUMIDIFIER			X					X
HUMIDIFIER ENABLE				X				X
CC VALVE		X						X
CC LAT	X							X
SF AIRFLOW (TYP. 4)		X						X
SF STATUS (TYP. 4)			X					X
SF START/STOP (TYP. 4)				X				X
SF VFD FAULT (TYP. 4)				X				X
SF VFD SPEED (TYP. 4)				X				X
SA LAT	X	X						X
SA HUMIDITY	X							X
SA STATIC PRESSURE	X							X
HIGH STATIC SHUTDOWN	X			X				X
SA SMOKE DETECTOR	X			X				X
RETURN AIR								
RA EAT	X							X
RA HUMIDITY	X							X
RA AIRFLOW	X							X
RA STATIC PRESSURE	X							X
LOW STATIC SHUTDOWN			X					X
RA SMOKE DETECTOR	X	X						X
RA DAMPER	X							X
OUTSIDE AIR								
MOA DAMPER		X						X
MOA AIRFLOW	X	X						X
ECONOMIZER DAMPER	X	X						X
ECONOMIZER AIRFLOW	X	X						X
RETURN/RELIEF								
RF STATUS			X					X
RF VFD FAULT			X					X
RF VFD SPEED		X						X
RF START/STOP				X				X
RF DAMPER			X					X
ERV DAMPER	X							X
SETPOINTS								
EMERGENCY SHUTDOWN				N/A		X		X
BUILDING DIFFERENTIAL PRESSURE SETPOINT				0.03 in w.g.	X			X
ECONOMIZER MAT SETPOINT				65 F	X			X
PHC LAT SETPOINT				NOTE 1	X			X
CC LAT SETPOINT				NOTE 1	X			X
RA STATIC PRESSURE SETPOINT				NOTE 1	X			X
RA HUMIDITY SETPOINT				NOTE 1	X			X
SA LAT SETPOINT				55 F	X			X
SA STATIC PRESSURE SETPOINT				NOTE 1	X			X
SA HUMIDITY SETPOINT				NOTE 1	X			X
ALARMS								
HIGH MIXED AIR TEMPERATURE				IF THE MIXED AIR TEMPERATURE IS GREATER THAN 90° F (ADJ.)				X
LOW MIXED AIR TEMPERATURE				IF THE MIXED AIR TEMPERATURE IS LESS THAN 45° F (ADJ.)				X
HIGH RETURN AIR TEMPERATURE				IF THE RETURN AIR TEMPERATURE IS GREATER THAN 90° F (ADJ.)				X
LOW RETURN AIR TEMPERATURE				IF THE RETURN AIR TEMPERATURE IS LESS THAN 45° F (ADJ.)				X
HIGH SUPPLY AIR TEMPERATURE				IF THE SUPPLY AIR TEMPERATURE IS 5° F GREATER THAN ITS SETPOINT (ADJ.)				X
LOW SUPPLY AIR TEMPERATURE				IF THE SUPPLY AIR TEMPERATURE IS 5° F LESS THAN ITS SETPOINT (ADJ.)				X
HIGH RETURN AIR HUMIDITY				IF THE RETURN AIR HUMIDITY IS GREATER THAN 70% (ADJ.)				X
LOW RETURN AIR HUMIDITY				IF THE RETURN AIR HUMIDITY IS LESS THAN 35% (ADJ.)				X
HIGH SUPPLY AIR HUMIDITY				IF THE SUPPLY AIR HUMIDITY IS GREATER THAN 90% (ADJ.)				X
LOW SUPPLY AIR HUMIDITY				IF THE SUPPLY AIR HUMIDITY IS LESS THAN 30% (ADJ.)				X
HIGH RETURN AIR STATIC PRESSURE				IF THE RETURN AIR STATIC PRESSURE IS 25% GREATER THAN SETPOINT (ADJ.)				X
LOW RETURN AIR STATIC PRESSURE				IF THE RETURN AIR STATIC PRESSURE IS 25% LESS THAN SETPOINT (ADJ.)				X
HIGH SUPPLY AIR STATIC PRESSURE				IF THE SUPPLY AIR STATIC PRESSURE IS 25% GREATER THAN SETPOINT (ADJ.)				X
LOW SUPPLY AIR STATIC PRESSURE				IF THE SUPPLY AIR STATIC PRESSURE IS 25% LESS THAN SETPOINT (ADJ.)				X
HIGH BUILDING STATIC PRESSURE				IF THE BUILDING STATIC PRESSURE IS 25% GREATER THAN SETPOINT (ADJ.)				X
LOW BUILDING STATIC PRESSURE				IF THE BUILDING STATIC PRESSURE IS 25% LESS THAN SETPOINT (ADJ.)				X
SUPPLY FAN FAILURE				COMMANDED ON, BUT THE STATUS IS OFF				X
SUPPLY FAN IN HAND				COMMANDED OFF, BUT THE STATUS IS ON				X
SUPPLY FAN RUNTIME EXCEEDED				STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.)				X
RETURN FAN FAILURE				COMMANDED ON, BUT THE STATUS IS OFF				X
RETURN FAN IN HAND				COMMANDED OFF, BUT THE STATUS IS ON				X
RETURN FAN RUNTIME EXCEEDED				STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.)				X
PREFILTER CHANGE REQUIRED				PREFILTER HAS BEEN IN USE FOR MORE THAN 2200 HOURS (ADJ.)				X
FINAL FILTER CHANGE REQUIRED				AFTER FILTER HAS BEEN IN USE FOR MORE THAN 2200 HOURS (ADJ.)				X

NOTES:
1 SEE EQUIPMENT SCHEDULES FOR SETPOINT VALUES
2 SEE PROJECT DESIGN CONDITIONS SCHEDULE FOR SETPOINT VALUES

CONSULTANT INFORMATION			ARCHITECT		SHEET TITLE MECHANICAL CONTROLS II		PROJECT PHASE BID DOCUMENTS		PROJECT TITLE RENOVATE A & B WING BUILDING 6		VA PROJECT NUMBER 589A5-19-116	
STRUCTURAL / CIVIL ENGINEER STAND STRUCTURAL ENGINEERING 11827 W. 112TH STREET, SUITE 200 OVERLAND PARK, KS 66210 (913) 214-2169			MECHANICAL / ELECTRICAL / PLUMBING / TECHNICAL ENGINEER SPUR DESIGN 11020 KING STREET, SUITE 350 OVERLAND PARK, KS 66210 (405) 842-6100		FIRE PROTECTION ENGINEER POOLE FIRE PROTECTION, INC. 19910 W. 161ST STREET OLATH, KS 66062 (913) 829-8650		Office of Construction and Facilities Management U.S. Department of Veteran Affairs		2200 SW GAGE BLVD TOPEKA, KS 66622		BUILDING NUMBER 6	
Revision #			Date		APPROVED: PROJECT DIRECTOR		FULLY SPRINKLERED		DATE 07/10/19		CHECKED BY JES	
									DRAWN BY JAD		DRAWING NUMBER 6-M-702	
											Dwg. 117 OF 160	

three inches = one foot
one and one-half inches = one foot
one inch = one foot
three-quarters inch = one foot
one-half inch = one foot
one-quarter inch = one foot
one-eighth inch = one foot



ENERGY RECOVERY VENTILATOR (ERV-X)
CONTROL DIAGRAM
NOT TO SCALE

POINT NAME	HARDWARE POINTS				SOFTWARE POINTS							SHOWN ON GRAPHIC
	AI	AO	BI	BO	SETPOINT	AV	BV	LOOP	SCHED	TREND	ALARM	
SUPPLY AIR												
BUILDING STATIC PRESSURE		X								X		X
CC VALVE		X								X		X
CC LAT		X								X		X
RHC VALVE		X								X		X
SF AIRFLOW	X									X		X
SF STATUS			X							X		X
SF START/STOP				X						X		X
SF VFD FAULT										X		X
SF VFD SPEED		X								X		X
SALAT	X									X		X
SA STATIC PRESSURE		X								X		X
SA DAMPER				X						X	X	X
HIGH STATIC SHUTDOWN				X						X	X	X
SA SMOKE DETECTOR				X						X	X	X
RETURN AIR												
RA EAT		X								X		X
RA AIRFLOW		X								X		X
RA STATIC PRESSURE		X								X		X
LOW STATIC SHUTDOWN				X						X	X	X
RA SMOKE DETECTOR				X						X	X	X
RA DAMPER				X						X		X
EXHAUST AIR												
EF STATUS			X							X		X
EF VFD FAULT			X							X		X
EF VFD SPEED		X								X		X
EF START/STOP				X						X		X
EA DAMPER				X						X		X
EA EAT	X									X		X
SETPOINTS												
EMERGENCY SHUTDOWN					N/A		X			X	X	
BUILDING DIFFERENTIAL PRESSURE SETPOINT					0.03 in w.g.	X				X		X
CC LAT SETPOINT					NOTE 1	X				X		
RA STATIC PRESSURE SETPOINT					NOTE 1	X				X		
SA LAT SETPOINT					55 F	X				X		
SA STATIC PRESSURE SETPOINT					NOTE 1	X				X		
ALARMS												
HIGH RETURN AIR TEMPERATURE					IF THE RETURN AIR TEMPERATURE IS GREATER THAN 90°F (ADJ.)					X		
LOW RETURN AIR TEMPERATURE					IF THE RETURN AIR TEMPERATURE IS LESS THAN 45°F (ADJ.)					X		
HIGH SUPPLY AIR TEMPERATURE					IF THE SUPPLY AIR TEMPERATURE IS 5°F GREATER THAN ITS SETPOINT (ADJ.)					X		
LOW SUPPLY AIR TEMPERATURE					IF THE SUPPLY AIR TEMPERATURE IS 5°F LESS THAN ITS SETPOINT (ADJ.)					X		
HIGH RETURN AIR STATIC PRESSURE					IF THE RETURN AIR STATIC PRESSURE IS 25% GREATER THAN SETPOINT (ADJ.)					X		
LOW RETURN AIR PLenum STATIC PRESSURE					IF THE RETURN AIR PLenum STATIC PRESSURE IS 25% LESS THAN SETPOINT (ADJ.)					X		
HIGH SUPPLY AIR STATIC PRESSURE					IF THE SUPPLY AIR STATIC PRESSURE IS 25% GREATER THAN SETPOINT (ADJ.)					X		
LOW SUPPLY AIR STATIC PRESSURE					IF THE SUPPLY AIR STATIC PRESSURE IS 25% LESS THAN SETPOINT (ADJ.)					X		
HIGH BUILDING STATIC PRESSURE					IF THE BUILDING STATIC PRESSURE IS 25% GREATER THAN SETPOINT (ADJ.)					X		
LOW BUILDING STATIC PRESSURE					IF THE BUILDING STATIC PRESSURE IS 25% LESS THAN SETPOINT (ADJ.)					X		
SF FAILURE					COMMANDERD ON, BUT THE STATUS IS OFF					X		
SF IN HAND					COMMANDERD OFF, BUT THE STATUS IS ON					X		
SF RUNTIME EXCEEDED					STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.)					X		
EF FAILURE					COMMANDERD ON, BUT THE STATUS IS OFF					X		
EF IN HAND					COMMANDERD OFF, BUT THE STATUS IS ON					X		
EF RUNTIME EXCEEDED					STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.)					X		
PREFILTER CHANGE REQUIRED					PREFILTER HAS BEEN IN USE FOR MORE THAN 2200 HOURS (ADJ.)					X		
FINAL FILTER CHANGE REQUIRED					AFTER FILTER HAS BEEN IN USE FOR MORE THAN 2200 HOURS (ADJ.)					X		
NOTES:												
1 SEE EQUIPMENT SCHEDULES FOR SETPOINT VALUES												
2 SEE PROJECT DESIGN CONDITIONS SCHEDULE FOR SETPOINT VALUES												

**SEQUENCE OF OPERATIONS
ENERGY RECOVERY VENTILATOR (ERV-X)
GENERAL DESCRIPTION**

The energy recovery ventilator described by this sequence of operations consists of a variable speed supply fan, variable speed exhaust fan energy recovery wheel (ERW), chilled water cooling coil, and hot water reheat coil that operate with zone level variable air volume terminal units to provide heating, ventilation and air-conditioning for the conditioned space as shown on the drawings.

OPERATING MODES

OCCUPIED MODE
The ERV shall be in occupied mode per the project design conditions schedule shown on the control drawings.

UNOCCUPIED MODE
The ERV shall be in unoccupied mode for all periods not included in the occupied hours of operation. Overrides of unoccupied schedule are defined at the zone level control.

COOLING ENERGY RECOVERY MODE- ENTHALPY ENABLED
The ERV shall be in cooling energy recovery mode when:
The economizer mode is disabled.
The outside airflow rate is equal to the minimum outside air (MOA) setpoint.
The outside air enthalpy (OAE) is greater than the return air enthalpy (RAE)

HEATING ENERGY RECOVERY MODE
The unit shall be in heating energy recovery mode when:
The unit is not in economizer mode.
The outside air temperature (OAT) is 5 degrees below the return air temperature (RAT)

FROST PROTECTION MODE
The ERV shall be in frost protection mode when:
The unit is not in economizer mode.
The outside air temperature (OAT) is below 15 degF.

CONTROL SETPOINT RESETS
VENTILATION RESET
System Level Ventilation Reset - If the space temperature setpoint is satisfied, the controller shall modify the minimum outside airflow setpoint value between the minimum airflow at minimum fan speed and the minimum outside airflow values shown on the ERV schedule subject to the maximum zone level CO2 setpoint of 1,000 ppm (adj.).

SAFETIES, OVERRIDES AND INTERLOCKS
SMOKE DETECTOR INTERLOCK
The unit shall be disabled via hard wired interlock at the fan start circuit on activation of a system smoke detector.

FIRE ALARM CONTROL PANEL INTERLOCK
The unit shall be disabled via hard wired interlock at the fan start circuit upon receipt of signal from the fire alarm control panel.

HIGH SUPPLY AIR STATIC PRESSURE INTERLOCK
The unit shall be disabled via hard wired interlock at the fan start circuit upon activation of duct high static pressure controller.

LOW RETURN AIR STATIC PRESSURE INTERLOCK
The unit shall be disabled via hard wired interlock at the fan start circuit upon activation of duct low static pressure controller.

SUPPLY FAN INTERLOCK
Exhaust fan shall be interlocked to be OFF with the associated unit supply fan.

COMPONENT CONTROL LOOPS
SUPPLY FAN CONTROL - VFD
When the HOA switch is in hand position, the variable speed supply fan shall operate at a speed set manually by the operator at the user interface of the drive.
When the HOA switch is in off position, the fan shall be off.
When the HOA switch is in auto position, the variable speed supply fan shall operate under the control of the unit enable signal, and unit operating modes.

When in Occupied Mode:
At fan startup, the fan shall energize and slowly ramp to the initial minimum fan speed determined during system startup.
On a call for cooling or heating, the fan shall operate at a constant speed to maintain its airflow setpoint.
Upon receiving a ventilation reset command, the supply fans shall modulate subject to the ventilation reset controls.

When in Unoccupied Mode:
The fan shall be OFF.

EXHAUST FAN (EF) - BUILDING PRESSURE
The exhaust fan provides building relief-exhaust and energy recovery exhaust to maintain the building differential setpoint and energy recovery operation.

When in Occupied Mode:
The exhaust fan shall be ON when the associated ERV supply fan is on
The exhaust fan VFD speed shall vary to maintain the building differential pressure (BDP) setpoint.

When in Unoccupied Mode:
The exhaust fan shall be OFF.

FILTER MONITORING
The unit filters shall be monitored for preventative maintenance and diagnostic purposes.

When in all Modes:
The controller shall monitor the fan runtime to provide maintenance reminder at 50% of filter elapsed time (1100 hours) and an alarm at 100% elapsed time (2200 hours).

ENERGY RECOVERY WHEEL (ERW)
The energy recovery system consists of a total heat energy recovery wheel (ERW) operated with a variable speed drive and bypass dampers to provide pre-conditioned minimum outside air.

When in Occupied Mode:
The ERW shall operate when the unit is in either cooling recovery mode or heating recovery mode.
The ERW self cleaning- the heat wheel shall run at 5 % speed (adj.) for 10 sec (adj.) every 4-hr (adj.) when the unit runs.

When in Unoccupied Mode:
The heat wheel shall be disabled, the minimum outside air dampers are closed and the bypass dampers are open.

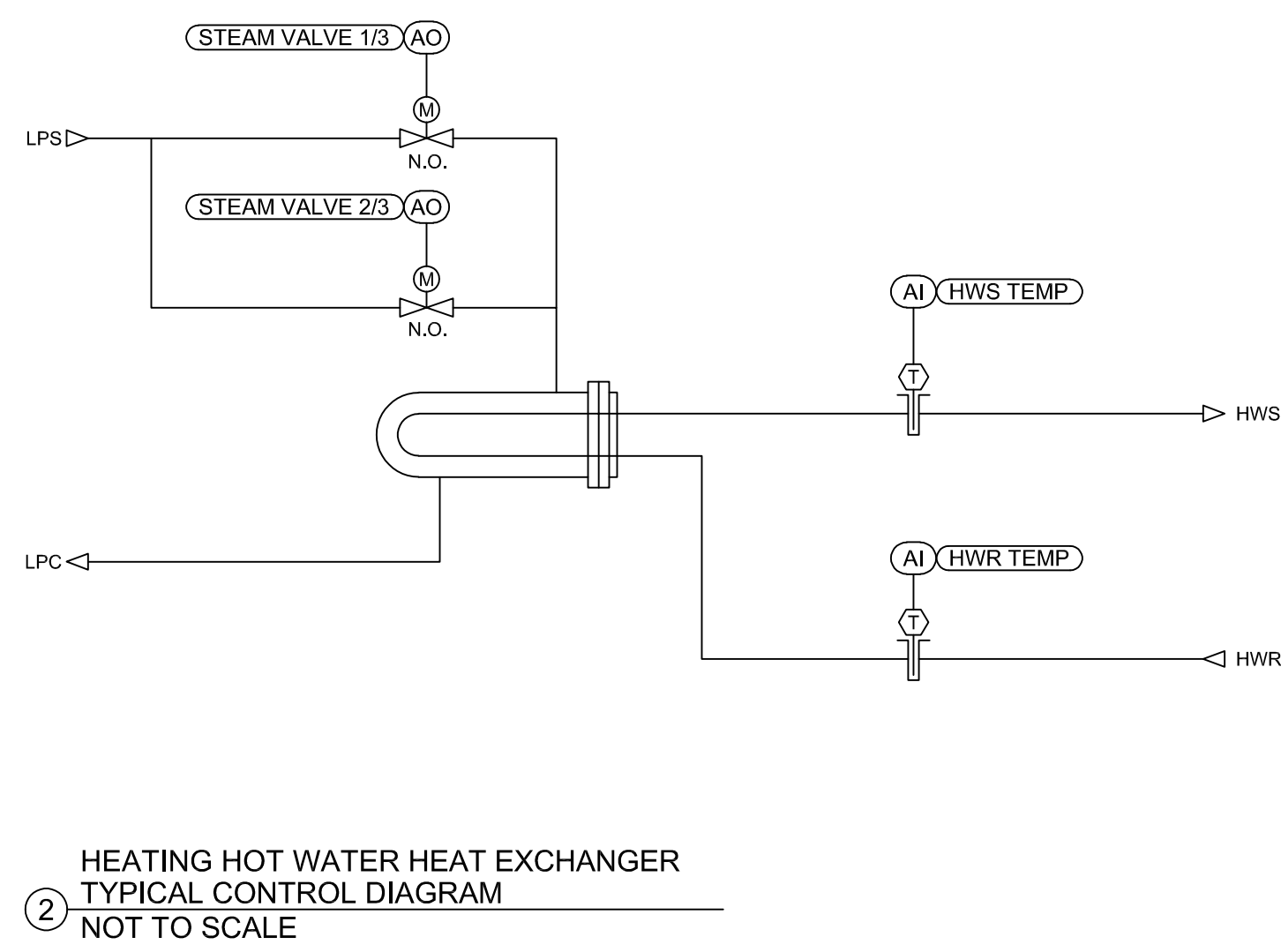
When in Cooling Recovery Mode:
The ERW shall be on.
The ERW bypass dampers shall be closed.

When in Heating Recovery Mode:
The ERW shall be on.
The ERW bypass dampers shall be closed.

When in Economizer Mode:
The ERW bypass dampers shall be open.

PREHEAT COIL- ELECTRIC (SCR)
When in Occupied Mode:
The preheat coil is off.
When in Unoccupied Mode:
The preheat coil is off.
When in Frost Protection Mode:
The preheat coil shall be activated and shall modulate to maintain an outside air temperature (OAT) of 20 degF.

CONSULTANT INFORMATION			ARCHITECT		Office of Construction and Facilities Management		SHEET TITLE MECHANICAL CONTROLS III		PROJECT PHASE BID DOCUMENTS		PROJECT TITLE RENOVATE A & B WING BUILDING 6		VA PROJECT NUMBER 589A5-19-116	
STRUCTURAL / CIVIL ENGINEER STAND STRUCTURAL ENGINEERING 11827 W. 112TH STREET, SUITE 200 OVERLAND PARK, KS 66210 (913) 214-2189			MECHANICAL / ELECTRICAL / PLUMBING / TECHNICAL ENGINEER SPUR DESIGN 11020 KING STREET, SUITE 350 OVERLAND PARK, KS 66210 (405) 842-6100		FIRE PROTECTION ENGINEER POOLE FIRE PROTECTION, INC. 19910 W. 161ST STREET OLATH, KS 66062 (913) 829-8650				APPROVED: PROJECT DIRECTOR		PROJECT LOCATION 2200 SW GAGE BLVD TOPEKA, KS 66622		BUILDING NUMBER 6	
Revision #			Date				FULLY SPRINKLERED		DATE 07/10/19		CHECKED BY JES		DRAWN BY JAD	
									Dwg. 118 OF 160					



**SEQUENCE OF OPERATIONS
STEAM TO HOT WATER HEAT EXCHANGER (HX-X)**

GENERAL DESCRIPTION

The steam to hot water shell and tube heat exchanger is used to heat water for the heating hot water system and its components as shown on the drawings.

Run Conditions

The heat exchanger system shall be enabled to run whenever a definable number of hot water coils need heating and outside air temperature is less than 65°F (adj.). To prevent short cycling, the heat exchanger shall run for and be off for minimum adjustable times (both user definable). The heat exchanger system shall also run for freeze protection whenever outside air temperature is less than 38°F (adj.).

Hot Water Supply Temperature Setpoint

The hot water supply temperature setpoint shall be a fixed setpoint of 180°F (adj.).

Heat Exchanger 1/3 - 2/3 Steam Valves - Hot Water Control

The controller shall measure the hot water supply temperature and modulate the two steam valves in sequence to maintain its setpoint. The steam valves shall be enabled whenever the heat exchanger is called to run AND hot water supply temperature is below its setpoint.

The steam valves shall open to 100% (adj.) whenever the heat exchanger is in freeze protection due to low outside air temperature. The steam valves shall close whenever the hot water supply temperature rises from 180°F to 200°F.

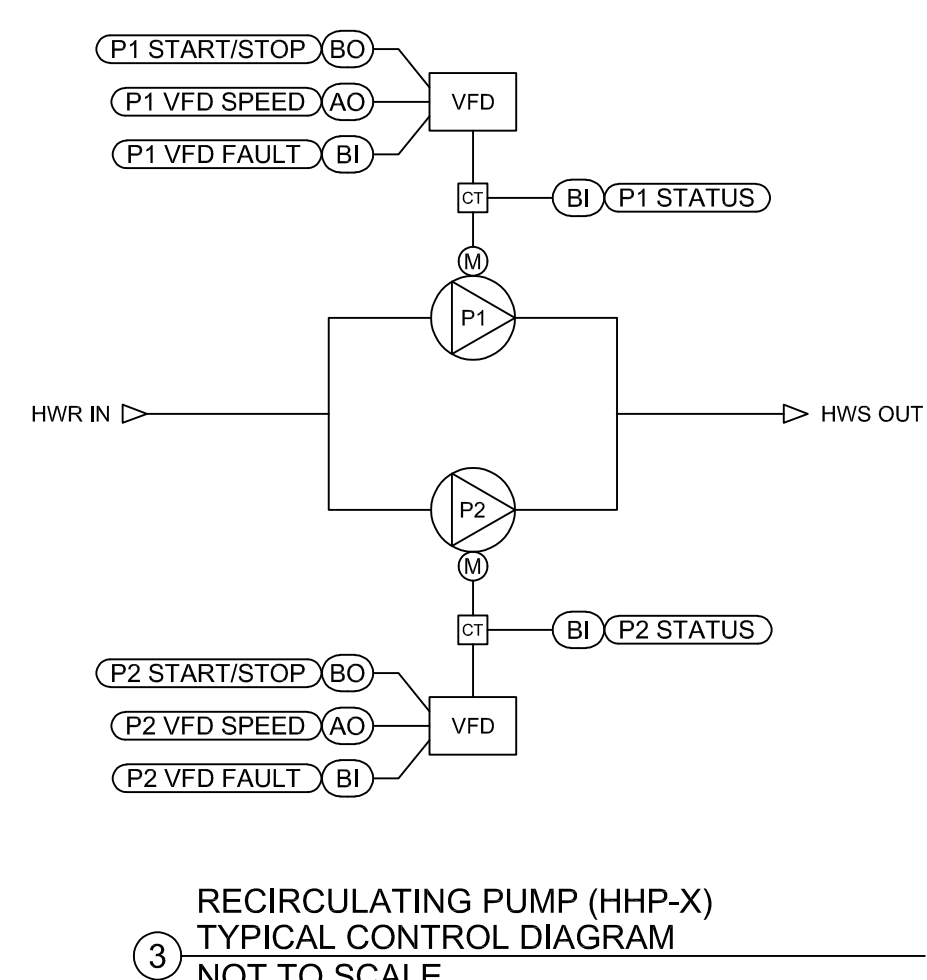
Alarms

Alarms shall be provided as follows:

- High HWS Temperature: If the HWS temperature is greater than 200°F.
- High HWR Temperature: If the HWR temperature is less than 160°F.

POINTS LIST - SHELL & TUBE HEAT EXCHANGER (HX-1 & HX-2)

POINT NAME	HARDWARE POINTS				SOFTWARE POINTS							SHOWN ON GRAPHIC
	AI	AO	BI	BO	SETPOINT	AV	BV	LOOP	SCHED	TREND	ALARM	
STEAM SIDE												
STEAM VALVE 1/3		X										X
STEAM VALVE 2/3		X										X
WATER SIDE												
HWS TEMPERATURE	X									X	X	X
HWR TEMPERATURE	X									X		X
SETPOINTS					SEE SEQ.	X						X
OUTSIDE AIR TEMPERATURE					180 F	X						X
HWS TEMPERATURE SETPOINT					180 F	X						X
HWR TEMPERATURE SETPOINT					160 F	X						X
ALARMS	DESCRIPTION										ALARM	
HIGH HWS TEMPERATURE	IF THE HWS TEMPERATURE IS GREATER THAN 200°F (ADJ.)										X	
LOW HWS TEMPERATURE	IF THE HWS TEMPERATURE IS LESS THAN 160°F (ADJ.)										X	



**SEQUENCE OF OPERATIONS
HEATING HOT WATER PUMPS (HHP-X)**

General Description

The inline pumps will operate as lead/standby to provide heating hot water to the AHU preheat coils and VAV reheat coils as shown on the drawings. 1 primary pump(s) will operate as lead, while the remaining pump will operate as standby and is to be activated upon shutdown or failure of the primary pump.

MODES OF OPERATION

NORMAL OPERATING MODE:

The pumps shall be in normal operating mode at all times unless overridden by the other modes outlined in this sequence.

STANDBY MODE:

Backup mode shall be activated upon failure of the lead pump. Backup mode shall be disabled by manual reset and the system will reset to normal operation.

COMPONENT CONTROLS

LEAD PUMP

NORMAL OPERATING MODE:

The controller shall modulate the pump to maintain the differential pressure setpoint as determined by final test and balance. The VFDs minimum speed shall not drop below 20%.

STANDBY MODE:

The pump shall be off.

STANDBY PUMP

NORMAL OPERATING MODE:

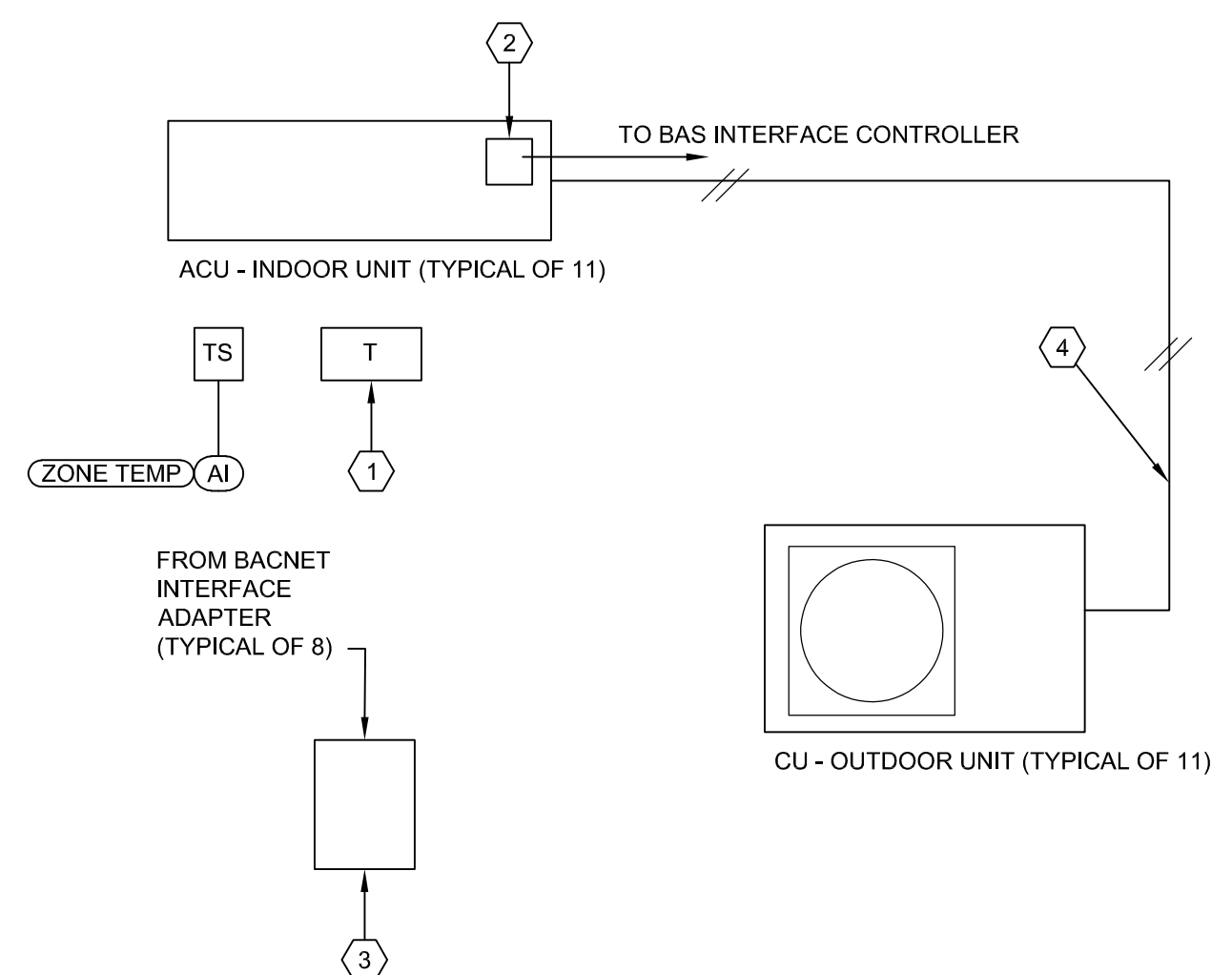
The pump shall be off.

STANDBY MODE:

The controller shall modulate the pump to maintain the differential pressure setpoint as determined by final test and balance. The VFDs minimum speed shall not drop below 20%.

POINT LIST SCHEDULE (HHP-X)

Point Name	Hardware Points				Software Points							
	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic	
PRIMARY LOOP												
LOOP DIFFERENTIAL PRESSURE	X									X		
LEAD PUMP VFD SPEED		X								X	X	
LEAD PUMP STATUS			X								X	
LEAD PUMP VFD FAULT			X								X	
LEAD PUMP VFD START/STOP				X							X	
STANDBY PUMP VFD SPEED		X								X	X	
STANDBY PUMP STATUS			X								X	
STANDBY PUMP VFD FAULT			X								X	
STANDBY PUMP VFD START/STOP				X							X	
SETPOINTS												
LOOP DIFFERENTIAL PRESSURE					X							
ALARMS	DESCRIPTION										ALARM	
LEAD PUMP												
FAILURE											X	
RUNNING IN HAND											X	
RUNTIME EXCEEDED											X	
STANDBY PUMP												
FAILURE											X	
RUNNING IN HAND											X	
RUNTIME EXCEEDED											X	
HIGH LOOP DIFFERENTIAL PRESSURE											X	
LOW LOOP DIFFERENTIAL PRESSURE											X	



**SEQUENCE OF OPERATIONS
VRF SPLIT SYSTEM FAN COIL UNITS**

GENERAL DESCRIPTION

The variable refrigerant flow (VRF) split system heat pump consists of an indoor fan coil unit (ACU) and outdoor condensing unit (CU) that provides heating, cooling and ventilation for the conditioned space as shown on the drawings. The outdoor unit is dedicated to an indoor fan coil unit providing independent temperature control for the space served.

RUN CONDITIONS

Continuous operation.
The unit shall be in occupied mode per the project design conditions schedule.

Remote Shutdown: The unit shall shut down and generate an alarm upon receiving a remote shutdown signal indicating the unit has been taken offline.

HEATING MODE

A call for heat from the zone level establishes a call for heat. Initial setpoints are as scheduled in the points list unless otherwise shown on the project design conditions schedule.

COOLING MODE

A call for cooling from the zone level establishes a call for cooling. Initial setpoints are as scheduled in the points list unless otherwise shown on the project design conditions schedule.

ZONE LEVEL OCCUPANCY OVERRIDE

None

ZONE LEVEL SETPOINT OVERRIDE

None.

MONITORING, MANAGEMENT and ALARMS

The VRF outdoor units (CU), indoor units (CU) are furnished with integrated factory digital controls (DDC) system with an internet based monitoring and management software and building automation system (BAS) interface protocol device based on BACnet ETL providing remote monitoring from a third-party BAS control system. The VRF system shall be controlled, scheduled and monitored through the factory integrated DDC system. Equipment and control devices not furnished with the VRF system shall be controlled, scheduled and monitored through the third-party BAS system in compliance with the specifications and shown on in the drawings.

POINTS LIST SCHEDULE - VRF SS HEAT PUMP

POINT NAME	HARDWARE POINTS				SOFTWARE POINTS							SHOWN ON GRAPHIC	NOTES
	AI	AO	BI	BO	SETPOINT	AV	BV	LOOP	SCHED	TREND	ALARM		
ACU													
FAN SLOW SPEED				X						X		X	1,5
FAN LOW SPEED				X						X		X	1,5
FAN MEDIUM SPEED				X						X		X	1,5
FAN HIGH SPEED				X						X		X	1,5
FAN STATUS			X							X		X	1,5
DISCHARGE AIR TEMPERATURE	X									X		X	1
ZONE TEMPERATURE	X									X		X	1,3
SMOKE DETECTOR			X							X	X	X	1,5
COMPRESSOR													
COMPRESSOR STAGE 1				X						X		X	1,5
REVERSING VALVE				X						X		X	1,5
REMOTE START/STOP				X						X		X	1,3
BAS INTERFACE COMM LINK													4
SETPOINTS													
EMERGENCY SHUTDOWN					NA	X				X	X		1
ZONE COOLING SETPOINT					NOTE 2	X				X		X	1,5
ZONE HEATING SETPOINT					NOTE 2	X				X		X	1,5
ALARMS	DESCRIPTION										ALARM		
FAN FAILURE	COMMANDED ON, BUT THE STATUS IS OFF.										X	1,5	
FAN IN HAND	COMMANDED OFF, BUT THE STATUS IS ON.										X	1	
FAN RUNTIME EXCEEDED	FAN RUNTIME HAS EXCEEDED A USER DEFINABLE LIMIT.										X	1,5	
COMPRESSOR RUNTIME EXCEEDED	COMPRESSOR RUNTIME HAS EXCEEDED A USER DEFINABLE LIMIT.										X	1,5	
HIGH DISCHARGE AIR TEMPERATURE	IF THE DISCHARGE AIR TEMPERATURE IS GREATER THAN 115°F (ADJ.).										X	1	
LOW DISCHARGE AIR TEMPERATURE	IF THE DISCHARGE AIR TEMPERATURE IS LESS THAN 45°F (ADJ.).										X	1	
HIGH ZONE TEMPERATURE	IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY 5°F (ADJ.).										X	1,5	
LOW ZONE TEMPERATURE	IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY 5°F (ADJ.).										X	1,5	
FILTER CHANGE REQUIRED	FILTER USE HAS EXCEEDED A USER DEFINABLE LIMIT.										X	1,5	
NOTES:													
1 ACU AND CONDENSING UNIT FURNISHED WITH FACTORY INSTALLED CONTROLS. COORDINATE CONTROLLER WITH ACU AND CONDENSING UNIT MANUFACTURER.													
2 SEE PROJECT DESIGN CONDITIONS SCHEDULE.													
3 TCC FIELD INSTALLED DEVICE. SEE PLANS FOR LOCATION.													
4 BACNET ETL INTERFACE COMMUNICATION LINK PROVIDED WITH EQUIPMENT. COORDINATE REQUIREMENTS WITH SECTION 230923 AND TEMPERATURE CONTROL CONTRACTOR.													
5 MAPPED CONTROL AND MONITORING THROUGH BACNET COMMUNICATION LINK TO BUILDING MANAGEMENT SYSTEM.													

**SEQUENCE OF OPERATIONS
BAC INTERFACE MONITORING**

A common alarm will be graphically displayed at the BAS system work station.

OUTDOOR CONDENSING UNIT (CU-X)

The condensing unit shall operate subject to the integrated factory digital controls (DDC) system.

INDOOR UNIT (ACU-X)

FAN - The fan switch shall be set to auto with the fan speed shall be auto or as note in the equipment schedule.

FILTER MONITORING - The controller shall monitor the fan runtime to provide maintenance reminder at 50% of filter elapsed time (1100 hours) and an alarm at 100% elapsed time (2200 hours).

SPACE TEMPERATURE MONITORING (TS-X)

The building automation system shall monitor the following spaces with a space temperature sensor with adjustable alarm settings for high limit and low limit temperature settings. The alarm shall be annunciated at the operator's work station with graphical interface.

Revision #	Date
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CONSULTANT INFORMATION

STRUCTURAL / CIVIL ENGINEER: STAND STRUCTURAL ENGINEERING, 11827 W. 112TH STREET, SUITE 200, OVERLAND PARK, KS 66210 (913) 214-2189

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FIRE PROTECTION ENGINEER: POOLE FIRE PROTECTION, INC., 19910 W. 161ST STREET, OLATH, KS 66062 (913) 828-8850

ARCHITECT

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Office of Construction and Facilities Management

U.S. Department of Veteran Affairs

SHEET TITLE: MECHANICAL CONTROLS V

APPROVED: PROJECT DIRECTOR

PROJECT PHASE: BID DOCUMENTS

FULLY SPRINKLERED

PROJECT TITLE: RENOVATE A & B WING BUILDING 6

PROJECT LOCATION: 2200 SW GAGE BLVD, TOPEKA, KS 66622

DATE: 07/10/19

CHECKED BY: JES

DRAWN BY: JAD

VA PROJECT NUMBER: 589A5-19-116

BUILDING NUMBER: 6

DRAWING NUMBER: 6-M-705

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