

THE UNIVERSITY OF GEORGIA STANDARD CONTROL DRAWINGS

LIST OF DRAWINGS

C-000	TITLE SHEET
C-001	CONTROL SYMBOLS & ABBREVIATIONS
C-101	FAN COIL UNIT (4-PIPE)
C-102	VAV BOX (COOL ONLY)
C-103	VAV TERMINAL UNIT WITH HOT WATER REHEAT
C-104	SERIES FAN POWERED VAV TERMINAL UNIT WITH HOT WATER REHEAT
C-105	PARALLEL FAN POWERED VAV TERMINAL UNIT WITH HOT WATER REHEAT
C-106	VRF (VARIABLE REFRIGERANT FLOW) SYSTEM INTERFACE
C-201	VAV AHU WITH PREHEAT, CHILLED WATER, AND RETURN FAN
C-202	VAV AHU WITH PREHEAT, AND CHILLED WATER
C-203	VAV AHU 100% OUTSIDE AIR WITH PREHEAT, AND CHILLED WATER
C-204	VAV AHU WITH PREHEAT, CHILLED WATER, AND REHEAT
C-301	CV AHU WITH PREHEAT, CHILLED WATER, MINIMUM OUTSIDE AIR, AND RETURN FAN
C-302	CV AHU 100% OUTSIDE AIR WITH PREHEAT, CHILLED WATER, AND ENERGY RECOVERY
C-401	STEAM TO HOT WATER CONVERTER WITH VARIABLE VOLUME PUMPS
C-402	PROCESS CHILLED WATER LOOP
C-501	VAV MANIFOLD LABORATORY EXHAUST
C-601	MISCELLANEOUS CONTROLS
	.A OUTSIDE AIR SENSORS
	.B HEADERED FAN
	.C ELECTRIC UNIT HEATER
	.D HUMIDIFIER
	.E FIRE/SMOKE DAMPER SAFETY
	.F INTERLOCKED EXHAUST FAN

Eng	HJN
Drawn	HJN
Chkd	---
Appd	---
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Proj Code	

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TITLE SHEET

01 OF XX
SHEET NUMBER

C-000

DWG NUMBER

CONTROL SYMBOLS			
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	DDC POINT DESCRIPTOR WITH NAME AI - ANALOG INPUT DI - DIGITAL INPUT AO - ANALOG OUTPUT DO - DIGITAL OUTPUT		DISCONNECT SWITCH
	TEMPERATURE SENSOR WITH AVERAGING ELEMENT		CONTROL TRANSFORMER
	TEMPERATURE SENSOR WITH SINGLE POINT ELEMENT		RELAY COILS
	TEMPERATURE SENSOR WITH PIPE WELL		FUSE
	SPACE TEMPERATURE SENSOR		THERMAL OVERLOAD
	CARBON DIOXIDE DUCT SENSOR		NORMALLY OPEN AND NORMALLY CLOSED CONTACTS
	CURRENT SENSOR		HAND-OFF-AUTO SELECTOR SWITCH
	SMOKE DETECTOR		WIRING DESIGNATION. (NO. OF HATCHES INDICATES NO. OF CONDUCTORS)
	DIFFERENTIAL PRESSURE SWITCH		WIRING CONNECTION
	WATER FLOW SWITCH		ON-OFF SELECTOR SWITCH
	TWO WAY CONTROL VALVE		THREE WAY CONTROL VALVE
	DAMPER ACTUATOR		LIMIT SWITCH
	AIR DIFFERENTIAL PRESSURE TRANSMITTER (0 - 5" RANGE)		CONTROL DAMPER
	VARIABLE SPEED DRIVE		HYDRONIC DIFFERENTIAL PRESSURE TRANSMITTER
	FREEZESTAT		HYDRONIC FLOWMETER
	AIRFLOW MEASURING STATION		THERMOSTAT
	TEMPERATURE SENSOR PIPE STRAP		AIR FLOW MONITORING STATION

SYMBOL AND ABBREVIATION SCHEDULE	
MISC. SYMBOLS AND ABBREVIATIONS	
	CONNECT NEW TO EXISTING NUMBER INDICATES SECTION LETTER INDICATES ELEVATION OR DETAIL SHEET NUMBER WHERE ELEVATION, SECTION OR DETAIL IS DRAWN
	ROOM NUMBER
	HEIGHT TO BOTTOM OF OBJECT
	ADJUSTABLE
	COMMON
	DRY BULB
	DIFFERENTIAL
	FIRE ALARM SYSTEM
	HORSEPOWER
	INPUT
	INCHES WATER GAUGE
	THOUSAND BTU/HR
	MOTOR STARTER
	COMMON
	NORMALLY CLOSED
	NORMALLY OPEN
	OUTPUT
	PHASE
	POUNDS PER SQUARE INCH (GAUGE)
	RELATIVE HUMIDITY
	SETPPOINT
	TIME DELAY RELAY
	WET BULB

- GENERAL NOTES**
1. WALL MOUNTED SPACE SENSORS FOR SINGLE ZONE EQUIPMENT: PROVIDE WITH COMMUNICATIONS PORT AND SET POINT ADJUSTMENT, EXCEPT FOR PUBLIC AREAS, AND MECHANICAL/ELECTRICAL SPACES; PROVIDE BASIC SENSOR WITH COMMUNICATIONS PORT, NO SET POINT ADJUSTMENT. PROVIDE SENSORS WITH LCD DISPLAY WHERE INDICATED ON FLOOR PLAN DRAWINGS.
 2. PANEL LABELS: IDENTIFY EACH CONTROL PANEL WITH A UNIQUE PANEL NUMBER AND THE NAME OF EQUIPMENT(SYSTEM(S)) CONTROLLED BY PANEL. SEE GUIDE SPECIFICATION 255500/3.09.

LEGEND	
WIRING DESIGNATIONS	
	NEW WIRING
	EXISTING WIRING (OR BY OTHERS)

- DESIGNER NOTES**
1. LIFE SAFETY MONITORING AND SEQUENCES: THESE DRAWINGS TYPICALLY DO NOT INDICATE LIFE SAFETY DEVICES FOR MONITORING OR SEQUENCING THROUGH THE BAS. COORDINATE LIFE SAFETY DEVICE CONTROL AND MONITORING USING THE BAS WITH UGA. TYPICALLY ADDITIONAL CODE REQUIREMENTS NOT INCLUDED WITH THESE GUIDE DRAWINGS WILL BE REQUIRED.
 2. UNINTERRUPTED POWER SUPPLY: INCLUDE IN DESIGN ONLY AFTER CONSULTATION WITH UGA. IF THE EQUIPMENT/SYSTEM APPLICATION REQUIRES UNINTERRUPTED OPERATION PROVIDE DETAILS FOR AN UNINTERRUPTIBLE POWER SUPPLY TO BE ADDED TO POWER THE EQUIPMENT CONTROL PANEL AND ACCESSORIES UNTIL GENERATOR POWER IS ONLINE OR NORMAL POWER IS RESTORED. (ALSO SEE GUIDE SPECIFICATION 255500/3.11).

ABBREVIATIONS			
ALM	ALARM	NC	NORMALLY CLOSED
AH	AIR HANDLER	NO	NORMALLY OPEN
BLDG	BUILDING	OA	OUTSIDE AIR
C	COMMON	OVHD	OVERHIDE
CL	COOL	RA	RETURN AIR
CHPS	CHILLED WATER PUMP, SECONDARY	REQ	REQUEST
CHWP	CHILLED WATER PUMP	RF	RETURN FAN
CHWR	CHILLED WATER RETURN	REL	RELIEF FAN
CHWS	CHILLED WATER SUPPLY	S/S	START / STOP
CW	CONDENSER WATER	SA	SUPPLY AIR
CWP	CONDENSER WATER PUMP	SD	SMOKE DETECTOR
CWR	CONDENSER WATER RETURN	SEC	SECONDARY OR SECONDS
CWS	CONDENSER WATER SUPPLY	SF	SUPPLY FAN
DD	DOWN-DUCT	SCHWR	SECONDARY CHILLED WATER RETURN
DP	DIFFERENTIAL PRESSURE	SCHWS	SECONDARY CHILLED WATER SUPPLY
EF	EXHAUST FAN	SHWR	SECONDARY HOT WATER RETURN
FBK	FEEDBACK	SHWS	SECONDARY HOT WATER SUPPLY
FC	FAN COIL	T	TEMPERATURE
HOA	HAND - OFF - AUTOMATIC	TB	TERMINAL BOX
HT	HEAT	TW	TEMPERED WATER
HWP	HOT WATER PUMP	TWP	TEMPERED WATER PUMP
HWPS	HOT WATER PUMP, SECONDARY	TWR	TEMPERED WATER RETURN
HWR	HOT WATER RETURN	TWS	TEMPERED WATER SUPPLY
HWS	HOT WATER SUPPLY	VP	VELOCITY PRESSURE
ISO	ISOLATION	VSD	VARIABLE SPEED DRIVE
MA	MIXED AIR		

THE UNIVERSITY OF GEORGIA
 STANDARD CONTROL DRAWINGS

Eng	HJN
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Appd	---
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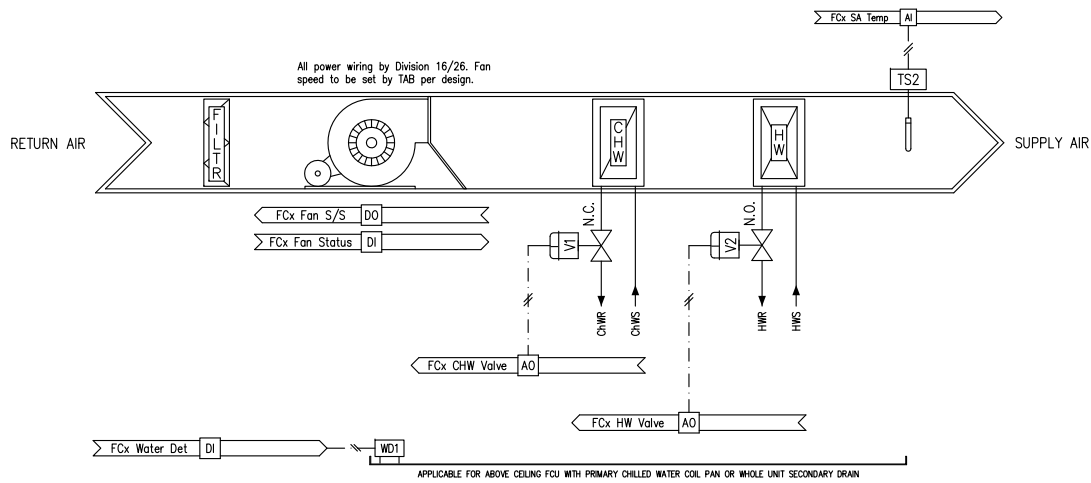
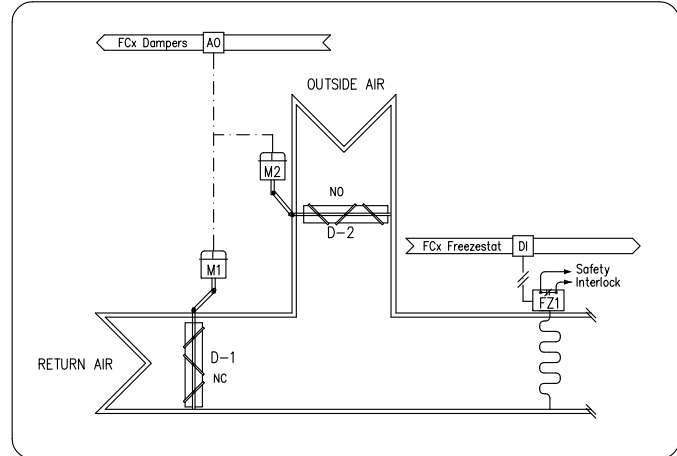
(REV.3)
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CONTROLS
SYMBOLS AND
ABBREVIATIONS

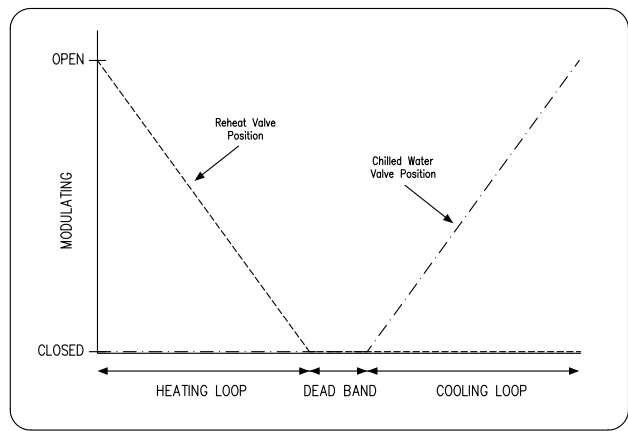
01 OF XX
SHEET NUMBER

C-001
DWG NUMBER

DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: Return air damper shall operate inversely to outside damper as described below. When unit starts in occupied mode, the outside air damper shall open to minimum position. During unoccupied periods, the outside air damper shall remain closed. Whenever the freezeostat is in alarm, the unit shall be commanded to stop, outside air damper commanded closed and hydronic valves commanded fully open. [For units with CO2 management include: When the space CO2 exceeds alarm set point and fan status is proven on, the outside air damper shall be overridden full open until CO2 falls below set point.]

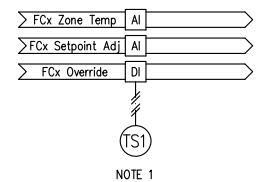


APPLICABLE FOR ABOVE CEILING FCU WITH PRIMARY CHILLED WATER COIL FAN OR WHOLE UNIT SECONDARY DRAIN



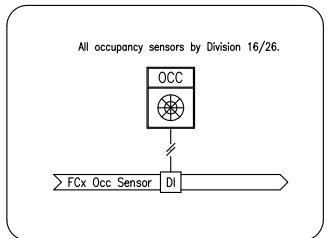
VALVE CONTROL DIAGRAM

CONTROL SCHEMATIC

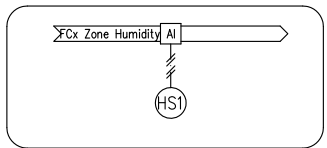


NOTE 1

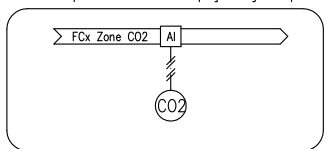
DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: While occupancy sensor is active within a 15 minute (adj.) deadband the unit shall be energized in occupied mode. Unit shall revert to normal occupancy schedule after deadband expires with no activity sensed.



DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: When zone humidity rises above set point (60%, adj.) chilled water valve shall be commanded open and reheat valve shall modulate to maintain zone temperature set point.



DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: When zone CO2 rises above set point (1,000 ppm, adj.) an alarm shall be generated and a request for additional outside air sent to the make-up air unit [for FCUs with adjustable outside air damper; FCU OA damper will be commanded open] serving this space.



SEQUENCE OF OPERATION

GENERAL: THE FOUR PIPE HORIZONTAL FAN COIL UNIT SHALL BE FULLY CONTROLLED BY THE BAS.

SPACE TEMPERATURE CONTROL: THREE SETPOINTS SHALL APPLY. NORMAL (73°F ADJ.), SETBACK HEATING (59°F), AND SETBACK COOLING (85°F). THESE VALUES SHALL BE THE ONLY VALUES CHANGED BY THE OPERATOR TO ADJUST SPACE TEMPERATURES. ALL OTHER DEADBANDS, DIFFERENTIALS, ETC. SHALL BE CALCULATED IN THE PROGRAM LOGIC (UNLESS ANOTHER MEANS IS PROVIDED TO PROHIBIT OVERLAP OF THE HEATING AND COOLING LOOPS). DURING THE NORMAL PERIODS, SEPARATE HEATING AND COOLING SETPOINTS SHALL BE CALCULATED:

- NORMAL SPACE COOLING SETPOINT SHALL BE THE EFFECTIVE SPACE TEMPERATURE SETPOINT PLUS 3°F (ADJ.).
- NORMAL SPACE HEATING SETPOINT SHALL BE THE EFFECTIVE SPACE TEMPERATURE SETPOINT MINUS 3°F (ADJ.).

OCCUPANCY OVERRIDE: OCCUPANCY OVERRIDE SHALL BE INITIATED AT THE LOCAL ZONE SENSOR OR VIA THE OCCUPANCY SENSOR. UNIT SHALL CHANGE TO THE OCCUPIED MODE WHENEVER THE OVERRIDE BUTTON IS DEPRESSED (OR SIGNAL IS RECEIVED FROM THE OCCUPANCY SENSOR) FOR A PERIOD OF 2 HOURS (ADJ.) AND RESET TO NORMAL OPERATION AT THE END OF THE PERIOD OR WHENEVER THE OVERRIDE BUTTON IS HELD FOR MORE THAN 5 SECONDS (ADJ.).

FAN: FAN SHALL BE ENABLED AND RUN CONTINUOUSLY DURING OCCUPIED MODE. DURING UNOCCUPIED MODE, FAN SHALL BE DEENERGIZED EXCEPT AS REQUIRED TO MAINTAIN SETBACK TEMPERATURE SETPOINTS FOR BOTH HEATING AND COOLING WITH A CYCLE DIFFERENTIAL OF 3°F (ADJ.). BAS SHALL PROVE FAN OPERATION AND USE THE STATUS INDICATION TO ACCUMULATE RUNTIME.

VALVES: BAS SHALL MODULATE THE CHILLED WATER AND HOT WATER VALVES TO MAINTAIN THE ACTIVE SPACE TEMPERATURE SETPOINT (NORMAL OCCUPIED, SETBACK COOLING, SETBACK HEATING). LOGIC SHALL PREVENT OVERLAPPING CONTROL OF THE VALVES. VALVES SHALL BE COMMANDED CLOSED AND AN ALARM GENERATED WHENEVER THE DRAIN FAN FLOAT SWITCH OR WATER DETECTOR IS ACTIVATED.

OPERATOR SHUTDOWN: THE BAS OPERATOR SHALL HAVE THE CAPABILITY, AT THE PROPER PASSWORD LEVEL, TO ISSUE A SINGLE SHUTDOWN COMMAND FROM THE OWS WHICH DEENERGIZES MULTIPLE TERMINAL UNITS AS DESIGNATED BY THE OPERATOR.

HEATING REQUEST: A "HEATING REQUEST" SHALL BE BROADCAST TO THE HW SYSTEM SERVING THIS UNIT WHENEVER THE HW OUTPUT IS AT 100% (ADJ.) OR THE SPACE TEMPERATURE FALLS BELOW THE THROTLING RANGE OF THE HEATING LOOP.

COOLING REQUEST: A "COOLING REQUEST" SHALL BE BROADCAST TO THE CHW SYSTEM SERVING THIS UNIT WHENEVER THE CHW OUTPUT IS AT 100% (ADJ.) OR THE SPACE TEMPERATURE RISES ABOVE THE THROTLING RANGE OF THE COOLING LOOP.

GRAPHICS AND TRENDS: PROVIDE TRENDS AND GRAPHIC DISPLAY FOR ALL CONTROL POINTS AND CALCULATED SET POINTS PER SPECIFICATIONS.

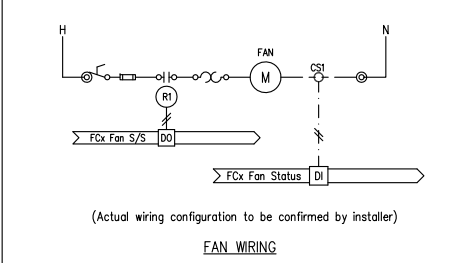
POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE					REMARKS
		DI	AI	DO	AO	VP	
bdg.FCUxxx.HWV	HW Valve				1		
bdg.FCUxxx.CHWV	CHW Valve				1		
bdg.FCUxxx.SAT	SA Temp		1				
bdg.FCUxxx.FANSS	Fan S/S			1			
bdg.FCUxxx.FANST	Fan Status	1					
bdg.FCUxxx.ZONET	Zone Temp		1				
bdg.FCUxxx.SPADJ	Setpoint Adj		1				
bdg.FCUxxx.OCCOVRD	Occ Override	1					
bdg.FCUxxx.WD	Water Detector	1					
	Htg Request					*	
	Cig Rqst					*	
	Normal SP					*	
	OA Temp					*	
	Cig Stpt					*	
	Htg Stpt					*	
	SB Htg Stpt					*	
	SB Cig Stpt					*	
TOTALS		3	3	1	2	8	

NOTES

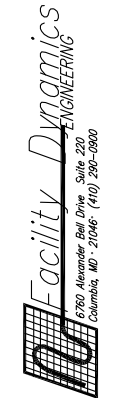
1. Provide with communications port and set point adjustment. For public areas, and mechanical/electrical spaces provide basic sensor with communications port; no set point adjustment. Provide sensors with LCD display where indicated on floor plan drawings.

ELECTRIC LADDER DIAGRAMS



(Actual wiring configuration to be confirmed by installer)

FAN WIRING



THE UNIVERSITY OF GEORGIA
STANDARD CONTROL DRAWINGS

Eng	HJN
Drawn	HJN
Chkd	---
Appd	---
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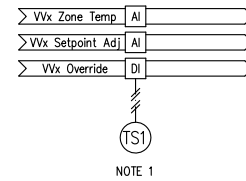
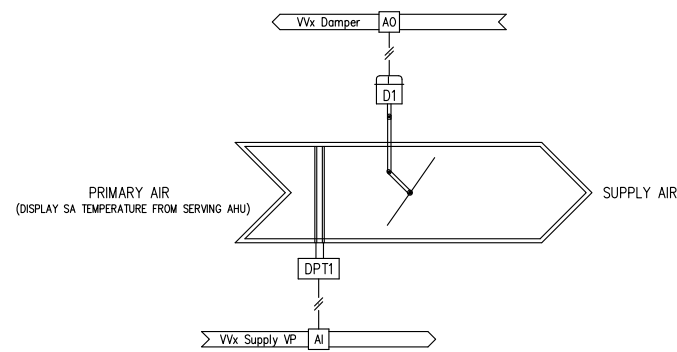
(REV.4)
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FAN COIL UNIT
(4-PIPE)

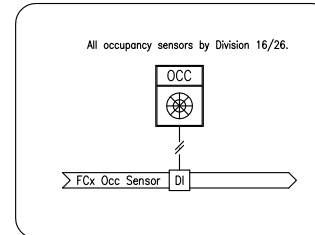
XX OF XX
SHEET NUMBER

C-101

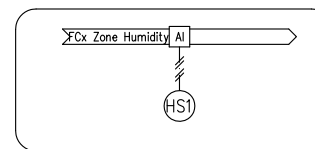
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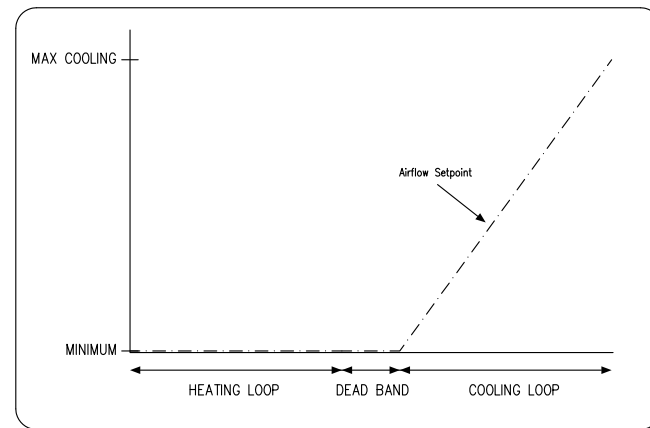
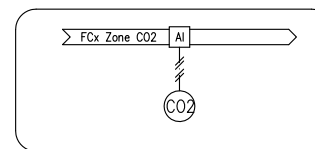
DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: While occupancy sensor is active within a 15 minute (adj.) deadband the unit shall be energized in occupied mode. Unit shall revert to normal occupancy schedule after deadband expires with no actively sensed.



DESIGNER NOTE: Include in design only after consultation with UGA. Zone humidity may be used as a monitoring point or broadcast to parent AHU for sequencing humidity control.



DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: When zone CO2 rises above set point (1,000 ppm, adj.) an alarm shall be generated and a request for additional outside air sent to the AHU serving this space.



DAMPER CONTROL DIAGRAM

CONTROL SCHEMATIC

SEQUENCE OF OPERATION

GENERAL: THE VARIABLE AIR VOLUME TERMINAL SHALL BE FULLY CONTROLLED BY THE BAS. CONTROL SHALL BE PRESSURE INDEPENDENT WITH MINIMUM AND MAXIMUM FLOW SETPOINTS, SCHEDULED OCCUPANCY WITH OPTIMUM PREOCCUPANCY AND OCCUPANCY OVERRIDE. SCHEDULE SHALL BE THE SAME AS THE PARENT AHU.

SPACE TEMPERATURE CONTROL: THREE SETPOINTS SHALL APPLY. NORMAL (73F ADJ.), SETBACK HEATING (55F), AND SETBACK COOLING (85F). THESE VALUES SHALL BE THE ONLY VALUES CHANGED BY THE OPERATOR TO ADJUST SPACE TEMPERATURES. ALL OTHER DEADBANDS, DIFFERENTIALS, ETC. SHALL BE CALCULATED IN THE PROGRAM LOGIC (UNLESS ANOTHER MEANS IS PROVIDED TO PROHIBIT OVERLAP OF THE HEATING AND COOLING LOOPS AND ENSURE A DEAD BAND SUCH AS FUNCTION BLOCK TEMPLATES THAT RESTRICT THE SETPOINT INPUT). DURING THE NORMAL PERIODS, SEPARATE HEATING AND COOLING SETPOINTS SHALL BE CALCULATED:

1. NORMAL SPACE COOLING SETPOINT SHALL BE THE EFFECTIVE SPACE TEMPERATURE SETPOINT PLUS 3F (ADJ.).
2. NORMAL SPACE HEATING SETPOINT SHALL BE THE EFFECTIVE SPACE TEMPERATURE SETPOINT MINUS 3F (ADJ.).

OCCUPANCY OVERRIDE: OCCUPANCY OVERRIDE SHALL BE INITIATED AT THE LOCAL ZONE SENSOR OR VIA THE OCCUPANCY SENSOR. UNIT SHALL CHANGE TO THE OCCUPIED MODE WHENEVER THE OVERRIDE BUTTON IS DEPRESSED (OR SIGNAL IS RECEIVED FROM THE OCCUPANCY SENSOR) FOR A PERIOD OF 2 HOURS (ADJ.) AND RESET TO NORMAL OPERATION AT THE END OF THE PERIOD OR WHENEVER THE OVERRIDE BUTTON IS HELD FOR MORE THAN 5 SECONDS (ADJ.) OR THE OCCUPANCY SENSOR DOES NOT DETECT MOTION CONTINUOUSLY FOR 20 MINUTES (ADJ.).

ZONE DAMPER: ZONE DAMPER SHALL MODULATE IN A PI LOOP TO MAINTAIN ZONE VOLUME SETPOINT. ZONE VOLUME SETPOINT SHALL BE RESET BETWEEN MAXIMUM AND MINIMUM VOLUME SETTINGS TO MAINTAIN SPACE TEMPERATURE COOLING SETPOINT WITH A 2F (ADJ.) RESET RANGE. ZONE VOLUME SETPOINT SHALL BE SET TO THE HEATING VOLUME SETPOINT WHENEVER THE SPACE TEMPERATURE FALLS BELOW THE HEATING SPACE TEMPERATURE SETPOINT.

1. COOLING MINIMUM VOLUME SETPOINT SHALL BE DETERMINED AS SCHEDULED ON THE DRAWINGS. IN THE UNOCCUPIED PERIOD THE MINIMUM VOLUME SETPOINT SHALL BE 0 CFM.
2. COOLING MAXIMUM VOLUME SETPOINT SHALL BE AS SCHEDULED ON THE DRAWINGS DURING THE OCCUPIED PERIOD AND SHALL BE SET TO ZERO OTHERWISE.
3. HEATING MINIMUM VOLUME SETPOINT: WHENEVER HEATING IS REQUESTED FROM THE BOX IN ANY PERIOD, THE MINIMUM VOLUME SHALL BE SET TO AN ADJUSTABLE HEATING SETPOINT AIRFLOW. INITIALLY, THIS SETPOINT SHALL EQUAL THE COOLING MINIMUM VOLUME SETPOINT.

COOLING REQUEST: THIS TERMINAL SHALL ISSUE A "COOLING REQUEST" TO THE PARENT AHU AS FOLLOWS:

1. WHENEVER THE ZONE DAMPER OUTPUT IS CONTROLLING FOR A COOLING SETPOINT AND THE CALCULATED SIGNAL IS GREATER THAN 90% (ADJ.), OR
2. WHENEVER THE SPACE TEMPERATURE RISES ABOVE THE THROTTLING RANGE OF THE COOLING LOOP.

GRAPHICS AND TRENDS: PROVIDE TRENDS AND GRAPHIC DISPLAY FOR ALL CONTROL POINTS AND CALCULATED SET POINTS PER SPECIFICATIONS.

NOTES

1. Provide with communications port and set point adjustment. For public areas, and mechanical/electrical spaces provide basic sensor with communications port; no set point adjustment. Provide sensors with LCD display where indicated on floor plan drawings.

POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE			REMARKS
		DI	AI	DO AO	
bdg.VAxxx.SAVP	Supply VP		1		
bdg.VAxxx.DMPR	Primary Damper			1	
bdg.VAxxx.OCCOVRD	Occ Override	1			
bdg.VAxxx.SPADJ	Setpoint Adj		1		
bdg.VAxxx.ZONET	Zone Temp		1		
TOTALS		1	3	0 1	

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Drawn HJN
Chkd ---
Appd ---
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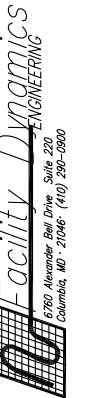
(REV.3)
FOR REVIEW
ONLY

VAV TERMINAL
UNIT
(COOLING ONLY)

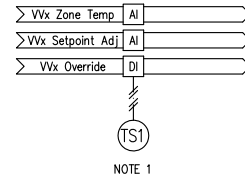
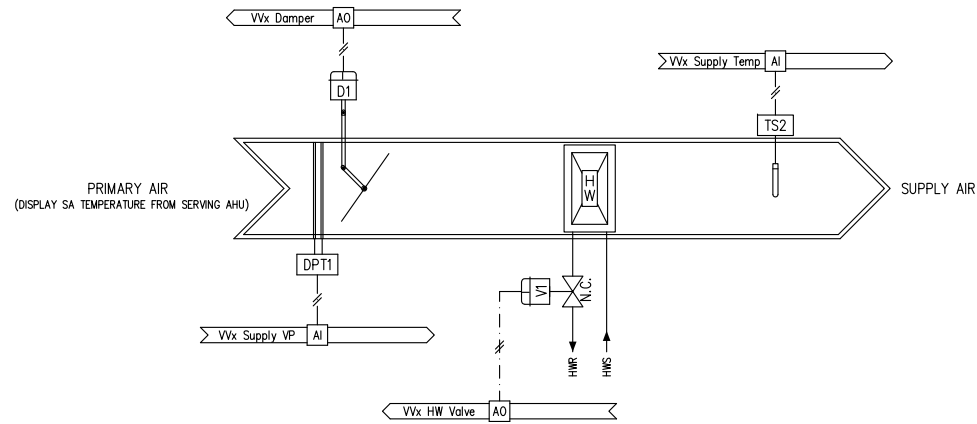
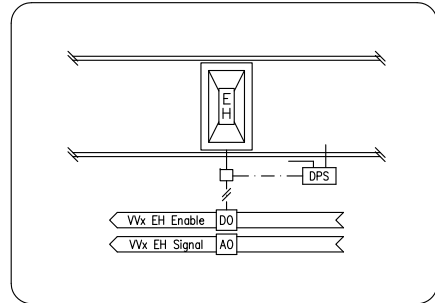
XX OF XX
SHEET NUMBER

C-102

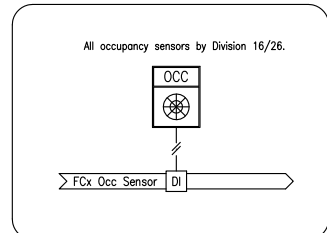
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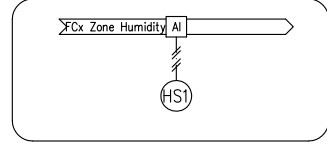
DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: Whenever the heating minimum volume setpoint is active and flow is proven at the electric coil the electric heating coil shall be enabled and modulate to maintain space temperature heating setpoint as defined above with a 2F throttling range. Electric heat shall be disabled whenever the parent AHU is off.



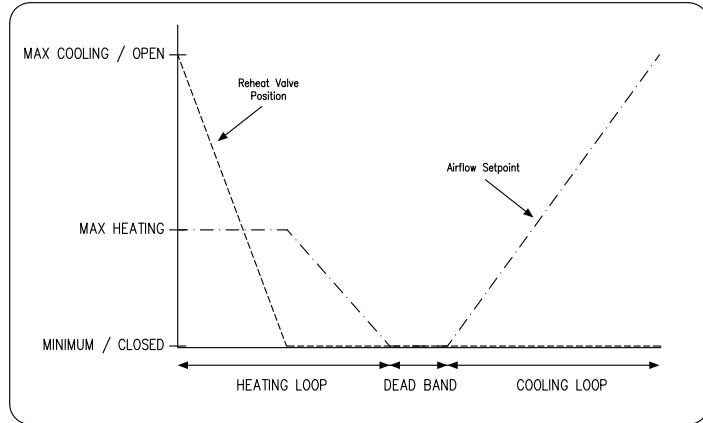
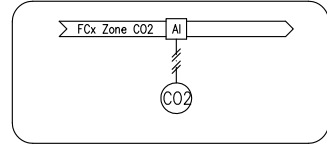
DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: While occupancy sensor is active within a 15 minute (adj.) deadband the unit shall be energized in occupied mode. Unit shall revert to normal occupancy schedule after deadband expires with no activity sensed.



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DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: When zone CO2 rises above set point (1,000 ppm, adj.) an alarm shall be generated and a request for additional outside air sent to the AHU serving this space.



TEMPERATURE CONTROL DIAGRAM

CONTROL SCHEMATIC

SEQUENCE OF OPERATION

GENERAL: THE VARIABLE AIR VOLUME TERMINAL SHALL BE FULLY CONTROLLED BY THE BAS. CONTROL SHALL BE PRESSURE INDEPENDENT WITH MINIMUM AND MAXIMUM FLOW SETPOINTS, SCHEDULED OCCUPANCY WITH OPTIMUM PREOCCUPANCY AND OCCUPANCY OVERRIDE. SCHEDULE SHALL BE THE SAME AS THE PARENT AHU.

SPACE TEMPERATURE CONTROL: THREE SETPOINTS SHALL APPLY. NORMAL (73F ADJ.), SETBACK HEATING (55F), AND SETBACK COOLING (85F). THESE VALUES SHALL BE THE ONLY VALUES CHANGED BY THE OPERATOR TO ADJUST SPACE TEMPERATURES. ALL OTHER DEADBANDS, DIFFERENTIALS, ETC. SHALL BE CALCULATED IN THE PROGRAM LOGIC (UNLESS ANOTHER MEANS IS PROVIDED TO PROHIBIT OVERLAP OF THE HEATING AND COOLING LOOPS AND ENSURE A DEAD BAND SUCH AS FUNCTION BLOCK TEMPLATES THAT RESTRICT THE SETPOINT INPUT). DURING THE NORMAL PERIODS, SEPARATE HEATING AND COOLING SETPOINTS SHALL BE CALCULATED:

1. NORMAL SPACE COOLING SETPOINT SHALL BE THE EFFECTIVE SPACE TEMPERATURE SETPOINT PLUS 3F (ADJ.).
2. NORMAL SPACE HEATING SETPOINT SHALL BE THE EFFECTIVE SPACE TEMPERATURE SETPOINT MINUS 3F (ADJ.).

OCCUPANCY OVERRIDE: OCCUPANCY OVERRIDE SHALL BE INITIATED AT THE LOCAL ZONE SENSOR OR VIA THE OCCUPANCY SENSOR. UNIT SHALL CHANGE TO THE OCCUPIED MODE WHENEVER THE OVERRIDE BUTTON IS DEPRESSED (OR SIGNAL IS RECEIVED FROM THE OCCUPANCY SENSOR) FOR A PERIOD OF 2 HOURS (ADJ.) AND RESET TO NORMAL OPERATION AT THE END OF THE PERIOD OR WHENEVER THE OVERRIDE BUTTON IS HELD FOR MORE THAN 5 SECONDS (ADJ.) OR THE OCCUPANCY SENSOR DOES NOT DETECT MOTION CONTINUOUSLY FOR 20 MINUTES (ADJ.).

ZONE DAMPER: ZONE DAMPER SHALL MODULATE IN A PI LOOP TO MAINTAIN ZONE VOLUME SETPOINT. ZONE VOLUME SETPOINT SHALL BE RESET BETWEEN MAXIMUM AND MINIMUM VOLUME SETTINGS TO MAINTAIN SPACE TEMPERATURE COOLING SETPOINT WITH A 2F (ADJ.) RESET RANGE. ZONE VOLUME SETPOINT SHALL BE SET TO THE HEATING VOLUME SETPOINT WHENEVER THE SPACE TEMPERATURE FALLS BELOW THE HEATING SPACE TEMPERATURE SETPOINT.

1. COOLING MINIMUM VOLUME SETPOINT SHALL BE DETERMINED AS SCHEDULED ON THE DRAWINGS. IN THE UNOCCUPIED PERIOD THE MINIMUM VOLUME SETPOINT SHALL BE 0 CFM.
2. COOLING MAXIMUM VOLUME SETPOINT SHALL BE AS SCHEDULED ON THE DRAWINGS DURING THE OCCUPIED PERIOD AND SHALL BE SET TO ZERO OTHERWISE.
3. HEATING MINIMUM VOLUME SETPOINT: WHENEVER HEATING IS REQUESTED FROM THE BOX IN ANY PERIOD, THE MINIMUM VOLUME SHALL BE SET TO AN ADJUSTABLE HEATING SETPOINT AIRFLOW. INITIALLY, THIS SETPOINT SHALL EQUAL THE COOLING MINIMUM VOLUME SETPOINT.

HYDRONIC REHEAT: WHENEVER THE HEATING MINIMUM VOLUME SETPOINT IS ACTIVE THE NORMALLY CLOSED ZONE REHEAT COIL VALVE SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE HEATING SETPOINT AS DEFINED ABOVE WITH A 2F THROTTLING RANGE. VALVE SHALL BE CLOSED WHENEVER THE PARENT AHU IS OFF.

HEATING REQUEST: THIS TERMINAL SHALL ISSUE A "HEATING REQUEST" TO THE HW SYSTEM AS FOLLOWS:

1. WHENEVER THE REHEAT OUTPUT IS GREATER THAN 90% (ADJ.), OR
2. WHENEVER THE SPACE TEMPERATURE FALLS BELOW THE THROTTLING RANGE OF THE HEATING LOOP.

COOLING REQUEST: THIS TERMINAL SHALL ISSUE A "COOLING REQUEST" TO THE PARENT AHU AS FOLLOWS:

1. WHENEVER THE ZONE DAMPER OUTPUT IS CONTROLLING FOR A COOLING SETPOINT AND THE CALCULATED SIGNAL IS GREATER THAN 90% (ADJ.), OR
2. WHENEVER THE SPACE TEMPERATURE RISES ABOVE THE THROTTLING RANGE OF THE COOLING LOOP.

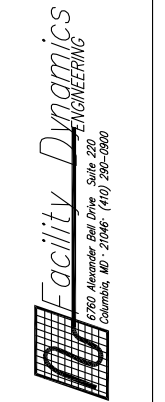
GRAPHICS AND TRENDS: PROVIDE TRENDS AND GRAPHIC DISPLAY FOR ALL CONTROL POINTS AND CALCULATED SET POINTS PER SPECIFICATIONS.

NOTES

1. Provide with communications port and set point adjustment. For public areas, and mechanical/electrical spaces provide basic sensor with communications port; no set point adjustment. Provide sensors with LCD display where indicated on floor plan drawings.

POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE			REMARKS
		DI	AI	DO	
bldg.VAxxx.SAVP	VAVx Supply VP		1		
bldg.VAxxx.DMPR	VAVx Damper			1	
bldg.VAxxx.RHCV	VAVx HW Valve				1
bldg.VAxxx.SAT	VAVx SA Temp		1		
bldg.VAxxx.OCCOVRD	VAVx Occ Override	1			
bldg.VAxxx.SPT	VAVx Zone Temp		1		
TOTALS		1	3	0	2



THE UNIVERSITY OF GEORGIA
STANDARD CONTROL DRAWINGS

Eng	HJN
Drawn	HJN
Chkd	---
Appd	---
Issued	10/31/2017
Job No.	15040
Scale	N/A
Proj Code	

(REV.3)
FOR REVIEW
ONLY

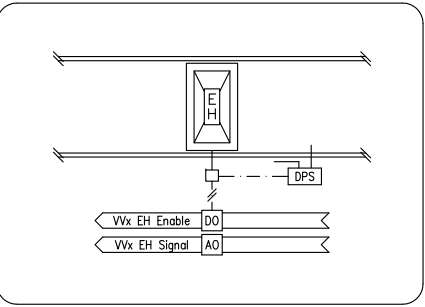
VAV TERMINAL
UNIT WITH HOT
WATER REHEAT

XX OF XX
SHEET NUMBER

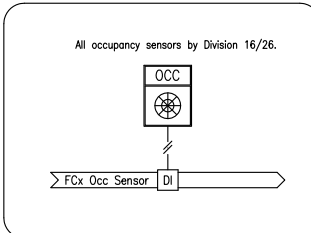
C-103

DWG NUMBER

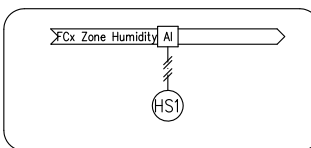
DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: Whenever the heating minimum volume setpoint is active and flow is proven at the electric coil the electric heating coil shall be enabled and modulate to maintain space temperature heating setpoint as defined above with a 2F throttling range. Electric heat shall be disabled whenever the parent AHU is off.



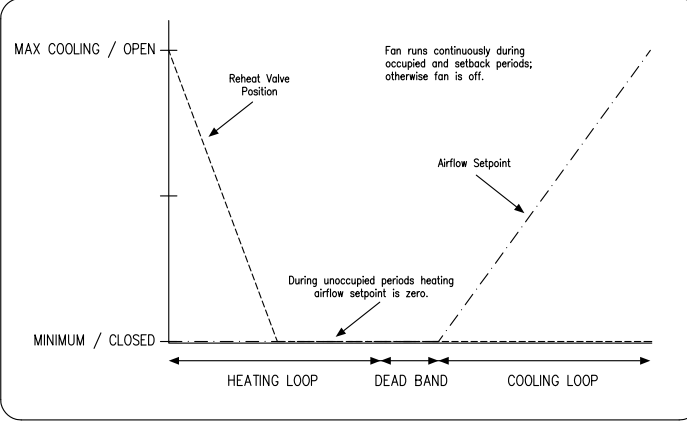
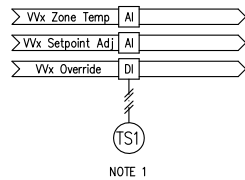
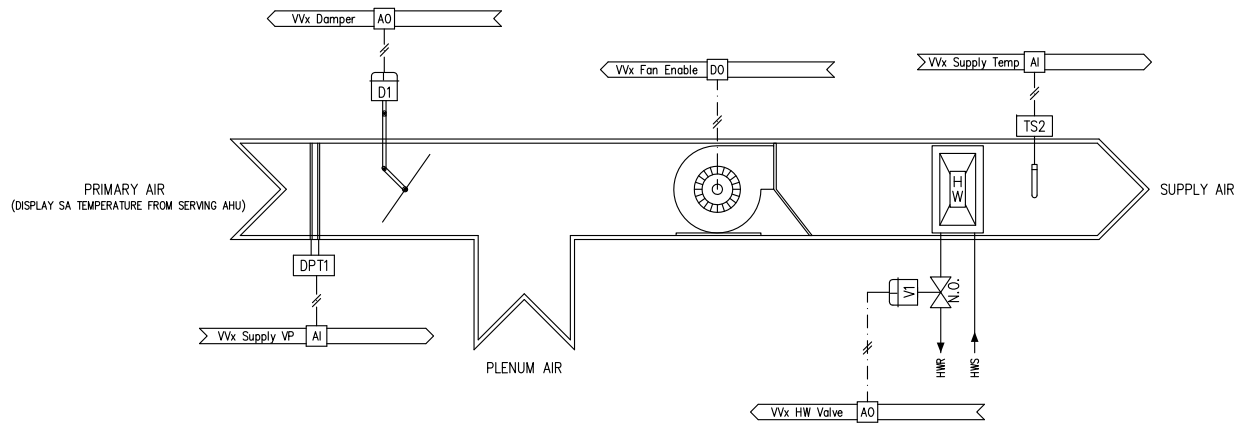
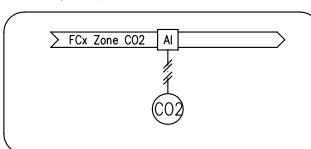
DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: While occupancy sensor is active within a 15 minute (adj.) deadband the unit shall be energized in occupied mode. Unit shall revert to normal occupancy schedule after deadband expires with no activity sensed.



DESIGNER NOTE: Include in design only after consultation with UGA. Zone humidity may be used as a monitoring point or broadcast to parent AHU for sequencing humidity control.



DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: When zone CO2 rises above set point (1,000 ppm, adj.) an alarm shall be generated and a request for additional outside air sent to the AHU serving this space.



TEMPERATURE CONTROL DIAGRAM

CONTROL SCHEMATIC

SEQUENCE OF OPERATION

GENERAL: THE VARIABLE AIR VOLUME TERMINAL SHALL BE FULLY CONTROLLED BY THE BAS. CONTROL SHALL BE PRESSURE INDEPENDENT WITH MINIMUM AND MAXIMUM FLOW SETPOINTS. SCHEDULED OCCUPANCY WITH OPTIMUM PREOCCUPANCY AND OCCUPANCY OVERRIDE. SCHEDULE SHALL BE THE SAME AS THE PARENT AHU.

SPACE TEMPERATURE CONTROL: THREE SETPOINTS SHALL APPLY. NORMAL (73F ADJ.), SETBACK HEATING (55F), AND SETBACK COOLING (85F). NORMAL TEMPERATURE SETPOINT MAY BE ADJUSTED BY THE OCCUPANT VIA THE LOCAL SENSOR SETPOINT ADJUSTMENT (THE RANGE OF ADJUSTMENT SHALL BE CONFIGURABLE VIA THE BAS, INITIALLY +/-2F). THESE VALUES SHALL BE THE ONLY VALUES CHANGED BY THE OPERATOR TO ADJUST SPACE TEMPERATURES.

DURING THE NORMAL PERIODS, SEPARATE HEATING AND COOLING SETPOINTS SHALL BE CALCULATED:
 1. NORMAL SPACE COOLING SETPOINT SHALL BE THE EFFECTIVE SPACE TEMPERATURE SETPOINT PLUS 3F (ADJ.).
 2. NORMAL SPACE HEATING SETPOINT SHALL BE THE EFFECTIVE SPACE TEMPERATURE SETPOINT MINUS 3F (ADJ.).

FAN: BAS SHALL START FAN AND IT SHALL RUN CONTINUOUSLY WHENEVER THE SPACE IS OCCUPIED OR IN SETBACK HEATING OR COOLING. FOR OCCUPIED OR SETBACK COOLING OPERATION, FAN SHALL BE STARTED 1 MINUTE (ADJ.) PRIOR TO THE AHU.

ZONE DAMPER: ZONE DAMPER SHALL MODULATE IN A PI LOOP TO MAINTAIN ZONE VOLUME SETPOINT. ZONE VOLUME SETPOINT SHALL BE RESET BETWEEN MAXIMUM AND MINIMUM VOLUME SETTINGS TO MAINTAIN SPACE TEMPERATURE COOLING SETPOINT WITH A 2F (ADJ.) RESET RANGE. ZONE VOLUME SETPOINT SHALL BE SET TO THE HEATING VOLUME SETPOINT WHENEVER THE SPACE TEMPERATURE FALLS BELOW THE HEATING SPACE TEMPERATURE SETPOINT.

1. COOLING MINIMUM VOLUME SETPOINT SHALL BE DETERMINED AS SCHEDULED ON THE DRAWINGS. IN THE UNOCCUPIED PERIOD THE MINIMUM VOLUME SETPOINT SHALL BE 0 CFM.
 2. COOLING MAXIMUM VOLUME SETPOINT SHALL BE AS SCHEDULED ON THE DRAWINGS DURING THE OCCUPIED PERIOD AND SHALL BE SET TO ZERO OTHERWISE.
 3. HEATING MINIMUM VOLUME SETPOINT: WHENEVER HEATING IS REQUESTED FROM THE BOX IN ANY PERIOD, THE MINIMUM VOLUME SHALL BE SET TO AN ADJUSTABLE HEATING SETPOINT AIRFLOW. INITIALLY, THIS SETPOINT SHALL EQUAL TO THE COOLING MINIMUM VOLUME SETPOINT.

HYDRONIC REHEAT: N.O. ZONE REHEAT COIL VALVE SHALL MODULATE IN A PI LOOP TO MAINTAIN SPACE TEMPERATURE HEATING SETPOINT AS DEFINED ABOVE WITH A 2F THROTTLING RANGE.

OCCUPANCY OVERRIDE: OCCUPANCY OVERRIDE SHALL BE INITIATED AT THE LOCAL ZONE SENSOR. UNIT SHALL CHANGE TO THE OCCUPIED MODE WHENEVER THE OVERRIDE BUTTON IS DEPRESSED FOR A PERIOD OF 2 HOURS (ADJ.) AND RESET TO NORMAL OPERATION AT THE END OF THE PERIOD OR WHENEVER THE OVERRIDE BUTTON IS HELD FOR MORE THAN 5 SECONDS (ADJ.).

HEATING REQUEST: THIS TERMINAL SHALL ISSUE A "HEATING REQUEST" TO THE HW SYSTEM AS FOLLOWS:
 1. WHENEVER THE REHEAT OUTPUT IS AT 100% OR
 2. WHENEVER THE SPACE TEMPERATURE FALLS BELOW THE THROTTLING RANGE OF THE HEATING LOOP.

COOLING REQUEST: THIS TERMINAL SHALL ISSUE A "COOLING REQUEST" TO THE PARENT AHU AS FOLLOWS:
 1. WHENEVER THE ZONE DAMPER OUTPUT IS AT 100% (FULL COOLING), OR
 2. WHENEVER THE SPACE TEMPERATURE RISES ABOVE THE THROTTLING RANGE OF THE COOLING LOOP.

GRAPHICS AND TRENDS: PROVIDE TRENDS AND GRAPHIC DISPLAY FOR ALL CONTROL POINTS AND CALCULATED SET POINTS PER SPECIFICATIONS.

NOTES

- Provide with communications port and set point adjustment. For public areas, and mechanical/electrical spaces provide basic sensor with communications port; no set point adjustment. Provide sensors with LCD display where indicated on floor plan drawings.
- [DESIGN NOTE] SERIES BOXES ARE TO BE USED ONLY WITH PRIOR UGA APPROVAL.

POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE			REMARKS
		DI	AI	DO	
bldg.VAxxxx.SAVP	Supply VP			1	
bldg.VAxxxx.DMPR	Primary Damper				1
bldg.VAxxxx.RHCV	HW Valve				1
bldg.VAxxxx.SAT	SA Temp		1		
bldg.VAxxxx.OCCOVRD	Occ Override	1			
bldg.VAxxxx.SPT	Zone Temp		1		
bldg.VAxxxx.FAN	Fan Enable			1	
TOTALS		1	3	1	2

Eng	HJN
Drawn	HJN
Chkd	---
Appd	---
Issued	10/31/2017
Job No.	15040
Scale	N/A
Proj Code	

(REV.4)
FOR REVIEW ONLY

SERIES FAN
POWERED VAV
TERMINAL UNIT
WITH HOT
WATER REHEAT

XX OF XX
SHEET NUMBER

C-104

DWG NUMBER

Eng	HJN
Drawn	HJN
Chkd	---
Appd	---
Issued	10/31/2017
Job No.	15040
Scale	N/A
Proj Code	

(REV.2)
FOR REVIEW
ONLY

PARALLEL FAN
POWERED VAV
TERMINAL UNIT
WITH HOT
WATER REHEAT

XX OF XX
SHEET NUMBER

C-105

DWG NUMBER

SEQUENCE OF OPERATION

GENERAL: THE VARIABLE AIR VOLUME TERMINAL SHALL BE FULLY CONTROLLED BY THE BAS. CONTROL SHALL BE PRESSURE INDEPENDENT WITH MINIMUM AND MAXIMUM FLOW SETPOINTS. SCHEDULED OCCUPANCY WITH OPTIMUM PREOCCUPANCY AND OCCUPANCY OVERRIDE. SCHEDULE SHALL BE THE SAME AS THE PARENT AHU.

SPACE TEMPERATURE CONTROL: THREE SETPOINTS SHALL APPLY. NORMAL (73F ADJ.), SETBACK HEATING (55F), AND SETBACK COOLING (85F). NORMAL TEMPERATURE SETPOINT MAY BE ADJUSTED BY THE OCCUPANT VIA THE LOCAL SENSOR SETPOINT ADJUSTMENT (THE RANGE OF ADJUSTMENT SHALL BE CONFIGURABLE VIA THE BAS, INITIALLY +/-2F). THESE VALUES SHALL BE THE ONLY VALUES CHANGED BY THE OPERATOR TO ADJUST SPACE TEMPERATURES.

DURING THE NORMAL PERIODS, SEPARATE HEATING AND COOLING SETPOINTS SHALL BE CALCULATED:
 1. NORMAL SPACE COOLING SETPOINT SHALL BE THE EFFECTIVE SPACE TEMPERATURE SETPOINT PLUS 3F (ADJ.).
 2. NORMAL SPACE HEATING SETPOINT SHALL BE THE EFFECTIVE SPACE TEMPERATURE SETPOINT MINUS 3F (ADJ.).

FAN: BAS SHALL START FAN AND IT SHALL RUN CONTINUOUSLY WHENEVER THE SPACE IS IN HEATING OR SETBACK HEATING. FOR OCCUPIED OPERATION AT COOLING MINIMUM, FAN SHALL START. FOR OCCUPIED OPERATION AT COOLING MAXIMUM OR SETBACK COOLING OPERATION, FAN SHALL BE OFF.

ZONE DAMPER: ZONE DAMPER SHALL MODULATE IN A PI LOOP TO MAINTAIN ZONE VOLUME SETPOINT. ZONE VOLUME SETPOINT SHALL BE RESET BETWEEN MAXIMUM AND MINIMUM VOLUME SETTINGS TO MAINTAIN SPACE TEMPERATURE COOLING SETPOINT WITH A 2F (ADJ.) RESET RANGE. ZONE VOLUME SETPOINT SHALL BE SET TO THE HEATING VOLUME SETPOINT WHENEVER THE SPACE TEMPERATURE FALLS BELOW THE HEATING SPACE TEMPERATURE SETPOINT.

1. COOLING MINIMUM VOLUME SETPOINT SHALL BE DETERMINED AS SCHEDULED ON THE DRAWINGS. IN THE UNOCCUPIED PERIOD THE MINIMUM VOLUME SETPOINT SHALL BE 0 CFM.
 2. COOLING MAXIMUM VOLUME SETPOINT SHALL BE AS SCHEDULED ON THE DRAWINGS DURING THE OCCUPIED PERIOD AND SHALL BE SET TO ZERO OTHERWISE.
 3. HEATING MINIMUM VOLUME SETPOINT: WHENEVER HEATING IS REQUESTED FROM THE BOX IN ANY PERIOD, THE MINIMUM VOLUME SHALL BE SET TO AN ADJUSTABLE HEATING SETPOINT AIRFLOW. INITIALLY, THIS SETPOINT SHALL EQUAL TO THE COOLING MINIMUM VOLUME SETPOINT. DURING UNOCCUPIED HEATING PERIODS THE PRIMARY AIR DAMPER SHALL BE CLOSED.

HYDRONIC REHEAT: N.O. ZONE REHEAT COIL VALVE SHALL MODULATE IN A PI LOOP TO MAINTAIN SPACE TEMPERATURE HEATING SETPOINT AS DEFINED ABOVE WITH A 2F THROTTLING RANGE.

OCCUPANCY OVERRIDE: OCCUPANCY OVERRIDE SHALL BE INITIATED AT THE LOCAL ZONE SENSOR. UNIT SHALL CHANGE TO THE OCCUPIED MODE WHENEVER THE OVERRIDE BUTTON IS DEPRESSED FOR A PERIOD OF 2 HOURS (ADJ.) AND RESET TO NORMAL OPERATION AT THE END OF THE PERIOD OR WHENEVER THE OVERRIDE BUTTON IS HELD FOR MORE THAN 5 SECONDS (ADJ.).

HEATING REQUEST: THIS TERMINAL SHALL ISSUE A "HEATING REQUEST" TO THE HW SYSTEM AS FOLLOWS:
 1. WHENEVER THE REHEAT OUTPUT IS AT 100%, OR
 2. WHENEVER THE SPACE TEMPERATURE FALLS BELOW THE THROTTLING RANGE OF THE HEATING LOOP.

COOLING REQUEST: THIS TERMINAL SHALL ISSUE A "COOLING REQUEST" TO THE PARENT AHU AS FOLLOWS:
 1. WHENEVER THE ZONE DAMPER OUTPUT IS AT 100% (FULL COOLING), OR
 2. WHENEVER THE SPACE TEMPERATURE RISES ABOVE THE THROTTLING RANGE OF THE COOLING LOOP.

GRAPHICS AND TRENDS: PROVIDE TRENDS AND GRAPHIC DISPLAY FOR ALL CONTROL POINTS AND CALCULATED SET POINTS PER SPECIFICATIONS.

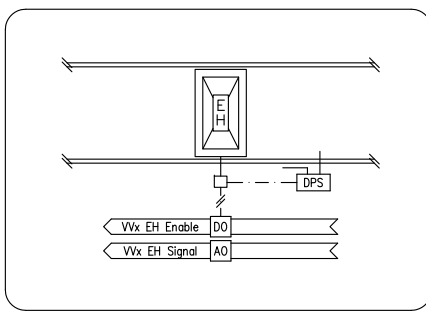
NOTES

1. Provide with communications port and set point adjustment. For public areas, and mechanical/electrical spaces provide basic sensor with communications port; no set point adjustment. Provide sensors with LCD display where indicated on floor plan drawings.

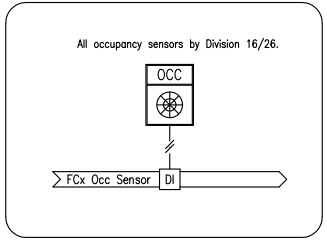
POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE			REMARKS
		DI	AI	DO	
bldg.VAxxxxSAVP	Supply VP		1		
bldg.VAxxxxDMPR	Primary Damper				1
bldg.VAxxxxRHCV	HW Valve				1
bldg.VAxxxxSAT	SA Temp		1		
bldg.VAxxxxOCCOVRD	Occ Override	1			
bldg.VAxxxxSPT	Zone Temp		1		
bldg.VAxxxxFAN	Fan Enable				1
TOTALS		1	3	1	2

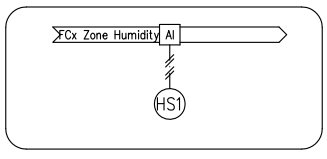
DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: Whenever the heating minimum volume setpoint is active and flow is proven at the electric coil the electric heating coil shall be enabled and modulate to maintain space temperature heating setpoint as defined above with a 2F throttling range. Electric heat shall be disabled whenever the parent AHU is off.



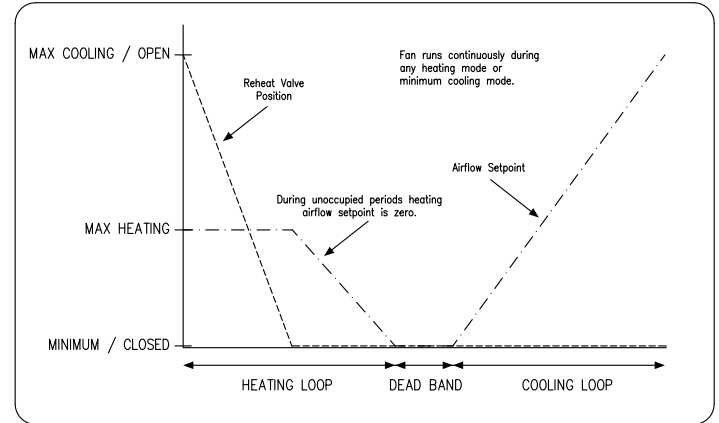
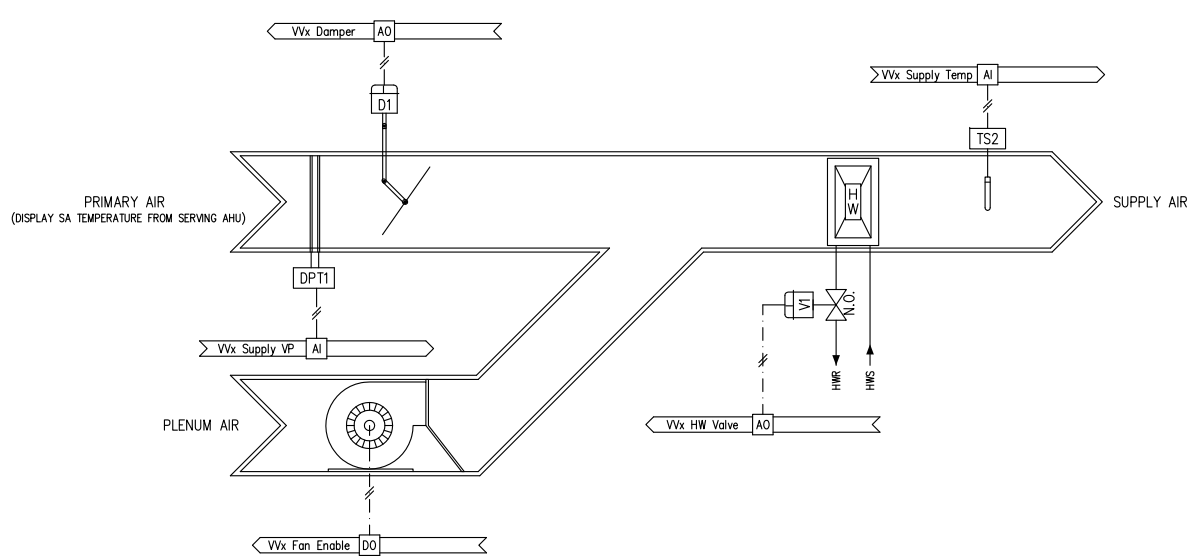
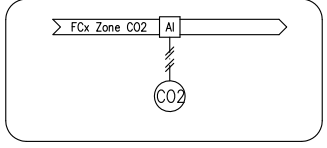
DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: While occupancy sensor is active within a 15 minute (adj.) deadband the unit shall be energized in occupied mode. Unit shall revert to normal occupancy schedule after deadband expires with no activity sensed.



DESIGNER NOTE: Include in design only after consultation with UGA. Zone humidity may be used as a monitoring point or broadcast to parent AHU for sequencing humidity control.

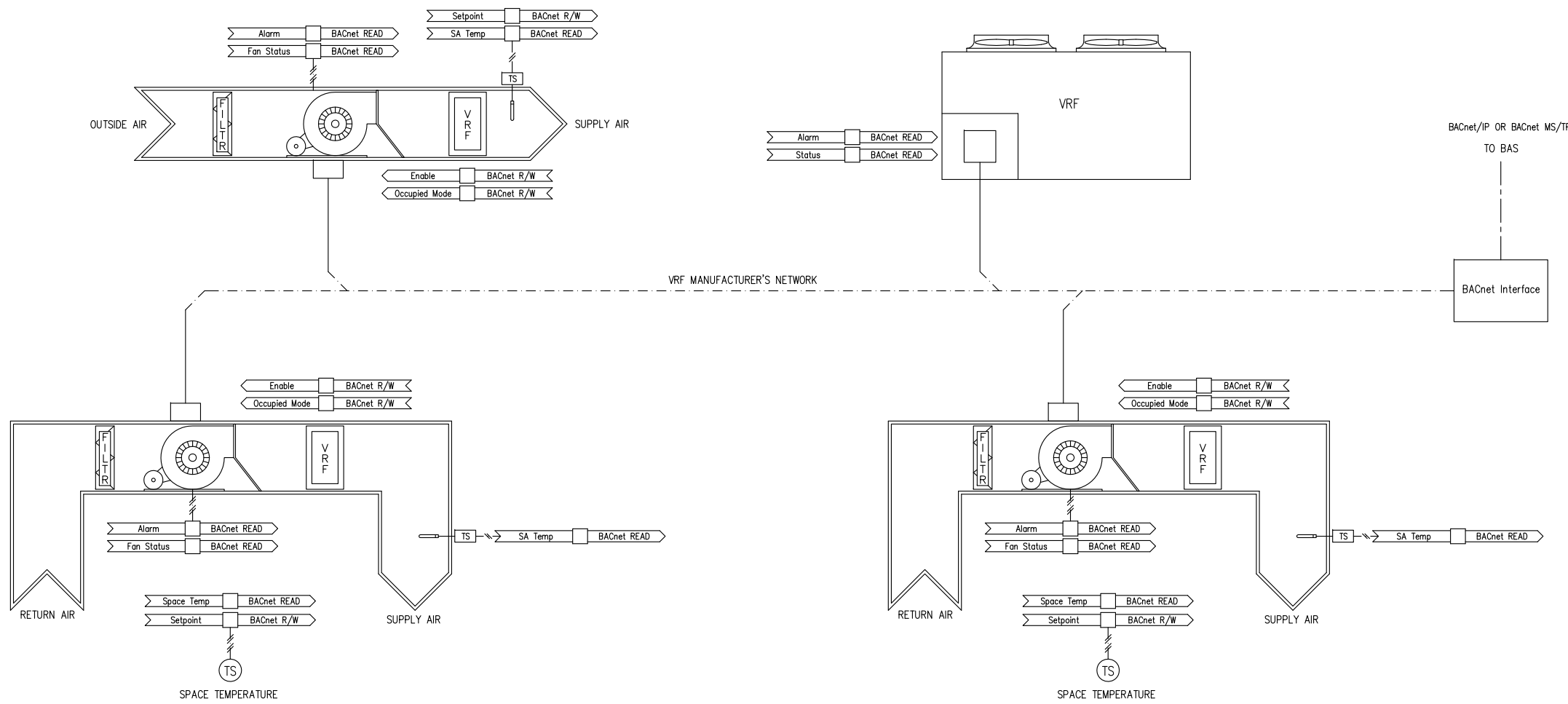


DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: When zone CO2 rises above set point (1,000 ppm, adj.) an alarm shall be generated and a request for additional outside air sent to the AHU serving this space.



TEMPERATURE CONTROL DIAGRAM

CONTROL SCHEMATIC



SEQUENCE OF OPERATION

GENERAL: THE BAS SHALL INTERFACE WITH TYPICAL VRF SYSTEMS THROUGH A BACNET NETWORK CONNECTION UTILIZING BACNET/IP AND/OR BACNET-MS/TP PROTOCOLS (ASHRAE 135).

ENABLE: VRF EQUIPMENT SHALL BE FULLY CONTROLLED BY THE VRF MANUFACTURER'S PACKAGED SYSTEM. BAS SHALL BE ABLE TO READ THE CURRENT ENABLED STATE FOR ALL EQUIPMENT AND WRITE OVERRIDE THE ENABLE STATE FOR ALL EQUIPMENT.

STATUS / ALARM MONITORING: BAS SHALL MONITOR EQUIPMENT STATUS AND ALARMS AND DISPLAY ON OPERATOR INTERFACE.

TEMPERATURE MONITORING: BAS SHALL MONITOR EQUIPMENT TEMPERATURE POINTS AND DISPLAY ON OPERATOR INTERFACE.

TEMPERATURE CONTROL: CONTROL SHALL BE PER THE VRF MANUFACTURER'S PACKAGED SEQUENCE. OCCUPIED AND UNOCCUPIED SPACE TEMPERATURE SET POINTS SHALL BE ADJUSTABLE THROUGH THE BAS INTERFACE. SUPPLY AIR TEMPERATURE SET POINTS SHALL BE ADJUSTABLE THROUGH THE BAS INTERFACE.

POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE					REMARKS
		DI	AI	DO	AO	VP	
bldg.VRF.Zxxx.SAT	Zone SA Temp	*					BACnet-R
bldg.VRF.Zxxx.ENABLE	Zone Enable	*	*				BACnet-R/W
bldg.VRF.Zxxx.OCC	Zone Occ Mode	*	*				BACnet-R/W
bldg.VRF.Zxxx.FANST	Zone Fan Status	*					BACnet-R
bldg.VRF.Zxxx.ZONET	Zone Temp	*					BACnet-R
bldg.VRF.Zxxx.STPT	Zone Setpoint	*	*	*			BACnet-R/W
bldg.VRF.Zxxx.ALARM	Zone Alarm	*					BACnet-R
bldg.VRF.Dxxx.SAT	DOAS SA Temp	*					BACnet-R
bldg.VRF.Dxxx.STPT	DOAS SA Setpoint	*	*	*			BACnet-R/W
bldg.VRF.Dxxx.ENABLE	DOAS Enable	*	*				BACnet-R/W
bldg.VRF.Dxxx.OCC	DOAS Occ Mode	*	*				BACnet-R/W
bldg.VRF.Dxxx.FANST	DOAS Fan Status	*					BACnet-R
bldg.VRF.Dxxx.ALARM	DOAS Alarm	*					BACnet-R
bldg.VRF.CUxx.ST	CJ Status	*					BACnet-R
bldg.VRF.CUxx.ALARM	CJ Alarm	*					BACnet-R
	OA Temp				*		
TOTALS		10	5	4	2	1	

THE UNIVERSITY OF GEORGIA
 STANDARD CONTROL DRAWINGS

Eng	HJN
Drawn	HJN
Chkd	---
Appd	---
Issued	10/31/2016
Job No.	15040
Scale	N/A
Proj Code	

(REV.0)
FOR REVIEW
ONLY

VRF SYSTEM
INTERFACE

XX OF XX
SHEET NUMBER

C-106

DWG NUMBER

Eng	H/JN
Drawn	H/JN
Chkd	---
Appd	---
Issued	11/1/2017
Job No.	15040
Scale	N/A
Proj Code	---

(REV.4)
FOR REVIEW ONLY

VAV AHU:
PREHEAT, CHW,
RETURN FAN,
ECONOMIZER

XX OF XX
SHEET NUMBER

C-201

DWG NUMBER

SEQUENCE OF OPERATION

GENERAL:

- THE VARIABLE AIR VOLUME AIR HANDLER SHALL BE FULLY CONTROLLED BY THE BAS.
- THE AIR HANDLER SHALL BE ENERGIZED AS REQUIRED TO SATISFY TERMINAL UNITS SERVED DURING OCCUPIED AND SET BACK PERIODS.
- SUPPLY AIR TEMPERATURE SET POINT:
 - THE SUPPLY AIR TEMPERATURE SET POINT SHALL BE RESET FROM 55°F TO 65°F TO MAINTAIN TERMINAL UNIT COOLING REQUESTS LESS THAN 5 (ALL VALUES ADJUSTABLE).
- PROVIDE TRENDS AND DISPLAY ON GRAPHIC ALL CONTROL POINTS AND CALCULATED SET POINTS PER SPECIFICATIONS. INCLUDE TAB VERIFIED FULL FLOW VALUE AT EACH AIR FLOW MONITORING STATION.
- BAS SHALL MONITOR THE FOLLOWING POINTS AND INITIATE AN ALARM IF ANY IS NOT WITHIN OPERATING LIMITS:
 - ALL HUMIDITY SENSORS
 - ALL TEMPERATURE SENSORS
 - ALL PRESSURE SWITCHES
 - ALL AIR FLOW STATIONS
 - ALL FREEZESTATS
 - ALL FAN STATUSES
 - ALL CONDENSATE WATER DETECTORS
 - ALL VFD ALARM CONDITIONS
- BAS SHALL PROVIDE A RELAY OUTPUT AND HOA SWITCH FOR EACH DIGITAL OUTPUT.

SETBACKS:

- THE OUTSIDE AIR DAMPERS SHALL BE OVERRIDDEN CLOSED AS NECESSARY TO MAINTAIN A MINIMUM MIXED AIR TEMPERATURE OF 38°F (ADJ.).
- REGARDLESS OF UNIT OPERATING MODE THE PREHEAT VALVE SHALL MODULATE TO MAINTAIN A MINIMUM 40°F (ADJ.) PREHEAT AIR TEMPERATURE.
- THE PREHEAT LOOP PUMP SHALL ENERGIZE WHENEVER OUTSIDE AIR TEMPERATURE IS BELOW 38°F (ADJ.).
- WHENEVER THE FREEZESTAT IS IN ALARM:
 - UNIT FANS SHALL STOP
 - HOT WATER AND CHILLED WATER VALVES SHALL OPEN
 - LOOP PUMPS SHALL START
 - OUTSIDE AIR, EXHAUST AIR AND RELIEF AIR DAMPERS SHALL CLOSE
 - RETURN AIR DAMPERS SHALL OPEN
- UPON ACTIVATION OF A HIGH OR LOW PRESSURE SAFETY SWITCH THE AIR HANDLER SHALL SHUTDOWN.

OCCUPIED MODE:

- SUPPLY AND RETURN FANS SHALL BE COMMANDED TO START.
 - SUPPLY FAN SPEED SHALL MODULATE TO MAINTAIN THE SUPPLY DUCT STATIC PRESSURE SET POINT.
 - THE STATIC PRESSURE SET POINT SHALL BE RESET BETWEEN TAB DETERMINED LIMITS TO MAINTAIN THE MOST OPEN TERMINAL DAMPER AT 90% OPEN (ALL VALUES ADJUSTABLE).
 - RETURN FAN SPEED SHALL MODULATE TO MAINTAIN THE RETURN FLOW SET POINT.
 - THE RETURN FLOW SET POINT SHALL EQUAL THE SUPPLY FAN FLOW MINUS RETURN FLOW OFFSET (DETERMINED BY TAB).
- DAMPERS:
 - OCCUPIED:
 - MINIMUM OUTSIDE AIR DAMPER SHALL BE COMMANDED OPEN.
 - EXHAUST AIR DAMPER SHALL BE COMMANDED CLOSED.
 - RETURN AIR DAMPER SHALL MODULATE TO MAINTAIN THE OUTSIDE AIR FLOW SET POINT.
 - MAXIMUM OUTSIDE AIR DAMPER SHALL BE COMMANDED OPEN.
 - OCCUPIED ECONOMIZER (WHEN OUTSIDE AIR TEMPERATURE < 60°F ADJ.):
 - EXHAUST AIR DAMPER SHALL BE COMMANDED OPEN.
 - RETURN AIR DAMPER AND MAXIMUM OUTSIDE AIR DAMPER SHALL MODULATE TO MAINTAIN THE MIXED AIR TEMPERATURE SET POINT.
- 1.1.1.1. THE MIXED AIR TEMPERATURE SET POINT SHALL BE EQUAL TO THE SUPPLY TEMPERATURE SET POINT MINUS 2°F (ADJ.).
- PREHEAT COIL:
 - THE PREHEAT VALVE SHALL MODULATE TO MAINTAIN THE SUPPLY AIR TEMPERATURE SET POINT MINUS 3°F (ADJ.).
- CHILLED WATER COIL:
 - THE CHILLED WATER VALVE SHALL MODULATE TO MAINTAIN THE SUPPLY AIR TEMPERATURE SET POINT.
- DEHUMIDIFICATION:
 - WHENEVER RETURN AIR HUMIDITY EXCEEDS 60% (ADJ.) ECONOMIZER OPERATION SHALL BE DISABLED AND THE CHILLED WATER VALVE SHALL MODULATE TO BRING RETURN AIR HUMIDITY DOWN TO 55% (ADJ.).

UNOCCUPIED MODE:

- SUPPLY AND RETURN FANS SHALL BE OFF.
- OUTSIDE AIR DAMPERS SHALL BE CLOSED.
- EXHAUST AIR DAMPER SHALL BE CLOSED.
- RETURN AIR DAMPER SHALL BE OPEN.
- CHILLED WATER VALVE SHALL BE CLOSED.
- PREHEAT VALVE SHALL MODULATE TO MAINTAIN MINIMUM PREHEAT TEMPERATURE.

SETBACK MODE (AHU ENERGIZED DURING UNOCCUPIED PERIOD):

- SUPPLY AND RETURN FANS SHALL ENERGIZE AS DESCRIBED IN OCCUPIED SEQUENCE.
- OUTSIDE AIR DAMPERS SHALL BE CLOSED UNLESS ECONOMIZER IS AVAILABLE.
- EXHAUST AIR DAMPER SHALL BE CLOSED UNLESS ECONOMIZER IS AVAILABLE.
- RETURN AIR DAMPER SHALL BE OPEN UNLESS ECONOMIZER IS AVAILABLE.
- CHILLED WATER VALVE SHALL MODULATE AS DESCRIBED IN OCCUPIED SEQUENCE.
- PREHEAT VALVE SHALL MODULATE AS DESCRIBED IN OCCUPIED SEQUENCE.
- DEHUMIDIFICATION SHALL OPERATE AS DESCRIBED IN OCCUPIED SEQUENCE.

POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE			REMARKS
		DI	AI	DO	
bdg.AHxxx.RAT	RA Temperature		1		TS4:"RAT"
bdg.AHxxx.RAH	RA Humidity		1		HS1:"RAH"
bdg.AHxxx.RFALRM	RF VFD Alarm	1			"RF-ALM"
bdg.AHxxx.RFST	RF Start/Stop		1		"RF-STAT"
bdg.AHxxx.RFSS	RF Start/Stop		1		"RF-SS"
bdg.AHxxx.RFSPD	RF Speed		1		"RF-SPD"
bdg.AHxxx.RFALARM	SF VFD Alarm	1			"SF-ALM"
bdg.AHxxx.SFALRM	SF VFD Alarm	1			"SF-STAT"
bdg.AHxxx.SFSS	SF Start/Stop		1		"SF-SS"
bdg.AHxxx.SFSPD	SF Speed		1		"SF-SPD"
bdg.AHxxx.SAFLOW	SA Flow		1		AFMS1:"SA-F"
bdg.AHxxx.OAFLOW	OA Flow		1		AFMS2:"OA-F"
bdg.AHxxx.RAFLOW	RA Flow		1		AFMS3:"RA-F"
bdg.AHxxx.EAD	EA Damper		1		M4:"EA-D"
bdg.AHxxx.EADP	EA Damper Position		1		M4:"EA-D-POS"
bdg.AHxxx.RAD	RA Damper		1		M3:"RA-D"
bdg.AHxxx.RADP	RA Damper Position		1		M3:"RA-D-POS"
bdg.AHxxx.OADMXP	OA Max Damper		1		M2:"OA-D-MAX"
bdg.AHxxx.OADMNP	OA Min Damper		1		M1:"OA-D-MIN"
bdg.AHxxx.OADMNP	OAD Min Position		1		M1:"OA-D-MIN-POS"
bdg.AHxxx.MAT	MA Temperature		1		TS3:"MAT"
bdg.AHxxx.SAT	SA Temperature		1		TS1:"SAT"
bdg.AHxxx.PHT	PH Temperature		1		TS2:"PHT"
bdg.AHxxx.DDSP	DD Static		1		DPT1:"DDSP"
bdg.AHxxx.FR_TSP	Filter DP		1		DPT2:"FLT-OP"
bdg.AHxxx.FRTSP	Freezestat		1		FZ1:"FRTZ"
bdg.AHxxx.SHSP	SF High Press		1		DPS1:"SF-HSP"
bdg.AHxxx.SLSP	SF Low Press		1		DPS2:"SF-LSP"
bdg.AHxxx.RHSP	RF High Press		1		DPS3:"RF-HSP"
bdg.AHxxx.RLSP	RF Low Press		1		DPS4:"RF-LSP"
bdg.AHxxx.LPSS	Loop Pump S/S		1		
bdg.AHxxx.LPST	Loop Pump Status		1		
bdg.AHxxx.HWV	HW Valve		1		V2:"HWV"
bdg.AHxxx.HWVP	HW Valve Position		1		V2:"HWV-POS"
bdg.AHxxx.CHWV	CHW Valve		1		V1:"CHWV"
bdg.AHxxx.CHWVP	CHW Valve Position		1		V1:"CHWV-POS"
bdg.AHxxx.HWST	HW Supply Temp		1		TS7:"HWST"
bdg.AHxxx.HWRT	HW Return Temp		1		TS8:"HWRT"
bdg.AHxxx.CHWST	CHW Supply Temp		1		TS5:"CHWST"
bdg.AHxxx.CHWRT	CHW Return Temp		1		TS6:"CHWRT"
TOTALS					12 18 5 6

ELECTRIC LADDER DIAGRAMS

NOTES

- Locate down stream duct static pressure pitot tube approximately 2/3 down duct. See floor plans for designed location; show final installation location on as-builts.
- Provide an ASHRAE 135 compliant (BACnet MS/TP or IP) communications interface to the control system for diagnostic point information. Include the following information for fan VFDs: operating frequency (Hz), RPM, percent fan speed, BAS signal to VFD, VFD output voltage, actual brake horsepower, and kW. On the VFD graphic screen also include the motor nameplate brake horsepower.
- Provide multiple freezestats as required to achieve 1ft of linear element for each 1sq.ft. of coil face area. Preheat sensor shall be installed intertwined with freezestat to cover the exact same area. One set of contacts wired directly to drive safety input.
- For single fan installation the AFMS may be duct or inlet type, see plans for design. For multiple fan/fan wall installation there will be a single AFMS installed in common duct served by all fans. Coordinate with mechanical design to ensure adequate upstream and downstream straight lengths for duct AFMS.

CONTROL SCHEMATIC

DESIGNER NOTE: Include in design only after consultation with UGA. Add sequence: When return air CO2 and/or zone CO2 rises above set point (1,000 ppm, adj.) an alarm shall be generated and outside air flow shall be increased until CO2 falls below set point.

DESIGNER NOTE: For designs utilizing fan walls include points for fan status at each fan. Include details for designs that include redundant/standby VFD for the fan wall.

Eng	HJN
Drawn	HJN
Chkd	---
Appd	---
Issued	10/30/2017
Job No.	15040
Scale	N/A
Proj Code	---

(REV.1)
FOR REVIEW
ONLY

VAV AHU:
PREHEAT, CHW,
ECONOMIZER

XX OF XX
SHEET NUMBER

C-202

DWG NUMBER

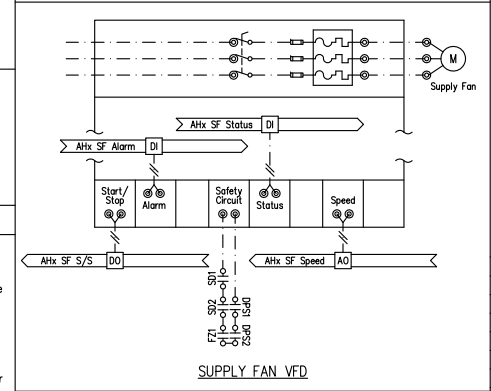
SEQUENCE OF OPERATION

- GENERAL:**
1. THE VARIABLE AIR VOLUME AIR HANDLER SHALL BE FULLY CONTROLLED BY THE BAS.
 2. THE AIR HANDLER SHALL BE ENERGIZED AS REQUIRED TO SATISFY TERMINAL UNITS SERVED DURING OCCUPIED AND SET BACK PERIODS.
 3. SUPPLY AIR TEMPERATURE SET POINT:
 - a. THE SUPPLY AIR TEMPERATURE SET POINT SHALL BE RESET FROM 55°F TO 65°F TO MAINTAIN TERMINAL UNIT COOLING REQUESTS LESS THAN 5 (ALL VALUES ADJUSTABLE).
 4. PROVIDE TRENDS AND DISPLAY ON GRAPHIC ALL CONTROL POINTS AND CALCULATED SET POINTS PER SPECIFICATIONS. INCLUDE TAB VERIFIED FULL FLOW VALUE AT EACH AIR FLOW MONITORING STATION.
 5. BAS SHALL MONITOR THE FOLLOWING POINTS AND INITIATE AN ALARM IF ANY IS NOT WITHIN OPERATING LIMITS:
 - a. ALL HUMIDITY SENSORS
 - b. ALL TEMPERATURE SENSORS
 - c. ALL PRESSURE SWITCHES
 - d. ALL AIR FLOW STATIONS
 - e. ALL FREEZESTATS
 - f. ALL FAN PROOFS
 - g. ALL CONDENSATE WATER DETECTORS
 - h. ALL VFD ALARM CONDITIONS
 6. BAS SHALL PROVIDE A RELAY OUTPUT AND HOA SWITCH FOR EACH DIGITAL OUTPUT.
- SAFETIES:**
1. THE OUTSIDE AIR DAMPERS SHALL BE OVERRIDDEN CLOSED AS NECESSARY TO MAINTAIN A MINIMUM MIXED AIR TEMPERATURE OF 38°F (ADJ.).
 2. REGARDLESS OF UNIT OPERATING MODE THE PREHEAT VALVE SHALL MODULATE TO MAINTAIN A MINIMUM 40°F (ADJ.) PREHEAT AIR TEMPERATURE.
 3. THE PREHEAT LOOP PUMP SHALL ENERGIZE WHENEVER OUTSIDE AIR TEMPERATURE IS BELOW 38°F (ADJ.).
 4. WHENEVER THE FREEZESTAT IS IN ALARM:
 - a. UNIT FANS SHALL STOP
 - b. HOT WATER AND CHILLED WATER VALVES SHALL OPEN
 - c. LOOP PUMPS SHALL START
 - d. OUTSIDE AIR, EXHAUST AIR AND RELIEF AIR DAMPERS SHALL CLOSE
 - e. RETURN AIR DAMPERS SHALL OPEN
 5. UPON ACTIVATION OF A HIGH OR LOW PRESSURE SAFETY SWITCH THE AIR HANDLER SHALL SHUTDOWN.
- OCCUPIED MODE:**
1. SUPPLY FAN SHALL BE COMMANDED TO START.
 - a. SUPPLY FAN SPEED SHALL MODULATE TO MAINTAIN THE SUPPLY DUCT STATIC PRESSURE SET POINT.
 - i.a. THE STATIC PRESSURE SET POINT SHALL BE RESET BETWEEN TAB DETERMINED LIMITS TO MAINTAIN THE MOST OPEN TERMINAL DAMPER AT 90% OPEN (ALL VALUES ADJUSTABLE).
 2. DAMPERS:
 - i.a. OCCUPIED:
 - i.a. MINIMUM OUTSIDE AIR DAMPER SHALL BE COMMANDED OPEN.
 - i.b. EXHAUST AIR DAMPER SHALL BE COMMANDED CLOSED.
 - i.c. RETURN AIR DAMPER SHALL MODULATE TO MAINTAIN THE OUTSIDE AIR FLOW SET POINT.
 - i.d. MAXIMUM OUTSIDE AIR DAMPER SHALL BE COMMANDED CLOSED.
 - i. OCCUPIED ECONOMIZER (WHEN OUTSIDE AIR TEMPERATURE < 60°F ADJ.):
 - i.a. MINIMUM OUTSIDE AIR DAMPER SHALL BE COMMANDED OPEN.
 - i.b. EXHAUST AIR DAMPER SHALL BE COMMANDED OPEN.
 - i.c. RETURN AIR DAMPER AND MAXIMUM OUTSIDE AIR DAMPER SHALL MODULATE TO MAINTAIN THE MIXED AIR TEMPERATURE SET POINT.
 - 1.1.1.1. THE MIXED AIR TEMPERATURE SET POINT SHALL BE EQUAL TO THE SUPPLY TEMPERATURE SET POINT MINUS 2°F (ADJ.).
 3. PREHEAT COIL:
 - a. THE PREHEAT VALVE SHALL MODULATE TO MAINTAIN THE SUPPLY AIR TEMPERATURE SET POINT MINUS 3°F (ADJ.).
 4. CHILLED WATER COIL:
 - a. THE CHILLED WATER VALVE SHALL MODULATE TO MAINTAIN THE SUPPLY AIR TEMPERATURE SET POINT.
 5. DEHUMIDIFICATION:
 - a. WHENEVER RETURN AIR HUMIDITY EXCEEDS 60% (ADJ.) ECONOMIZER OPERATION SHALL BE DISABLED AND THE CHILLED WATER VALVE SHALL MODULATE TO BRING RETURN AIR HUMIDITY DOWN TO 55% (ADJ.).
- UNOCCUPIED MODE:**
1. SUPPLY FAN SHALL BE OFF.
 2. OUTSIDE AIR DAMPERS SHALL BE CLOSED.
 3. EXHAUST AIR DAMPER SHALL BE CLOSED.
 4. RETURN AIR DAMPER SHALL BE OPEN.
 5. CHILLED WATER VALVE SHALL BE CLOSED.
 6. PREHEAT VALVE SHALL MODULATE TO MAINTAIN MINIMUM PREHEAT TEMPERATURE.
- SETBACK MODE (AHU ENERGIZED DURING UNOCCUPIED PERIOD):**
1. SUPPLY FAN SHALL ENERGIZE AS DESCRIBED IN OCCUPIED SEQUENCE.
 2. OUTSIDE AIR DAMPERS SHALL BE CLOSED UNLESS ECONOMIZER IS AVAILABLE.
 3. EXHAUST AIR DAMPER SHALL BE CLOSED UNLESS ECONOMIZER IS AVAILABLE.
 4. RETURN AIR DAMPER SHALL BE OPEN UNLESS ECONOMIZER IS AVAILABLE.
 5. CHILLED WATER VALVE SHALL MODULATE AS DESCRIBED IN OCCUPIED SEQUENCE.
 6. PREHEAT VALVE SHALL MODULATE AS DESCRIBED IN OCCUPIED SEQUENCE.
 7. DEHUMIDIFICATION SHALL OPERATE AS DESCRIBED IN OCCUPIED SEQUENCE.

POINTS LIST

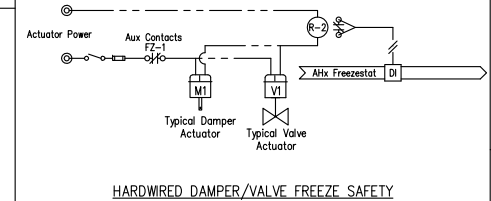
POINT NAME	POINT DESCRIPTOR	POINT TYPE				REMARKS
		DI	AI	DO	AO	
bdg.AHxxx.SFALRM	SF_VFD Alarm	1				"SF-A"
bdg.AHxxx.SFST	SF_Status					"SF-STAT"
bdg.AHxxx.SFSS	SF_Start/Stop		1			"SF-SS"
bdg.AHxxx.SFSPD	SF_Speed				1	"SF-SPO"
bdg.AHxxx.SAFLOW	SA Flow			1		AFMS1:"SA-F"
bdg.AHxxx.OAFLOW	OA Flow			1		AFMS2:"OA-F"
bdg.AHxxx.EAD	EA Damper			1		M4:"EA-D"
bdg.AHxxx.RAD	RA Damper			1		M3:"RA-D"
bdg.AHxxx.OADMx	OA Max Damper			1		M2:"OA-D-MAX"
bdg.AHxxx.OADMN	OA Min Damper			1		M1:"OA-D-MIN"
bdg.AHxxx.RAT	RA Temperature		1			TS4:"RAT"
bdg.AHxxx.RAH	RA Humidity		1			HS1:"RAH"
bdg.AHxxx.MAT	MA Temperature		1			TS3:"MAT"
bdg.AHxxx.SAT	SA Temperature		1			TS1:"SAT"
bdg.AHxxx.PHT	PH Temperature		1			TS2:"PHT"
bdg.AHxxx.DDSP	DD Static		1			DPT1:"DDSP"
bdg.AHxxx.FLTSP	Filter DP		1			DPT2:"FLT-DP"
bdg.AHxxx.FRZ	Freezestat		1			FZ1:"FRZ"
bdg.AHxxx.SHSP	SF High Press		1			DPS1:"SF-HSP"
bdg.AHxxx.SLSP	SF Low Press		1			DPS2:"SF-LSP"
bdg.AHxxx.LPSS	Loop Pump S/S			1		
bdg.AHxxx.LPST	Loop Pump Status			1		
bdg.AHxxx.HWV	HW Valve				1	V2:"HWV"
bdg.AHxxx.CHWV	CHW Valve				1	V1:"CHWV"
bdg.AHxxx.HWST	HW Supply Temp		1			TS7:"HWST"
bdg.AHxxx.HWRT	HW Return Temp		1			TS8:"HWRT"
bdg.AHxxx.CHWST	CHW Supply Temp		1			TS5:"CHWST"
bdg.AHxxx.CHWRT	CHW Return Temp		1			TS6:"CHWRT"
TOTALS		6	13	4	5	

ELECTRIC LADDER DIAGRAMS

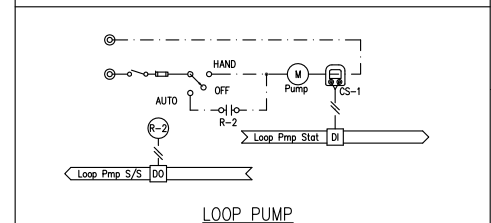


NOTES

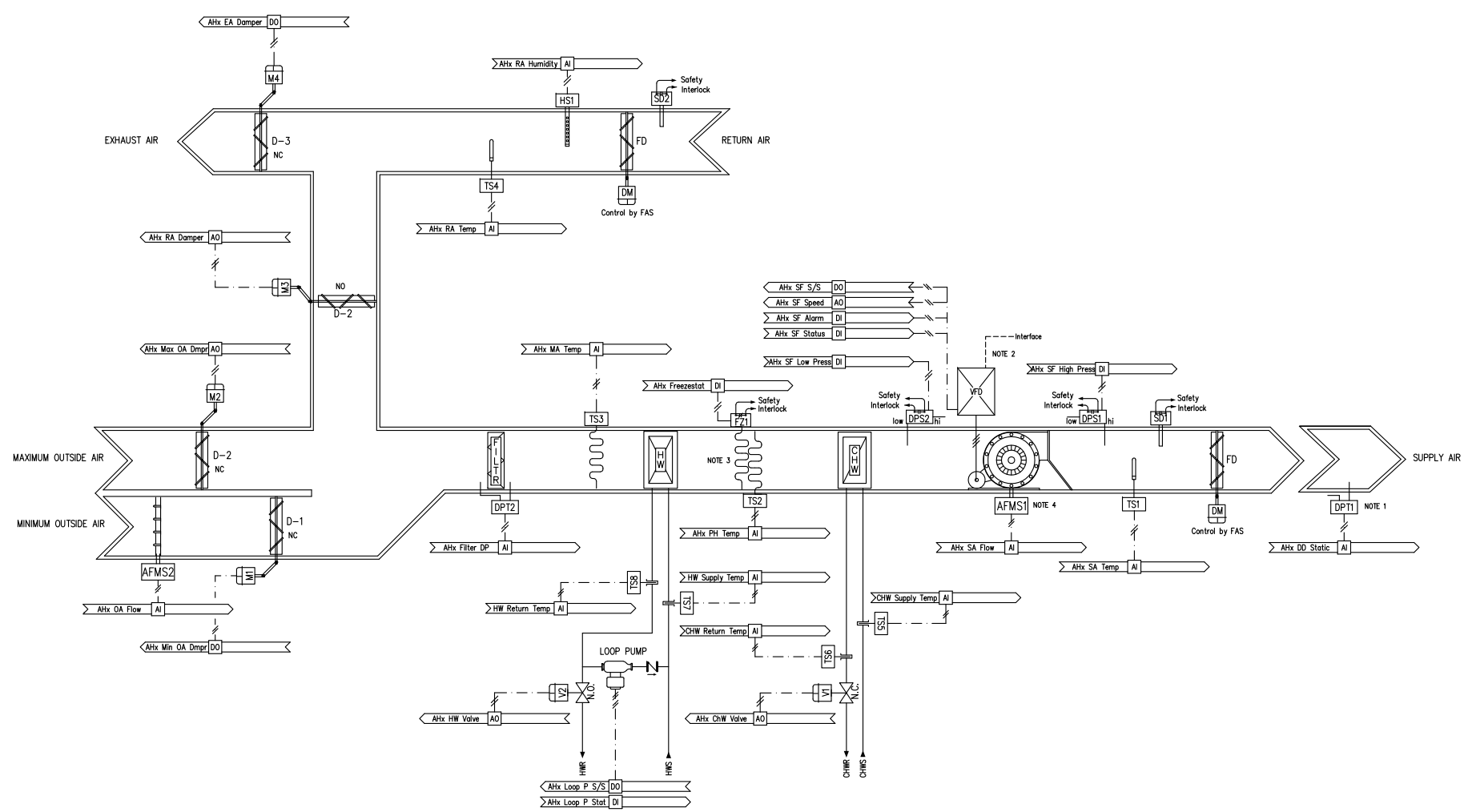
1. Locate down stream duct static pressure pitot tube approximately 2/3 down duct. See floor plans for designed location; show final installation location on as-builts.
2. Provide an ASHRAE 135 compliant (BACnet MS/TP or IP) communications interface to the control system for diagnostic point information.
3. Provide multiple freezestats as required to achieve 1ft of linear element for each 1sq.ft. of coil face area. Preheat sensor shall be installed intertwined with freezestat to cover the exact same area. One set of contacts wired directly to drive safety input.
4. For single fan installation the AFMS may be duct or inlet type, see plans for design. For multiple fan/fan wall installation there will be a single AFMS installed in common duct served by all fans. Coordinate with mechanical design to ensure adequate upstream and downstream straight lengths for duct AFMS.



HARDWIRED DAMPER/VALVE FREEZE SAFETY



CONTROL SCHEMATIC



Eng	HJN
Drawn	HJN
Chkd	---
Appd	---
Issued	10/30/2017
Job No.	15040
Scale	N/A
Proj Code	---

(REV.2)
FOR REVIEW ONLY

VAV AHU:
100% OA,
PREHEAT, CHW

XX OF XX
SHEET NUMBER

C-203

DWG NUMBER

SEQUENCE OF OPERATION		POINTS LIST				
POINT NAME	POINT DESCRIPTOR	POINT TYPE				REMARKS
		DI	AI	DO	AO	
bdg.AHxxx.SFALRM	AHx SF_VFD Alarm	1				"SF-A"
bdg.AHxxx.SFST	AHx SF Status	1				"SF-STAT"
bdg.AHxxx.SFSS	AHx SF Start/Stop			1		"SF-SS"
bdg.AHxxx.SFSPD	AHx SF Speed			1		"SF-SP"
bdg.AHxxx.SAFLOW	SA Flow		1			AFMS;"SA-F"
bdg.AHxxx.OADL	AHx OAD Limit Sw	1				LST;"OAD-LS"
bdg.AHxxx.SAH	AHx SA Humidity		1			HST;"SAH"
bdg.AHxxx.SAT	AHx SA Temperature		1			TS1;"SAT"
bdg.AHxxx.PHT	AHx PH Temperature		1			TS2;"PHT"
bdg.AHxxx.DDSP	AHx DD Static		1			DPT1;"DDSP"
bdg.AHxxx.FRZ	AHx Freezestat		1			FZ1;"FRZ"
bdg.AHxxx.SHSP	AHx SF High Press		1			DPS1;"SF-HSP"
bdg.AHxxx.SLSP	AHx SF Low Press		1			DPS2;"SF-LSP"
bdg.AHxxx.LPSS	Loop Pump S/S			1		
bdg.AHxxx.LPST	Loop Pump Status		1			
bdg.AHxxx.HWV	AHx HW Valve			1	V2;"HWV"	
bdg.AHxxx.CHWV	AHx ChW Valve			1	V1;"CHWV"	
bdg.AHxxx.CHWST	CHW Supply Temp		1			TS3;"CHWST"
bdg.AHxxx.CHWRT	CHW Return Temp		1			TS4;"CHWRT"
bdg.AHxxx.HWST	HW Supply Temp		1			TS5;"HWST"
bdg.AHxxx.HWRT	HW Return Temp		1			TS6;"HWRT"
bdg.AHxxx.FLTSP	Filter DP		1			DPT2;"FLT-OP"
TOTALS		7	10	2	3	

GENERAL: THE VARIABLE AIR VOLUME AIR HANDLER SHALL BE FULLY CONTROLLED BY THE BAS. GENERAL CONTROL SEQUENCES INCLUDE:

- SCHEDULED OCCUPANCY: BAS SHALL DETERMINE THE OCCUPANCY PERIODS BASED ON OPERATOR SCHEDULE.
 - OCCUPIED PERIOD: BAS SHALL ENERGIZE THE AH DURING ALL OCCUPIED PERIODS, OPTIMIZED START SHALL APPLY.
 - UNOCCUPIED PERIOD: BAS SHALL ENERGIZE THE AH AS REQUIRED TO MAINTAIN SET BACK SPACE TEMPERATURES. THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED, EXCEPT WHERE ECONOMIZER OPERATION IS AVAILABLE.
- SEQUENCED HEATING AND COOLING: BAS SHALL PROHIBIT THE HEATING AND COOLING VALVES AS WELL AS THE HEATING VALVE AND ECONOMIZER DAMPER TO BE OPEN SIMULTANEOUSLY. THIS DOES NOT APPLY TO COOLING AND REHEAT VALVES THAT ARE USED SIMULTANEOUSLY FOR DEHUMIDIFICATION.
- FREEZE SAFETY: UPON OPERATION OF A FREEZESTAT THE FOLLOWING SEQUENCE SHALL OCCUR:
 - THE UNIT FANS SHALL BE DEENERGIZED.
 - ALL HOT WATER VALVES AND CHILLED WATER VALVES WILL BE COMMANDED TO 100% OPEN.
 - ALL HOT WATER COOL PUMPS AND CHILLED WATER COOL PUMPS WILL BE COMMANDED TO RUN.
 - OUTSIDE AIR DAMPERS SHALL FULLY CLOSE AND RETURN AIR DAMPERS SHALL FULLY OPEN.
 - BAS SHALL ENERGIZE APPROPRIATE ALARM.
- HIGH OR LOW PRESSURE SAFETY: UPON ACTIVATION OF A HIGH OR LOW PRESSURE SAFETY SWITCH, AH SHALL BE DEENERGIZED, AND BAS SHALL ENUNCIATE AN ALARM.

SUPPLY FAN CONTROL: BAS SHALL CONTROL THE STARTING AND STOPPING OF THE SUPPLY FAN AS FOLLOWS:

- START/STOP: BAS SHALL COMMAND THE SUPPLY FAN TO RUN CONTINUOUSLY AS REQUIRED BY SCHEDULE OR TERMINAL UNIT REQUEST. THE BAS COMMAND TO THE FAN VFD ENERGIZES THE DAMPER MOTOR. ONCE THE DAMPER END SWITCH IS PROVEN THE FAN IS ALLOWED TO START.
- PROOF: BAS SHALL PROVE FAN OPERATION. UPON FAILURE OF THE SUPPLY FAN, BAS SHALL REPORT AN ALARM.
- VFD CONTROL: WHENEVER THE FAN IS ENERGIZED, BAS SHALL CONTROL THE SPEED OF THE VFD TO MAINTAIN THE SUPPLY DUCT STATIC PRESSURE SETPOINT. ON START AND STOP, THE VFD SHALL RAMP TO SPEED AND SLOW DOWN WITHIN ADJUSTABLE ACCELERATION AND DECELERATION LIMITS. BAS SHALL MONITOR A COMMON ALARM OUTPUT FROM THE DRIVE AND REPORT WHEN ACTIVE.
- SUPPLY DUCT PRESSURE SETPOINT: THE DOWN DUCT STATIC PRESSURE SETPOINT SHALL BE RESET BETWEEN THE LIMITS OF 1/2" TO 2" TO MAINTAIN THE MOST OPEN TERMINAL DAMPER AT 80% (WITH ALL VALUES ADJUSTABLE).

SPACE TEMPERATURE CONTROL: THE SPACE TEMPERATURES SHALL BE CONTROLLED VIA INDIVIDUAL VAV BOXES.

DISCHARGE TEMPERATURE CONTROL: THE DISCHARGE TEMPERATURE SETPOINT SHALL BE CALCULATED AND CONTROLLED AS FOLLOWS:

- SETPOINT SHALL BE RESET FROM 55F TO 65F (BOTH ADJUSTABLE) TO MAINTAIN VAV BOX COOLING REQUESTS AT 4 (ADJ.)
- WHEN THE UNIT IS ENERGIZED FOR SETBACK HEATING DURING THE UNOCCUPIED PERIOD, THE DISCHARGE TEMPERATURE SETPOINT SHALL BE 75F (ADJ.)
- WHEN THE UNIT IS ENERGIZED FOR MORNING COOL-DOWN OR SETBACK COOLING, THE DISCHARGE SETPOINT SHALL BE THE WARMEST ZONE TEMPERATURE, MINUS 15F.

PREHEATING SECTION: CONTROL SHALL BE AS FOLLOWS:

WHENEVER THE AH IS ENERGIZED, THE HOT WATER VALVE SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT MINUS 3F (ADJ.).

REGARDLESS OF AH OPERATING MODE THE HOT WATER VALVE SHALL MODULATE TO MAINTAIN A LOW LIMIT OF 40F PREHEAT AIR TEMPERATURE.

COOLING SECTION: CONTROL SHALL BE AS FOLLOWS:

WHENEVER THE AH IS ENERGIZED, THE CHILLED WATER VALVE SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT.

WHENEVER THE RETURN AIR HUMIDITY EXCEEDS 55% (ADJ.) DURING NORMAL OPERATION THE CHILLED WATER VALVE SHALL BE OVERRIDDEN OPEN.

LOOP PUMP CONTROL: BAS SHALL CONTROL THE STARTING AND STOPPING OF THE LOOP PUMP AS FOLLOWS:

- START/STOP: BAS SHALL COMMAND THE OPERATION OF THE LOOP PUMP AND IT SHALL RUN CONTINUOUSLY WHENEVER THE OUTSIDE AIR TEMPERATURE IS BELOW 38F (ADJ.).
- PROOF: BAS SHALL PROVE PUMP OPERATION AND USE THE STATUS INDICATION TO ACCUMULATE RUNTIME.

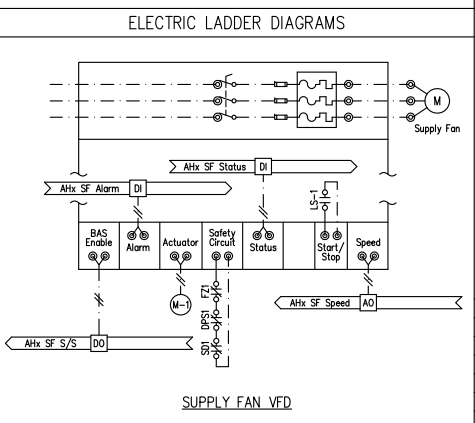
FILTER ALARM: WHEN THE FILTER DIFFERENTIAL PRESSURE SENSOR READING EXCEEDS THE DESIGN SPECIFIED PRESSURE DROP AN ALARM SHALL BE GENERATED AT THE BAS.

GRAPHICS AND TRENDS: PROVIDE TRENDS AND GRAPHIC DISPLAY FOR ALL CONTROL POINTS AND CALCULATED SET POINTS PER SPECIFICATIONS.

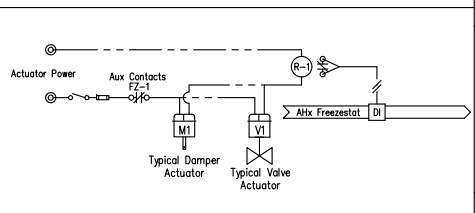
NOTES

- Locate down stream duct static pressure pitot tube approximately 1/3 down duct. See floor plans for designed location; show final installation location on as-builts.
- Provide an ASHRAE 135 compliant (BACnet MS/TP or IP) communications interface to the control system for diagnostic point information.
- Provide multiple freezestats as required to achieve 1ft of linear element for each 1sq.ft. of coil face area. Preheat sensor shall be installed intertwined with freezestat to cover the exact same area. One set of contacts wired directly to drive safety input.
- For single fan installation the AFMS may be duct or inlet type, see plans for design. For multiple fan/ton installation there will be a single AFMS installed in common duct served by all fans. Coordinate with mechanical design to ensure adequate upstream and downstream straight lengths for duct AFMS.

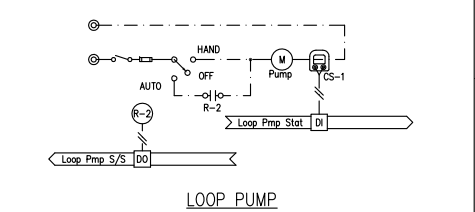
ELECTRIC LADDER DIAGRAMS



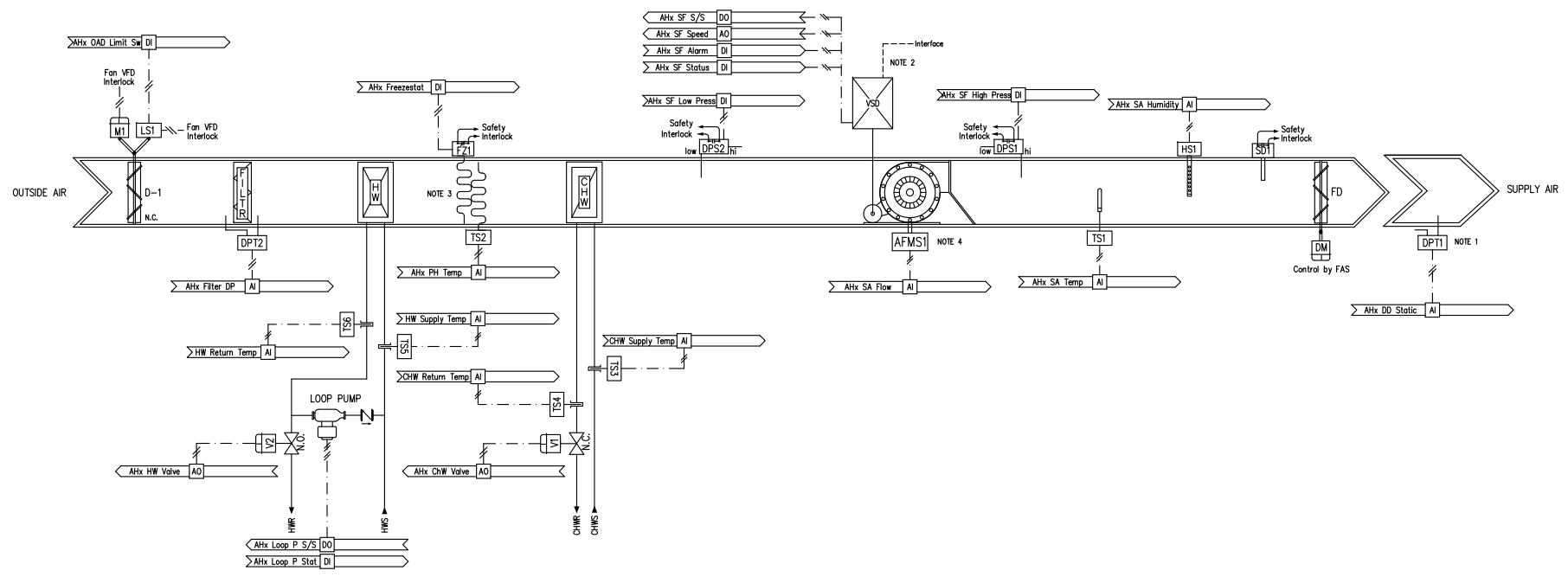
SUPPLY FAN_VFD



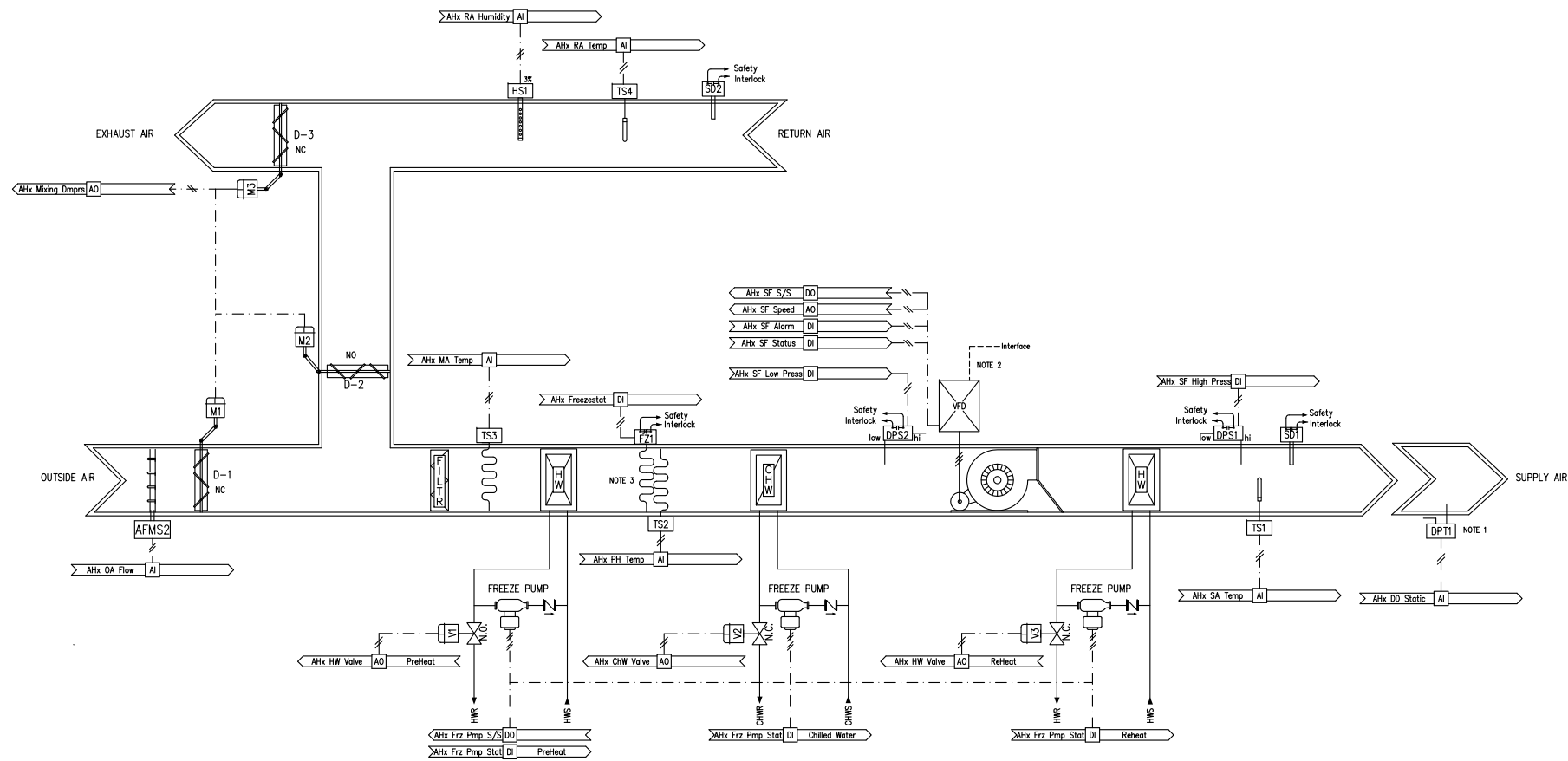
HARDWIRED DAMPER/VALVE FREEZE SAFETY



LOOP PUMP



CONTROL SCHEMATIC



SEQUENCE OF OPERATION

GENERAL: THE VARIABLE AIR VOLUME AIR HANDLER SHALL BE FULLY CONTROLLED BY THE BAS. GENERAL CONTROL SEQUENCES INCLUDE:

- SCHEDULED OCCUPANCY:** BAS SHALL DETERMINE THE OCCUPANCY PERIODS BASED ON OPERATOR SCHEDULE.
 - OCCUPIED PERIOD:** BAS SHALL ENERGIZE THE AH DURING ALL OCCUPIED PERIODS, OPTIMIZED START SHALL APPLY.
 - UNOCCUPIED PERIOD:** BAS SHALL ENERGIZE THE AH AS REQUIRED TO MAINTAIN SET BACK SPACE TEMPERATURES. THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED, EXCEPT WHERE ECONOMIZER OPERATION IS AVAILABLE.
- ARISIDE ECONOMIZER:** BAS SHALL MODULATE THE MIXING DAMPERS TO PROVIDE "FREE COOLING" WHEN CONDITIONS ALLOW. THE FREE COOLING SHALL BE STAGED BEFORE ANY MECHANICAL COOLING. DAMPERS WILL BE MODULATED TO MAINTAIN MIXED AIR TEMPERATURE SETPOINT. THE FOLLOWING STRATEGY SHALL BE USED TO ENABLE THE ECONOMIZER MODE:
 - DRY BULB SWITCH:** ECONOMIZER MODE SHALL BE ACTIVE WHILE THE UNIT IS ENERGIZED AND WHEN OUTSIDE AIR TEMPERATURE FALLS BELOW THE SUPPLY AIR TEMPERATURE SET POINT MINUS 2F (ADJ.). ECONOMIZER MODE SHALL BE INACTIVE WHEN OUTSIDE AIR TEMPERATURE RISES ABOVE THE SUPPLY AIR TEMPERATURE SET POINT.
- SEQUENCED HEATING AND COOLING:** BAS SHALL PROHIBIT THE HEATING AND COOLING VALVES AS WELL AS THE HEATING VALVE AND ECONOMIZER DAMPER TO BE OPEN SIMULTANEOUSLY. THIS DOES NOT APPLY TO COOLING AND REHEAT VALVES THAT ARE USED SIMULTANEOUSLY FOR DEHUMIDIFICATION.
- MIXED AIR LOW LIMIT OVERRIDE:** BAS SHALL OVERRIDE THE SIGNAL TO THE OUTSIDE AIR DAMPER TO MAINTAIN A MINIMUM MIXED AIR TEMPERATURE OF 38F (ADJ.).
 - THE UNIT FANS SHALL BE DEENERGIZED.
 - ALL HOT WATER VALVES AND CHILLED WATER VALVES WILL BE COMMANDED TO 100% OPEN.
 - ALL HOT WATER COIL PUMPS AND CHILLED WATER COIL PUMPS WILL BE COMMANDED TO RUN.
 - OUTSIDE AIR DAMPERS SHALL FULLY CLOSE AND RETURN AIR DAMPERS SHALL FULLY OPEN.
 - BAS SHALL ENUNCIATE APPROPRIATE ALARM.
- HIGH OR LOW PRESSURE SAFETY:** UPON ACTIVATION OF A HIGH OR LOW PRESSURE SAFETY SWITCH, AH SHALL BE DEENERGIZED, AND BAS SHALL ENUNCIATE AN ALARM.

SUPPLY FAN CONTROL: BAS SHALL CONTROL THE STARTING AND STOPPING OF THE SUPPLY FAN AS FOLLOWS:

- START/STOP:** BAS SHALL COMMAND THE SUPPLY FAN TO RUN CONTINUOUSLY AS REQUIRED BY SCHEDULE OR TERMINAL UNIT REQUEST.
- PROOF:** BAS SHALL PROVE FAN OPERATION. UPON FAILURE OF THE SUPPLY FAN, BAS SHALL REPORT AN ALARM.
- VFD CONTROL:** WHENEVER THE FAN IS ENERGIZED, BAS SHALL CONTROL THE SPEED OF THE VFD TO MAINTAIN THE SUPPLY DUCT STATIC PRESSURE SETPOINT. ON START AND STOP, THE VFD SHALL RAMP TO SPEED AND SLOW DOWN WITHIN ADJUSTABLE ACCELERATION AND DECELERATION LIMITS. BAS SHALL MONITOR A COMMON ALARM OUTPUT FROM THE DRIVE AND REPORT WHEN ACTIVE.
- SUPPLY DUCT PRESSURE SETPOINT:** THE DOWN DUCT STATIC PRESSURE SETPOINT SHALL BE RESET BETWEEN THE LIMITS OF 1/2" TO 2" TO MAINTAIN THE MOST OPEN TERMINAL DAMPER AT 90% (WITH ALL VALUES ADJUSTABLE).

DAMPER CONTROL: BAS SHALL CONTROL THE DAMPERS AS FOLLOWS:

- AIR HANDLER OFF:** WHEN AH IS COMMANDED OFF, ALL DAMPERS SHALL REMAIN IN THEIR OFF POSITIONS. WHEN AH IS ENERGIZED DURING THE UNOCCUPIED PERIOD THE OA DAMPER SHALL REMAIN CLOSED UNLESS ECONOMIZER MODE IS AVAILABLE.
- AIR HANDLER ON OCCUPIED:** WHEN AH IS COMMANDED ON IN OCCUPIED MODE THE OUTSIDE AIR, RETURN AIR, AND EXHAUST AIR DAMPERS SHALL MODULATE TO MAINTAIN THE MINIMUM OUTSIDE AIR FLOW SET POINT.
- AIR HANDLER ON UNOCCUPIED:** WHEN AH IS COMMANDED ON IN UNOCCUPIED MODE THE OUTSIDE AIR DAMPER SHALL REMAIN FULLY CLOSED, EXHAUST DAMPER FULLY CLOSED AND RETURN DAMPER FULLY OPEN UNLESS ECONOMIZER MODE IS AVAILABLE.
- ECONOMIZER:** WHEN ECONOMIZER MODE IS AVAILABLE THE BAS SHALL MODULATE THE OUTSIDE AIR, RETURN AIR, AND EXHAUST AIR DAMPERS TO MAINTAIN THE MIXED AIR TEMPERATURE SET POINT. THE MIXED AIR TEMPERATURE SETPOINT SHALL BE EQUAL TO THE DISCHARGE AIR TEMPERATURE SETPOINT MINUS 3F (ADJ.).

SPACE TEMPERATURE CONTROL: THE SPACE TEMPERATURES SHALL BE CONTROLLED VIA INDIVIDUAL VAV BOXES.

DISCHARGE TEMPERATURE CONTROL: THE DISCHARGE TEMPERATURE SETPOINT SHALL BE CALCULATED AND CONTROLLED AS FOLLOWS:

- SETPOINT SHALL BE RESET FROM 55F TO 65F (BOTH ADJUSTABLE) TO MAINTAIN VAV BOX COOLING REQUESTS AT 4 (ADJ.).
- WHEN THE UNIT IS ENERGIZED FOR SETBACK HEATING DURING THE UNOCCUPIED PERIOD, THE DISCHARGE TEMPERATURE SETPOINT SHALL BE 75F (ADJ.).
- WHEN THE UNIT IS ENERGIZED FOR MORNING COOL-DOWN OR SETBACK COOLING, THE DISCHARGE SETPOINT SHALL BE THE WARMEST ZONE TEMPERATURE, MINUS 15F.

PREHEATING SECTION: CONTROL SHALL BE FOR HEATING AS FOLLOWS: WHENEVER THE AH IS ENERGIZED, THE HOT WATER PRE-HEAT VALVE SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT MINUS 3F (ADJ.). REGARDLESS OF AH OPERATING MODE THE HOT WATER VALVE SHALL MODULATE TO MAINTAIN A LOW LIMIT OF 40F PREHEAT AIR TEMPERATURE.

COOLING SECTION: CONTROL SHALL BE FOR COOLING AND DEHUMIDIFICATION AS FOLLOWS: WHENEVER THE AH IS ENERGIZED, THE CHILLED WATER VALVE SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT. WHENEVER THE RETURN AIR HUMIDITY EXCEEDS 55% (ADJ.) DURING NORMAL OPERATION THE CHILLED WATER VALVE SHALL BE OVERRIDDEN OPEN.

REHEATING SECTION: CONTROL SHALL BE FOR DEHUMIDIFICATION AS FOLLOWS: WHENEVER THE AH IS ENERGIZED AND RETURN AIR HUMIDITY IS ABOVE SET POINT (SEE COOLING SECTION), THE HOT WATER RE-HEAT VALVE SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT (ADJ.).

FREEZE PUMP CONTROL: BAS SHALL CONTROL THE STARTING AND STOPPING OF THE FREEZE PUMPS AS FOLLOWS:

- START/STOP:** BAS SHALL COMMAND THE OPERATION OF THE FREEZE PUMPS AND THEY SHALL RUN CONTINUOUSLY WHENEVER THE OUTSIDE AIR TEMPERATURE IS BELOW 38F (ADJ.).
- PROOF:** BAS SHALL PROVE PUMP OPERATION AND USE THE STATUS INDICATION TO ACCUMULATE RUNTIME.

FILTER ALARM: WHEN THE FILTER DIFFERENTIAL PRESSURE SENSOR READING EXCEEDS THE DESIGN SPECIFIED PRESSURE DROP AN ALARM SHALL BE GENERATED AT THE BAS.

GRAPHICS AND TRENDS: PROVIDE TRENDS AND GRAPHIC DISPLAY FOR ALL CONTROL POINTS AND CALCULATED SET POINTS PER SPECIFICATIONS.

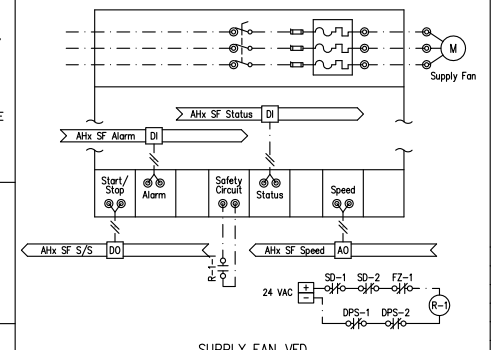
NOTES

- Locate down stream duct static pressure pitot tube approximately 2/3 down duct. See floor plans for designed location; show final installation location on as-builts.
- Provide communications interface to the control system for diagnostic point information.
- Provide multiple freeze-stats as required to achieve 1ft of linear element for each 1sq.ft. of coil face area. Preheat sensor shall be installed intertwined with freeze-stat to cover the exact same area. One set of contacts wired directly to drive safety input.
- For single fan installation the AFMS may be duct or inlet type, see plans for design. For multiple fan/fan wall installation there will be a single AFMS installed in common duct served by all fans. Coordinate with mechanical design to ensure adequate upstream and downstream straight lengths for duct AFMS.

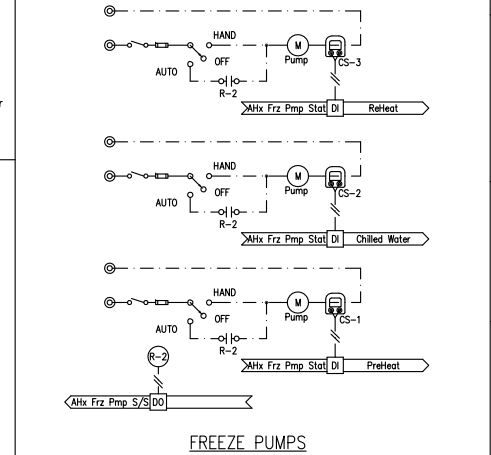
POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE				REMARKS
		DI	AI	DO	AO	
bdg.AHxxx.RAT	AHx RA Temperature	1				
bdg.AHxxx.RAH	AHx RA Humidity	1				
bdg.AHxxx.SFALRM	AHx SF VFD Alarm	1				
bdg.AHxxx.SFSTS	AHx SF Status	1				
bdg.AHxxx.SFST	AHx SF Start/Stop		1			
bdg.AHxxx.SFSPD	AHx SF Speed		1	1		
bdg.AHxxx.OAFLW	AHx OA Flow	1				
bdg.AHxxx.OARAD	AHx Mixing Dmpers			1	1	
bdg.AHxxx.MAT	AHx MA Temperature	1				
bdg.AHxxx.SAT	AHx SA Temperature	1				
bdg.AHxxx.PHT	AHx PH Temperature	1				
bdg.AHxxx.DDSP	AHx DD Static	1				
bdg.AHxxx.FRZ	AHx Freezestat	1				
bdg.AHxxx.SHSP	AHx SF High Press	1				
bdg.AHxxx.SLSP	AHx SF Low Press	1				
bdg.AHxxx.FPSS	AHx Freeze Pmp			1	1	
bdg.AHxxx.CFPS	AHx ChW FP Stat	1				
bdg.AHxxx.HFPS	AHx HW FP Stat	1				
bdg.AHxxx.PHW	AHx Preheat Valve			1	1	
bdg.AHxxx.CHW	AHx ChW Valve			1	1	
bdg.AHxxx.RHW	AHx Reheat Valve			1	1	
TOTALS		7	7	2	5	

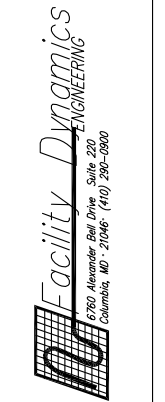
ELECTRIC LADDER DIAGRAMS



SUPPLY FAN VFD



FREEZE PUMPS



THE UNIVERSITY OF GEORGIA
 STANDARD CONTROL DRAWINGS

Eng	HJN
Drawn	HJN
Chkd	---
Appd	---
Issued	10/30/2017
Job No.	15040
Scale	N/A
Proj Code	---

FOR REVIEW ONLY

VAV AHU:
PREHEAT, CHW,
REHEAT,
ECONOMIZER

XX OF XX
SHEET NUMBER

C-204

DWG NUMBER

CONTROL SCHEMATIC

Eng	HJN
Drawn	HJN
Chkd	---
Appd	---
Issued	11/3/2017
Job No.	15040
Scale	N/A
Proj Code	---

(REV.2)
FOR REVIEW ONLY

CV AHU:
PREHEAT, CHW,
RETURN FAN,
MIN OA, CO2,
ECONOMIZER

XX OF XX
SHEET NUMBER

C-301

DWG NUMBER

SEQUENCE OF OPERATION

GENERAL: THE CONSTANT AIR VOLUME AIR HANDLER SHALL BE FULLY CONTROLLED BY THE BAS. GENERAL CONTROL SEQUENCES INCLUDE:

- SCHEDULED OCCUPANCY:** BAS SHALL DETERMINE THE OCCUPANCY PERIODS BASED ON OPERATOR SCHEDULE.
 - OCCUPIED PERIOD: BAS SHALL ENERGIZE THE AH DURING ALL OCCUPIED PERIODS, OPTIMIZED START SHALL APPLY.
 - UNOCCUPIED PERIOD: BAS SHALL ENERGIZE THE AH AS REQUIRED TO MAINTAIN SET BACK SPACE TEMPERATURES. THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED, EXCEPT WHERE ECONOMIZER OPERATION IS AVAILABLE.
- ARISE ECONOMIZER:** BAS SHALL MODULATE THE MIXING DAMPERS TO PROVIDE "FREE COOLING" WHEN CONDITIONS ALLOW. THE FREE COOLING SHALL BE STAGED BEFORE ANY MECHANICAL COOLING. DAMPERS WILL BE MODULATED TO MAINTAIN MIXED AIR TEMPERATURE SETPOINT. THE FOLLOWING STRATEGY SHALL BE USED TO ENABLE THE ECONOMIZER MODE:
 - DRY BULB SWITCH: ECONOMIZER MODE SHALL BE ACTIVE WHILE THE UNIT IS ENERGIZED AND WHEN OUTSIDE AIR TEMPERATURE FALLS BELOW 60°F (ADJ.). ECONOMIZER MODE SHALL BE INACTIVE WHEN OUTSIDE AIR TEMPERATURE RISES 3°F (ADJ.) ABOVE THE ENABLE SET POINT.
- SEQUENCED HEATING AND COOLING:** BAS SHALL PROHIBIT THE HEATING AND COOLING VALVES AS WELL AS THE HEATING VALVE AND ECONOMIZER DAMPER TO BE OPEN SIMULTANEOUSLY. THIS DOES NOT APPLY TO COOLING AND REHEAT VALVES THAT ARE USED SIMULTANEOUSLY FOR DEHUMIDIFICATION.
- MIXED AIR LOW LIMIT OVERRIDE:** BAS SHALL OVERRIDE THE SIGNAL TO THE OUTSIDE AIR DAMPER TO MAINTAIN A MINIMUM MIXED AIR TEMPERATURE OF 38°F (ADJ.).
- FREEZE SAFETY:** UPON OPERATION OF A FREEZESTAT THE FOLLOWING SEQUENCE SHALL OCCUR:
 - THE UNIT FANS SHALL BE DEENERGIZED.
 - ALL HOT WATER VALVES AND CHILLED WATER VALVES WILL BE COMMANDED TO 100% OPEN.
 - ALL HOT WATER COIL PUMPS AND CHILLED WATER COIL PUMPS WILL BE COMMANDED TO RUN.
 - OUTSIDE AIR DAMPERS SHALL FULLY CLOSE AND RETURN AIR DAMPERS SHALL FULLY OPEN.
 - BAS SHALL ENUNCIATE APPROPRIATE ALARM.

SUPPLY FAN CONTROL: BAS SHALL CONTROL THE STARTING AND STOPPING OF THE SUPPLY FAN AS FOLLOWS:

- START/STOP: BAS SHALL COMMAND THE SUPPLY FAN TO RUN CONTINUOUSLY AS REQUIRED BY SCHEDULE.
- PROOF: BAS SHALL PROVE FAN OPERATION THROUGH THE VFD INTERFACE. UPON FAILURE OF THE SUPPLY FAN, BAS SHALL REPORT AN ALARM.
- VFD CONTROL: WHENEVER THE FAN IS ENERGIZED, BAS SHALL MODULATE THE SPEED OF THE VFD TO A FIXED VALUE DETERMINED BY TAB TO MEET SCHEDULED FLOW AND FAN PERFORMANCE SCHEDULES. ON START AND STOP, THE VFD SHALL RAMP TO SPEED AND SLOW DOWN WITHIN ADJUSTABLE ACCELERATION AND DECELERATION LIMITS. BAS SHALL MONITOR A COMMON ALARM OUTPUT FROM THE DRIVE AND REPORT WHEN ACTIVE.

RETURN FAN CONTROL: BAS SHALL CONTROL THE STARTING AND STOPPING OF THE RETURN FAN AS FOLLOWS:

- START/STOP: BAS SHALL COMMAND THE RETURN FAN TO RUN CONTINUOUSLY WHENEVER THE SUPPLY FAN IS RUNNING.
- PROOF: BAS SHALL PROVE FAN OPERATION. UPON FAILURE OF THE RETURN FAN, BAS SHALL REPORT AN ALARM.
- VFD CONTROL: WHENEVER THE FAN IS ENERGIZED, BAS SHALL MODULATE THE SPEED OF THE VFD TO A FIXED VALUE DETERMINED BY TAB TO MEET SCHEDULED FLOW AND FAN PERFORMANCE SCHEDULES. ON START AND STOP, THE VFD SHALL RAMP TO SPEED AND SLOW DOWN WITHIN ADJUSTABLE ACCELERATION AND DECELERATION LIMITS. BAS SHALL MONITOR A COMMON ALARM OUTPUT FROM THE DRIVE AND REPORT WHEN ACTIVE.

DAMPER CONTROL: BAS SHALL CONTROL THE DAMPERS AS FOLLOWS:

- AIR HANDLER OFF: WHEN AH IS COMMANDED OFF, ALL DAMPERS SHALL REMAIN IN THEIR OFF POSITIONS. (ON DAMPERS CLOSED, EXHAUST DAMPER CLOSED, RETURN DAMPER OPEN)
- AIR HANDLER ON OCCUPIED: WHEN AH IS COMMANDED ON IN OCCUPIED MODE THE MINIMUM OUTSIDE AIR DAMPER WILL BE COMMANDED OPEN. THE MIXING DAMPERS SHALL MODULATE TO MAINTAIN THE MINIMUM OUTSIDE AIR FLOW SET POINT. (MAX OUTSIDE AIR CLOSED, EXHAUST AIR, AND RETURN AIR DAMPERS MODULATING)
- AIR HANDLER ON UNOCCUPIED: WHEN AH IS COMMANDED ON IN UNOCCUPIED MODE THE OUTSIDE AIR DAMPERS SHALL REMAIN FULLY CLOSED. EXHAUST DAMPER FULLY CLOSED AND RETURN DAMPER FULLY OPEN UNLESS ECONOMIZER MODE IS AVAILABLE.
- ECONOMIZER: WHEN ECONOMIZER MODE IS AVAILABLE THE BAS SHALL MODULATE THE MAXIMUM OUTSIDE AIR DAMPER TO MAINTAIN THE MIXED AIR TEMPERATURE SET POINT. THE MIXED AIR TEMPERATURE SETPOINT SHALL BE EQUAL TO THE DISCHARGE AIR TEMPERATURE SETPOINT MINUS 3°F (ADJ.). THE EXHAUST AIR DAMPER SHALL BE CLOSED AND RETURN AIR DAMPER OPEN.
- DEMAND VENTILATION: AS RETURN AIR CO2 RISES ABOVE SET POINT, INITIALLY 1500 PPM (ADJ.), THE MINIMUM OUTSIDE AIR FLOW SET POINT SHALL BE RESET HIGHER UNTIL THE RETURN AIR DAMPER IS FULLY CLOSED OR THE CO2 SET POINT IS SATISFIED. IF THE RETURN AIR DAMPER HAS RESET FULLY CLOSED AND THE CO2 LEVELS ARE STILL ABOVE SET POINT THE MAXIMUM OUTSIDE AIR DAMPER SHALL BE MODULATED OPEN TO MAINTAIN THE CO2 SET POINT. ONCE RETURN AIR CO2 FALLS BELOW SET POINT THE DAMPERS SHALL RETURN TO NORMAL CONTROL. DEMAND VENTILATION SEQUENCING SHALL NOT OVERRIDE FREEZE PROTECTION SEQUENCING.

SPACE TEMPERATURE CONTROL: THE BAS SHALL MAINTAIN THE SPACE TEMPERATURE SET POINTS BY RESETTING THE DISCHARGE AIR TEMPERATURE. THE NORMAL COOLING SETPOINT SHALL BE 76°F (ADJ.) AND NORMAL HEATING SETPOINT SHALL BE 70°F (ADJ.). THE SETBACK COOLING SETPOINT SHALL BE 85°F (ADJ.) AND SETBACK HEATING SETPOINT SHALL BE 60°F (ADJ.).

DISCHARGE TEMPERATURE SETPOINT: THE DISCHARGE TEMPERATURE SETPOINT SHALL BE RESET AS FOLLOWS:

- AS THE SPACE TEMPERATURE FALLS BELOW THE SPACE HEATING SETPOINT A PID LOOP WILL CALCULATE THE HEATING DEMAND FROM 0-100%. AS THE HEATING DEMAND RISES FROM 0 TO 100% THE DISCHARGE AIR TEMPERATURE SETPOINT SHALL RISE FROM 75°F TO 100°F (WITH ALL VALUES ADJUSTABLE).
- AS THE SPACE TEMPERATURE RISES ABOVE THE SPACE COOLING SETPOINT A PID LOOP WILL CALCULATE THE COOLING DEMAND FROM 0-100%. AS THE COOLING DEMAND RISES FROM 0 TO 100% THE DISCHARGE AIR TEMPERATURE SETPOINT SHALL FALL FROM 70°F TO 50°F (WITH ALL VALUES ADJUSTABLE).
- WHEN THE SPACE TEMPERATURE IS BETWEEN THE ACTIVE HEATING AND COOLING SET POINTS THE HEATING AND COOLING DEMAND WILL BOTH BE 0.

PREHEATING SECTION: CONTROL SHALL BE AS FOLLOWS:

- WHENEVER THE AH IS ENERGIZED, THE HOT WATER PREHEAT VALVE SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT.
- REGARDLESS OF AH OPERATING MODE THE HOT WATER PREHEAT VALVE SHALL MODULATE TO MAINTAIN A LOW LIMIT OF 40°F PREHEAT AIR TEMPERATURE.

COOLING SECTION: CONTROL SHALL BE AS FOLLOWS:

- WHENEVER THE AH IS ENERGIZED, THE CHILLED WATER VALVE SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT.
- WHENEVER THE RETURN AIR HUMIDITY EXCEEDS 55% (ADJ.) DURING UNIT OPERATION THE CHILLED WATER VALVE SHALL BE OVERRIDDEN OPEN FOR DEHUMIDIFICATION.

REHEATING SECTION: CONTROL SHALL BE AS FOLLOWS:

- WHENEVER THE AH IS ENERGIZED IN DEHUMIDIFICATION MODE, THE HOT WATER REHEAT VALVE SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT.
- WHEN THE AH IS DEENERGIZED OR NOT OPERATING IN DEHUMIDIFICATION MODE THE REHEAT VALVE SHALL BE CLOSED.

LOOP PUMP CONTROL: BAS SHALL CONTROL THE STARTING AND STOPPING OF THE LOOP PUMP AS FOLLOWS:

- START/STOP: BAS SHALL COMMAND THE OPERATION OF THE LOOP PUMP AND IT SHALL RUN CONTINUOUSLY WHENEVER THE OUTSIDE AIR TEMPERATURE IS BELOW 38°F (ADJ.).
- PROOF: BAS SHALL PROVE PUMP OPERATION AND USE THE STATUS INDICATION TO ACCUMULATE RUNTIME.

FILTER ALARM: WHEN THE FILTER DIFFERENTIAL PRESSURE SENSOR READING EXCEEDS THE DESIGN SPECIFIED PRESSURE DROP AN ALARM SHALL BE GENERATED AT THE BAS.

GRAPHICS AND TRENDS: PROVIDE TRENDS AND GRAPHIC DISPLAY FOR ALL CONTROL POINTS AND CALCULATED SET POINTS PER SPECIFICATIONS. INCLUDE TAB VERIFIED FULL FLOW VALUE AT EACH AFMS.

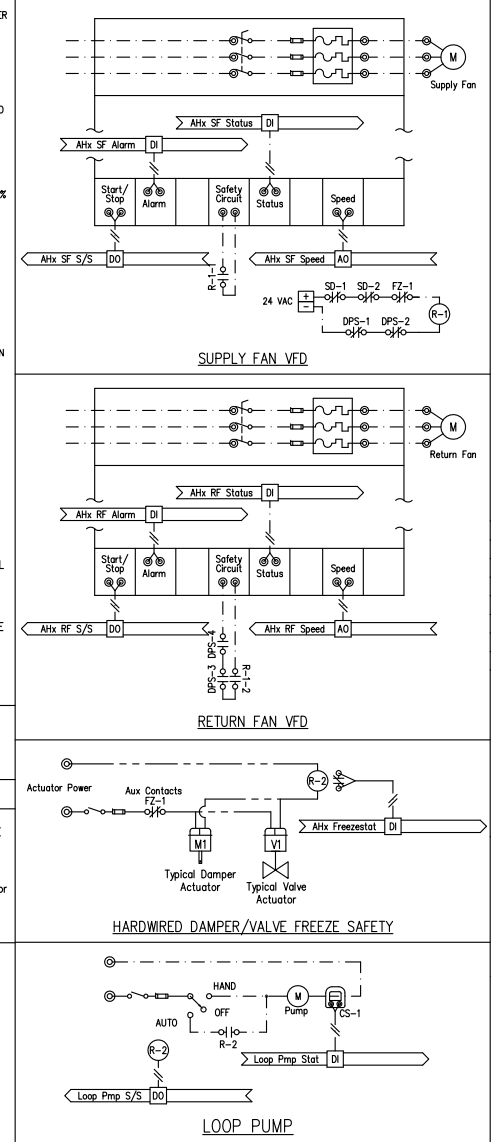
NOTES

- Provide multiple freezestats as required to achieve 1ft of linear element for each 1sq.ft. of coil face area. Preheat sensor shall be installed intertwined with freezestat to cover the exact same area. One set of contacts wired directly to drive safety input.
- Provide an ASHRAE 135 compliant (BACnet MS/TP or IP) communications interface to the control system for diagnostic point information. Include the following information for fan VFDs: operating frequency (Hz), RPM, percent fan speed, BAS signal to VFD, VFD output voltage, actual brake horsepower, and kW. On the VFD graphic screen also include the motor nameplate brake horsepower.

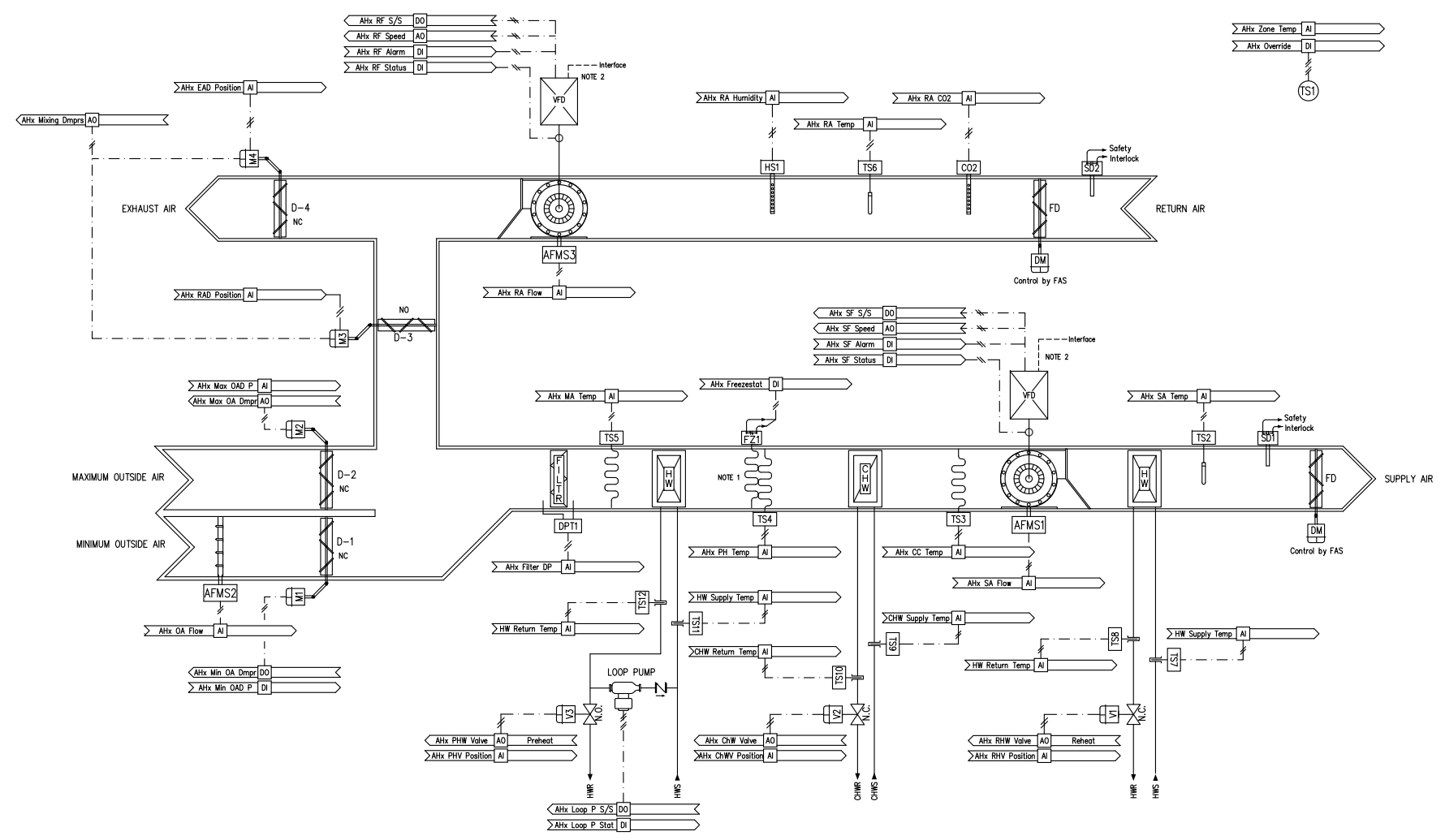
POINTS LIST

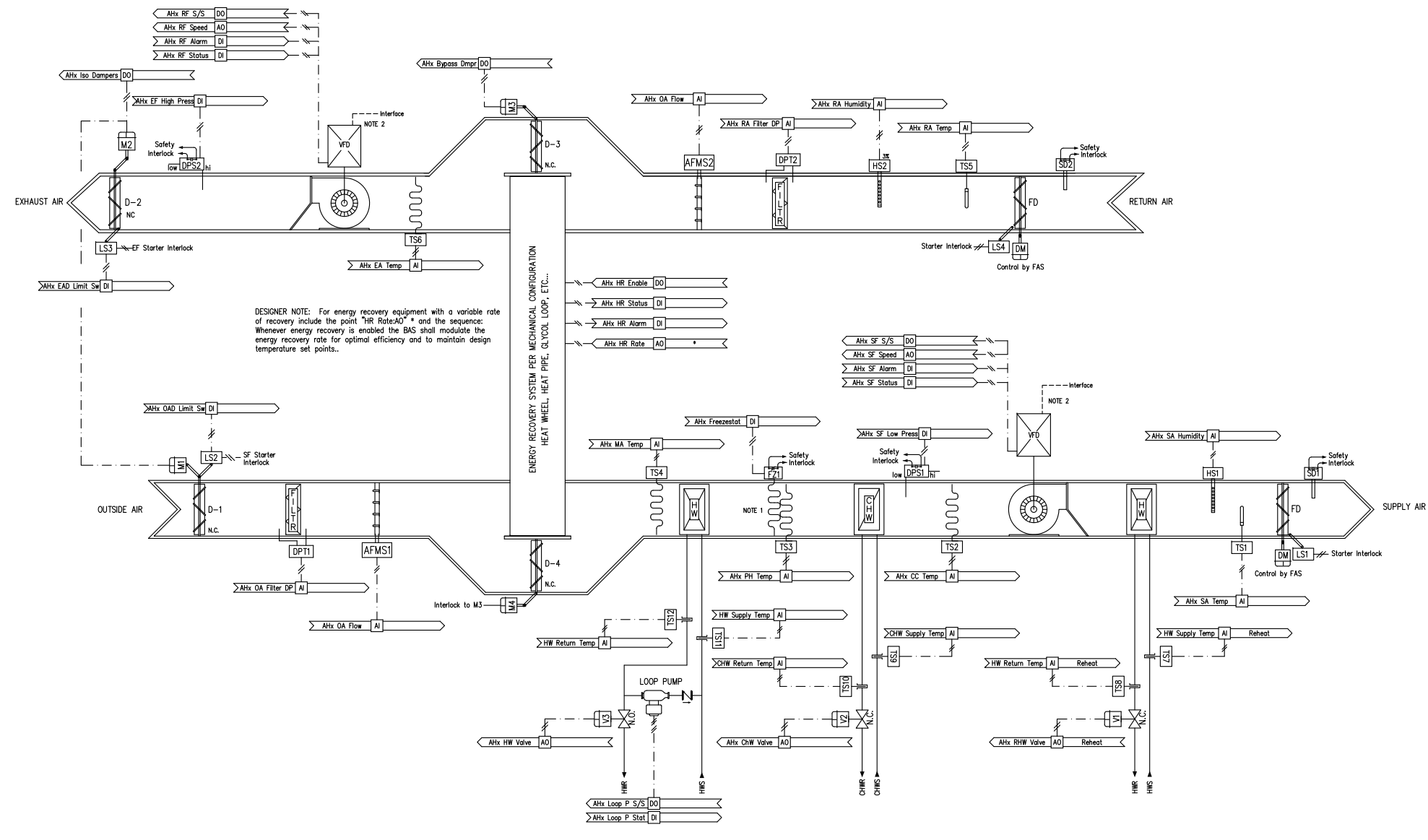
POINT NAME	POINT DESCRIPTOR	POINT TYPE				REMARKS
		DI	AI	DO	AO	
bdg.AHxxx.RAT	RA Temperature		1			TS6:"RAT"
bdg.AHxxx.RAH	RA Humidity		1			HS1:"RAH"
bdg.AHxxx.RACO2	RA CO2		1			CO2:"CO2"
bdg.AHxxx.RFALRM	RF VFD Alarm	1				"RF-A"
bdg.AHxxx.RFST	RF Status		1			"RF-STAT"
bdg.AHxxx.RFSS	RF Start/Stop			1		"RF-SS"
bdg.AHxxx.RFSPD	RF Speed			1		"RF-SPD"
bdg.AHxxx.SFALRM	SF VFD Alarm	1				"SF-A"
bdg.AHxxx.SFST	SF Status		1			"SF-STAT"
bdg.AHxxx.SFSS	SF Start/Stop			1		"SF-SS"
bdg.AHxxx.SFSPD	SF Speed			1		"SF-SPD"
bdg.AHxxx.MINOAD	Min OA Damper			1		M1:"OA-D-MIN"
bdg.AHxxx.OADMNP	OAD Min Position	1				M1:"OA-D-MIN-POS"
bdg.AHxxx.MAXOAD	Max OA Damper			1		M2:"OA-D-MAX"
bdg.AHxxx.OADMXP	OAD Max Position	1				M2:"OA-D-MAX-POS"
bdg.AHxxx.MIXD	Mixing Dmpers			1		M3:"MX-D"
bdg.AHxxx.EADP	EA Damper Position	1				M4:"EA-D-POS"
bdg.AHxxx.RADP	RA Damper Position	1				M3:"RA-D-POS"
bdg.AHxxx.SAT	SA Temperature		1			TS2:"SAT"
bdg.AHxxx.CCT	CC Temperature		1			TS3:"CCT"
bdg.AHxxx.MAT	MA Temperature		1			TS4:"MAT"
bdg.AHxxx.PHT	PH Temperature		1			TS5:"PHT"
bdg.AHxxx.FRZ	Freezestat	1				FZ1:"FRZ"
bdg.AHxxx.LPSS	Loop Pump S/S			1		
bdg.AHxxx.LPST	Loop Pump Status	1				
bdg.AHxxx.PHWV	PHW Valve			1		V3:"PHWV"
bdg.AHxxx.PHWVP	PHW Valve Position	1				V3:"PHWV-POS"
bdg.AHxxx.CHWV	CHW Valve			1		V2:"CHWV"
bdg.AHxxx.CHWVP	CHW Valve Position	1				V2:"CHWV-POS"
bdg.AHxxx.RHWV	RHW Valve			1		V1:"RHWV"
bdg.AHxxx.RHWVP	RHW Valve Position	1				V1:"RHWV-POS"
bdg.AHxxx.HWST	HW Supply Temp		1			TS7:"HWST"
bdg.AHxxx.HWRT	HW Return Temp		1			TS8:"HWRT"
bdg.AHxxx.CHWST	CHW Supply Temp		1			TS5:"CHWST"
bdg.AHxxx.CHWRT	CHW Return Temp		1			TS6:"CHWRT"
bdg.AHxxx.ZONET	Zone Temp		1			TS1:"ZONET"
bdg.AHxxx.OCCOVRD	Occ Override	1				TS1:"OVRD"
bdg.AHxxx.SAFLOW	SA Flow		1			AFMS1:"SA-F"
bdg.AHxxx.OAFLOW	OA Flow		1			AFMS2:"OA-F"
bdg.AHxxx.RAFLOW	RA Flow		1			AFMS3:"RA-F"
bdg.AHxxx.FLTPS	Filter DP		1			DPT1:"FLT-DP"
TOTALS						8 22 4 7

ELECTRIC LADDER DIAGRAMS



CONTROL SCHEMATIC





DESIGNER NOTE: For energy recovery equipment with a variable rate of recovery include the point "HR Rate:AO" * and the sequence: Whenever energy recovery is enabled the BAS shall modulate the energy recovery rate for optimal efficiency and to maintain design temperature set points.

CONTROL SCHEMATIC

SEQUENCE OF OPERATION

GENERAL: THE CONSTANT AIR VOLUME AIR HANDLER SHALL BE FULLY CONTROLLED BY THE BAS. GENERAL CONTROL SEQUENCES INCLUDE:

- SCHEDULED OCCUPANCY: BAS SHALL DETERMINE THE OCCUPANCY PERIODS BASED ON OPERATOR SCHEDULE.
 - OCCUPIED PERIOD: BAS SHALL ENERGIZE THE AH DURING ALL OCCUPIED PERIODS, OPTIMIZED START SHALL APPLY.
 - UNOCCUPIED PERIOD: BAS SHALL ENERGIZE THE AH AS REQUIRED TO MAINTAIN SET BACK SPACE TEMPERATURES. THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED, EXCEPT WHERE ECONOMIZER OPERATION IS AVAILABLE.
- FREE COOLING: BAS SHALL MODULATE THE MIXING DAMPERS TO PROVIDE "FREE COOLING" WHEN CONDITIONS ALLOW. THE FREE COOLING SHALL BE STAGED BEFORE ANY MECHANICAL COOLING. DAMPERS WILL BE MODULATED TO MAINTAIN MIXED AIR TEMPERATURE SETPOINT. THE FOLLOWING STRATEGY SHALL BE USED TO ENABLE THE ECONOMIZER MODE:
 - DRY BULB SWITCH: ECONOMIZER MODE SHALL BE ACTIVE WHILE THE UNIT IS ENERGIZED AND WHEN OUTSIDE AIR TEMPERATURE FALLS WITHIN 3°F (ADJ.) OF THE SUPPLY AIR TEMPERATURE SET POINT. ECONOMIZER MODE SHALL BE INACTIVE WHEN OUTSIDE AIR TEMPERATURE IS OUTSIDE OF THIS RANGE.
- SEQUENCED HEATING AND COOLING: BAS SHALL PROHIBIT THE HEATING AND COOLING VALVES AS WELL AS THE HEATING VALVE AND ECONOMIZER DAMPER TO BE OPEN SIMULTANEOUSLY. THIS DOES NOT APPLY TO COOLING AND REHEAT VALVES THAT ARE USED SIMULTANEOUSLY FOR DEHUMIDIFICATION.
- FREEZE SAFETY: UPON OPERATION OF A FREEZESTAT THE FOLLOWING SEQUENCE SHALL OCCUR:
 - THE UNIT FANS SHALL BE DEENERGIZED.
 - ALL HOT WATER VALVES AND CHILLED WATER VALVES WILL BE COMMANDED TO 100% OPEN.
 - ALL HOT WATER COOL PUMPS AND CHILLED WATER COOL PUMPS WILL BE COMMANDED TO RUN.
 - OUTSIDE AIR DAMPERS SHALL FULLY CLOSE AND RETURN AIR DAMPERS SHALL FULLY OPEN.
 - BAS SHALL ENUNCIATE APPROPRIATE ALARM.
- HIGH OR LOW PRESSURE SAFETY: UPON ACTIVATION OF A HIGH OR LOW PRESSURE SAFETY SWITCH, AH SHALL BE DEENERGIZED, AND BAS SHALL ENUNCIATE AN ALARM.

SUPPLY FAN CONTROL: BAS SHALL CONTROL THE STARTING AND STOPPING OF THE SUPPLY FAN AS FOLLOWS:

- START/STOP: BAS SHALL COMMAND THE SUPPLY FAN TO RUN CONTINUOUSLY AS REQUIRED BY OPERATOR SCHEDULE. ONCE THE OUTSIDE AIR ISOLATION DAMPER END SWITCH IS PROVEN THE FAN IS ALLOWED TO START.
- PROOF: BAS SHALL PROVE FAN OPERATION. UPON FAILURE OF THE SUPPLY FAN, BAS SHALL REPORT AN ALARM.
- VFD CONTROL: WHENEVER THE FAN IS ENERGIZED, BAS SHALL MODULATE THE SPEED OF THE VFD TO A FIXED VALUE DETERMINED BY TAB TO MEET SCHEDULED FLOW AND FAN PERFORMANCE SCHEDULES. ON START AND STOP, THE VFD SHALL RAMP TO SPEED AND SLOW DOWN WITHIN ADJUSTABLE ACCELERATION AND DECELERATION LIMITS. BAS SHALL MONITOR A COMMON ALARM OUTPUT FROM THE DRIVE AND REPORT WHEN ACTIVE.

EXHAUST FAN CONTROL: BAS SHALL CONTROL THE STARTING AND STOPPING OF THE EXHAUST FAN AS FOLLOWS:

- START/STOP: BAS SHALL COMMAND THE EXHAUST FAN TO RUN CONTINUOUSLY WHENEVER THE SUPPLY FAN IS RUNNING. ONCE THE EXHAUST AIR ISOLATION DAMPER END SWITCH IS PROVEN THE FAN IS ALLOWED TO START.
- PROOF: BAS SHALL PROVE FAN OPERATION. UPON FAILURE OF THE EXHAUST FAN, BAS SHALL REPORT AN ALARM.
- VFD CONTROL: WHENEVER THE FAN IS ENERGIZED, BAS SHALL MODULATE THE SPEED OF THE VFD TO A FIXED VALUE DETERMINED BY TAB TO MEET SCHEDULED FLOW AND FAN PERFORMANCE SCHEDULES. ON START AND STOP, THE VFD SHALL RAMP TO SPEED AND SLOW DOWN WITHIN ADJUSTABLE ACCELERATION AND DECELERATION LIMITS. BAS SHALL MONITOR A COMMON ALARM OUTPUT FROM THE DRIVE AND REPORT WHEN ACTIVE.

ISOLATION DAMPER CONTROL: WHENEVER THE AH IS COMMANDED TO RUN AND THERE ARE NO ACTIVE SAFETY ALARMS BOTH ISOLATION DAMPERS (EXHAUST AND OUTSIDE AIR) SHALL BE COMMANDED TO OPEN. A LIMIT SWITCH FOR EACH DAMPER SHALL INDICATE WHEN THE DAMPER IS FULLY OPEN AND ALLOW THE ASSOCIATED FAN TO ENERGIZE.

DISCHARGE TEMPERATURE CONTROL: THE DISCHARGE TEMPERATURE SET POINT SHALL BE FIXED AT 72°F.

ENERGY RECOVERY CONTROL: CONTROL SHALL BE AS FOLLOWS:

- WHENEVER THE AH IS ENERGIZED AND ECONOMIZER IS NOT AVAILABLE THE ENERGY RECOVERY SYSTEM SHALL BE ENABLED. THE BAS WILL MONITOR THE ENERGY RECOVERY SYSTEM OPERATING STATUS AND ALARM. WHENEVER THE AH IS ENERGIZED AND ECONOMIZER OPERATION IS AVAILABLE THE ENERGY RECOVERY SYSTEM SHALL REMAIN OFF AND THE BYPASS DAMPERS SHALL BE COMMANDED OPEN.

PREHEATING SECTION: CONTROL SHALL BE AS FOLLOWS:

- WHENEVER THE AH IS ENERGIZED, THE HOT WATER VALVE SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT MINUS 3°F (ADJ.).
- REGARDLESS OF AH OPERATING MODE THE HOT WATER VALVE SHALL MODULATE TO MAINTAIN A LOW LIMIT OF 40°F PREHEAT AIR TEMPERATURE.

REHEATING SECTION: CONTROL SHALL BE AS FOLLOWS:

- WHENEVER THE AH IS ENERGIZED IN DEHUMIDIFICATION MODE, THE HOT WATER REHEAT VALVE SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT.
- WHEN THE AH IS DEENERGIZED OR NOT OPERATING IN DEHUMIDIFICATION MODE THE REHEAT VALVE SHALL BE CLOSED.

COOLING SECTION: CONTROL SHALL BE AS FOLLOWS:

- WHENEVER THE AH IS ENERGIZED, THE CHILLED WATER VALVE SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT.
- WHENEVER THE RETURN AIR HUMIDITY EXCEEDS 55% (ADJ.) DURING UNIT OPERATION THE CHILLED WATER VALVE SHALL BE OVERRIDDEN OPEN FOR DEHUMIDIFICATION.

LOOP PUMP CONTROL: BAS SHALL CONTROL THE STARTING AND STOPPING OF THE LOOP PUMP AS FOLLOWS:

- START/STOP: BAS SHALL COMMAND THE OPERATION OF THE LOOP PUMP AND IT SHALL RUN CONTINUOUSLY WHENEVER THE OUTSIDE AIR TEMPERATURE IS BELOW 38°F (ADJ.).
- PROOF: BAS SHALL PROVE PUMP OPERATION AND USE THE STATUS INDICATION TO ACCUMULATE RUNTIME.

FILTER ALARM: WHEN THE FILTER DIFFERENTIAL PRESSURE SENSOR READING EXCEEDS THE DESIGN SPECIFIED PRESSURE DROP AN ALARM SHALL BE GENERATED AT THE BAS.

GRAPHICS AND TRENDS: PROVIDE TRENDS AND GRAPHIC DISPLAY FOR ALL CONTROL POINTS AND CALCULATED SET POINTS PER SPECIFICATIONS. INCLUDE TAB VERIFIED FULL FLOW VALUE AT EACH ARM.

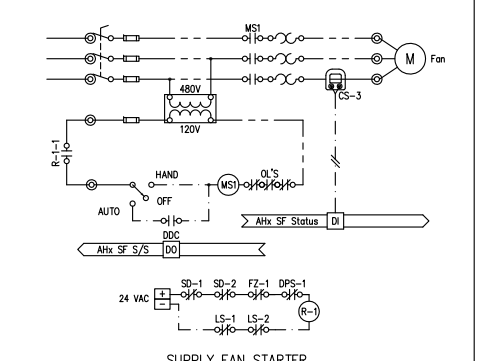
NOTES

- Provide multiple freezestats as required to achieve 1ft of linear element for each 1sq.ft. of coil face area. Preheat sensor shall be installed intertwined with freezestat to cover the exact same area. One set of contacts wired directly to drive safety input.
- Provide an ASHRAE 135 compliant (BAcNet MS/TP or IP) communications interface to the control system for diagnostic point information.

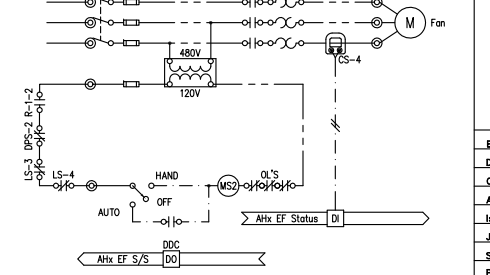
POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE				REMARKS
		DI	AI	DO	AO	
bdg.AHxxx.EFALRM	EF VFD Alarm	1				"EF-A"
bdg.AHxxx.EFST	EF Status		1			"EF-STAT"
bdg.AHxxx.EFSS	EF Start/Stop			1		"EF-SP"
bdg.AHxxx.EFSPD	EF Speed				1	"EF-A"
bdg.AHxxx.SFALRM	SF VFD Alarm	1				"SF-A"
bdg.AHxxx.SFST	SF Status		1			"SF-STAT"
bdg.AHxxx.SFSS	SF Start/Stop			1		"SF-SP"
bdg.AHxxx.SFSPD	SF Speed				1	"SF-A"
bdg.AHxxx.EHSP	AHx EF High Press	1				DPS2:"EF-HSP"
bdg.AHxxx.SLSP	AHx SF Low Press	1				DPS1:"SF-LSP"
bdg.AHxxx.SOD	AHx Iso Damper		1			Mx:"ISO-D"
bdg.AHxxx.SAT	AHx SA Temp		1			TS1:"SAT"
bdg.AHxxx.CCT	AHx CC Temp		1			TS2:"CCT"
bdg.AHxxx.PHT	AHx PH Temp		1			TS3:"PHT"
bdg.AHxxx.MAT	AHx MA Temp		1			TS4:"MAT"
bdg.AHxxx.RAT	AHx RA Temperature		1			TS5:"RAT"
bdg.AHxxx.EAT	AHx EA Temp		1			TS6:"EAT"
bdg.AHxxx.SRH	AHx SA Humidity		1			HS1:"SAH"
bdg.AHxxx.RRH	AHx RA Humidity		1			HS2:"RAH"
bdg.AHxxx.FRZ	AHx Freezestat		1			FZ1:"FRZ"
bdg.AHxxx.PHWV	PHW Valve			1	V3:"PHW"	
bdg.AHxxx.CHWV	CHW Valve			1	V2:"CHW"	
bdg.AHxxx.RHWV	RHW Valve			1	V1:"RHW"	
bdg.AHxxx.BYPMPR	AHx Bypass Damper		1			Mx:"BYP-D"
bdg.AHxxx.HRS	AHx HR Status		1			Heat Wheel Units
bdg.AHxxx.HRSE	AHx HR Enable		1			Heat Wheel Units
bdg.AHxxx.HRA	AHx HR Alarm		1			Heat Wheel Units
bdg.AHxxx.LPSS	Loop Pump S/S			1		
bdg.AHxxx.LPST	Loop Pump Status		1			
bdg.AHxxx.RHWST	RHW Return Temp		1			TS7:"RHWST"
bdg.AHxxx.RHWRT	RHW Return Temp		1			TS8:"RHWRT"
bdg.AHxxx.CHWST	CHW Supply Temp		1			TS9:"CHWST"
bdg.AHxxx.CHWRT	CHW Return Temp		1			TS10:"CHWRT"
bdg.AHxxx.PHWST	PHW Supply Temp		1			TS11:"PHWST"
bdg.AHxxx.PHWRT	PHW Return Temp		1			TS12:"PHWRT"
bdg.AHxxx.OAFLTSP	OA Filter DP		1			DPT1:"OAFLT-OP"
bdg.AHxxx.OAFLTSP	OA Filter DP		1			DPT2:"OAFLT-OP"
bdg.AHxxx.OAFMS	OA Flow Station		1			AFMS1:"OAFMS"
bdg.AHxxx.OAFMS	OA Flow Station		1			AFMS2:"OAFMS"
bdg.AHxxx.HRRATE	HR Rate			1		HR:"RATE"
TOTALS		10	18	6	6	

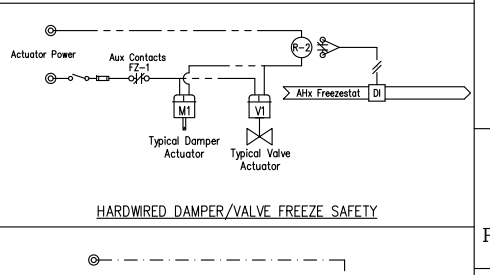
ELECTRIC LADDER DIAGRAMS



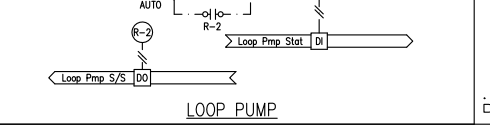
SUPPLY FAN STARTER



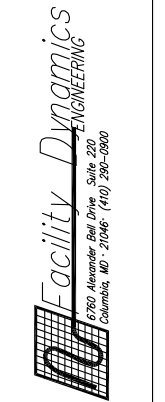
EXHAUST FAN STARTER



HARDWIRED DAMPER/VALVE FREEZE SAFETY



LOOP PUMP



THE UNIVERSITY OF GEORGIA
STANDARD CONTROL DRAWINGS

Eng	HJN
Drawn	HJN
Chkd	---
Appd	---
Issued	10/31/2017
Job No.	15040
Scale	N/A
Proj Code	---

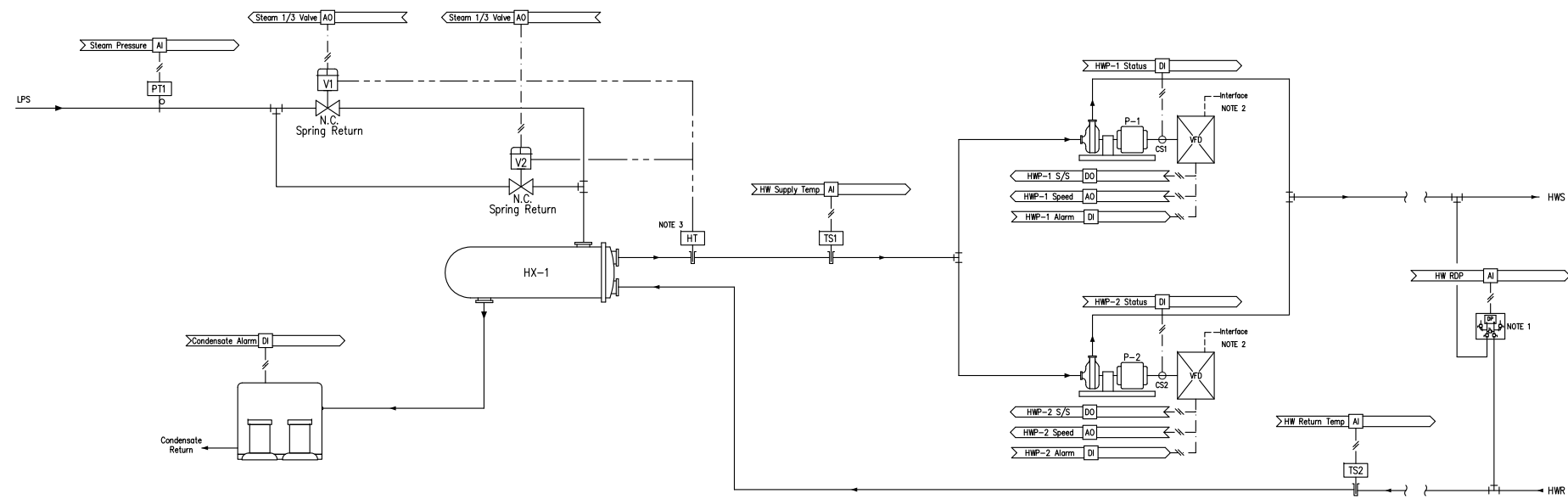
(REV.2)
FOR REVIEW ONLY

CV AHU:
100% OA,
ENERGY
RECOVERY,
PREHEAT, CHW

XX OF XX
SHEET NUMBER

C-302

DWG NUMBER



CONTROL SCHEMATIC

SEQUENCE OF OPERATION

General: BAS shall fully control the hot water converter system and equipment and provide monitoring and diagnostic information for management purposes.

Heating Enable: Heating shall be enabled whenever:
 1. Any hot water valve served opens more than 50% (adj) for 10 min. (adj) continuously.
 2. OR, the operator at the operator interface enables the system via a graphic icon.
 3. OR, outside air temperature is less than 55F (adj) with a 5F cycle differential.
 Once enabled, heating shall remain enabled for at least one hour.

HW Pumps (P-1 & P-2): BAS shall control the pumps as follows:
 1. Whenever the system is enabled, a minimum of one heating water pump shall run continuously.
 2. BAS shall use a PID loop to maintain the differential pressure setpoint across the remote differential pressure sensor. The differential pressure setpoint shall initially be set at 15 psi (adj, as determined by the balance contractor).
 3. The output of this loop shall control the starting, stopping, and speed of the pumps as follows:
 a) On a PID output of greater than 95% for 5 min (adj), the BAS shall start an additional pump. The new pump shall ramp to speed per adjustable acceleration rates.
 b) If more than one pump is running, on a PID output of less than 50% for 5 min (adj), the BAS shall stop a pump.
 4. The output of the PID loop shall control the VSD's of all operating pumps at the same speed.
 5. BAS shall prove operation of each pump individually. Upon failure of a pump, the standby shall be started (lead pump command is not removed) and an alarm shall be enunciated.
 6. BAS shall monitor pump status and accumulate runtime of the pumps. The BAS shall rotate the lead and lag pumps as follows:
 a) Whenever a pump is started, the BAS shall start the pump with the least runtime.
 b) Whenever a pump is stopped, the BAS shall stop the pump with the highest runtime.
 c) If the lead pump has not changed after 7 (adj) days BAS shall force a lead pump change.

HW Temperature Control: BAS shall reset the hot water supply temperature setpoint linearly from 180F (adj) to 130F (adj) as the OA temperature rises from 20F (adj) to 60F (adj).
 1. The BAS shall modulate the 1/3 and 2/3 steam valves to the Heat Exchanger in sequence via a PID loop to maintain the HW supply temperature set point.
 1.1. As the PID capacity output rises from 0% to 50% the 1/3 steam valve shall open from 0% to 100% (all values adjustable).
 1.2. As the PID capacity output rises from 45% to 100% the 2/3 steam valve shall open from 0% to 100% (all values adjustable).
 2. The valves shall remain closed under the following conditions:
 2.1. Pump status is not proven.
 2.2. Loss of power to steam valve actuators.
 2.3. Loss of command signal to valve actuators.

Steam Pressure: Steam supply pressure to the heat exchanger shall be monitored by the BAS and enunciate an alarm if it falls below 5 psi (adj).

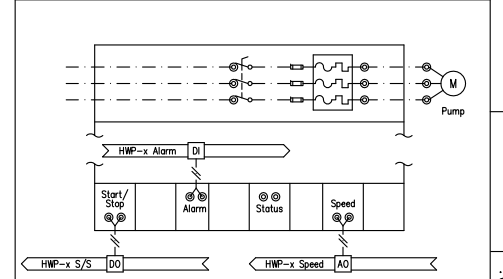
POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE					REMARKS
		DI	AI	DO	AO	VP	
blgd.HX.DP	Remote Diff Press			1			
blgd.HX.HWST	HWS Temp		1				
blgd.HX.HWRT	HWR Temp		1				
blgd.HX.P.x.ALARM	P-x VFD Alarm	2					
blgd.HX.P.x.STAT	P-x Status	2					
blgd.HX.P.x.SS	P-x Start/Stop			2			
blgd.HX.V1.3	1/3 Steam Valve				1		
blgd.HX.V2.3	2/3 Steam Valve				1		
blgd.HX.STMP	Steam Pressure		1				
blgd.COND.ALA	Condensate Alarm	1					
	Heat Requests					*	
	OA Temp					*	
TOTALS		5	4	2	4	2	

NOTES

- Locate remote differential pressure sensor at most remote HW coil, as directed. Install transmitter and bypass assembly no higher than 6 feet AFF.
- Provide communications interface to the control system for diagnostic point information.
- Provide high temperature (200F, adj.) safety switch wired directly to steam valve actuators. Switch will override valves closed and auto-reset once temperature falls below 170F (adj.).

ELECTRIC LADDER DIAGRAMS



TYPICAL VV PUMP VFD



THE UNIVERSITY OF GEORGIA
STANDARD CONTROL DRAWINGS

Eng	HJN
Drawn	HJN
Chkd	---
Appd	---
Issued	4/15/2016
Job No.	15040
Scale	N/A
Proj Code	

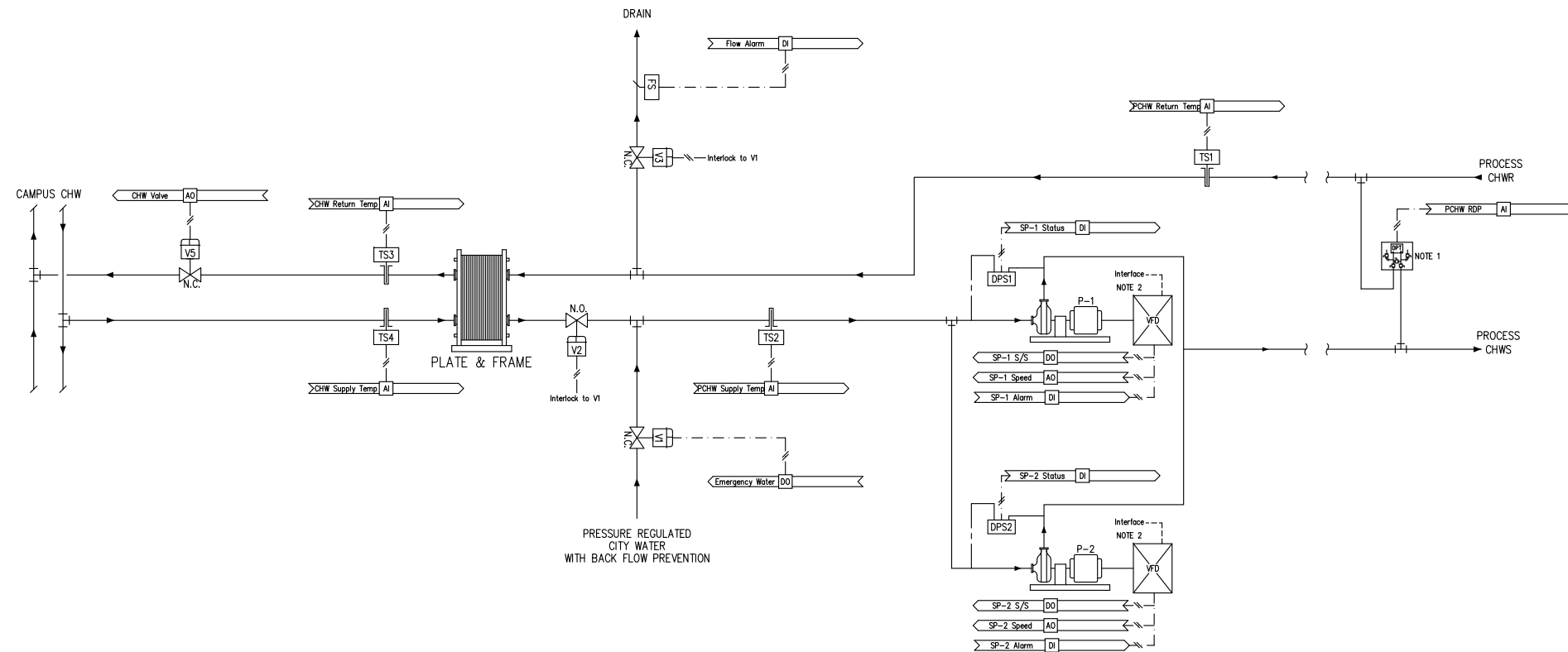
(REV.1)
FOR REVIEW ONLY

Steam to HW
Converter
(VV Pumps)

XX OF XX
SHEET NUMBER

C-401

DWG NUMBER



CONTROL SCHEMATIC

SEQUENCE OF OPERATION

General: BAS shall fully control the secondary chilled water system and equipment and provide monitoring and diagnostic information for management purposes.

Cooling Enable: Cooling shall be enabled by the operator at the operator interface via a graphic icon.

Secondary CHW Pumps: BAS shall control the pumps as follows:

1. **START/STOP:** BAS shall command the operation of the lead pump and it shall run continuously whenever cooling is enabled. The pump with the least runtime shall be selected as lead. If the current lead pump has been in operation for more than 160 hours continuously (adj.) lead shall change to the lag pump.
2. **PROOF:** BAS shall prove pump operation and use the status indication to accumulate runtime. Upon failure of the lead pump, BAS shall energize the lag pump and enunciate a level 1 alarm.
3. **VFD CONTROL:** Whenever cooling is enabled, BAS shall control the output of the active pump VFDs to maintain the CHW remote differential pressure (RDP) setpoint (determined by TAB, initially 10 PSD). If the lead pump is unable to maintain the RDP setpoint the lag pump shall be started and ramped to match the lead pump speed. If the lead and lag pumps are both operating and the commanded speed is less than 40% (adj.) of the individual pump capacity the lag pump shall be ramped down to minimum speed and stopped.
4. On start and stop, the VFD shall ramp to speed and slow down within adjustable acceleration and deceleration limits.

Chilled Water Valve: BAS shall modulate the primary chilled water valve via PID loop to maintain the secondary chilled water temperature set point. Whenever secondary pump flow is not proven the primary chilled water valve shall be closed.

Water Flow Alarm: BAS shall monitor the secondary chilled water system and enunciate an alarm whenever flow is proven through the emergency water drain.

Emergency Water Mode (Critical Process Only): BAS shall enunciate an alarm AND enable City Water whenever the following is true:

1. Process chilled water system has been enabled for at least 15 minutes (adj.) AND
2. Secondary pump status has been proven for at least 5 minutes (adj.) AND
3. Secondary chilled water supply temperature exceeds set point plus 7F (adj.) for 10 minutes (adj.) continuously.

Operators shall be able to manually enable emergency water through the OWS with proper password authorization. When emergency water mode is active the secondary chilled water isolation valve shall be closed and domestic water isolation valves shall be opened to provide cooling. Emergency water mode must be manually reset by the Operator.

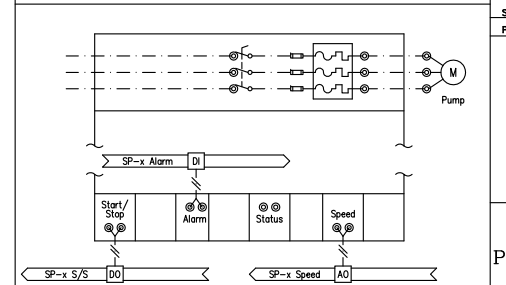
POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE					REMARKS
		DI	AI	DO	AO	VP	
bldg.PROCCHW.PCHWDPT	Remote Diff Press		1				
bldg.PROCCHWSYS.PCHWST	Proc CHWS Temp		1				
bldg.PROCCHWSYS.PCHWRT	Proc CHWR Temp		1				
bldg.PROCCHW.SP1ALRM	SP-1 VFD Alarm	1					
bldg.PROCCHW.SP1STAT	SP-1 Status	1					
bldg.PROCCHW.SP1SS	SP-1 Start/Stop			1			
bldg.PROCCHW.SP1SPD	SP-1 Speed				1		
bldg.PROCCHW.SP2ALRM	SP-2 VFD Alarm	1					
bldg.PROCCHW.SP2STAT	SP-2 Status	1					
bldg.PROCCHW.SP2SS	SP-2 Start/Stop			1			
bldg.PROCCHW.SP2SPD	SP-2 Speed				1		
bldg.PROCCHW.CHWST	Pri CHWS Temp		1				
bldg.PROCCHW.CHWRT	Pri CHWR Temp		1				
bldg.PROCCHW.EWATER	Emergency Water			1			
bldg.PROCCHW.FLOWA	Flow Alarm	1					
bldg.PROCCHW.CHWV	ChW Valve				1		
	Cooling Request					*	
TOTALS		5	5	3	3	1	

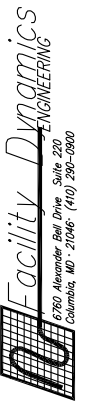
NOTES

1. Locate remote differential pressure sensor at most remote CHW coil, as directed. Install transmitter and bypass assembly no higher than 6 feet AFF.
2. Provide communications interface to the control system for diagnostic point information.
3. City water connection and sequencing only applies to critical process water systems.

ELECTRIC LADDER DIAGRAMS



TYPICAL SECONDARY PUMP VFD



THE UNIVERSITY OF GEORGIA
 STANDARD CONTROL DRAWINGS

Eng	HJN
Drawn	HJN
Chkd	---
Appd	---
Issued	4/15/2016
Job No.	15040
Scale	N/A
Proj Code	---

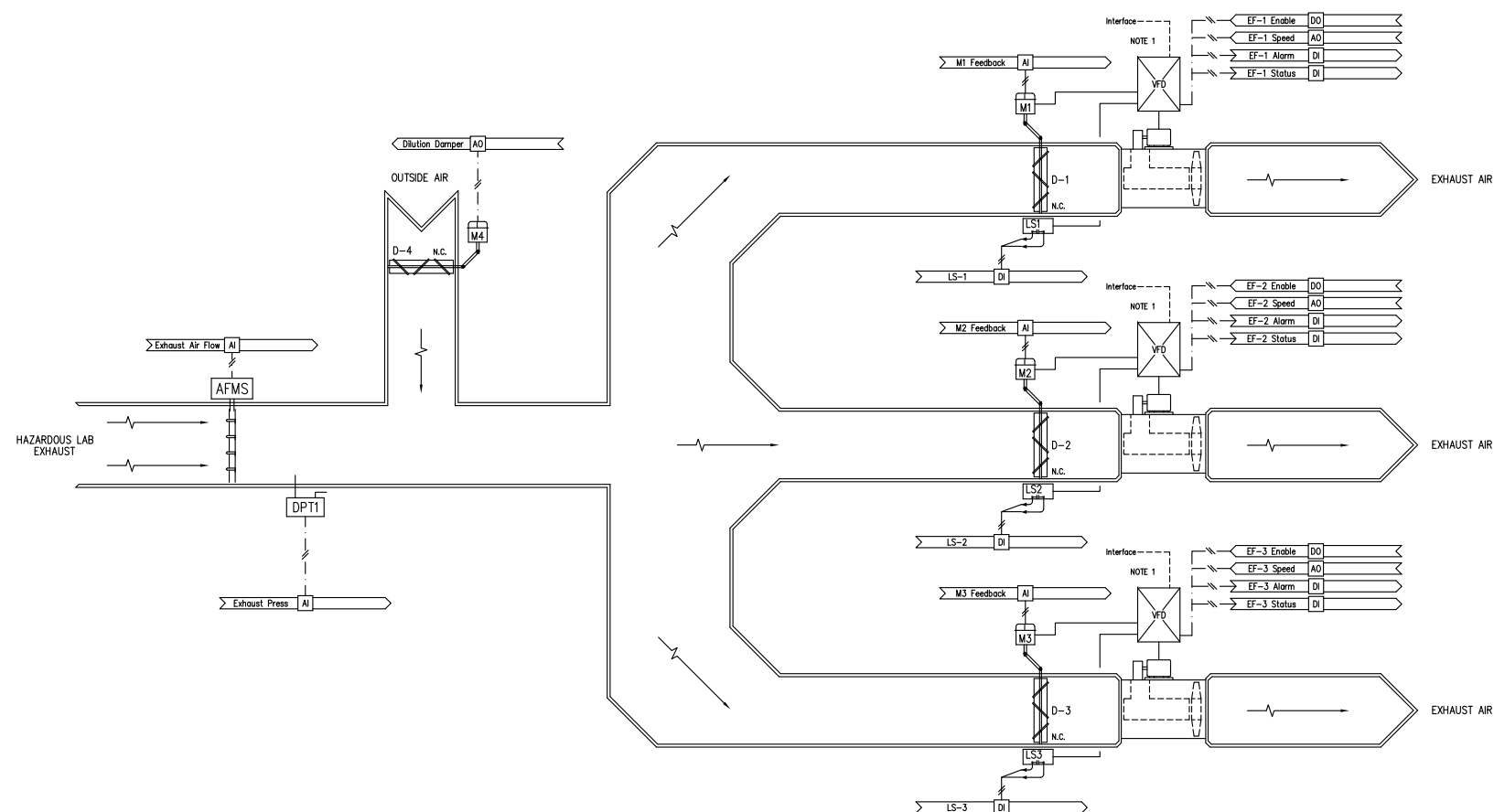
(REV.1)
FOR REVIEW ONLY

Process Chilled Water

XX OF XX SHEET NUMBER

C-402

DWG NUMBER



CONTROL SCHEMATIC

SEQUENCE OF OPERATION

GENERAL: THE VARIABLE AIR VOLUME REDUNDANT MANFOLD EXHAUST FAN SYSTEM SHALL BE FULLY CONTROLLED BY THE BAS. BY DEFAULT THIS SYSTEM SHALL RUN CONTINUOUSLY AND REQUIRE OPERATOR OVERRIDE TO STOP.

TYPICAL EXHAUST FAN CONTROL: BAS SHALL CONTROL THE STARTING AND STOPPING OF EACH EXHAUST FAN AS FOLLOWS:

1. START/STOP: BAS SHALL COMMAND THE EXHAUST FAN TO RUN CONTINUOUSLY. TWO FANS SHALL OPERATE SIMULTANEOUSLY AT ALL TIMES. THE THIRD FAN WILL OPERATE AS STANDBY. THE TWO LEAD FANS AND STANDBY FAN SHALL ROTATE EVERY 170 HOURS (ADJ.) OR WHEN MANUALLY SELECTED BY THE OPERATOR.
2. PROOF: BAS SHALL PROVE FAN OPERATION VIA VFD STATUS INPUT. UPON FAILURE OF A FAN, BAS SHALL IMMEDIATELY START THE STANDBY FAN.
3. VFD CONTROL: WHEN THE FANS ARE ENERGIZED, BAS SHALL CONTROL THE SPEED OF ALL VFDS TO MAINTAIN THE EXHAUST STATIC PRESSURE SET POINT. ON START AND STOP, THE VFDS SHALL RAMP TO SPEED AND SLOW DOWN WITHIN ADJUSTABLE ACCELERATION AND DECELERATION LIMITS. UPON INITIAL START EXHAUST FAN SPEED SHALL BE CONSTRAINED TO MINIMUM UNTIL ISOLATION DAMPER LIMIT POSITION (LS-1, 2, 3) IS PROVEN.
4. VFD ALARM: THE BAS SHALL MONITOR A COMMON ALARM OUTPUT FROM EACH DRIVE AND REPORT WHEN ACTIVE.
5. EXHAUST DUCT PRESSURE SETPOINT: THE EXHAUST DUCT STATIC PRESSURE SETPOINT SHALL BE SET BY TAB TO MEET SCHEDULED HAZARDOUS EXHAUST FLOW AND PREVENT EXHAUST FAN PLUME DISCHARGE FROM FALLING BELOW ITS LOW LIMIT THRESHOLD.

TYPICAL DAMPER CONTROL: BAS SHALL CONTROL THE DAMPERS AS FOLLOWS:

1. EXHAUST FAN ISOLATION DAMPER: ISOLATION DAMPERS SHALL BE HARDWIRED TO THE VFD OF THE EXHAUST FAN SERVED TO OPEN WHEN THE VFD IS COMMANDED TO START. LIMIT SWITCHES SHALL BE HARDWIRED TO THE VFD TO ALLOW FANS TO RAMP UP FROM MINIMUM SPEED ONCE MINIMUM DAMPER OPENING POSITION IS ACHIEVED. BAS SHALL MONITOR CONTACTS ON LIMIT SWITCHES AND DAMPER ACTUATORS TO REFLECT ACTUAL POSITION ON GRAPHICS. BAS SHALL GENERATE AN ALARM WHEN COMMANDED DAMPER POSITION DOES NOT MATCH ACTUAL WITHIN 30 SECONDS (ADJ.).
2. DILUTION DAMPER: UPON SYSTEM START THE DILUTION DAMPER SHALL BE CLOSED. WHEN EXHAUST FANS ARE OPERATING AT MINIMUM SPEED FOR 1 MINUTE (ADJ.) CONTINUOUSLY AND THE EXHAUST STATIC PRESSURE IS BELOW SET POINT, DUCT STATIC PRESSURE IS TOO LOW, THE DILUTION DAMPER WILL BE MODULATED OPEN TO MAINTAIN THE EXHAUST STATIC PRESSURE AS READ AT DPT1 AT THE EXHAUST STATIC PRESSURE SET POINT MINUS 0.1" W.G. (ADJ.) TO MAINTAIN CONSTANT DISCHARGE VELOCITY (ADJ.) AT THE STACK OUTLET.

GRAPHICS AND TRENDS: PROVIDE TRENDS AND GRAPHIC DISPLAY FOR ALL CONTROL POINTS AND CALCULATED SET POINTS PER SPECIFICATIONS.

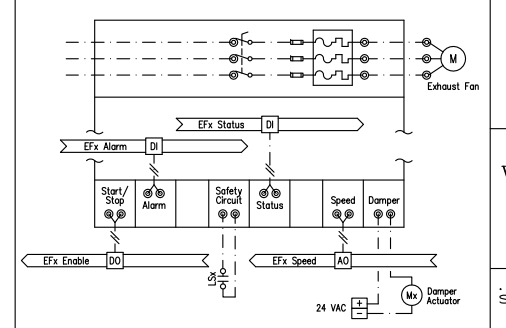
POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE			REMARKS
		DI	AI	DO	
bdg.EFx.ALARM	Efx VFD Alarm	3			"Efx-A"
bdg.EFx.ST	Efx Status	3			"Efx-STAT"
bdg.EFx.SS	Efx Enable			3	"Efx-SS"
bdg.EFx.SPD	Efx Speed				3 "Efx-SPD"
bdg.EFx.DFDBK	Efx Damper Feedback		3		Mx: "Efx-DFDBK"
bdg.EFx.LS	Efx Limit Switch	3			LSx: "Efx-LS"
bdg.EFx.DP	Exhaust Pressure		1		DPT1: "Efx-DP"
bdg.EFx.AFMS	Exhaust Air Flow		1		AFMS: "Efx-AFMS"
bdg.EFx.DILUTION	Dilution Damper			1	M4: "DILUTION-D"
TOTALS		9	5	3	4

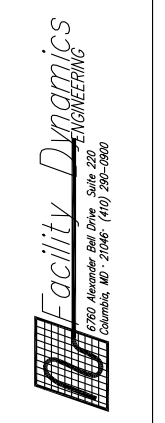
NOTES

1. Provide an ASHRAE 135 compliant (BACnet MS/TP or IP) communications interface to the control system for diagnostic point information. Include the following information for fan VFDs: operating frequency (Hz), RPM, percent fan speed, BAS signal to VFD, VFD output voltage, actual brake horsepower, and kW. On the VFD graphic screen also include the motor nameplate brake horsepower.

ELECTRIC LADDER DIAGRAMS



TYPICAL EXHAUST FAN VFD



THE UNIVERSITY OF GEORGIA
STANDARD CONTROL DRAWINGS

Eng	HJN
Drawn	HJN
Chkd	---
Appd	---
Issued	11/1/2017
Job No.	15040
Scale	N/A
Proj Code	

(REV.3)
FOR REVIEW ONLY

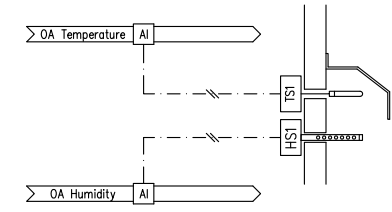
VAV MANIFOLD LABORATORY EXHAUST

XX OF XX SHEET NUMBER

C-501

DWG NUMBER

Locate outside air temperature and humidity sensors on North exterior wall as directed. One set of sensors shall be installed for each building and tied to the nearest controller. Values shall be broadcast to all other controllers in the building that require outside air values.



OUTSIDE AIR SENSORS

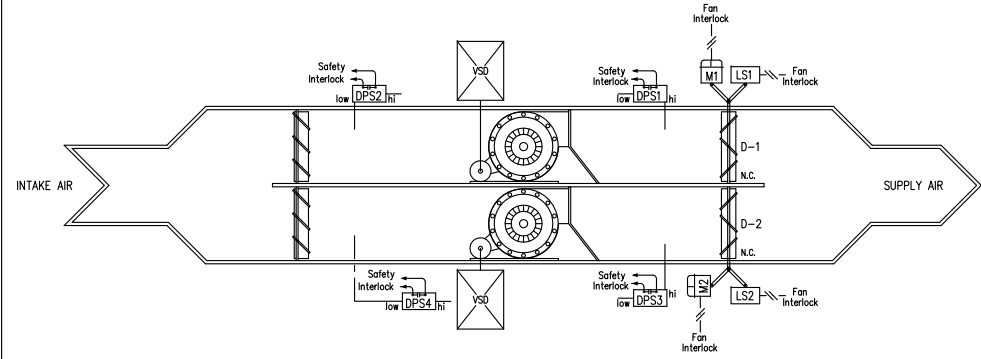
A
C-601

POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE					REMARKS
		DI	AI	DO	AO	VP	
bldg.OA-T	OA Temperature				1		
bldg.OA-H	OA Humidity						
	OA Enthalpy						*

NOTES

- MOUNT OUTSIDE AIR SENSORS UNDER A SUN SHIELD, AS HIGH ON THE WALL AS POSSIBLE, ON THE NORTH SIDE OF THE BUILDING. LOCATION SHALL BE SELECTED SUCH THAT SOLAR RADIATION, EXHAUST, HEATING SOURCES, AND COOLING SOURCES WILL NOT AFFECT SENSOR READINGS.
- BAS SHALL CONTINUOUSLY CALCULATE ACTIVE OA ENTHALPY FOR USE BY BUILDING SUBROUTINES.
- GRAPHICS SHALL DISPLAY CAMPUS OUTSIDE AIR STATION VALUES ALONG WITH THESE LOCAL OUTSIDE AIR STATION VALUES. LOCAL VALUES SHALL BE USED FOR ALL BUILDING SEQUENCES BY DEFAULT. AN ON GRAPHIC OPTION SHALL BE PROVIDED FOR THE OPERATOR TO CHANGE TO CAMPUS VALUES FOR SEQUENCING.



HEADERED FAN CONTROL

B
C-601

NOTES

HEADERED FAN SYSTEMS WILL TYPICALLY APPLY TO CRITICAL 100% OUTSIDE AIR UNITS REQUIRING REDUNDANCY. STANDARD UNIT POINT MONITORING AND CONTROL WILL STILL APPLY.

THE FOLLOWING IS IN ADDITION TO STANDARD CONTROL FOR HEADERED FAN SYSTEMS: BAS SHALL CONTROL LEAD/STAND-BY OPERATION OF HEADERED FANS. A COMMAND TO ENERGIZE A FAN WILL SIMULTANEOUSLY ENERGIZE THE ASSOCIATED ISOLATION DAMPER, ONCE THE DAMPER PROVES OPEN THE FAN WILL BE ALLOWED TO START. LOW AND HIGH PRESSURE SAFETY SWITCHES WILL ALLOW OPERATION OF FANS WITHIN DUCT PRESSURE LIMITS. BAS SHALL ENUNCIATE AN ALARM UPON FAILURE OF ANY FAN AND AUTOMATICALLY START THE STANDBY FAN. BAS SHALL MONITOR RUNTIME FOR EACH FAN AND START THE FAN WITH THE LEAST RUNTIME AS LEAD.

POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE					REMARKS
		DI	AI	DO	AO	VP	
bldg.EHxx.SS	Ehx Start/Stop				1		
bldg.EHxx.ZONET	Ehx Zone Temp						

SEQUENCE OF OPERATION

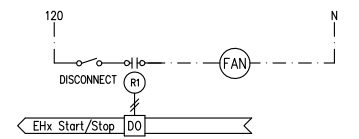
GENERAL: THE ELECTRIC UNIT HEATER SHALL BE FULLY CONTROLLED BY THE BAS.

SPACE TEMPERATURE CONTROL: ONE USER ADJUSTABLE SETPOINT SHALL APPLY; NORMAL SPACE HEATING (68°F ADJ.).

ELECTRIC UNIT HEATER ENABLE: WHENEVER THE SPACE TEMPERATURE FALLS BELOW THE NORMAL SPACE HEATING SET POINT THE ELECTRIC UNIT HEATER WILL BE ENABLED BY THE BAS. ONCE ENABLED THE UNIT HEATER FACTORY CONTROLS WILL ENERGIZE THE FAN AND ELECTRIC COIL PER THE FACTORY SEQUENCE AND FACTORY SAFETIES.

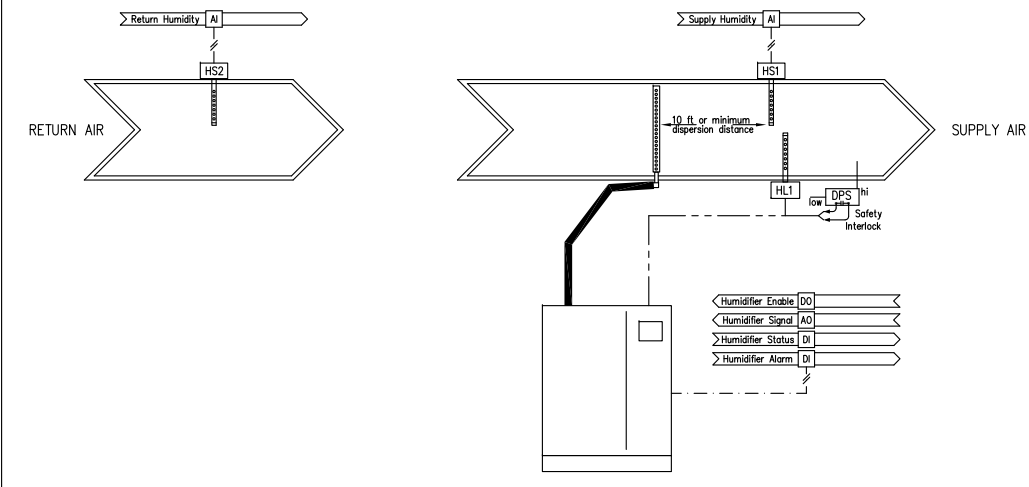
ALARM: WHENEVER SPACE TEMPERATURE FALLS BELOW 50°F (ADJ.) BAS WILL ACTIVATE AN ALARM AT THE WORKSTATION.

ELECTRIC LADDER DIAGRAMS



ELECTRIC UNIT HEATER

C
C-601



HUMIDIFIER

D
C-601

POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE					REMARKS
		DI	AI	DO	AO	VP	
bldg.AHxx.HUMEN	Humidifier Enable				1		
bldg.AHxx.SAH	Supply Humidity						HS1:"SAH"
bldg.AHxx.RAH	Return Humidity						HS2:"RAH"
bldg.AHxx.HUMC	Humidifier Signal					1	
bldg.AHxx.HUMST	Humidifier Status						
bldg.AHxx.HUMALRM	Humidifier Alarm						

SEQUENCE OF OPERATION

GENERAL: ADD THIS SCHEMATIC AND SEQUENCE TO AHU WHERE REQUIRED BY MECHANICAL DESIGN.

HUMIDIFIER CONTROL: BAS SHALL CONTROL THE HUMIDIFIER AS FOLLOWS:

- HUMIDIFIER ENABLE:** WHENEVER THE AH IS ENERGIZED IN OCCUPIED MODE, OUTSIDE AIR TEMPERATURE IS BELOW 55°F (ADJ.), AND RETURN HUMIDITY IS BELOW SET POINT THE HUMIDIFIER SHALL BE ENABLED.
- HUMIDIFIER SIGNAL:** WHEN THE HUMIDIFIER IS ENABLED THE HUMIDIFIER SIGNAL SHALL BE MODULATED TO MAINTAIN THE HUMIDIFICATION SETPOINT PER THE LOWER OF:
 - A RA PID LOOP TO MAINTAIN THE HUMIDIFICATION SETPOINT (INITIALLY 40%, ADJUSTABLE)
 - A PROPORTIONAL ONLY LOOP MAINTAINING MAXIMUM SUPPLY HUMIDITY AT 90% (ADJ.)
- HUMIDIFIER ALARM:** WHEN HUMIDIFIER ALARM OUTPUT IS ACTIVE BAS WILL REMOVE HUMIDIFIER ENABLE AND SEND ALARM TO OWS.

POINTS LIST

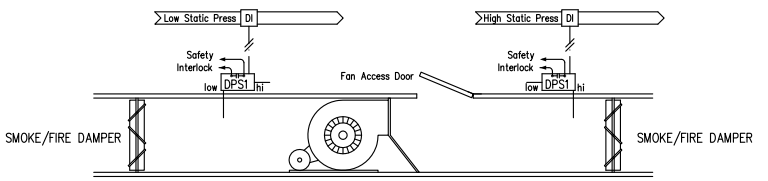
POINT NAME	POINT DESCRIPTOR	POINT TYPE					REMARKS
		DI	AI	DO	AO	VP	
bldg.AHxx.yHSP	High Static Press				1		
bldg.AHxx.yLSP	Low Static Press				1		

NOTES

GENERAL: WHERE SMOKE/FIRE DAMPERS ARE INSTALLED THAT CAN ISOLATE THE DISCHARGE OR SUCTION SIDE OF A FAN APPROPRIATE PRESSURE SWITCHES SHALL BE INSTALLED TO PROTECT THE DUCT WORK.

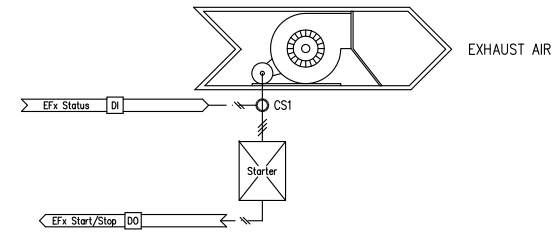
SMOKE/FIRE DAMPERS: ARE DIRECTLY CONTROLLED BY THE FIRE ALARM SYSTEM AND POWERED PER DIVISION 26. NO CONTROL OR POWER OF LIFE SAFETY DEVICES THROUGH THE BUILDING AUTOMATION SYSTEM.

PRESSURE SWITCH: UPON ACTIVATION OF A HIGH OR LOW PRESSURE SAFETY SWITCH THE FAN SHALL BE HARDWIRED TO SHUT DOWN IMMEDIATELY. AUXILIARY CONTACTS ON THE SWITCH SHALL BE USED TO GENERATE AN ALARM AT THE BAS.



TYPICAL FIRE/SMOKE DAMPER SAFETY

E
C-601



TYPICAL INTERLOCKED EXHAUST FAN

F
C-601

POINTS LIST

POINT NAME	POINT DESCRIPTOR	POINT TYPE					REMARKS
		DI	AI	DO	AO	VP	
bldg.EFxx.EFSS	EF Start/Stop				1		
bldg.EFxx.EFST	EF Status						

SEQUENCE OF OPERATION

EXHAUST FAN: BAS SHALL CONTROL THE EXHAUST FAN AS FOLLOWS:

- THE EXHAUST FAN SHALL BE ENERGIZED WHENEVER THE ASSOCIATED AHU IS OPERATING IN THE OCCUPIED MODE.
- BAS SHALL PROVE FAN OPERATION AND USE THE STATUS INDICATION TO ACCUMULATE RUNTIME.

Eng	HJN
Drawn	HJN
Chkd	---
Appd	---
Issued	10/09/2017
Job No.	15040
Scale	N/A
Proj Code	---

(REV.4)
FOR REVIEW
ONLY

MISCELLANEOUS
CONTROLS

XX OF XX
SHEET NUMBER

C-601

DWG NUMBER