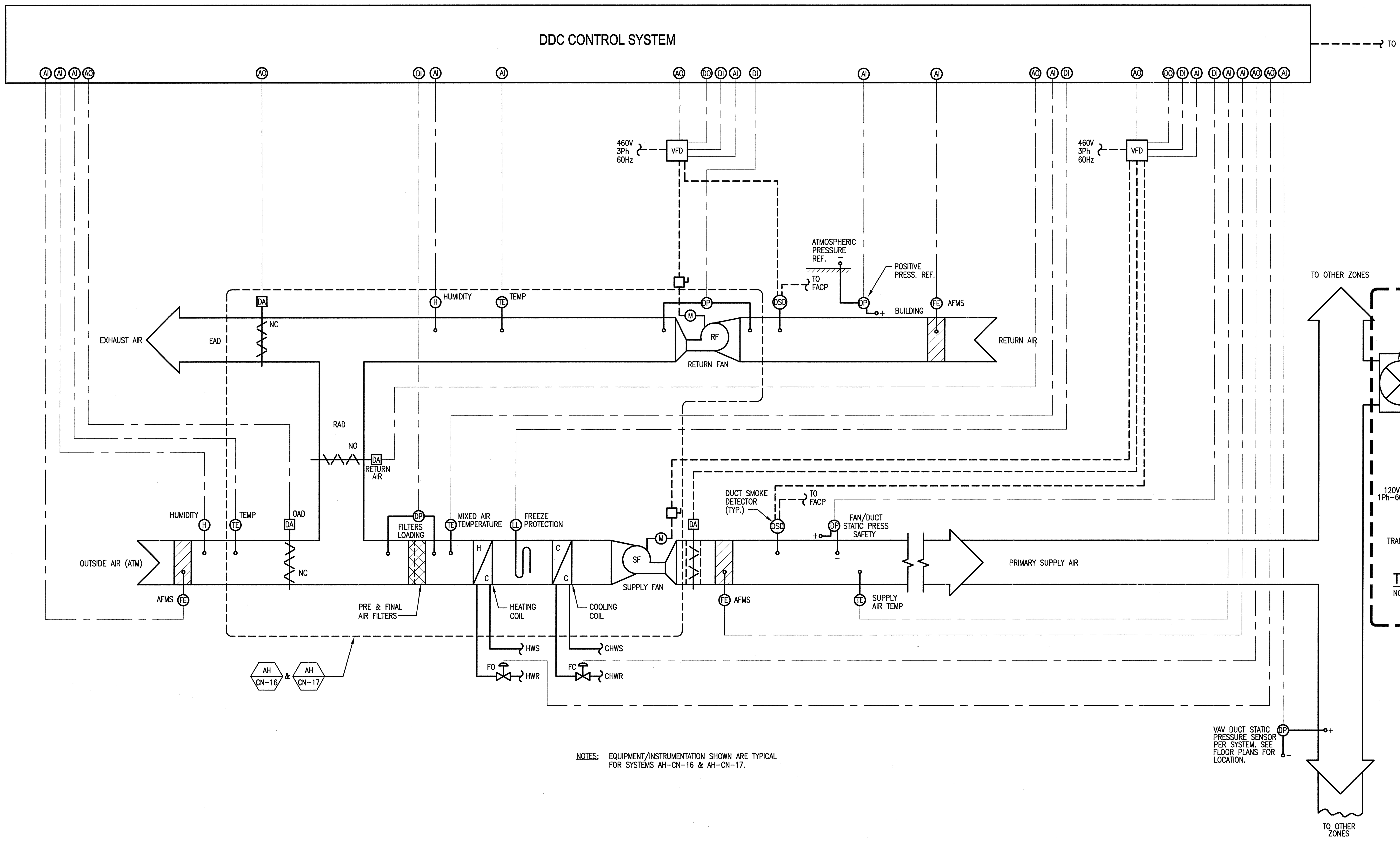
CONTROL POINT LIST AH-CN-16 & AH-CN-17

CENTRAL LAB OFFICE BUILDING		CONNECTED POINTS																			
		OUTPUT FROM DDC								INPUT TO DDC											
		DIGITAL					ANALOG			DIGITAL							ANALOG				
POINT DESCRIPTION	GRAPHIC DISPLAY	CONTROL RELAY	SOLENOID	HAND/OFF/AUTO	START/STOP		CONTROL POINT ADJUSTMENT	FAN SPEED		PRESSURE SWITCH	DIFFERENTIAL PRESSURE SWITCH	FLOW SWITCH	VFD FAULT	PULSE	GENERAL ALARM	FREEZE PROTECTION	TEMPERATURE °F	% RELATIVE HUMIDITY	DUCT STATIC PRESSURE	FAN SPEED FEEDBACK	FLOW
AIR HANDLER, AH-CN-16, AH-CN-17	X																				
SUPPLY FAN VFD					X			X					X							X	
RETURN FAN VFD					X			X					X							X	
HEATING COIL							X														
COOLING COIL							X														
SUPPLY AIR FLOW MEASUREMENT																					X
OUTDOOR AIR FLOW MEASUREMENT																					X
RETURN AIR FLOW MEASUREMENT																					X
SUPPLY AIR TEMP.																	X				
OA TEMPERATURE																	X				
OA HUMIDITY																		X			
MIXING AIR TEMP.																	X				
COIL FREEZE PROTECTION																X					
SUPPLY FAN/DUCT SP SAFETY											X										
VAV SP SENSOR																			X		
BUILDING ATM. SP																			X		
RETURN AIR TEMP.																	X				
RETURN AIR HUMIDITY,																		X			
OUTSIDE AIR DAMPER							X														
RETURN AIR DAMPER							X														
EXHAUST AIR DAMPER							X														

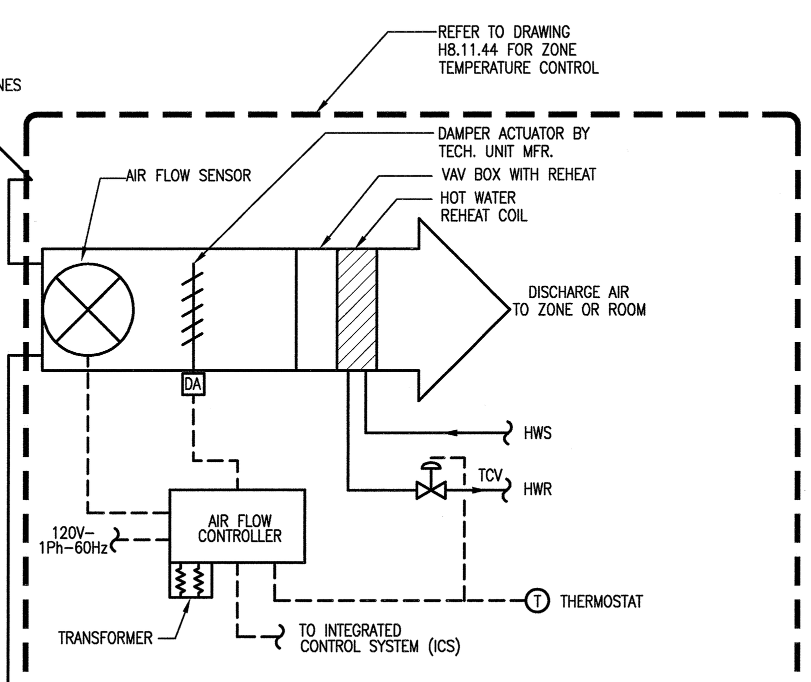
	SOFTWARE																					
	ALARMS							APPLICATION PROGRAMS														
	DIGITAL			ANALOG																		
POINT DESCRIPTION	CONTACT CLOSURE			HIGH LIMIT	LOW LIMIT	RUN TIME	BTU	SCHEDULED START/STOP	OPTIMUM STOP/START	DUTY CYCLING	DEMAND LIMITING		SUMMER WINTER	DAY/NIGHT SETBACK	ECONOMIZER	ENTHALPY	VENTILATION/RECIRCULATION	CHILLER SELECTION	CHILLED WATER RESET	LIGHTING CONTROL		FAILURE MODE
AIR HANDLER, AH-CN-16, AH-CN-17																						X
SUPPLY FAN VFD																						X
RETURN FAN VFD																						X
HEATING COIL																						
COOLING COIL																						
SUPPLY AIR FLOW MEASUREMENT				X	X																	X
OUTDOOR AIR FLOW MEASUREMENT				X	X																	X
RETURN AIR FLOW MEASUREMENT																						
SUPPLY AIR TEMP.																						
OA TEMPERATURE																						
OA HUMIDITY																						
MIXING AIR TEMP.																						
COIL FREEZE PROTECTION																						
SUPPLY FAN/DUCT SP SAFETY																						
VAV SP SENSOR																						
BUILDING ATM. SP																						
RETURN AIR TEMP.																						
RETURN AIR HUMIDITY,																						
OUTSIDE AIR DAMPER																						
RETURN AIR DAMPER																						
EXHAUST AIR DAMPER																						



NOTES: EQUIPMENT/INSTRUMENTATION SHOWN ARE TYPICAL FOR SYSTEMS AH-CN-16 & AH-CN-17.

TYPICAL VAV SYSTEM CONTROL DIAGRAM

NO SCALE HDG15009-8



TYPICAL VAV AIR TERMINAL UNIT WITH REHEAT

NO SCALE

SEQUENCE OF OPERATION

GENERAL:
THE SYSTEM SHALL CONSIST OF AN AIR HANDLING UNIT WITH CHILLED WATER COOLING AND HOT WATER HEATING COILS. THE SYSTEM SHALL HAVE PNEUMATICALLY OPERATED VALVES AND DAMPERS AND ITS OWN DDC STAND ALONE LOCAL CONTROL STATION (LCS). THE LOCAL CONTROL (LCS) SHALL BE SUPERVISED BY A BUILDING DDC CENTRAL WORKSTATION WITH GRAPHICS MONITORING AND CONTROL SYSTEM PROGRAMMING CAPABILITIES.
ALL SETPOINTS SHALL BE ADJUSTABLE.

TOLERANCES AND SETPOINTS:
SPACE COOLING TOLERANCE: 72 – 76°F
SPACE COOLING SETPOINT: 74°F
SPACE HEATING TOLERANCE: 68 – 72°F
SPACE HEATING SETPOINT: 70°F
MIXED AIR-LOW TEMPERATURE LIMIT: 50°F
MIXED AIR SETPOINT: 55°F
SUPPLY AIR SETPOINT: 55°F
FREEZE PROTECTION ALARM: 40°F
FREEZE PROTECTION LIMIT: 35°F
SUPPLY FAN DISCHARGE STATIC PRESSURE LIMIT: 1.0 INCH WG ABOVE RATED FAN STATIC PRESSURE.

FREEZE CONTROL
THE LOW LIMIT FREEZE PROTECTION SENSOR SHALL BE LOCATED ON THE DISCHARGE SIDE OF HEATING COIL. WHEN THE TEMPERATURE LEAVING THE HEATING COIL IS AT OR BELOW THE FREEZE PROTECTION LIMIT SET POINT, THE FOLLOWING EVENTS SHALL OCCUR:
1. THE SUPPLY FAN SHALL STOP.
2. THE EXHAUST/RETURN AIR FAN SHALL STOP.
3. THE RETURN AIR DAMPER SHALL OPEN.
4. THE OUTSIDE AIR AND EXHAUST AIR DAMPERS SHALL CLOSE.
5. THE COOLING COIL, CONTROL VALVE SHALL RETURN TO ITS NORMAL POSITION (CLOSED).
6. THE HEATING COIL CONTROL VALVE SHALL BE FULL OPEN.
7. A VISUAL AND AUDIBLE ALARM SHALL BE TRANSMITTED TO THE DDC CENTRAL CONTROL STATION.
8. A MANUAL RESET OF FREEZE PROTECTION DEVICES SHALL BE REQUIRED.

SYSTEM START/STOP CONTROL:
THE UNITS SHALL BE STARTED AND STOPPED VIA THE BUILDING DDC CENTRAL CONTROL OR THE LOCAL CONTROL STATION (LCS). WHEN A FAN SYSTEM IS STARTED, THE FOLLOWING EVENTS SHALL OCCUR:
1. ITS RESPECTIVE CONTROL SYSTEM SHALL BE ENABLED.
2. WITH RETURN DAMPER OPEN, OUTSIDE AIR DAMPER CLOSED, AND EXHAUST DAMPER CLOSED, THE EXHAUST/RETURN FAN SHALL START.
3. THE SUPPLY AIR FAN SHALL START.
4. CONFIRMATION OF AIR FLOW SHALL BE BY AIR FLOW MEASUREMENT (SUPPLY) OR A DIFFERENTIAL PRESSURE SWITCH ACROSS THE FAN (RETURN).
5. THE MIXED AIR TEMPERATURE CONTROL SHALL BE PERMITTED AND THE RETURN, EXHAUST, AND OUTSIDE AIR DAMPERS SHALL BE MODULATED TO SETPOINT.
6. THE USE OF SCHEDULED START/STOP AND OPTIMUM START/STOP PROGRAMS SHALL BE IMPLEMENTED IN THE CONTROL SOFTWARE FOR FUTURE USE.

WHEN THE FAN SYSTEM IS SHUTDOWN, THE FOLLOWING EVENTS SHALL OCCUR:
1. THE SUPPLY FAN AND THE EXHAUST/RETURN FANS SHALL STOP.
2. THE RETURN AIR DAMPER SHALL OPEN.
3. THE OUTSIDE AIR DAMPER SHALL CLOSE.
4. THE EXHAUST AIR DAMPER SHALL CLOSE.
5. THE COOLING COIL, CONTROL VALVE SHALL RETURN TO ITS NORMAL POSITION (CLOSED).
6. THE HEATING COIL CONTROL VALVE SHALL RETURN TO ITS NORMAL POSITION (CLOSED).
7. ITS RESPECTIVE CONTROL SYSTEM SHALL BE DISABLED.

A HAND (OFF) AUTO SWITCH AT THE FAN STARTERS AND VFDS SHALL OVERRIDE THE SYSTEM FOR MAINTENANCE USE.

ECONOMIZER CONTROL:

THE MIXED AIR TEMPERATURE SENSOR SHALL PROVIDE INPUT TO THE DDC CONTROL SYSTEM. THE CONTROL SYSTEM SHALL MODULATE THE OUTSIDE AIR, RETURN AIR AND EXHAUST AIR CONTROL DAMPERS TO MAINTAIN THE 55 DEGREES F SETPOINT.

TEMPERATURE AND HUMIDITY SENSORS IN THE OUTSIDE AIR AND RETURN AIR STREAMS SHALL PERMIT THE DDC CONTROL SYSTEM TO DETERMINE THE ENTHALPY OF EACH AIR STREAM. SHOULD THE ENTHALPY OF THE OUTSIDE AIR EXCEED THAT OF THE RETURN AIR, THE DDC CONTROL SYSTEM SHALL CLOSE THE OUTSIDE AIR MAIN DAMPER AND EXHAUST AIR DAMPERS, WHILE OPENING THE RETURN AIR DAMPERS.

MINIMUM OUTSIDE AIR CONTROL:

AN AIR FLOW MEASUREMENT STATION IN THE OUTSIDE AIR DUCT SHALL PROVIDE INPUT TO THE DDC CONTROL SYSTEM. THE DDC CONTROL SYSTEM SHALL MODULATE THE OUTSIDE AIR DAMPER TO MAINTAIN THE MINIMUM OUTSIDE AIR QUANTITY AT ANY SUPPLY AIR FAN SPEED.

SUPPLY AIR TEMPERATURE CONTROL:

THE SUPPLY AIR TEMPERATURE SENSOR SHALL PROVIDE INPUT TO THE DDC CONTROL SYSTEM. THE CONTROL SYSTEM SHALL MODULATE THE HEATING COIL 2-WAY CONTROL VALVE AND THE COOLING COIL 2-WAY CONTROL VALVE AS REQUIRED TO MAINTAIN THE SUPPLY AIR TEMPERATURE AT 55 DEGREES F.

STATIC PRESSURE CONTROL:

A STATIC PRESSURE SENSOR IN THE SUPPLY AIR DUCTWORK SHALL PROVIDE INPUT TO THE DDC CONTROL SYSTEM. THE DDC CONTROL SYSTEM SHALL MODULATE THE SUPPLY FAN SPEED, THRU THE VFD, AS REQUIRED TO MAINTAIN THE REQUIRED DUCT STATIC PRESSURE (FIELD MEASURED). VFD SPEED FEEDBACK AND FAULT SIGNALS SHALL BE REPORTED AT THE DDC CENTRAL CONTROL.

A BUILDING STATIC PRESSURE SENSOR WITH ATMOSPHERIC REFERENCE SHALL PROVIDE INPUT TO THE DDC CONTROL SYSTEM. AIR FLOW MEASUREMENT STATIONS IN THE SUPPLY AIR DUCT AND RETURN AIR DUCTS SHALL PROVIDE INPUT TO DDC CONTROL SYSTEM. UTILIZING THE MONITORED BUILDING STATIC PRESSURE THE DESIRED SUPPLY/RETURN AIR OFFSET SHALL BE MANUALLY ESTABLISHED AND SET POINT PROGRAMMED. THE DDC CONTROL SYSTEM SHALL MODULATE THE RETURN FAN SPEED, THRU THE VFD, AS REQUIRED TO MAINTAIN DESIRED OFFSET. VFD SPEED FEEDBACK AND FAULT SIGNALS SHALL BE REPORTED AT THE DDC CENTRAL CONTROL.

DUCT STATIC PRESSURE SAFETY LIMIT:
THE DUCT STATIC PRESSURE LIMIT SHALL BE AS FOLLOWS:
1. AN ALARM SHALL ANNUNCIATE AT THE DDC CENTRAL CONTROL STATION WHEN THE STATIC PRESSURE IS 1.0 IN WG ABOVE OF THE NORMAL STATIC PRESSURE.
2. THE SYSTEM SHALL STOP THE FANS WHEN THE DUCT STATIC PRESSURE IS GREATER THAN OR EQUAL TO THE STATIC PRESSURE LIMIT. THE UNIT SHALL FOLLOW THE SYSTEM SHUTDOWN CONTROL SEQUENCE OF OPERATION.

DUCT SMOKE DETECTOR CONTROL:
WHENEVER THE SUPPLY AIR OR RETURN AIR SMOKE DETECTOR (BY OTHERS) IS ACTIVATED, AND A SIGNAL IS SENT TO THE FIRE ALARM PANEL, THE FOLLOWING EVENTS SHALL OCCUR:
1. AN ALARM SHALL BE ANNUNCIATED AT THE FIRE ALARM PANEL.
2. THE SUPPLY FAN SHALL STOP AND EXHAUST/RETURN FAN SHALL STOP.
3. THE OUTSIDE AIR, AND EXHAUST AIR DAMPERS SHALL CLOSE.
4. THE COOLING COIL VALVE SHALL RETURN TO ITS NORMAL POSITION (CLOSED).
5. THE HEATING COIL VALVE SHALL CLOSE.
6. AN ALARM SHALL OCCUR AT THE DDC CENTRAL CONTROL.
NC CONTACTS BY FIRE ALARM CONTRACTOR. CIRCUITRY TO PERFORM CONTROLS BY HVAC CONTRACTOR.

ZONE TEMPERATURE CONTROL: REFER TO DRAWING H8.11.44.

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SECTION AND DETAIL KEY: NUMBER OF SECTION OR DETAIL — DRAWING ON WHICH SECTION OR DETAIL IS SHOWN OR TAKEN

THIS DOCUMENT CONTROLLED BY
CHANGE CONTROL SYSTEM ______
ENGINEERING PROCEDURE ______

REV	CHANGE TYPE	CHANGE CONTROL SYSTEM	CHANGE REQUEST NUMBER	DESCRIPTION	DSN	CHK	DEPT	DATE	PE	DATE	PJ	DATE	REQ	DATE	UTB	DATE	RPE	RPE NO	DATE	ST	CV	EC	EE	EM	IE	M	PD	SE	AR
0				CERTIFIED FOR CONSTRUCTION – 12/9/02	JG	BWJ			CLG	1/03	JS	1/03	LGH	1/03			BWJ	105869	12/9/02	BZ	AW	BWJ	AK	IM	DM	–	BWJ	–	TW

REVISION OR ISSUE PURPOSE — REVISION APPROVALS — SQUAD CHECK

RPE: BRUCE W. JOHNSON, REGISTERED ENGINEER, No. 00105869, STATE OF TENNESSEE — REV. 0 DATE 12/9/02

DRAWING APPROVALS			
DSN			
DRW			
CHK			
DEPT			
PE	CLG	(signature)	1/24/03
PJ	JS	(signature)	1/23/03
REQ		(signature)	1/24/03
UTB	JRL		

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UT-BATTELLE, LLC, Oak Ridge, Tennessee

PROJECT NAME:
CENTER FOR NANOPHASE MATERIALS SCIENCES
OFFICE AIR CONDITIONING SYSTEM CONTROL DIAGRAM

1	48	49	50	PLANT	BLDG	FL	SH.	OF	TYPE	CLASS
3	H	X	X	8	8610		1	1	D	U
51	52	53	A/E DRAWING NUMBER:							REV
NC	NA		H8.11.40							0

NEXT ASS'Y: FINAL ASS'Y:

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