

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 ELECTRICALLY OPERATED VALVES AND DAMPERS AND ITS OWN DDC STAND ALONE LOCAL CONTROL STATION (LCS). ALL SETPOINTS SHALL BE ADJUSTABLE.

TOLERANCES AND SETPOINTS:
SPACE COOLING TOLERANCE 73 - 77F
SPACE COOLING SETPOINT 73F
SPACE HEATING TOLERANCE 68 - 72F
SPACE HEATING SETPOINT 70F
FREEZE PROTECTION ALARM 40F
FREEZE PROTECTION LIMIT 35F

FREEZE CONTROL:
THE LOW LIMIT FREEZE PROTECTION SHALL BE LOCATED ON THE ENTERING SIDE OF HEATING COIL. WHEN THE TEMPERATURE PRECEEDING 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 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 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 RETURN FAN SHALL START.
3. THE SUPPLY AIR FAN SHALL START.
4. CONFIRMATION OF AIR FLOW SHALL BE BY THE AIR FLOW MEASURING STATION (SUPPLY FAN) OR A DIFFERENTIAL PRESSURE SWITCH ACROSS THE FAN (RETURN FAN).
5. 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 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 SHALL PERMIT SYSTEM OPERATION FOR MAINTENANCE USE.

SPACE TEMPERATURE CONTROL:
A SPACE TEMPERATURE SENSOR SHALL PROVIDE INPUT TO THE DDC CONTROL SYSTEM. SHOULD THE SPACE TEMPERATURE DROP BELOW SETPOINT, THE DDC CONTROL SYSTEM SHALL MODULATE OPEN THE HEATING COIL 2-WAY CONTROL VALVE AS REQUIRED TO MAINTAIN THE DESIRED SPACE TEMPERATURE. THE OUTSIDE AIR AND EXHAUST AIR DAMPERS SHALL BE FULLY CLOSED AND THE RETURN AIR DAMPERS FULLY OPEN DURING HEATING. SHOULD THE SPACE TEMPERATURE RISE ABOVE SETPOINT, THE DDC CONTROL SYSTEM SHALL MODULATE OPEN THE OUTSIDE AIR AND EXHAUST AIR DAMPERS, WHILE CLOSING THE RETURN AIR DAMPERS IN AN ATTEMPT TO UTILIZE FREE OUTSIDE AIR COOLING. SHOULD INSUFFICIENT COOLING BE AVAILABLE FOR THE OUTSIDE AIR, THE DDC CONTROL SYSTEM SHALL MODULATE OPEN THE COOLING COIL 2-WAY CONTROL VALVE AS REQUIRED TO MAINTAIN THE DESIRED SPACE TEMPERATURE. TEMPERATURE AND HUMIDITY SENSORS IN THE OUTSIDE AIR AND RETURN AIR STREAMS SHALL PROVIDE INPUT TO THE DDC IN ORDER TO PERMIT THE DDC CONTROL SYSTEM TO DETERMINE THE ENTHALPY OF EACH AIR STREAM. SHOULD THE OUTSIDE AIR ENTHALPY EXCEED THE RETURN AIR ENTHALPY, THE DDC CONTROL SYSTEM SHALL CLOSE THE OUTSIDE AIR AND EXHAUST AIR DAMPERS WHILE FULLY OPENING THE RETURN AIR DAMPER.

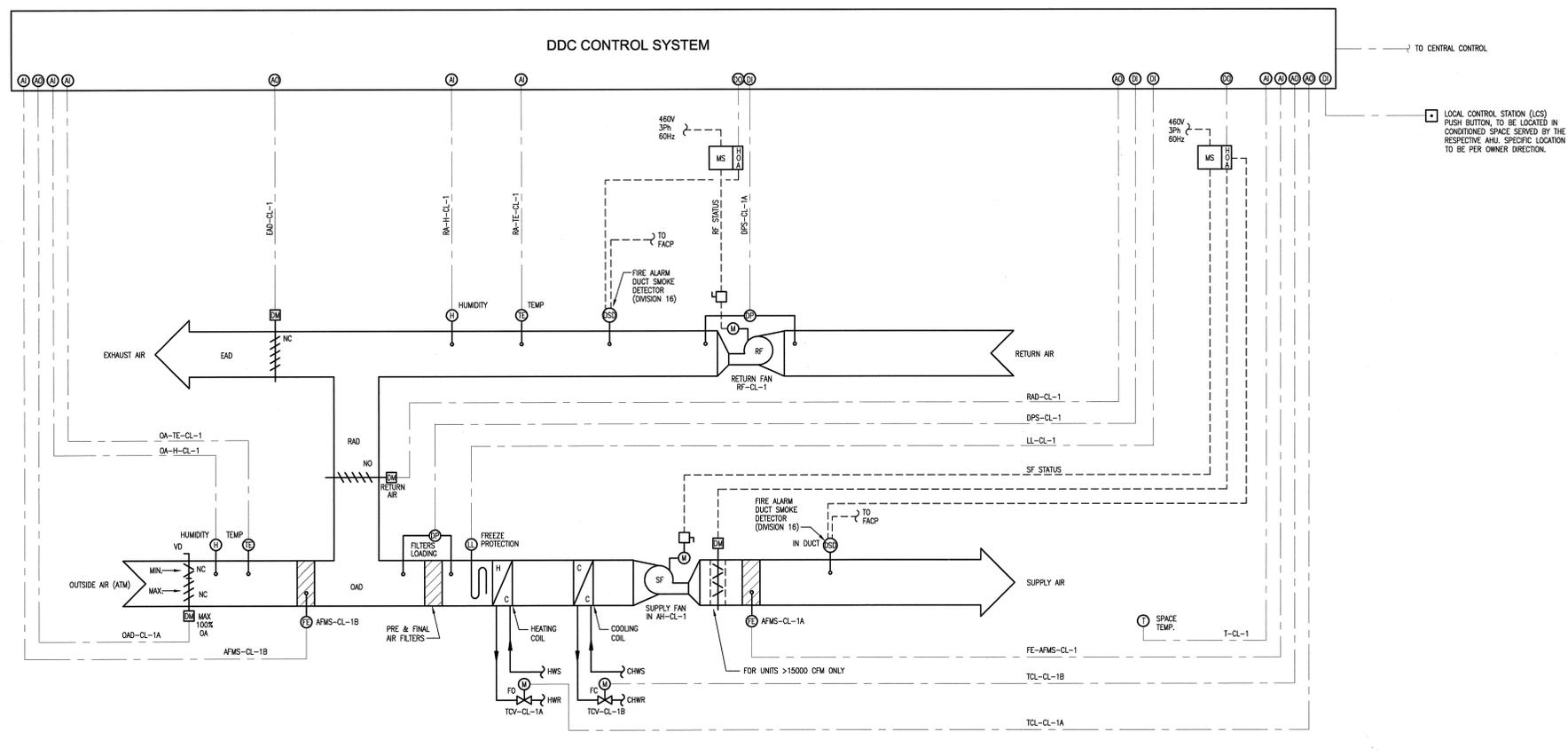
DUCT SMOKE DETECTOR CONTROL:
WHENEVER THE SUPPLY AIR OR RETURN AIR SMOKE DETECTOR IS ACTIVATED, A SIGNAL IS SENT TO THE FIRE ALARM PANEL AND THE FOLLOWING EVENTS SHALL OCCUR:
1. AN ALARM SHALL BE ANNUNCIATED AT THE FIRE ALARM PANEL.
2. THE SUPPLY FAN SHALL STOP AND RETURN FAN SHALL STOP.
3. THE OUTSIDE AIR, RETURN 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 PANEL.

CENTRAL LAB OFFICE BUILDING	CONTROL POINT LIST AH-CL-1 (TYP FOR AH-CL-5, 12, 21, 25, 26*, &27)																																				
	OUTPUT FROM DDC							INPUT TO DDC							ALARMS		SOFTWARE																				
	DIGITAL			ANALOG				DIGITAL			ANALOG				DIGITAL	ANALOG	APPLICATION PROGRAMS																				
POINT DESCRIPTION	GRAPHIC DISPLAY	CONTROL RELAY	SOLENOID	HAND/OFF/AUTO START/STOP	CONTROL POINT ADJUSTMENT	PRESSURE SWITCH	DIFFERENTIAL PRESSURE SWITCH	FLOW SWITCH	AUXILIARY CONTACT/ PUSH BUTTON	PULSE	GENERAL ALARM	FREEZE PROTECTION	TEMPERATURE °F	* RELATIVE HUMIDITY	DUCT STATIC PRESSURE	POSITION	FLOW	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/REGULATION	CHILLER SELECTION	CHILLED WATER RESET	LIGHTING CONTROL	FAILURE MODE		
AIR HANDLING UNIT, AH-CL-1	X																					X	X														
SUPPLY FAN				X																																	
RETURN FAN				X																																	
RETURN FAN STATUS, DPS-CL-1A						X																															
HEATING COIL, TCV-CL-1A						X																															
COOLING COIL, TCV-CL-1B						X																															
SUPPLY AIR FLOW, FE-AFMS-CL-1A																X																					
SPACE TEMPERATURE, T-CL-1												X																									
RA TEMPERATURE, RA-TE-CL-1												X																									
RA HUMIDITY, RA-H-CL-1												X																									
OA TEMPERATURE, OA-TE-CL-1												X																									
OA HUMIDITY, OA-H-CL-1												X																									
OAD (MAXIMUM), OAD-CL-1A					X																																
OAD POSITION, RAD-CL-1					X																																
EAD POSITION, EAD-CL-1					X																																
FREEZE PROTECTION, LL-CL-1												X																									
OUTDOOR AIR FLOW, FE-AFMS-CL-1B																X																					
LOCAL CONTROL STATION									X																												

AIR HANDLING UNIT NO.	RETURN FAN NO.	EXHAUST FAN NO.	SERVING
AH-CL-1	RF-CL-17	EF-CL-10	SUBSTATION
AH-CL-5	RF-CL-15	-	B1 GALLERY
AH-CL-12	RF-CL-5	EF-CL-14	CONTROL ROOM
AH-CL-21	RF-CL-18	EF-CL-17	SUB-BASEMENT
AH-CL-25	RF-CL-7	EF-CL-15	OFFICE ATRIUM (SEE NOTE 1)
AH-CL-26*	RF-CL-8	EF-CL-11, EF-CL-16	AUDITORIUM
AH-CL-27	RF-CL-9	EF-CL-9	LOBBY (SEE NOTE 1)

NOTE: 1) SEE DRAWING H8.10.47 REV. 0 FOR "SMOKE-REMOVAL" INTERFACE WHEN BLDG. CENTRAL SMOKE DETECTION SYSTEM IS ACTIVATED IN HIGH-BAY "ATRIUM" OR "LOBBY".

* AH-CL-26, INSTALLATION OF EQUIPMENT UNDER ALTERNATE #1C



NOTE 1. EQUIPMENT/INSTRUMENTATION NUMBER 5 ARE SHOWN FOR SYSTEM AH-CL-1. SEE SYSTEM SUMMARY ABOVE FOR SIMILAR DESIGNATION OF OTHER APPLICABLE SYSTEMS.

TYPICAL "CONSTANT VOLUME" HVAC SYSTEM WITH RETURN FAN
NO SCALE

108031400-H8E-8600-A090

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managed for the DEPARTMENT OF ENERGY under
U.S. GOVERNMENT contract DE-AC05-00OR22725
UT-BATTELLE, LLC, a Oak Ridge Tennessee

PROJECT NAME:
SPALLATION NEUTRON SOURCE
CENTRAL LAB AND OFFICE BUILDING
HVAC-CONSTANT AIR VOLUME CONTROLS
WITH RETURN FAN

1	48	49	50	PLANT	BLDG	FL	SH.	OF	TYPE	CLASS
3	H	X	X	8	8600		1	1	D	U
REV.	DATE	UTB	J.R. LAWSON	09/25/01	51	52	53	WBS	1.8.3.14	H8.10.42
NC										REV 1

REV	DATE	DESCRIPTION	DSN	CHK	DEPT	DATE	PE	DATE	PJ	DATE	REQ	DATE	UTB	DATE	RPE	RPE NO	DATE
1		CERTIFIED FOR CONSTRUCTION - 12/20/01	RTW	KJH													
0		CERTIFIED FOR CONSTRUCTION - MAY 15, 2001	RTW	KJH													

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SECTION AND DETAIL KEY

THIS DOCUMENT CONTROLLED BY
CHANGE CONTROL SYSTEM
ENGINEERING PROCEDURE SNS-ENG-0001

RPE

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PE	C.L. GARREN	9/6/01
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12/20/01

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