CONTROL POINT LIST AH-CL-6 (TYP FOR AH-CL-10, 13, 16, 17, 18, 22, 23, 24, 28, 29, 30, 31, & 32)

CENTRAL LAB OFFICE BUILDING	CONNECTED POINTS																																SOFTWARE													
	OUTPUT FROM DDC								INPUT TO DDC												ALARMS						APPLICATION PROGRAMS																			
	DIGITAL					ANALOG			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	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-CL-6	X																												X	X					X	X										X
SUPPLY FAN VFD					X			X					X						X																												X
RETURN FAN VFD					X			X					X						X																												X
EXHAUST FAN					X						X																																				
HEATING COIL, TCV-CL-6A							X																																								
COOLING COIL, TCV-CL-6B							X																																								
SUPPLY AIR FLOW, FE-AFMS-CL-6A																				X			X	X																							X
OUTDOOR AIR FLOW, FE-AFMS-CL-6B																				X			X	X																							X
RETURN AIR, FE-AFMS-CL-6C																				X																											
SUPPLY AIR TEMP. SA-RTD-CL-6																	X																														
OA TEMPERATURE, OA-TE-CL-6																	X																														
OA HUMIDITY, OA-H-CL-6																		X																													
MIXING AIR TEMP. TE-MIX-CL-6																	X																														
COIL FREEZE PROTECTION, LL-CL-6																X																															
SUPPLY FAN/DUCT SP SAFETY, DPS-CL-6A											X																																				
VAV SP SENSOR(S) DPS-CL-6B, 6C, & 6D																			X																												
BUILDING ATM. SP REF. DPS-CL-6E																			X																												
RETURN FAN SP REF. DPS-CL-6F																			X																												
RETURN AIR TEMP. RA-TE-CL-6																	X																														
RETURN AIR HUMIDITY, RA-H-CL-6																		X																													
OA DAMPER. OAD-CL-6A							X																																								
RAD, RAD-CL-6							X																																								
EAD, EAD-CL-6							X																																								

VARIABLE AIR VOLUME - HVAC SYSTEM SUMMARY

AIR HANDLING UNIT NO.	RETURN FAN NO.	EXHAUST FAN NO.	SERVING
AH-CL-6	RF-CL-16	–	CAFE
AH-CL-10	RF-CL-1	–	LOCKER ROOM
AH-CL-13	–	EF-CL-6	PLANT SHOP, SEE NOTE 1
AH-CL-16	RF-CL-2	EF-CL-18	DRY-LABORATORY, SEE NOTE 2
AH-CL-17	RF-CL-3	EF-CL-18	DRY-LABORATORY, SEE NOTE 2
AH-CL-18	RF-CL-4	EF-CL-18	DRY-LABORATORY, SEE NOTE 2
AH-CL-22	RF-CL-20	–	NORTH OFFICE WING EAST
AH-CL-23	RF-CL-19	–	NORTH OFFICE WING
AH-CL-24	RF-CL-6	–	CONFERENCE ROOM
AH-CL-28	RF-CL-10	–	LEVEL 5
AH-CL-29	RF-CL-11	–	LEVEL 4
AH-CL-30	RF-CL-12	–	LEVEL 3
AH-CL-31	RF-CL-13	–	LEVEL 2
AH-CL-32	RF-CL-14	–	LEVEL 1

NOTES:

1. HVAC SYSTEM AH-CL-13,HAS NO RETURN AND ACHIEVES VAV OPERATION WITH DEDICATED EXHAUST FANS.
2. HVAC SYSTEMS AH-CL-16,-17 & -18 SHARE "SCAVANGER" COMMON EXHAUST FAN EF-CL-18.

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 ELECTRONICALLY 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 – 77°F
SPACE COOLING SETPOINT: 75°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.
SPACE PRESSURIZATION (ATMOSPHERIC REFRENCE): 0.03–0.05 INCHES WG

FREEZE CONTROL
THE LOW LIMIT FREEZE PROTECTION SENSOR 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 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 OVERRIDDEN 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 AND 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.

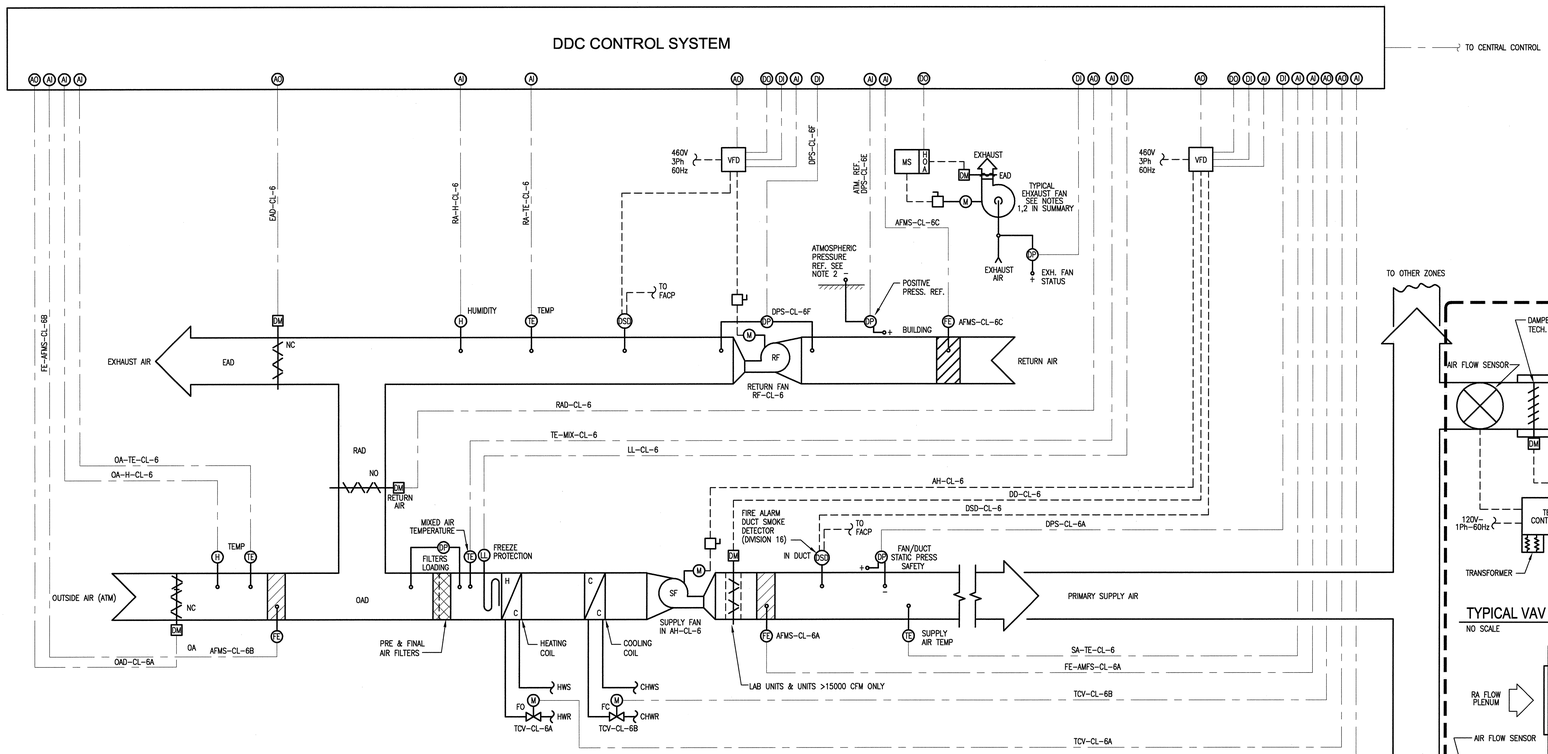
A BUILDING STATIC PRESSURE SENSOR WITH ATMOSPHERIC REFERENCE SHALL PROVIDE INPUT TO THE DDC CONTROL SYSTEM. AIR FLOW MEASUREMENT STATIONS IN THE SUPPLY AIR DUCT AND RETURN AIR DUCTS SHALL PROVIDE INPUT TO DDC CONTROL SYSTEM. UTILIZING THE MONITORED BUILDING STATIC PRESSURE THE DESIRED SUPPLY/RETURN AIR 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 START/STOP CONTROL SEQUENCE OF OPERATION.

DUCT SMOKE DETECTOR CONTROL:
WHENEVER THE SUPPLY AIR OR RETURN AIR SMOKE DETECTOR 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.

ZONE TEMPERATURE CONTROL: REFER TO DRAWING H8.10.41.

EXHAUST SYSTEM CONTROL:
EXHAUST FANS SHALL BE SOFTWARE INTERLOCKED TO THE ASSOCIATED AIR HANDLING UNIT(S), SUCH THAT THE EXHAUST FAN IS ENERGIZED WHEN THE AIR UNIT IS ENERGIZED. THE EXHAUST AIR DISCHARGE DAMPER SHALL BE ELECTRICALLY INTERLOCKED TO THE MOTOR STARTER SUCH THAT THE DAMPER IS OPENED WHEN THE FAN IS ENERGIZED. A DIFFERENTIAL PRESSURE SWITCH SHALL REPORT EXHAUST FAN OPERATING STATUS AT THE DDC.



NOTES:
1) EQUIPMENT/INSTRUMENTATION NUMBERS ARE SHOWN FOR SYSTEM AH-CL-6. SEE SYSTEM SUMMARY ABOVE FOR SIMILAR DESIGNATION OF OTHER APPLICABLE SYSTEMS.
2) ALL ATMOSPHERIC PRESSURE SENSORS SHALL BE SHIELDED FROM WIND EFFECTS IN ORDER TO ACHIEVE AN ACCURATE READING.

TYPICAL VAV SYSTEM CONTROL DIAGRAM
NO SCALE

NO REPRESENTATION OR WARRANTY, EXPRESSED OR IMPLIED, IS MADE AS TO THE ACCURACY, COMPLETENESS OR USEFULNESS OF THE INFORMATION OR STATEMENTS CONTAINED IN THESE DRAWINGS, OR THAT THE USE OR DISCLOSURE OF ANY INFORMATION, APPARATUS, METHOD, OR PROCESS DISCLOSED IN THESE DRAWINGS MAY NOT INFRINGE PRIVATE RIGHTS OF OTHERS. NO LIABILITY IS ASSUMED WITH RESPECT TO THE USE OF, OR FOR DAMAGES RESULTING FROM THE USE OF ANY INFORMATION, APPARATUS, METHOD, OR PROCESS DISCLOSED IN THESE DRAWINGS. DRAWINGS MADE AVAILABLE FOR INFORMATION TO BIDDERS ARE NOT TO BE USED FOR OTHER PURPOSES AND ARE TO BE RETURNED UPON REQUEST OF THE FORWARDING CONTRACTOR.

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

THIS DOCUMENT CONTROLLED BY
CHANGE CONTROL SYSTEM 4
ENGINEERING PROCEDURE SNS-ENG-G001

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
1				CERTIFIED FOR CONSTRUCTION – 12/20/01	RTW	KJH													
0				CERTIFIED FOR CONSTRUCTION – MAY 15, 2001	RTW	KJH			CLG	9/6/01	JS	8/21/01			JRL	9/25/01	BWJ	105869	5/15/01

REVISION OR ISSUE PURPOSE — REVISION APPROVALS

RW	AW	BWJ	PD	BWJ	BWJ	--	BWJ	--	ED
SC	BWJ	WRS	RL	WRS	BWJ	--	WRS	--	WAS
ST	CV	EC	EE	EM	IE	M	PD	SE	AR

SQUAD CHECK

RPE — BRUCE W. JOHNSON, REGISTERED ENGINEER, STATE OF TENNESSEE, No. 00105580
1 — REV. — 12/20/01 — DATE

DSN	S. VERECZEY	05/15/01
DRW	M. THAW	05/15/01
CHK	B. JOHNSON	05/15/01
DEPT		
PE	C.L. GARREN	9/6/01
PJ	J. STELLERN	08/21/01
REQ		
UTB	J.R. LAWSON	09/25/01

DRAWING APPROVALS

108031400-H8E-8600-A088

Knight Jacobs — Knight/Jacobs Joint Venture, 701 Scarboro Road, MS 8253, Oak Ridge, TN 37830, 865-241-9433, fax 865-241-3400

KNIGHT — Knight Advanced Technology, 540 West Randolph Street, Chicago, IL 60661

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

PROJECT NAME:
SPALLATION NEUTRON SOURCE
CENTRAL LAB AND OFFICE BUILDING
HVAC-VARIABLE AIR VOLUME CONTROLS
OFFICE / DRY LAB. VAV SYSTEMS

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