

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 - 77F SPACE COOLING SETPOINT 75F 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 PRECEDING 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 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 EXHAUST 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 (EXHAUST 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 EXHAUST 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 ANNOUNCED AT THE FIRE ALARM PANEL.
2. THE SUPPLY FAN SHALL STOP AND EXHAUST 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.

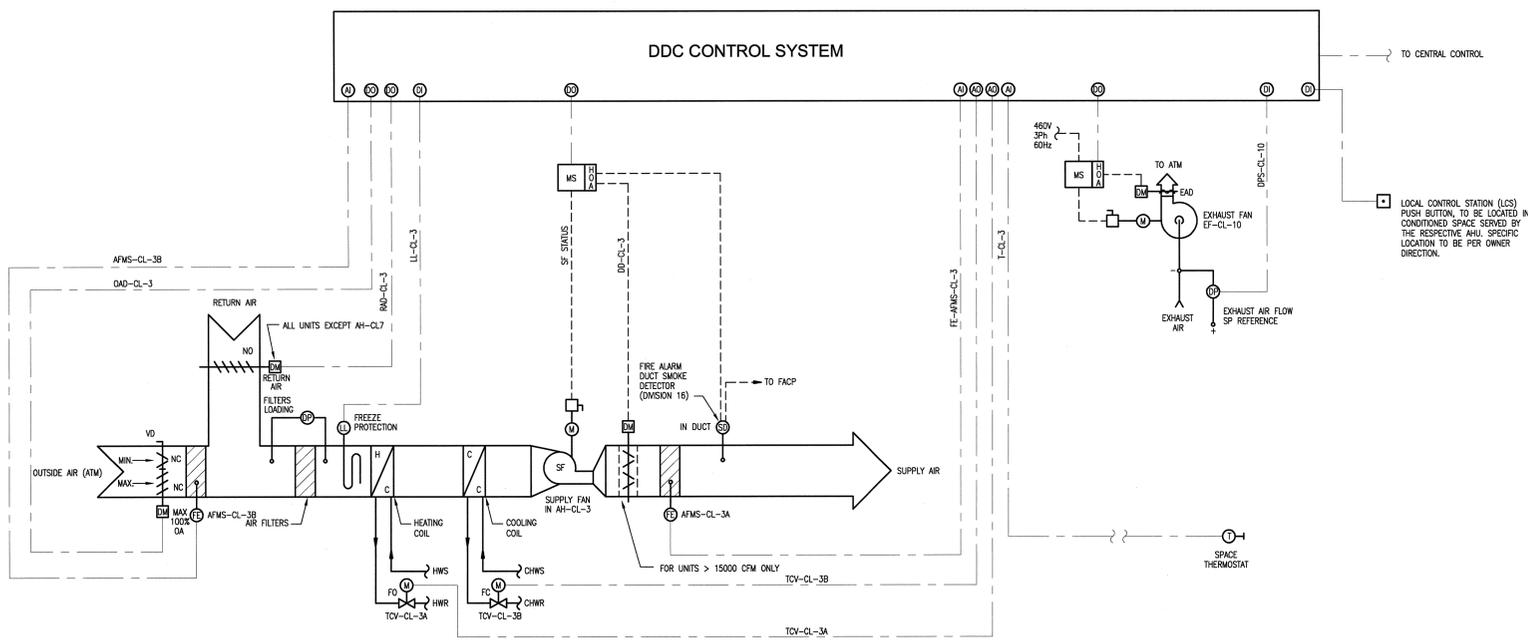
CONTROL POINT LIST - AH-CL-3 (TYP FOR AH-2, 4, 7*, 8, 9, 11 & 33*)
CENTRAL LABORATORY OFFICE BUILDING
CONNECTED POINTS
OUTPUT FROM DDC: DIGITAL, ANALOG
INPUT TO DDC: DIGITAL, ANALOG
ALARMS: DIGITAL, ANALOG
SOFTWARE: APPLICATION PROGRAMS
POINT DESCRIPTION: AIR HANDLING UNIT, AH-CL-3; SUPPLY FAN; EXHAUST FAN; EXHAUST FAN STATUS, DPS-CL-10; FREEZE PROTECTION, LL-CL-3; HEATING COIL, TOV-CL-3A; COOLING COIL, TOV-CL-3B; SUPPLY AIR FLOW, FE-AFMS-CL-3; SPACE TEMPERATURE, T-CL-3; LOCAL CONTROL STATION

CONSTANT VOLUME W/EXHAUST HVAC SYSTEM SUMMARY

Table with columns: AIR HANDLING UNIT NO., RETURN FAN NO., EXHAUST FAN NO., SERVING. Rows include ME SHOP, POWER SUPPLY SHOP, MAGNET SHOP, KITCHEN, TRING CAVITY, WAIT. HANDLING, VACUUM SHOPS, KITCHEN HOOD.

* AHU-CL-7 AND AHU-CL-33 ARE 100% OUTSIDE AIR SYSTEMS. CONTROL SHALL BE SIMILAR TO THAT SHOWN EXCEPT WITHOUT OUTSIDE AIR AND RETURN AIR ECONOMIZER DAMPERS. FOR THESE TWO UNITS THE FREEZE PROTECTION SENSOR SHALL BE LOCATED DOWNSTREAM OF THE HEATING COIL, INSTALLED UNDER ALTERNATE #1C.

AHU-CL-7 SHALL BE SOFTWARE INTERLOCKED TO AH-CL-6 SUCH THAT AH-CL-7 SHALL ONLY BE ENERGIZED WHEN AH-CL-6 IS DE-ENERGIZED.



NOTE: EQUIPMENT/INSTRUMENTATION NUMBERS ARE SHOWN FOR SYSTEM AH-CL-3. SEE SYSTEM SUMMARY ABOVE FOR SIMILAR DESIGNATIONS OF OTHER APPLICABLE SYSTEMS.

TYPICAL "CONSTANT VOLUME" HVAC SYSTEM W/EXHAUST FAN
NO SCALE

108031400-H8E-8600-A091
Knight Jacobs
Knight Advanced Technology
865-241-9433
fax 865-241-3400

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

PROJECT NAME: SPALLATION NEUTRON SOURCE
CENTRAL LAB AND OFFICE BUILDING
HVAC-CONSTANT AIR VOLUME CONTROLS
WITH EXHAUST FAN
REV 1

Revision table with columns: REV, DESCRIPTION, DATE, REVISION OR ISSUE PURPOSE, and revision approvals (RTW, KJH, CLG, etc.).

Table with columns: RPE, DSN, CHK, DEPT, REQ, and dates. Includes a signature stamp for Bruce W. Johnson.

SECTION AND DETAIL KEY
THIS DOCUMENT CONTROLLED BY
CHANGE CONTROL SYSTEM
ENGINEERING PROCEDURE: SNS-ENG-0001