NEXT ASS'Y: FINAL ASS'Y:

CONTROL POINT LIST - MUA-CN-03 & MUA-CN-04

CENTRAL LABORATORY OFFICE BUILDING

CONNECTED POINTS

POINT DESCRIPTION	GRAPHIC DISPLAY	OUTPUT FROM DDC – DIGITAL: CONTROL RELAY	SOLENOID	HAND/OFF/AUTO	(START/STOP)		OUTPUT FROM DDC – ANALOG: PROPORTIONAL CONTROL	FAN SPEED		INPUT TO DDC – DIGITAL: PRESSURE SWITCH	DIFFERENTIAL PRESSURE SWITCH	FLOW SWITCH	AUXILLARY CONTACT	PULSE	GENERAL ALARM	FREEZE PROPECTION	INPUT TO DDC – ANALOG: TEMPERATURE °F	% RELATIVE HUMIDITY	DUCT STATIC PRESSURE	FAN SPEED FEEDBACK	FLOW
AIR HANDLER MUA-CN-03, MUA-CN-04	X																				
SUPPLY FAN VFD.					X			X					X							X	
EXHAUST FAN START/STOP					X																
EXHAUST FAN START/STOP					X																
EXHAUST FAN STATUS											X										
EXHAUST FAN STATUS											X										
HEATING COIL							X														
COOLING COIL							X														
SUPPLY AIR FLOW																					X
SUPPLY AIR TEMP																	X				
SUPPLY DUCT STATIC PRESS																			X		
FREEZE PROTECTION																X					
FAN/DUCT STATIC PRESS. SAFETY											X										
OA MAKE-UP DAMPER							X														
HUMIDIFIER (SEE NOTE A)							X											X			
LABORATORY LOCAL CONTROL PANEL																					
SUPPLY AIR FLOW																					X
TOTAL EXHAUST AIR FLOW																					X
HOOD EXHAUST AIR FLOW																					X
ROOM EXHAUST AIR FLOW																					X
ROOM TEMPERATURE																	X				
ROOM SP REFERENCE																			X		
REHEAT COIL CONTROL (TCV)							X														
ROOM EXHAUST DAMPER							X														
SUPPLY AIR TO ROOM DAMPER							X														

POINT DESCRIPTION	ALARMS – DIGITAL: CONTACT CLOSURE			ALARMS – ANALOG: HIGH LIMIT	LOW LIMIT	RUN TIME	BTU	SOFTWARE – APPLICATION PROGRAMS: 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 MUA-CN-03, MUA-CN-04																						
SUPPLY FAN VFD.																						X
EXHAUST FAN START/STOP																						
EXHAUST FAN START/STOP																						
EXHAUST FAN STATUS						X																X
EXHAUST FAN STATUS						X																X
HEATING COIL																						
COOLING COIL																						
SUPPLY AIR FLOW				X	X	X																X
SUPPLY AIR TEMP																						
SUPPLY DUCT STATIC PRESS																						
FREEZE PROTECTION																						
FAN/DUCT STATIC PRESS. SAFETY																						
OA MAKE-UP DAMPER																						
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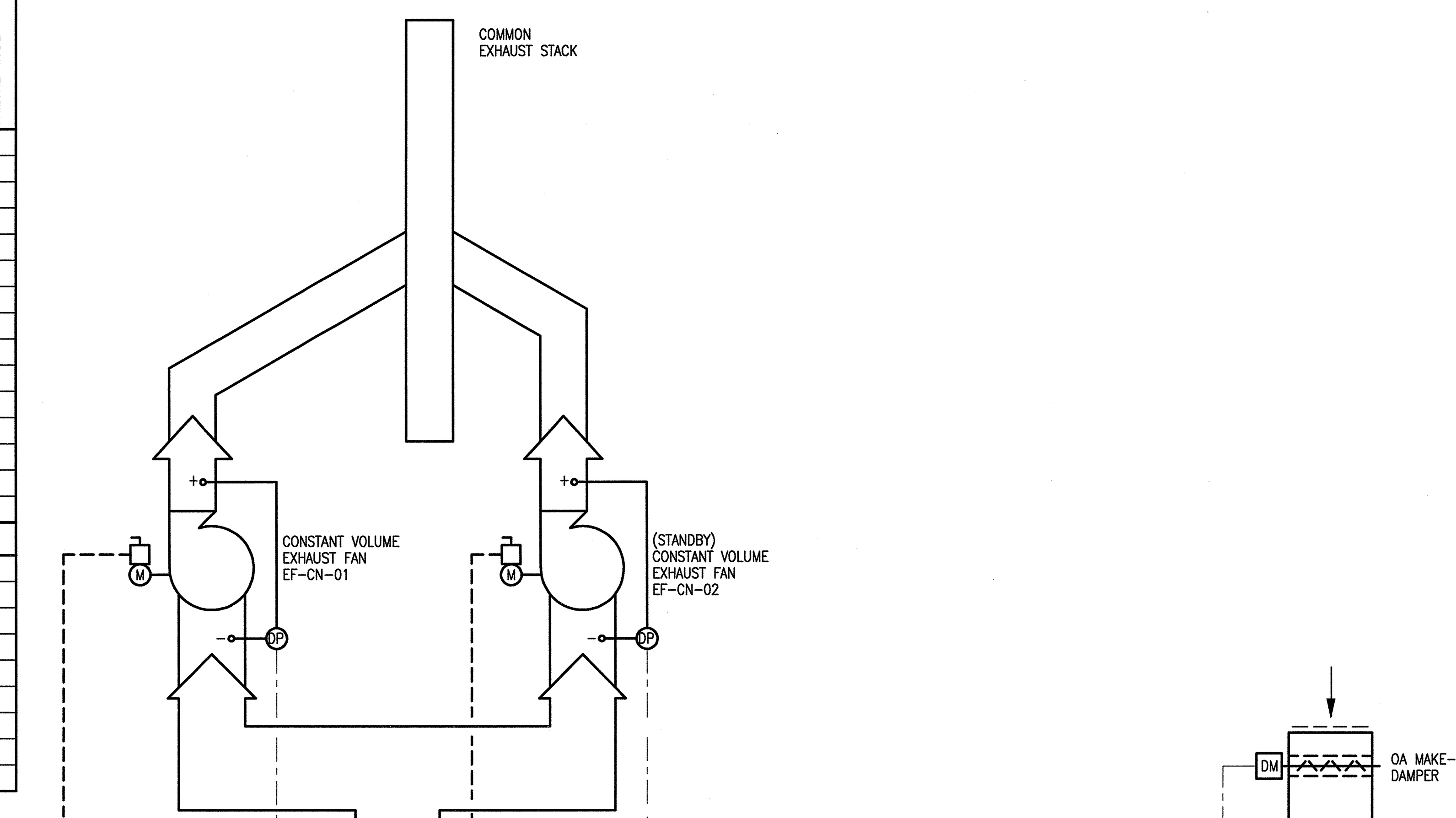
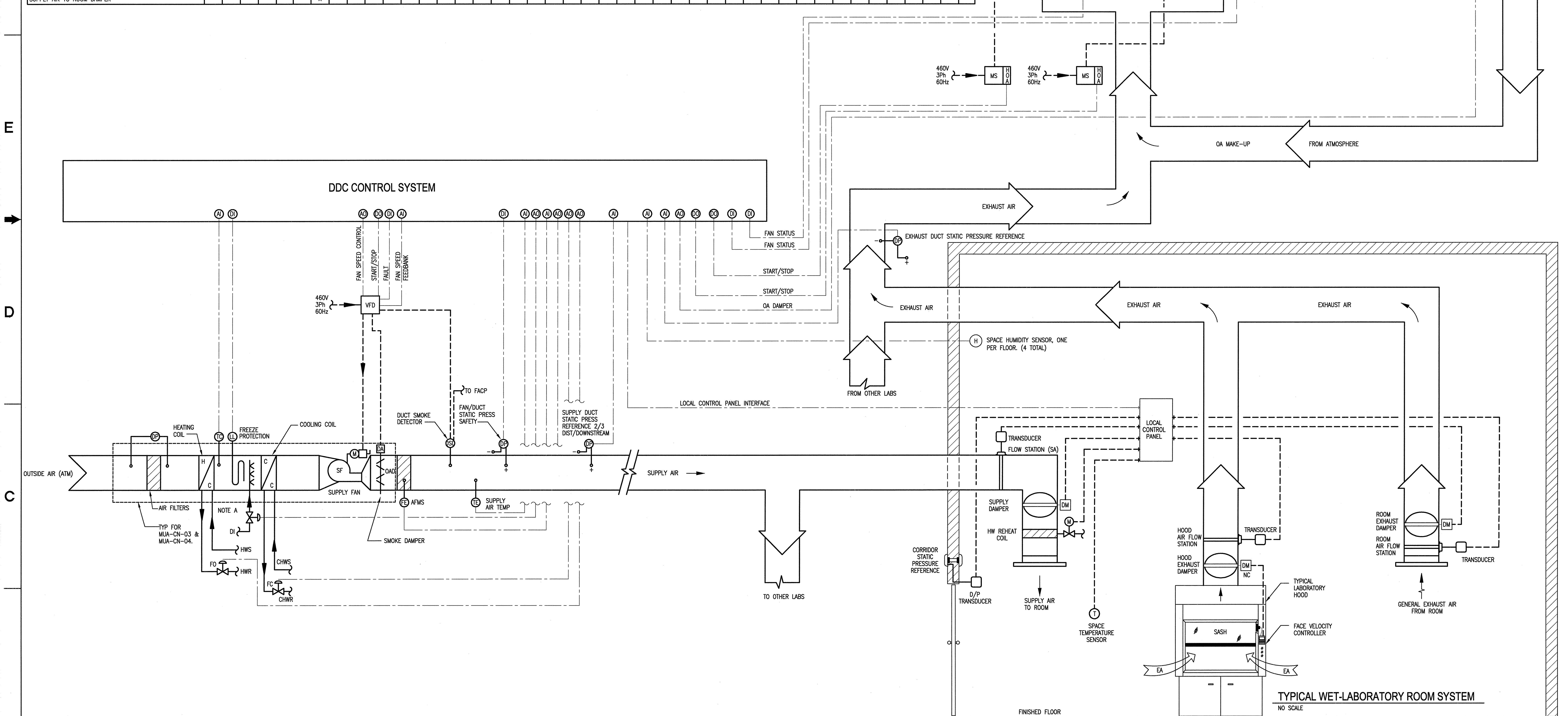
REHEAT COIL CONTROL (TCV)																						
ROOM EXHAUST DAMPER																						
SUPPLY AIR TO ROOM DAMPER																						





TYPICAL WET-LABORATORY ROOM SYSTEM
NO SCALE

NOTE: EQUIPMENT/INSTRUMENTATION SHOWN ARE TYPICAL FOR SYSTEM MUA-CN-03 & MUA-CN-04.

LABORATORY VAV SYSTEM - HOOD TRACKING SYSTEM CONTROL DIAGRAM
NO SCALE HDG-15014-8

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
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 NORMAL STATIC PRESSURE.
SPACE PRESSURIZATION: 0.02 INCHES WG

FREEZE CONTROL
THE LOW LIMIT FREEZE PROTECTION SHALL BE LOCATED ON THE LEAVING 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, AND THE SMOKE DAMPER SHALL CLOSE.
2. THE COOLING COIL, CONTROL VALVE SHALL RETURN TO ITS NORMAL POSITION (CLOSED).
3. THE HEATING COIL CONTROL VALVE SHALL BE FULL OPEN.
4. A VISUAL AND AUDIBLE ALARM SHALL BE TRANSMITTED TO THE DDC CENTRAL CONTROL STATION.
5. 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. THE SUPPLY AIR FAN SHALL START, AND THE SMOKE DAMPER SHALL OPEN.
3. CONFIRMATION OF AIR FLOW SHALL BE BY AIR FLOW MEASUREMENT.

WHEN THE FAN SYSTEM IS SHUTDOWN, THE FOLLOWING EVENTS SHALL OCCUR:
1. THE SUPPLY FAN SHALL STOP, AND THE SMOKE DAMPER SHALL CLOSE.
2. THE COOLING COIL, CONTROL VALVE SHALL RETURN TO ITS NORMAL POSITION (CLOSED).
3. THE HEATING COIL CONTROL VALVE SHALL RETURN TO ITS NORMAL POSITION (CLOSED).
4. 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.

SUPPLY AIR TEMPERATURE CONTROL:

A TEMPERATURE SENSOR DOWNSTREAM OF THE PREHEAT COIL SHALL PROVIDE INPUT TO THE CONTROL SYSTEM. THE DDC CONTROL SYSTEM SHALL MODULATE THE HEATING WATER 2-WAY CONTROL VALVE AS REQUIRED TO MAINTAIN THE COIL DISCHARGE TEMPERATURE IN ACCORDANCE WITH RESET SCHEDULE A.
A TEMPERATURE SENSOR IN THE SUPPLY DUCT SHALL PROVIDE INPUT TO THE CONTROL SYSTEM. THE DDC CONTROL SYSTEM SHALL MODULATE THE CHILLED WATER 2-WAY CONTROL VALVE AS REQUIRED TO MAINTAIN THE SUPPLY AIR TEMPERATURE AT 55°F. SHOULD ALL LABORATORY PREHEAT CONTROL VALVES BE OPEN, THE DDC CONTROL SHALL RESET THE SUPPLY AIR TEMPERATURE SETPOINT HIGHER UNTIL ONE REHEAT CONTROL VALVE IS FULLY CLOSED.

SPACE HUMIDITY CONTROL:

A SPACE HUMIDITY CONTROL SENSOR WITHIN ONE LABORATORY ON EACH FLOOR SHALL PROVIDE INPUT TO THE CONTROL SYSTEM. THE DDC CONTROL SYSTEM SHALL MODULATE THE HUMIDIFIER AS REQUIRED TO MAINTAIN THE SPACE RELATIVE HUMIDITYAT 40%.

SUPPLY 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.

EXHAUST STATIC PRESSURE CONTROL:

A STATIC PRESSURE SENSOR IN THE EXHAUST AIR DUCTWORK SHALL PROVIDE INPUT TO THE DDC CONTROL SYSTEM. THE DDC CONTROL SYSTEM SHALL MODULATE THE OUTSIDE AIR MAKE-UP DAMPER AS REQUIRED TO MAINTAIN THE DESIRED DUCT STATIC PRESSURE (FIELD MEASURED).

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 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 THE SMOKE DAMPER SHALL CLOSE.
3. THE COOLING COIL VALVE SHALL RETURN TO ITS NORMAL POSITION (CLOSED).
4. THE HEATING COIL VALVE SHALL CLOSE.
5. AN ALARM SHALL OCCUR AT THE DDC CENTRAL CONTROL.
NC CONTACTS BY FIRE ALARM CONTRACTOR. CIRCUITRY TO PERFORM CONTROLS BY HVAC CONTRACTOR.

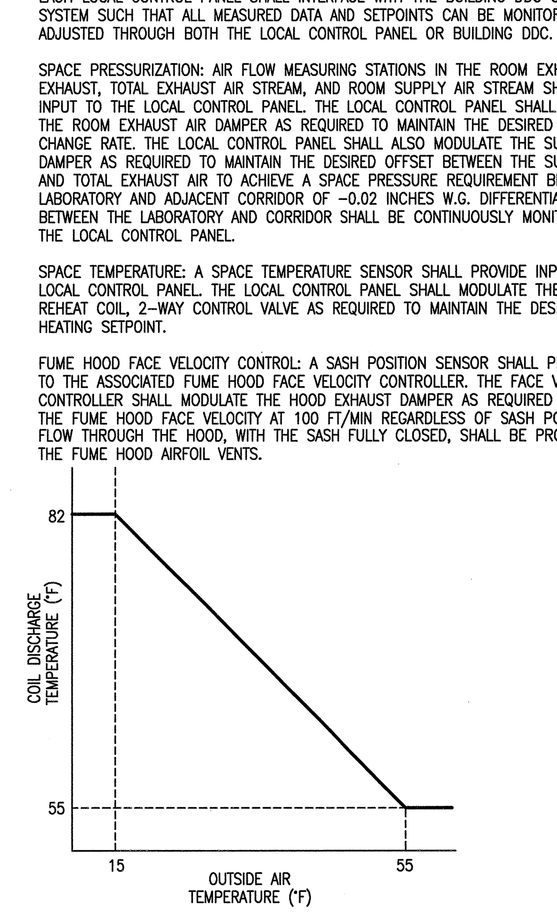
LABORATORY ROOM CONTROLS:

GENERAL: EACH LABORATORY ROOM SHALL BE PROVIDED WITH DEDICATED LOCAL CONTROL PANEL UTILIZED TO CONTROL SPACE PRESSURIZATION AND TEMPERATURE. EACH LOCAL CONTROL PANEL SHALL INTERFACE WITH THE BUILDING DDC CONTROL SYSTEM SUCH THAT ALL MEASURED DATA AND SETPOINTS CAN BE MONITORED OR ADJUSTED THROUGH BOTH THE LOCAL CONTROL PANEL OR BUILDING DDC.

SPACE PRESSURIZATION: AIR FLOW MEASURING STATIONS IN THE ROOM EXHAUST, HOOD EXHAUST, TOTAL EXHAUST AIR STREAM, AND ROOM SUPPLY AIR STREAM SHALL PROVIDE INPUT TO THE LOCAL CONTROL PANEL. THE LOCAL CONTROL PANEL SHALL MODULATE THE ROOM EXHAUST AIR DAMPER AS REQUIRED TO MAINTAIN THE DESIRED ROOM AIR CHANGE RATE. THE LOCAL CONTROL PANEL SHALL ALSO MODULATE THE SUPPLY AIR DAMPER AS REQUIRED TO MAINTAIN THE DESIRED OFFSET BETWEEN THE SUPPLY AIR AND TOTAL EXHAUST AIR TO ACHIEVE A SPACE PRESSURE REQUIREMENT BETWEEN THE LABORATORY AND ADJACENT CORRIDOR OF –0.02 INCHES W.G. DIFFERENTIAL PRESSURE BETWEEN THE LABORATORY AND CORRIDOR SHALL BE CONTINUOUSLY MONITORED AT THE LOCAL CONTROL PANEL.

SPACE TEMPERATURE: A SPACE TEMPERATURE SENSOR SHALL PROVIDE INPUT TO THE LOCAL CONTROL PANEL. THE LOCAL CONTROL PANEL SHALL MODULATE THE HOT WATER REHEAT COIL, 2-WAY CONTROL VALVE AS REQUIRED TO MAINTAIN THE DESIRED SPACE HEATING SETPOINT.

FUME HOOD FACE VELOCITY CONTROL: A SASH POSITION SENSOR SHALL PROVIDE INPUT TO THE ASSOCIATED FUME HOOD FACE VELOCITY CONTROLLER. THE FACE VELOCITY CONTROLLER SHALL MODULATE THE HOOD EXHAUST DAMPER AS REQUIRED TO MAINTAIN THE FUME HOOD FACE VELOCITY AT 100 FT/MIN REGARDLESS OF SASH POSITION. MINIMUM FLOW THROUGH THE HOOD, WITH THE SASH FULLY CLOSED, SHALL BE PROVIDED BY THE FUME HOOD AIRFOIL VENTS.



RESET SCHEDULE A
NO SCALE

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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 ______
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				1/03		1/03		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 1/24/03; PJ JS 1/23/03; REQ 1/24/03; UTB JRL

ORNL DRAWING NUMBER:

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

1	48	49	50	PLANT	BLDG	FL	SH.	OF	TYPE	CLASS
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51	52	53	A/E DRAWING NUMBER:						REV	
NC	NA		H8.11.41						0	

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