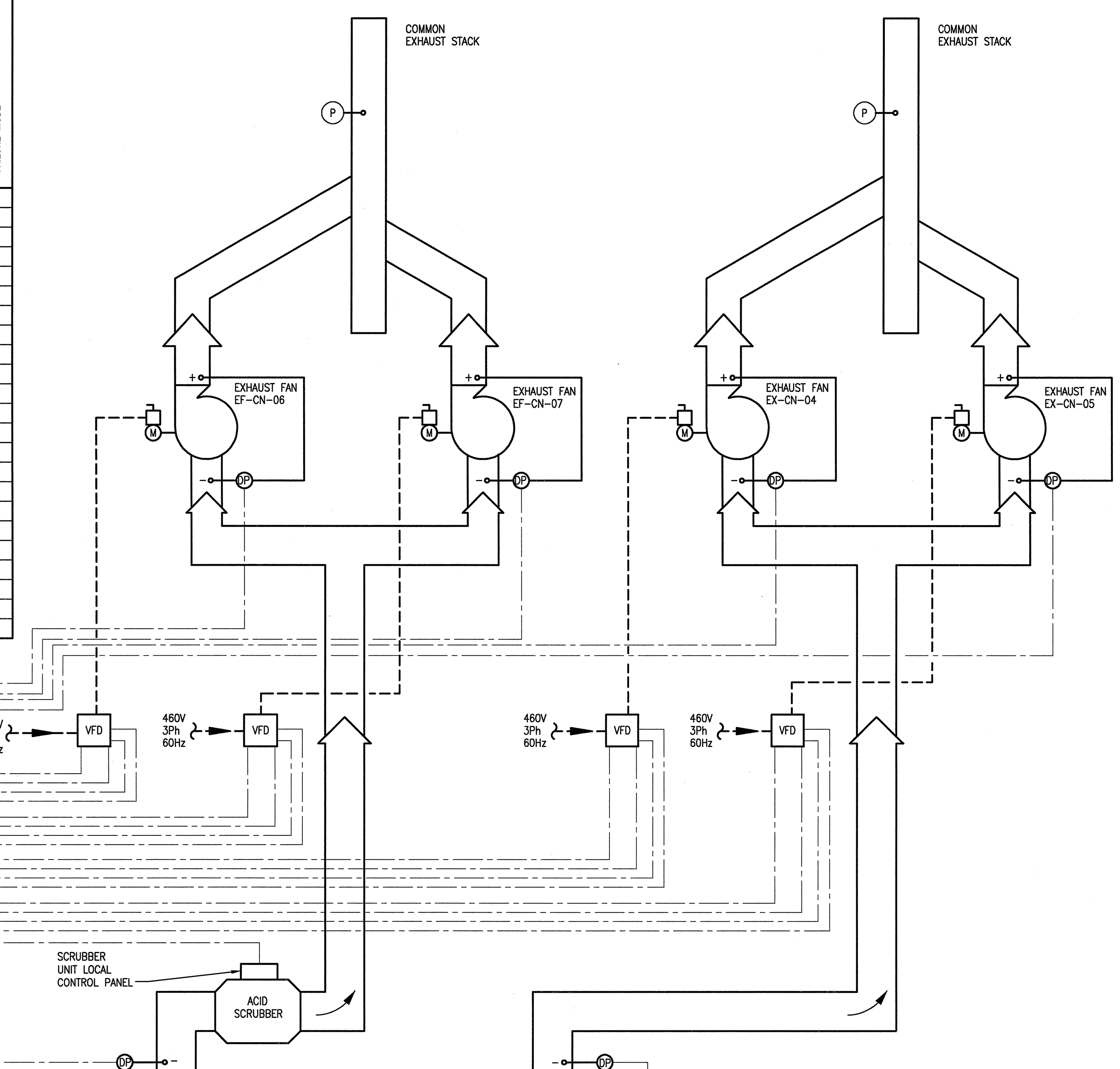
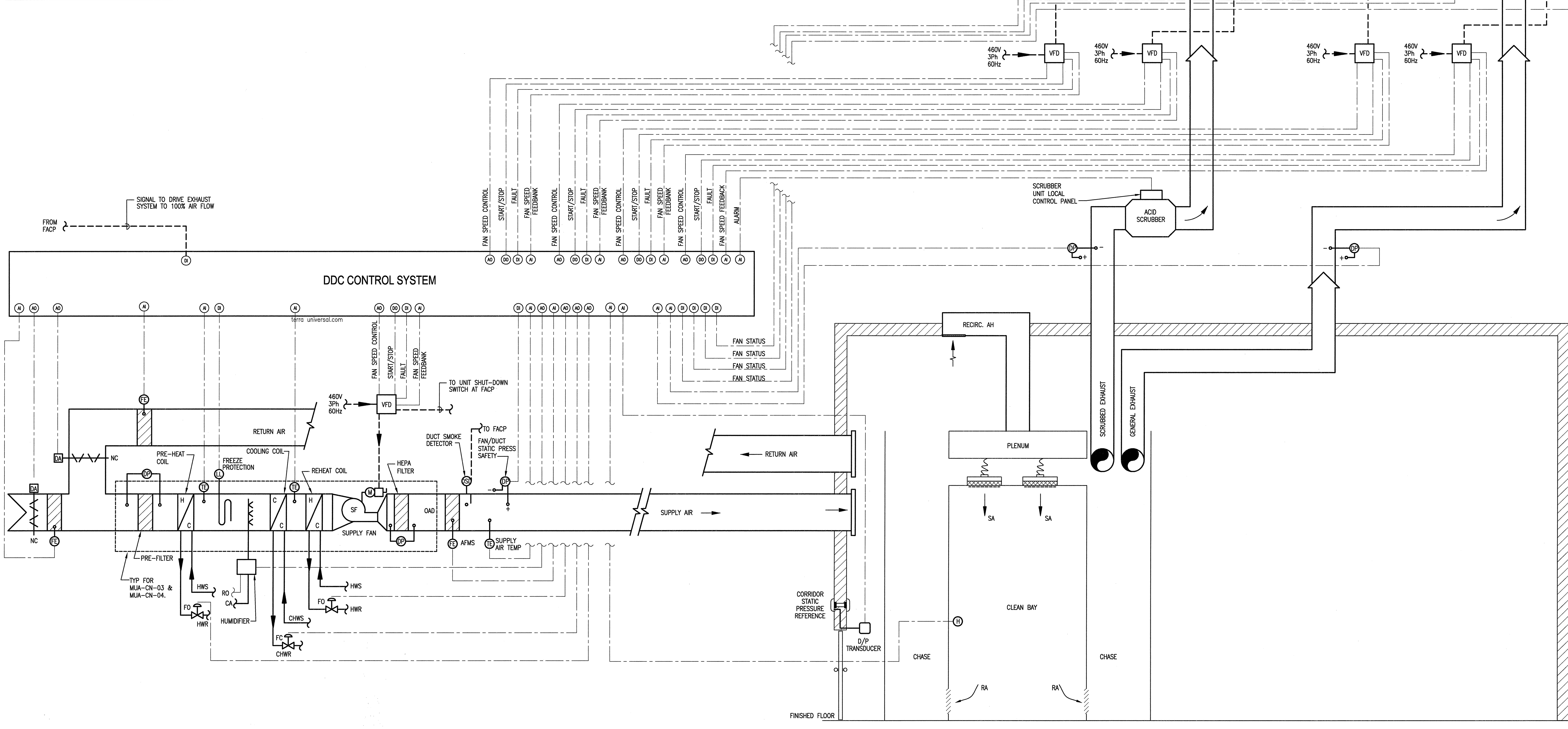
CENTRAL LABORATORY OFFICE BUILDING		CONNECTED POINTS																				SOFTWARE																					
		OUTPUT FROM DDC								INPUT TO DDC												ALARMS							APPLICATION PROGRAMS														
		DIGITAL					ANALOG			DIGITAL							ANALOG					DIGITAL			ANALOG																		
POINT DESCRIPTION	GRAPHIC DISPLAY	CONTROL RELAY	SOLENOID	HAND/OFF/AUTO	(START/STOP)		PROPORTIONAL CONTROL	FAN SPEED		PRESSURE SWITCH	DIFFERENTIAL PRESSURE SWITCH	FLOW SWITCH	AUXILLARY CONTACT	PULSE	GENERAL ALARM	FREEZE PROPECTION	TEMPERATURE °F	% RELATIVE HUMIDITY	DUCT STATIC PRESSURE / SPACE DIFF. 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 MUA-CN-03, MUA-CN-04	X																																										
SUPPLY FAN VFD.					X			X					X							X																							X
EXHAUST FAN VFDS (SCRUBBED)					X			X					X							X																							
EXHAUST FAN VFDS (GENERAL)					X			X					X							X																							
EXHAUST FAN STATUS (SCRUBBED)											X																X																X
EXHAUST FAN STATUS (GENERAL)											X																X																X
SUPPLY AIR FLOW																					X						X																X
PREHEAT COIL							X																																				
REHEAT COIL							X																																				
COOLING COIL							X																																				
PRECOIL DISCHARGE TEMP.																	X																										
COOLING COIL DISCHARGE TEMP.																	X																										
SUPPLY AIR TEMP																	X																										
RETURN AIR FLOW																					X																						
OA FLOW																					X																						
OA MAKE-UP DAMPER							X																																				
RETURN AIR DAMPER							X																																				
FREEZE PROTECTION																X																											
SPACE RELATIVE HUMIDITY SENSOR																		X																									
HUMIDIFIER							X																																				
SPACE DIFFERENTIAL PRESSURE																			X																								
EXHAUST DUCT STATIC PRESSURE (SCRUBBED)																			X																								
EXHAUST DUCT STATIC PRESSURE (GENERAL)																			X																								

CONTROL POINT LIST - MUA-CN-01 & MUA-CN-02





NOTE: EQUIPMENT/INSTRUMENTATION SHOWN IS TYPICAL FOR SYSTEM MUA-CN-01 & MUA-CN-02.

CLEANROOM MAKE-UP AIR SYSTEM CONTROL DIAGRAM

NO SCALE

HDG-15015-8

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

TOLERANCES AND SETPOINTS:

SUPPLY AIR SETPOINT: 68±1°F
RELATIVE HUMIDITY: 55%
SET POINT RELATIVE HUMIDITY TOLERANCE : 50 – 60%
FREEZE PROTECTION ALARM: 40°F
FREEZE PROTECTION LIMIT: 35°F
SPACE PRESSURIZATION: 0.05 BETWEEN CLEANROOMS OR CLEAN SPACE AND NON CLEAN SPACE, 0.02 BETWEEN CLEANROOM AND LESS CORRIDOR.
SUPPLY FAN DISCHARGE STATIC PRESSURE LIMIT; 1.0 INCH W.G. ABOVE NORMAL STATIC PRESSURE.

FREEZE CONTROL
THE LOW LIMIT FREEZE PROTECTION SHALL BE LOCATED ON THE LEAVING SIDE OF PREHEAT COIL. WHEN THE TEMPERATURE LEAVING THE PREHEAT COIL IS AT OR BELOW THE FREEZE PROTECTION LIMIT SET POINT, THE FOLLOWING EVENTS SHALL OCCUR:
1. THE SUPPLY FAN SHALL STOP, THE OUTSIDE AIR AND RETURN AIR DAMPERS WILL CLOSE.
2. THE COOLING COIL, CONTROL VALVE SHALL RETURN TO ITS NORMAL POSITION (CLOSED).
3. THE PREHEAT 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, THE OUTSIDE AIR AND RETURN AIR DAMPERS WILL BE PERMITTED TO OPEN. THE RETURN AIR DAMPER SHOULD INITIALLY GO TO THE 100% OPEN POSITION, WHILE THE OUTSIDE AIR DAMPER INITIALLY STAYS IN THE CLOSED POSITION.
3. CONFIRMATION OF AIR FLOW SHALL BE BY AIR FLOW MEASUREMENT.
4. A UNIT SHUTDOWN SWITCH, LOCATED AT THE FACP, SHALL CAUSE THE UNIT TO DEENERGIZE.

WHEN THE FAN SYSTEM IS SHUTDOWN, THE FOLLOWING EVENTS SHALL OCCUR:
1. THE SUPPLY FAN SHALL STOP, THE OUTSIDE AIR AND RETURN AIR DAMPERS SHALL CLOSE.
2. THE COOLING COIL, CONTROL VALVE SHALL RETURN TO ITS NORMAL POSITION (CLOSED).
3. THE HEATING COIL CONTROL VALVES SHALL RETURN TO THEIR NORMAL POSITION (OPEN).
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.

PREHEAT COIL TEMPERATURE CONTROL:

A TEMPERATURE SENSOR ON THE DISCHARGE SIDE OF THE PREHEAT COIL SHALL PROVIDE INPUT TO THE CONTROL SYSTEM. THE DDC SYSTEM SHALL MODULATE THE HEATING WATER 2-WAY CONTROL VALVE AS REQUIRED TO MAINTAIN THE COIL DISCHARGE TEMPERATURE IN ACCORDANCE WITH RESET SCHEDULE A.

COOLING COIL TEMPERATURE CONTROL:

A TEMPERATURE SENSOR ON THE DISCHARGE SIDE OF THE COOLING COIL SHALL PROVIDE INPUT TO THE CONTROL SYSTEM. THE DDC SYSTEM SHALL MODULATE THE CHILLED WATER 2-WAY CONTROL VALVE AS REQUIRED TO MAINTAIN THE COIL DISCHARGE TEMPERATURE AT 52°F.

SUPPLY AIR TEMPERATURE CONTROL:

A TEMPERATURE SENSOR IN THE SUPPLY AIR DUCT SHALL PROVIDE INPUT TO THE CONTROL SYSTEM. THE DDC SYSTEM SHALL MODULATE THE REHEAT COIL HEATING WATER 2-WAY CONTROL VALVE AS REQUIRED TO MAINTAIN THE SUPPLY AIR TEMPERATURE AT 68°F.

SPACE PRESSURIZATION CONTROL:

FAN SPEED AS SET THROUGH THE VFD SHALL ESTABLISHED TO MAINTAIN FAN CAPACITY AT 50% OF TOTAL. SHOULD THE DDC SYSTEM SENSE LOSS OF AIR FLOW OF THE SECOND OPERATING MAKE-UP AIR UNIT, THE FAN SPEED OF THE REMAINING OPERATING UNIT SHALL BE RAMPED TO 100% SPEED, WHILE A SIGNAL IS SENT TO DEACTIVATE THE FAILED UNIT.

A DIFFERENTIAL PRESSURE SENSOR BETWEEN THE CORRIDOR AND THE CLEANROOM SHALL PROVIDE INPUT TO THE CONTROL SYSTEM. THE DDC SYSTEM SHALL OPEN THE OUTSIDE AIR DAMPER, WHILE CLOSING THE RETURN AIR DAMPER AS REQUIRED TO MAINTAIN THE CLEANROOM SPACE PRESSURE AT +0.02 INCHES W.G.

SPACE HUMIDITY CONTROL:

A SPACE RELATIVE HUMIDITY SENSOR SHALL PROVIDE INPUT TO THE CONTROL SYSTEM. THE DDC SYSTEM SHALL MODULATE THE HUMIDIFIER AS REQUIRED TO MAINTAIN THE SPACE RELATIVE HUMIDITY AT 50%.

EXHAUST STATIC PRESSURE CONTROL:

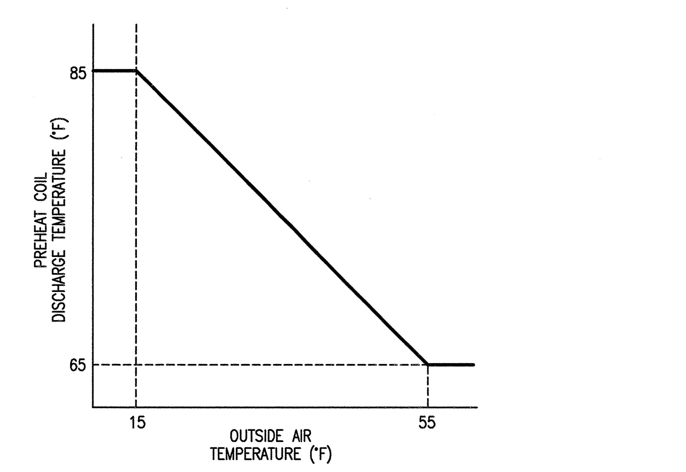
A STATIC PRESSURE SENSOR IN THE EXHAUST AIR DUCTWORK OF EACH SYSTEM SHALL PROVIDE INPUT TO THE DDC CONTROL SYSTEM. THE DDC CONTROL SYSTEM SHALL MODULATE THE EXHAUST FANS VFPS (BOTH FANS RUN CONTINUOUSLY) AS REQUIRED TO MAINTAIN THE DESIRED DUCT STATIC PRESSURE (FIELD MEASURED).
IN THE EVENT OF A HAZARDOUS CHEMICAL OR TOXIC GAS RELEASE, A SWITCH AT FACP, SHALL THRU THE DDC DRIVE EACH SET OF THE EXHAUST FANS (50% FLOW EACH) TO 100% SYSTEM AIR FLOW.

SCRUBBER MONITORING:

THE SCRUBBER SHALL RUN CONTINUOUSLY AND SHALL BE CONTROLLED BY THE INTEGRAL UNIT CONTROL PANEL.

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.



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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			[illegible]	1/03	[illegible]	1/03	[illegible]	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

DSN
DRW
CHK
DEPT
PE CLG 1/24/03
PJ JS 1/23/03
REQ 1/24/03
REV. 0 DATE 12/9/02 UTB JRL
DRAWING APPROVALS

ORNL DRAWING NUMBER:

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

M+W Zander U.S. Operations, Inc.
549 West Randolph Street
Chicago, IL 60661
Telephone: (312) 577-3200
Fax: (312) 577-3525

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PROJECT NAME:
CENTER FOR NANOPHASE MATERIALS SCIENCES
CLEANROOM MUA CONTROL DIAGRAM CONTROL DIAGRAM

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