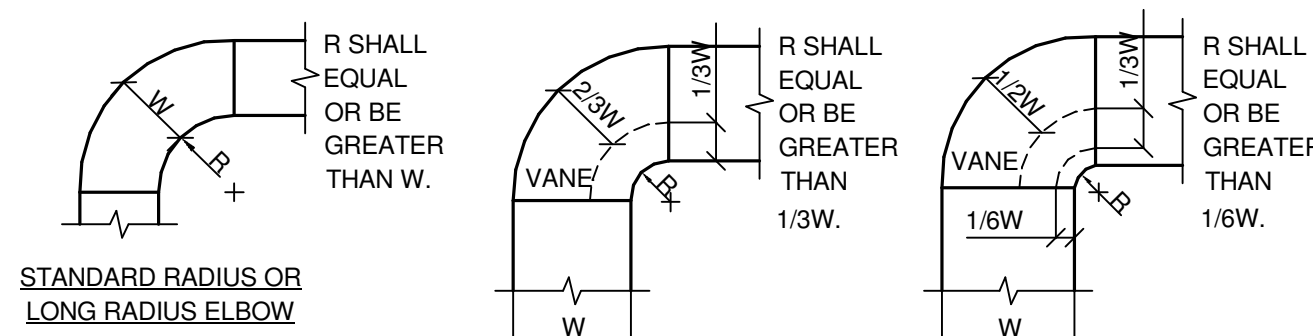


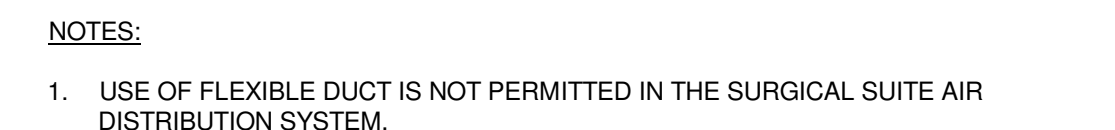
EXHAUST OR RETURN BRANCH DUCTWORK



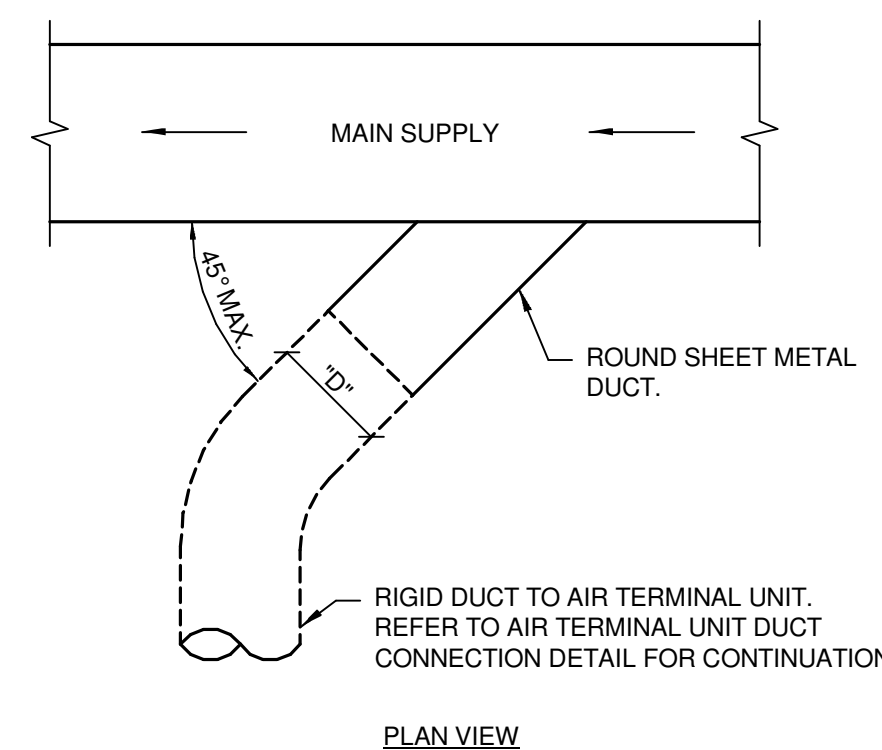
OPERATING ROOM RETURN GRILLE

- | <u>NOTES:</u> | <u>WITH ONE VANE</u> | <u>WITH TWO VANES</u> |
|---|----------------------|-----------------------|
| 1. THE INTERIOR SURFACE OF ALL RADIUS ELBOWS SHALL BE MADE ROUND. | | |
| 2. ALL STANDARD RADIUS ELBOWS CAN BE SUBSTITUTED WITH SHORT RADIUS ELBOWS. ALL SHORT RADIUS ELBOWS SHALL HAVE VANES. VANES SHALL BE CONSTRUCTED, SUPPORTED AND FASTENED AS RECOMMENDED BY SMACNA. | | |

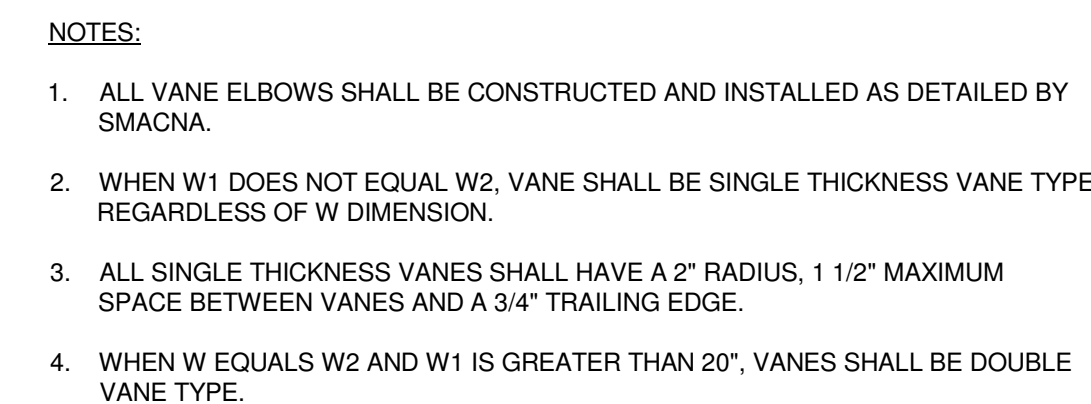
CANOPY HOOD TYPE "A"



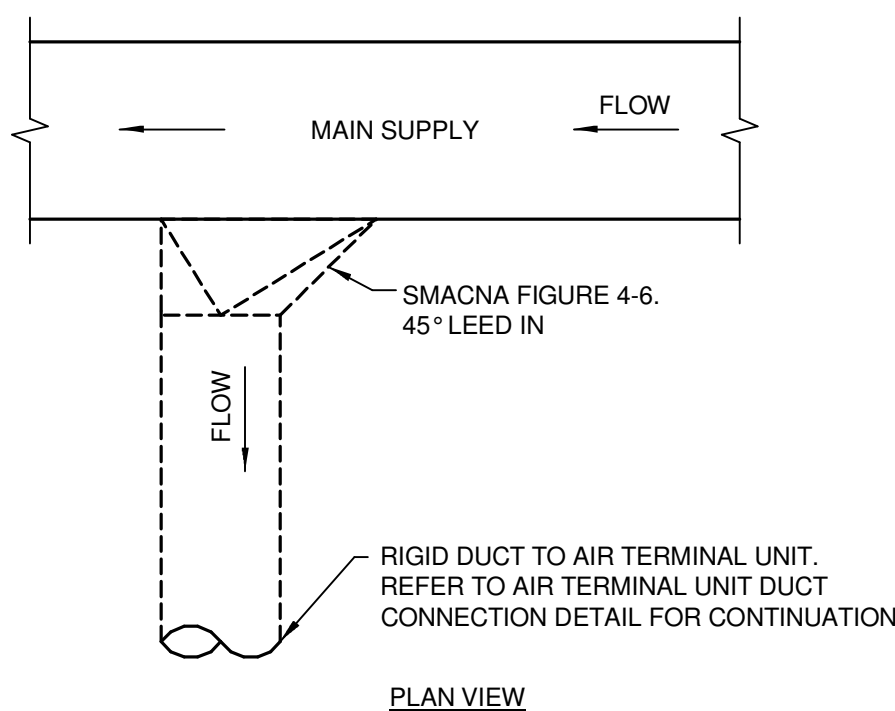
FLEXIBLE AIR DUCT CONNECTOR



DUCTWORK RADIUS ELBOWS



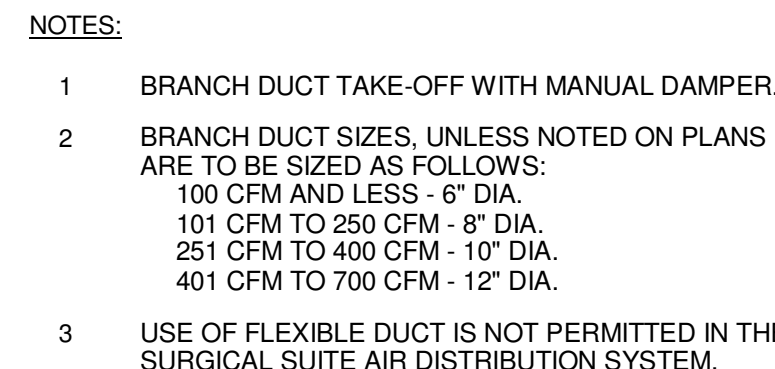
DUCTWORK SQUARE VANE ELBOWS



SUPPLY DUCT TAKEOFF - AIR TERMINAL UNITS



SUPPLY DUCTWORK TAKE-OFFS



RETURN OR EXHAUST GRILLE/REGISTER CONNECTION

FLEXIBLE DUCT CONNECTIONS



ALTERNATE SUPPLY DUCT
TAKEOFF - AIR TERMINAL UNITS

FULLY SPRINKLERED

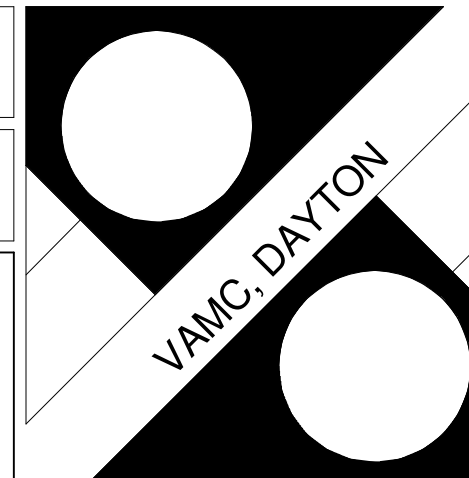
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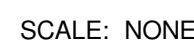
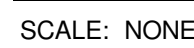
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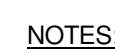
VA
Department of
Veterans Affairs

VA

Drawing No.



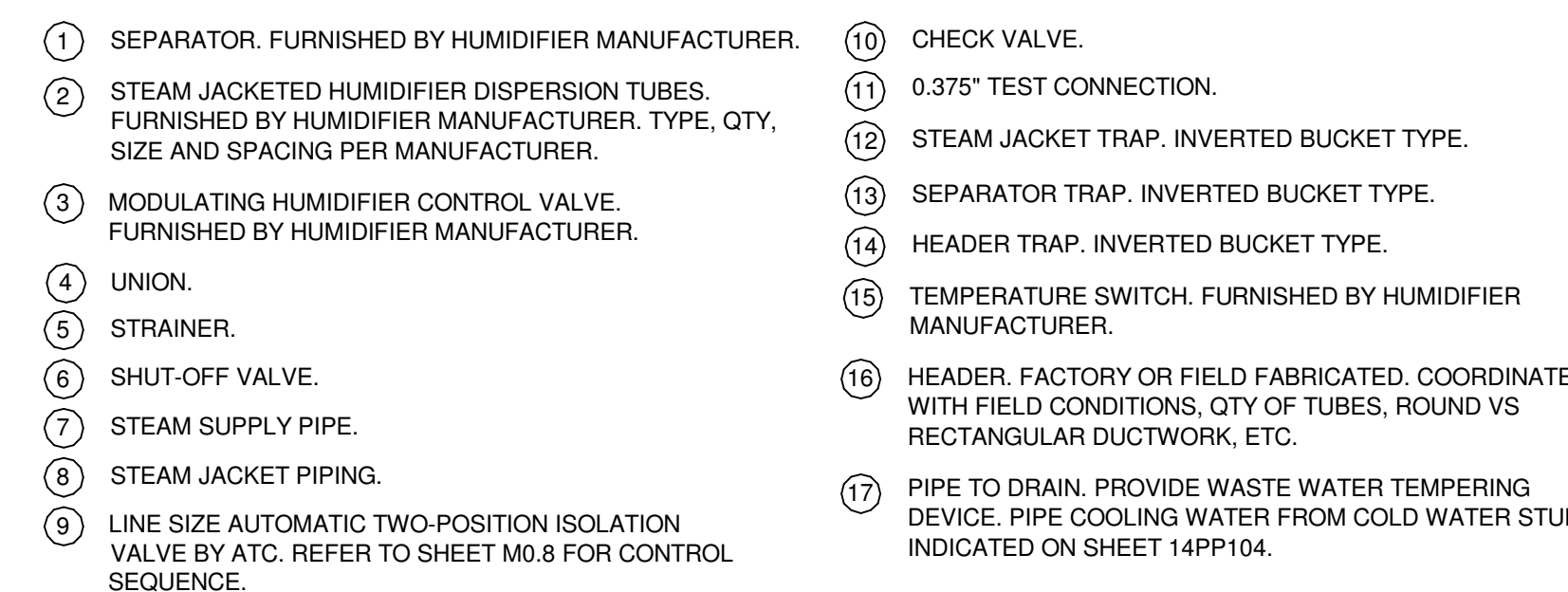
- ① FRESH AIR PLENUM
- ② AIR BLENDER SECTION
- ③ FILTER SECTION
- ④ IPB COIL SECTION
- ⑤ ACCESS SECTION
- ⑥ HEAT-WHEEL SECTION
- ⑦ SUPPLY FAN SECTION
- ⑧ UNIT SILENCER SECTION
- ⑨ PRE-COOLING COIL SECTION WITH UV LIGHTS
- ⑩ COOLING COIL SECTION WITH UV LIGHTS
PROVIDE HEAT TRACING ON PIPING ABOVE ROOF LINE
- ⑪ HUMIDIFIER SECTION
- ⑫ DISCHARGE AIR PLENUM SECTION
- ⑬ RETURN AIR PLENUM SECTION
- ⑭ EXHAUST FAN SECTION
- ⑮ VESTIBULE SECTION
- ⑯ RELIEF AIR AUTO DAMPERS/HOOD
- ⑰ RETURN AIR AUTO DAMPERS
- ⑱ OUTSIDE AIR AUTO DAMPERS/HOOD WITH INTEGRAL
AIRFLOW MEASURING STATION
- ⑲ SERVICE VESTIBULE LIGHT
- ⑳ AHU MODULE LIGHT
- ㉑ DRAIN CONNECTION
- ㉒ SAFETY GRATE OVER UNIT OPENING
- ㉓ DESICCANT WHEEL BYPASS DAMPERS
- ㉔ VARIABLE FREQUENCY DRIVE (1 VFD PER 2 MOTORS)
- ㉕ FAN MOTOR DISCONNECT (1 PER MOTOR)
- ㉖ DDC CONTROL PANEL
- ㉗ 400V POWER PANEL (FACTORY PROVIDED)



1. WHEN COIL IS INCLUDED IN CASING MOUNTED ON VIBRATION ISOLATORS THE FIRST 2 HANGERS FOR EACH PIPE SHALL BE SPRING AND NEOPRENE TYPE. TYPE "H" FOR 4" DIA. PIPE & SMALLER. TYPE "H-P" FOR 4" DIA. PIPE & LARGER.
2. PIPING SHALL BE INSTALLED IN SUCH MANNER THAT IT WILL NOT BLOCK THE SWING OR USE OF ACCESS DOORS OR PANELS; NEITHER SHALL IT BLOCK THE SERVICING OF FILTERS, VALVES, OR EQUIPMENT.
3. ALL COILS ASSOCIATED WITH THE SURGICAL SUITE AIR DISTRIBUTION SYSTEM SHALL UTILIZE COPPER FINS AND TUBES.

NOTES

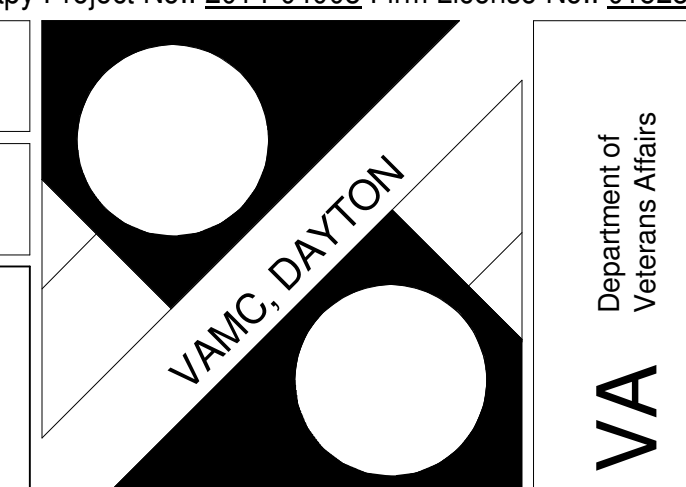
1. WHEN COIL IS INCLUDED IN CASING MOUNTED ON VIBRATION ISOLATOR UNITS, THE RUNOUT PIPING FOR CONNECTIONS TO COIL SHALL BE INSTALLED WITH SWING JOINTS TO ALLOW FOR THE VIBRATION.
2. PIPING SHALL BE INSTALLED IN SUCH MANNER THAT IT WILL NOT BLOCK THE SWING SURROUND ACCESS DOORS OR PANELS; THERE SHALL IT BLOCK THE SERVICE OF FILTERS, VALVES, OR EQUIPMENT.
3. TRAP EACH COIL SEPARATELY WHEN INSTALLED IN A BANK OF TWO OR MORE HIGH. ALSO PROVIDE SEPARATE VACUUM BREAKER FOR EACH COIL.
4. TWO TRAP ASSEMBLIES IN PARALLEL ARE SHOWN. IT IS THE REQUIREMENT THAT THE TRAP LOAD IS 5,000 LBS/Hr [2400 KG/Hr] OR GREATER.
5. WHERE THE DISTANCE FROM THE INTAKE OF TRAP TO BOTTOM OF COIL IS RESTRICTED, FLOAT AND THERMOSTATIC TRAP CAPACITIES SHALL BE SELECTED TO AT A LOW PRESSURE. THE MINIMUM DISTANCE BETWEEN BOTTOM OF COIL AND TRAP INLET.
6. PROVIDE FULL SIZE BYPASS WITH GLOBE VALVE.
7. ALL COILS ASSOCIATED WITH THE SURGICAL SUITE AIR DISTRIBUTION SYSTEM SHALL UTILIZE COPPER PIPES AND



NOTES:
1. UNIT MOUNTED THERMOSTAT SHALL MAINTAIN SPACE TEMPERATURE
BY CYCLING THE FAN. THE CONTROL VALVE SHALL BE INTERLOCK WITH THE FAN

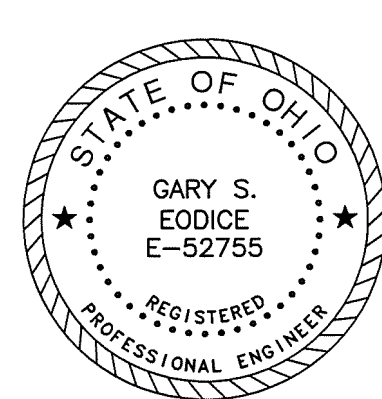
Project Title RENOVATE OPERATING ROOMS B310			Date 05/29/15
			Project No. 552-15-101
Building Number 310	Checked DLE	Drawn PCW	Drawing No. MO
Location 4100 WEST THIRD STREET DAYTON, OH 45428			

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Revised By:

Drawing Title
DETAILS

Approved: Project Manager
CHRIS MOORHEAD

Approved: Service Chief
PHILIP KIRK

Project Title	RENOVATE OPERATING ROOMS B310
---------------	----------------------------------

Building Number 310	Checked DLE	Drawn PC
Location 4100 WEST THIRD STREET DAYTON, OH 45428		

Date	05/29/15
------	----------

Project No.
552-15-101

Drawing No.

M0.5

NOTES:
1 REFERS TO OCCUPANCY STATUS FOR CONTROL OF AIR TERMINAL UNITS. SEE AIR
TERMINAL UNIT SCHEDULE ON SHEET M0.7.

DUCT PRESSURE CLASS & LEAKAGE TABLE					
SYSTEM	DUCT INVOLVED	POSITIVE (P) OR NEGATIVE (N) PRESSURE	SMACNA CONST. CLASS W.G.	SMACNA SEAL CLASS	SMACNA LEAKAGE CLASS RECTANGULAR DUCT ROUND DUCT
ALL SYSTEMS	ALL DUCTWORK EXCEPT AS LISTED BELOW.	P/N	± 2"	A	6 3
	SUPPLY AIR DUCTS FROM OUTLET OF AH-UNITS TO INLET OF AIR TERMINAL UNITS.	P	8"6" (NOTE 1)	A	6 3
	SUPPLY AIR DUCTS FROM OUTLET OF AIR TERMINAL UNITS TO SUPPLY AIR DEVICES	P	2"	A	6 3
	RETURN AIR DUCTS FROM CEILING REGISTERS TO INLET OF AH-UNITS	N	8"4" (NOTE 2)	A	6 3
	OUTSIDE AIR AND EXHAUST DUCTS	N	2"	A	6 3

WATER FILTER SCHEDULE				
UNIT NO.	SYSTEM	FILTER GPM	AUTOMATIC VALVE PRESSURE RANGE	VALVE SIZE
310-CWF1	CHILLED WATER	35	4-57 PSI	1.25" VALVE

AIR FLOW MEASURING DEVICE SCHEDULE								
UNIT NO.	LOCATION	DUSTY DAMPER SIZE WxH	FAN SIZE & TYPE	CFM		S.P. DROP	SYSTEM	NOTES
				MIN.	MAX.			
310-AFM4A1 THRU 6	310-AHU4 SUPPLY FAN INLET	N/A	(6) 18" PLENUM	5,000	25,000	0.02"	310-AHU4	1
310-AFM4B1 THRU 6	310-AHU4 RETURN FAN INLET	N/A	(6) 18" PLENUM	0	19,600	0.02"	310-AHU4	1
310-AFM4C	310-AHU4 OUTSIDE AIR DAMPER	52 X 72	N/A	5,000	25,000	0.10"	310-AHU4	2

DX SPLIT SYSTEM FAN COIL UNITS SCHEDULE												
UNIT NO.	TYPE	FAN CFM	OA CFM	COOLING CAPACITY MBH (NOTE 1)	HEATING CAPACITY MBH (NOTE 2)	INDOOR UNIT ELECTRIC			APPROXIMATE SIZE			NOTES
						E.S.P.	MCA	VOLT-PHASE	W	D	H	
310-VRF1	HORIZONTAL WALL MTD.	900	0	34.2	37.0	FREE DISCH	1	208-1	67"	10"	14"	1,2,3
310-VRF2	HORIZONTAL WALL MTD.	300	0	9.0	10.9	FREE DISCH	1	208-1	31"	8"	12"	1,2,4
310-VRF3	HORIZONTAL WALL MTD.	375	0	15.0	18.0	FREE DISCH	1	208-1	31"	8"	12"	1,2,4

AIR HANDLING UNIT SCHEDULE										
UNIT NO.	LOCATION	AREA SERVED	SUPPLY FAN NO.	CFM		EXTERNAL S.P. (1) IN. SUP./RET.	SPECIFIED INTERNAL LOSSES (2) IN.	UNSPECIFIED INTERNAL LOSSES (3) IN.	FAN TOTAL S.P. (4) IN. SUP./RET.	TYPE OF SYSTEM (5)
				SUPPLY	O.A.					
310-AHU4	FOURTH FLOOR MECH. PENTHOUSE	OPERATING ROOM SUITE	310-SF4	25,000	5,390	5.1/3.8	5.9	4.2	12.0/7.0	VAV

CHILLED WATER COOLING COIL SCHEDULE																	
COIL NO.	SYSTEM	CFM	MAX. FACE V.F. FPM	MAX. S. LOSS	ENT. AIR °F		LVG. AIR °F		FLUID	CIRCULATING FLUID				AUTO VALVE TYPE	AUTO VALVE CV	MINIMUM MBH TOTAL (1)	MINIMUM MBH SENS. (1)
					DB	WB	DB	WB		TEMP. IN °F	TEMP. OUT °F	LOSS FT.	WAY				
310-CC4A	310-AHU4	25,000	450	1.2	113.2	79.1	51.0	50.9	CHILLED WATER COOLED	344	42	56	14.0	2-WAY	137.2	2,418	1,724
310-CC4B	310-AHU4	25,000	450	0.7	79.3	55.8	49.0	42.3	CHILLED WATER COOLED	118	42	56	13.0	3-WAY	48.8	826	826

STEAM HEATING COIL SCHEDULE												
COIL NO.	TYPE	SYSTEM	CFM	MAX. FACE VEL FPM	MAX. S.P. LOSS IN	TEMP. AIR °F		MIN. BTUH	STEAM PSIG		CONTROL VALVE LBS/HR	TRAP LBS/HR
						ENT.	LVG.		ENT. CONTROL VALVE	ENT. COIL		
310-PH3	IFB	310-AHU3	25,000	500	0.3	52.0	125.1	1,962,519	30	15	2,088	4,176

DESICCANT WHEEL SCHEDULE																
WHEEL NO.	SYSTEM	APPLICATION	CFM	MAX FACE VEL FPM	APPROX. SIZE (3) DIA/DEPTH	MAX. S.P. LOSS	PROCESS				MBH SHS	REGEN				REMARKS
							ENT. AIR °F		LVG. AIR °F			ENT. AIR °F		LVG. AIR °F		
							°F	°F	°F	°F		°F	°F	°F	°F	
310 DW4	310-AH4	HUMIDITY CONTROL	25,000	800	120"x 6"	2.26	50.0	49.2	79.2	54.2	790	51.8	42.2	97.8	67.5	WATER CONDITION SUMMER CONDITION
							51.0	50.9	79.3	55.8	764	73.4	63.0	111.7	78.8	

STEAM HUMIDIFIER SCHEDULE									
HUMID. NO.	SYSTEM	CFM	ABSORP. DISTANCE (MAX.)	LVG. AIR °F		STEAM PSIG		ON-OFF & CONTROL VALVE LBS/HR	TRAP LBS/HR (1)
				Db	%RH	ENT. ON-OFF VALVE	ENT. CONTROL VALVE		
310-SH4	310-AHU4	25,000	18"	44.3	54	30	24	447	23

PACKAGED AIR COOLED CHILLER UNIT SCHEDULE						
UNIT NO.	EQUIPMENT	LOCATION	PERFORMANCE MINIMUM CAPACITY	ELECTRIC		REMARKS
				MCA	VOLT- PHASE	
310-ACC#1 AND 310-ACC#2 (EACH)	COMPRESSOR	ROOF	172.6 TONS FULL LOAD: 9.4 EER IPLV 14.6 EER	394	460-3	COMPRESSOR SHALL BE CAPABLE OF CAPACITY REDUCTION TO 20%
	CHILLER		345 GPM 54° F WATER IN 42° F WATER OUT	—	—	10 FT. MAX. WATER P.D.
	AIR COOLED CONDENSER		—	—	SHALL PERFORM SATISFACTORILY AT MIN. COMPRESSOR CAPACITY WITH 40° F AMBIENT TEMP.	

STEAM UNIT HEATER SCHEDULE																
UNIT NO.	LOCATION	TYPE UNIT	CFM	MIN. MBH	ENT AIR	STEAM PSIG		CTRL. SIZE LBS/HR	TRAP LBS/HR	RUNOUT S/R	APPROX. CABINET DIMS.			MOTOR HP (W)	VOLT. PHASE	NOTES
						ENT. UNIT	ENT. UNIT				LENGTH	WIDTH	HEIGHT			
310-PUH1	SEE PLANS	HORIZONTAL PROPELLER	450	28.3	60	30	15	29.9	60	.75"/0.5"	15"	10"	18"	(16)	115-1	1

FAN NO.	LOCATION	FAN CFM	FAN S.P.	FAN TYPE	DESCRIPTION	WHEEL		MAX. RPM	DRIVE	MOTOR				SEE NOTE
						TYPE	MIN. DIA.			MAX. BHP	NOM. HP (2)	VOLT. PHASE	VFD	
310-SF4	310-AH4	4,167	12"	CF	DIRECT DRIVE HORIZONTAL PLENUM	AFW	18"	3,427	DIRECT	11.1	15	460-3	YES	1,2,3,4,6
310-RF4	310-AH4	3,267	7"	CF	DIRECT DRIVE HORIZONTAL PLENUM	AFW	18"	3,267	DIRECT	5.0	10	460-3	YES	1,2,3,4,6
310-EF10	MECHANICAL MEZZANINE	470	0.625"	ICF	DIRECT DRIVE INLINE CENTRIFUGAL	BIW	9"	1,725	DIRECT	0.14	0.25	115-1	NO	1,2,5
310-EF32	MECHANICAL MEZZANINE	2,230	0.8"	ICF	DIRECT DRIVE INLINE CENTRIFUGAL	BIW	14"	1,509	DIRECT	0.66	1	208-1	NO	1,2,5

AIR FILTER SCHEDULE									
FILTER NO.	CFM	SYSTEM	MERV RATING	EFFICIENCY	MAX. S.P. DROP (in)		HOUSING TYPE	MAX. FACE VELOCITY	SEE NOTE
					INITIAL	FINAL			
310-PF1	25,000	310-AHU4	8	35%	0.33"	0.66"	SIDE ACCESS HOUSING	500	1,2
310-PF2	25,000	310-AHU4	11	65%	0.27"	0.54"	SIDE ACCESS HOUSING	500	1,2
310-AF3	25,000	310-AHU4	14	95%	0.37"	0.74"	SIDE ACCESS HOUSING	500	1,2

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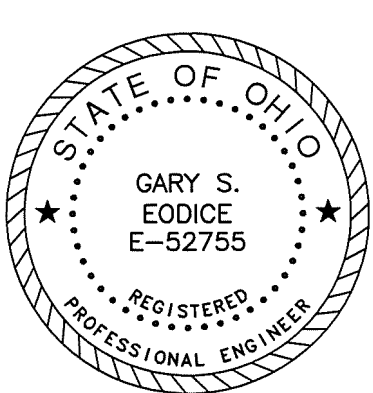
HVAC PUMP SCHEDULE														
PUMP NO.	LOCATION	SYSTEM	CIRCULATING FLUID					% EFF.	TYPE	MOTOR			VFD	NOTES
			FLUID	GPM	PUMP HEAD FT. FLUID	TEMP °F	SP. GR.			NOM. HP	VOLT.-PHASE	RPM		
310-HWP1	2ND FLOOR MECH. ROOM	BUILDING HEATING HOT WATER	CLEAR WATER	285	75	160	1	66	BASE MOUNTED END SUCTION	10	460-3	1750	YES	1.2
310-HWP2	2ND FLOOR MECH. ROOM	BUILDING HEATING HOT WATER	CLEAR WATER	285	75	160	1	66	BASE MOUNTED END SUCTION	10	460-3	1750	YES	1.2
310-CWP1	2ND FLOOR MECH. ROOM	BUILDING COOLING CHILLED WATER	CLEAR WATER	360	95	45	1	76.5	BASE MOUNTED END SUCTION	15	460-3	1750	NO	1
310-CWP2	2ND FLOOR MECH. ROOM	BUILDING COOLING CHILLED WATER	CLEAR WATER	360	95	45	1	76.5	BASE MOUNTED END SUCTION	15	460-3	1750	NO	1
310-CWP3	2ND FLOOR MECH. ROOM	BUILDING COOLING CHILLED WATER	CLEAR WATER	360	95	45	1	76.5	BASE MOUNTED END SUCTION	15	460-3	1750	NO	1

CONVERTER SCHEDULE													
CONVERTER NO.	LOCATION	CIRCULATING FLUID					STEAM PSIG		MINIMUM HEATING SURFACE	HEATING CAPACITY MBH	CONTROL VALVE LBS/HR	TRAP LBS/HR	NOTES
		FLUID	GPM	TEMP INT	TEMP OUT	MAX. LOSS FT. FLUID	ENTERING CONTROL VALVE	EXITING CONTROL VALVE					
310-HWC1	SECOND FLOOR MECH. ROOM	WATER	270	130	160	3 FT.		15	71.8	3,962	4,111	6,222	1,2,3
310-HWC2	SECOND FLOOR MECH. ROOM	WATER	270	130	160	3 FT.		15	71.8	3,962	4,111	6,222	1,2,3

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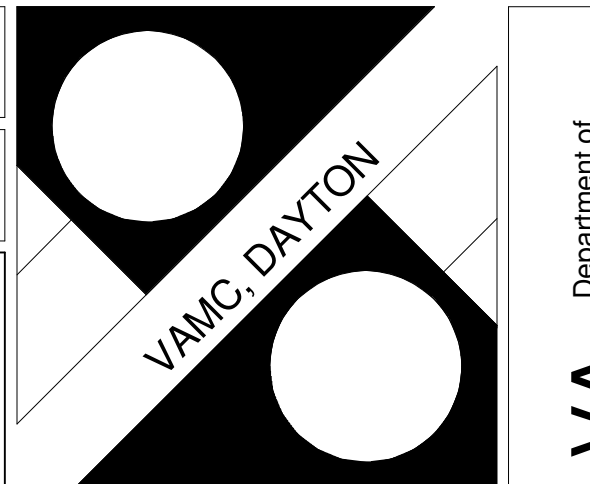


Revised By:

Drawing Title SCHEDULES
Approved: Project Manager CHRIS MOORHEAD
Approved: Service Chief PHILIP KIRK

Project Title		
RENOVATE OPERATING ROOMS B310		
Building Number 310	Checked DLE	Drawn PCW
Location 4100 WEST THIRD STREET DAYTON, OH 45428		

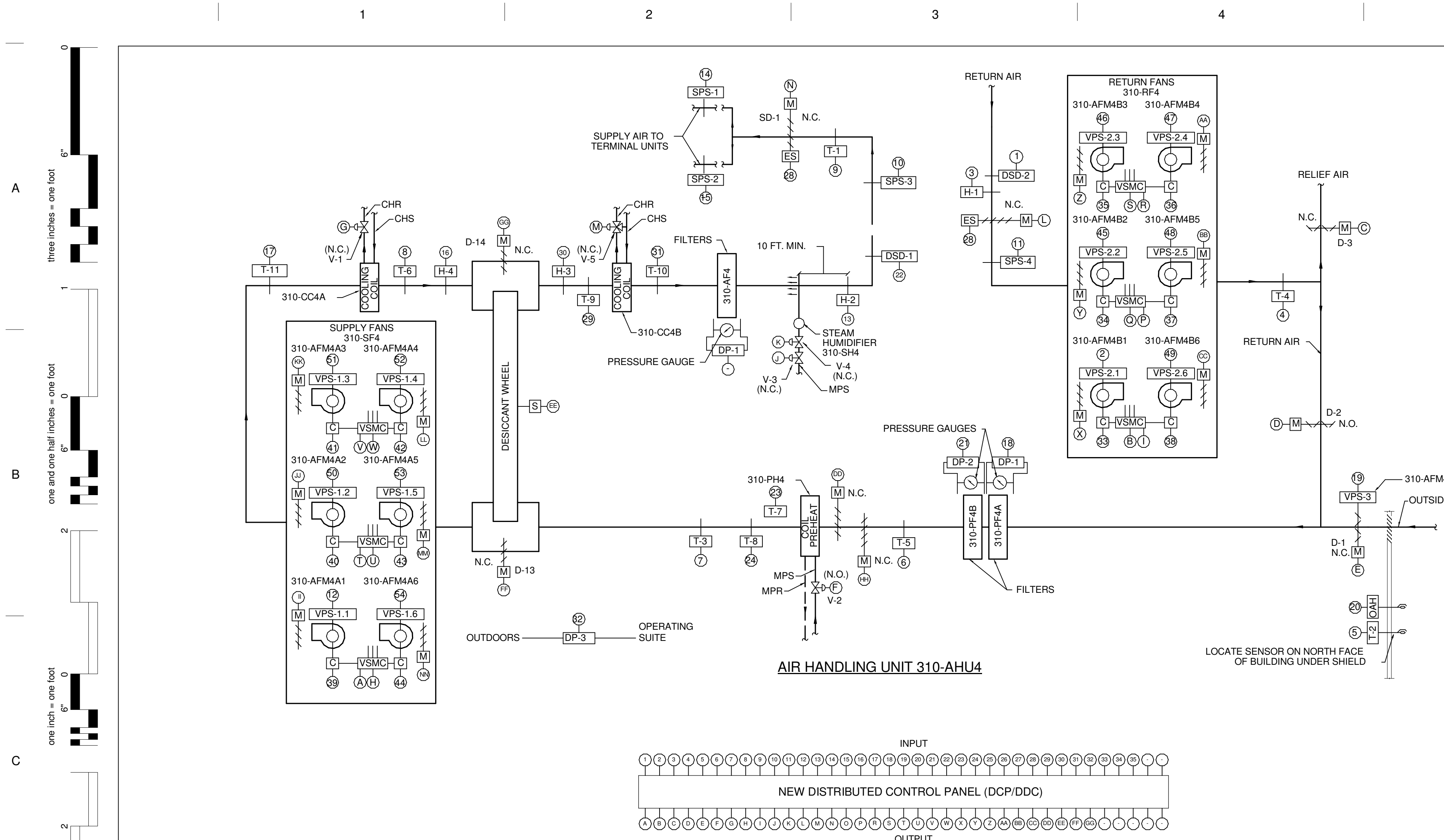
Date 05/29/15
Project No. 552-15-101
Drawing No. M0.6



AIR FLOW SYSTEM CONTROLLER / AIR TERMINAL UNIT SCHEDULE																						
UNIT NO.	CFM			UNOCCUPIED (7)	APPROX. INLET SIZE (IN.)	DUCT RUNOUT SIZE TO UNIT (IN.) (1)	UNIT MAX. SP AT MAX. CFM (2)	SOUND REQUIREMENTS			HOT WATER HEATING COIL										CONTROL TYPE (6)	NOTES
	MAX.	WINTER MIN.	SUMMER MIN.					SP ACROSS UNIT AT MAXIMUM ROOM NC	MAX. ROOM NC (3) (4)	ATTN TYPE	ENT. AIR TEMP. F°	ENT. WATER TEMP. F°	GPM	MAX. WATER P.D. FT. HD.	PIPE RUNOUT SIZE TO COIL	AUTO VALVE Cv	AUTO VALVE TYPE	MIN. MBH				
3-01	785	785	785	-	8	10	0.35"	3"	35	-	55	160	2.1	2	0.75"	1.0	3-WAY	30	C.V.R.	9		
3-02	990	990	990	-	14	16	0.35"	3"	35	-	55	160	1.9	2	0.75"	0.9	3-WAY	28	C.V.R.	9		
3-03 (PHASE 1)	880	0	0	-	6	8	0.35"	3"	35	-	-	-	-	-	-	-	-	-	V.V.	9.13		
3-03 (PHASE 2)	600	0	0	-	6	8	0.35"	3"	35	-	-	-	-	-	-	-	-	-	V.V.	9.13		
3-04	295	295	295	50	7	9	0.35"	3"	35	-	55	160	0.8	2	0.75"	0.4	2-WAY	11	C.V.R.	9		
3-05	410	245	105	65	7	9	0.35"	3"	35	-	55	160	0.8	2	0.75"	0.4	2-WAY	11	V.V.R.	9		
3-06	340	160	95	50	6	8	0.35"	3"	35	-	55	160	0.5	2	0.75"	0.2	3-WAY	7	V.V.R.	9		
3-07	330	135	80	50	6	8	0.35"	3"	35	-	55	160	0.5	2	0.75"	0.2	3-WAY	6	V.V.R.	9		
3-08	585	245	95	90	6	8	0.35"	3"	35	-	55	160	0.8	2	0.75"	0.4	3-WAY	11	V.V.R.	9		
3-09	695	280	150	105	12	14	0.35"	3"	35	-	55	160	0.9	2	0.75"	0.4	2-WAY	12	V.V.R.	9		
3-10	410	255	255	65	7	9	0.35"	3"	35	-	55	160	0.6	2	0.75"	0.3	3-WAY	8	V.V.R.	9		
3-11	1060	425	270	160	14	16	0.35"	3"	35	-	55	160	1.3	2	0.75"	0.6	3-WAY	19	V.V.R.	9		
3-12	245	105	40	-	6	8	0.35"	3"	35	-	55	160	0.5	2	0.75"	0.2	3-WAY	3	V.V.R.	9		
3-13	160	80	25	-	6	8	0.35"	3"	35	-	55	160	0.5	2	0.75"	0.2	3-WAY	2	V.V.R.	9		
3-14	380	230	80	60	7	9	0.35"	3"	35	-	55	160	0.7	2	0.75"	0.3	3-WAY	10	V.V.R.	9		
3-15	865	700	130	130	9	11	0.35"	3"	35	-	55	160	1.9	2	0.75"	0.9	3-WAY	27	V.V.R.	9		
3-16	230	230	40	40	6	8	0.35"	3"	35	-	55	160	0.7	2	0.75"	0.3	2-WAY	10	V.V.R.	9		
3-17	510	510	510	80	8	10	0.35"	3"	35	-	55	160	1.4	2	0.75"	0.7	2-WAY	20	C.V.R.	9		
3-18	820	410	280	125	12	14	0.35"	3"	35	-	55	160	1.3	2	0.75"	0.6	2-WAY	18	V.V.R.	9		
3-19	680	680	680	-	9	11	0.35"	3"	35	-	55	160	1.5	2	0.75"	0.7	3-WAY	22	C.V.R.	9		
3-20	145	90	90	25	6	8	0.35"	3"	35	-	55	160	0.5	2	0.75"	0.2	2-WAY	4	V.V.R.	9		
4-01A	1050	1050	1050	-	12	14	1.5"	3"	35	-	49	160	3.6	2	0.75"	1.7	3-WAY	53	C.V.R.	8,11,12		
4-01B	895	895	895	-	12	14	1.25"	3"	35	SA-3	-	-	-	-	-	-	-	-	C.V.E.	8		
4-02A	1050	1050	1050	-	12	14	1.5"	3"	35	-	49	160	3.6	2	0.75"	1.7	3-WAY	53	C.V.R.	8,11,12		
4-02B	895	895	895	-	12	14	1.25"	3"	35	SA-3	-	-	-	-	-	-	-	-	C.V.E.	8		
4-04A	410	320	320	-	8	8	1.5"	3"	35	-	49	160	0.8	2	0.75"	0.4	3-WAY	11	C.V.R.	8,11		
4-05A	2100	2100	2100	1050	14	18	1.5"	3"	35	-	49	160	4.4	2	1"	2.1	3-WAY	66	C.V.R.	8,11		
4-05B	1780	1780	1780	-	14	16	1.25"	3"	35	SA-4	-	-	-	-	-	-	-	-	C.V.E.	8		
4-06A	2100	2100	2100	1050	14	18	1.5"	3"	35	-	49	160	4.4	2	1"	2.1	2-WAY	66	C.V.R.	8,11		
4-06B	1780	1780	1780	-	14	16	1.25"	3"	35	SA-4	-	-	-	-	-	-	-	-	C.V.E.	8		
4-07A	155	155	155	80	8	8	1.5"	3"	35	-	49	160	0.5	2	0.75"	0.2	2-WAY	5	C.V.R.	8,11		
4-07B	155	155	155	80	8	8	1.25"	3"	35	SA-1	-	-	-	-	-	-	-	-	C.V.E.	8		
4-08A	2100	2100	2100	1050	14	18	1.5"	3"	35	-	49	160	4.4	2	1"	2.1	2-WAY	66	C.V.R.	8,11		
4-08B	1780	1780	1780	890	14	16	1.25"	3"	35	SA-4	-	-	-	-	-	-	-	-	C.V.E.	8		
4-09A	365	365	365	185	8	10	1.5"	3"	35	-	49	160	0.9	2	0.75"	0.4	3-WAY	12	C.V.R.	8,11		
4-09B	320	320	320	160	8	10	1.25"	3"	35	SA-1	-	-	-	-	-	-	-	-	C.V.E.	8		
4-10A	2100	2100	2100	1050	14	18	1.5"	3"	35	-	49	160	4.4	2	1"	2.1	2-WAY	66	V.V.R.	8,11		
4-10B	1780	1780	1780	890	14	16	1.25"	3"	35	SA-4	-	-	-	-	-	-	-	-	V.V.E.	8		
4-11A	2100	2100	2100	1050	14	18	1.5"	3"	35	-	49	160	4.4	2	1"	2.1	2-WAY	66	C.V.R.	8,11		
4-11B	1780	1780	1780	890	14	16	1.25"	3"	35	SA-4	-	-	-	-	-	-	-	-	C.V.E.	8		
4-12A	2100	2100	2100	1050	14	18	1.5"	3"	35	-	49	160	4.4	2	1"	2.1	2-WAY	66	C.V.R.	8,11		
4-12B	1780	1780	1780	890	14	16	1.25"	3"	35	SA-4	-	-	-	-	-	-	-	-	C.V.E.	8		
4-13A	495	495	495	-	8	10	1.5"	3"	35	-	49	160	1.1	2	0.75"	0.5	2-WAY	16	C.V.R.	8,11		
4-14A	185	170	170	-	8	8	1.5"	3"	35	SA-1	49	160	0.5	2	0.75"	0.2	2-WAY	6	C.V.R.	8,11		
4-15A	565	565	565	-	10	12	1.5"	3"	35	-	49	160	1.3	2	0.75"	0.6	2-WAY	19	C.V.R.	8,11		
4-15B	565	565	565	-	10	12	1.25"	3"	35	SA-2	-	-	-	-	-	-	-	-	C.V.E.	8		
4-16A	1100	1100	1100	550	14	16	1.5"	3"	35	-	49	160	2.5	2	0.75"	1.2	2-WAY	37	C.V.R.	8,11		
4-16B	830	830	830	415	12	14	1.25"	3"	35	SA-3	-	-	-	-	-	-	-	-	C.V.E.	8		
4-17A	1680	1680	1680	840	14	16	1.5"	3"	35	-	49	160	3.7	2	1"	1.7	2-WAY	55	C.V.R.	8,11		
4-17B	1260	1260	1260	630	12	14	1.25"	3"	35	SA-3	-	-	-	-	-	-	-	-	C.V.E.	8		
4-18A	1550	1550	1550	775	12	14	1.5"	3"	35	-	49	160	3.5	2	0.75"	1.7	2-WAY	52	C.V.R.	8,11		
4-18B (PHASE 1)	760	760	760	380	12	14	1.25"	3"	35	SA-3	-	-	-	-	-	-	-	-	C.V.E.	8,13		
4-18B (PHASE 2)	1990	1990	1990	995	12	14	1.25"	3"	35	SA-3	-	-	-	-	-	-	-	-	C.V.E.	8,13		
4-19A	945	945	945	460	10	12	1.5"	3"	35	-	49	160	2.1	2	0.75"	1.0	2-WAY	31	C.V.R.	8,11		
4-19B	1640	1640	1640	820	10	12	1.25"	3"	35	SA-2	-	-	-	-	-	-	-	-	C.V.E.	8		
4-20A	1100	1100	1100	565	12	14	1.5"	3"	35	-	49	160	2.6	2	0.75"	1.2	3-WAY	38	C.V.R.	8,11		
4-20B	1720	1720	1720	860	12	14	1.25"	3"	35	SA-3	-	-	-	-	-	-	-	-	C.V.E.	8		

- NOTES:
1. PROVIDE DUCT TRANSITION AT UNIT INLET WHERE UNIT INLET SIZE AND DUCT RUNOUT SIZE ARE DIFFERENT.
 2. THE UNIT MAXIMUM SP IS THE PRESSURE DIFFERENCE BETWEEN THE UNIT INLET AND DISCHARGE INCLUDING REHEAT COIL AND SOUND ATTENUATOR. IT IS ALSO THE MINIMUM PRESSURE REQUIRED AT THE UNIT INLET TO OBTAIN THE RATED CFM.
 3. PROVIDE MANUFACTURER SPECIFIC SOUND NEUTRALIZER OR HOSPITAL GRADE SOUND ATTENUATOR TO CONFORM TO THE MAXIMUM NC35 REQUIREMENT.
 4. UNIT NOISE LEVEL SELECTION SHALL NOT EXCEED A ROOM NC OF 35 FROM BOTH AIRBORNE AND RADIATED NOISE, BASED ON A 10 DB ROOM ABSORPTION COEFFICIENT (REFERENCE 10 [-12] WATTS) WITH 3" S.P. DIFFERENTIAL ACROSS UNIT AT MAXIMUM CFM SETTING.
 5. HEATING COIL CAPACITY BASED ON TERMINAL UNIT MAXIMUM CFM.
 6. CONTROL TYPES: V.V.R.: VARIABLE VOLUME REHEAT; C.V.R.: CONSTANT VOLUME REHEAT; C.V.E.: CONSTANT VOLUME EXHAUST; V.V.E.: VARIABLE VOLUME EXHAUST; V.V.: VARIABLE VOLUME; C.V.: CONSTANT VOLUME.
 7. AIR TERMINAL UNIT WITH LISTED CFM SHALL BE CONTROLLED THRU ECO WITH PROGRAMMABLE OCCUPIED/UNOCCUPIED TIMES AND/OR BE CONNECTED TO OCCUPANCY SENSOR(S). PROVIDE OCCUPANCY SENSORS AND ASSOCIATED WIRING WHERE NOT PROVIDED BY DIV. 26. REFER TO DIV. 26 SPECIFICATIONS FOR PRODUCT REQUIREMENTS. REFER TO "HVAC DESIGN DATA" SCHEDULE ON SHEET M0.6 FOR UNOCCUPIED TEMPERATURES.
 8. AIRFLOW CONTROL VALVE (AFCV) LABORATORY TYPE AIR FLOW SYSTEM CONTROLLER. REFER TO SPECIFICATION SECTION 23 36 00.
 9. AIR TERMINAL UNIT. REFER TO SPECIFICATION SECTION 23 36 00.
 10. HEATING COIL CAPACITY BASED ON WINTER MINIMUM CFM.
 11. REMOTE DUCT MOUNTED HEATING COIL. REFER TO SPECIFICATION SECTION 23 82 16.
 12. HOT WATER REHEAT COIL CAPABLE OF MAINTAINING 86°F ROOM TEMPERATURE SETPOINT ON DEMAND.
 13. UNIT BALANCED IN MULTIPLE PHASES TO MAINTAIN ROOM PRESSURE OFFSETS. COORDINATE ALL REQUIREMENTS.

AIR DISTRIBUTION DEVICE SCHEDULE										
SYMBOL	DESCRIPTION	TYPE MOUNTING		MATERIAL		S.S.	FINISH		ACCESSORIES	NOTES
		LAY-IN	SURFACE	STEEL	ALUM.		E.C.L.	W.B.E.		
CD1	STANDARD SQ. PLAQUE CEILING DIFFUSER ROUND NECK	*			*			*		
CD2	STANDARD SQ. PLAQUE CEILING DIFFUSER ROUND NECK		*		*			*		
CD3	VERTICAL LAMINAR FLOW CEILING DIFFUSER		*		*			*	FACE OPERATED DAMPER	1,3
CD4	VERTICAL LAMINAR FLOW CEILING DIFFUSER		*		*			*	FACE OPERATED DAMPER	1,4
CD5	VERTICAL LAMINAR FLOW CEILING DIFFUSER		*		*			*	FACE OPERATED DAMPER	1,5
CD6	VERTICAL LAMINAR FLOW CEILING DIFFUSER		*		*			*	FACE OPERATED DAMPER	1,6
CD7	STANDARD SQ. PLAQUE CEILING DIFFUSER ROUND NECK		*		*			*	FACE OPERATED DAMPER	
CD8	VERTICAL AIR CURTAIN CEILING DIFFUSER		*		*			*	FACE OPERATED DAMPER	1,2
CG1	EGGCRATE CEILING GRILLE	*			*			*		
CG2	EGGCRATE CEILING GRILLE		*		*			*		
CR1	EGGCRATE CEILING REGISTER	*			*			*	OPPOSED BLADE DAMPER	
CR2	EGGCRATE CEILING REGISTER		*		*			*	OPPOSED BLADE DAMPER	
TR1	ADJUSTABLE BLADE SUPPLY REGISTER		*	*				*	OPPOSED BLADE DAMPER	
TR2	FIXED BLADE RETURN/ EXHAUST REGISTER		*	*		*		*	OPPOSED BLADE DAMPER	7



310-AHU4 SERVICE VESTIBULE CONTROL PANEL POINTS LIST						
POINT ID	DEVICE TAG	DEVICE DESCRIPTION	POINT TYPE			
			DI	DO	AO	
1	DSD-2	RETURN AIR DUCT SMOKE DETECTOR (FIRE SYSTEM SHUTDOWN)	X			
2	VPS-2.1	RETURN AIR FLOW MEASURING STATION		X		
3	H-1	RETURN AIR HUMIDITY SENSOR			X	
4	T-4	RETURN AIR TEMPERATURE SENSOR		X		
5	T-2	OUTSIDE AIR TEMPERATURE SENSOR (GLOBAL POINT)		X		
6	T-5	MIXED AIR TEMPERATURE SENSOR		X		
7	T-3	PREHEAT COIL LEAVING AIR TEMPERATURE SENSOR		X		
8	T-6	PRE-COOLING COIL LEAVING AIR TEMPERATURE SENSOR		X		
9	T-1	SUPPLY AIR TEMPERATURE SENSOR			X	
10	SPS-3	SUPPLY DUCT HIGH STATIC SAFETY	X			
11	SPS-4	RETURN DUCT HIGH STATIC SAFETY (NEGATIVE)	X			
12	VPS-1.1	SUPPLY AIR FLOW MEASURING STATION		X		
13	H-2	SUPPLY AIR HUMIDITY SENSOR (HIGH LIMIT)		X		
14	SPS-1	SUPPLY AIR STATIC PRESSURE SENSOR			X	
15	SPS-2	SUPPLY AIR STATIC PRESSURE SENSOR		X		
16	H-4	PRE-COOLING COIL LEAVING AIR HUMIDITY SENSOR		X		
17	T-11	COOLING COIL ENTERING AIR TEMPERATURE SENSOR		X		
18	DP-1	PRE FILTER PRESSURE DROP		X		
19	VPS-3	OUTSIDE AIR FLOW MEASURING STATION		X		
20	OAH	OUTSIDE AIR HUMIDITY (GLOBAL POINT)		X		
21	DP-2	AFTER FILTER PRESSURE DROP		X		
22	DSD-1	SUPPLY AIR DUCT SMOKE DETECTOR (FIRE SYSTEM SHUTDOWN)	X			
23	T-7	PREHEAT COIL 310-P1H4 LEAVING WATER TEMPERATURE SENSOR		X		
24	T-8	FREEZE/STAT	X			
25	C	EXHAUST FAN 310-EF4 STATUS CURRENT SWITCH	X			
26	SPS-5	EXHAUST FAN 310-EF4 EXHAUST DUCT HIGH STATIC SAFETY	X			
27	ES	SUPPLY ISOLATION SMOKE DAMPER END SWITCH	X			
28	ES	RETURN ISOLATION SMOKE DAMPER END SWITCH	X			
29	T-9	DESICCANT WHEEL LEAVING AIR TEMPERATURE SENSOR		X		
30	H-3	DESICCANT WHEEL LEAVING AIR HUMIDITY SENSOR		X		
31	T-10	COOLING COIL LEAVING AIR TEMPERATURE SENSOR		X		
32	DP-3	SPACE DIFFERENTIAL PRESSURE SENSOR		X		
33 THRU 38	C	RETURN FAN STATUS CURRENT SWITCH (6 TOTAL)	X			
39 THRU 44	C	SUPPLY FAN STATUS CURRENT SWITCH (6 TOTAL)	X			
45 THRU 49	VPS-2.2 THRU 2.6	RETURN AIR FLOW MEASURING STATION			X	
50 THRU 54	VPS-1.2 THRU 1.6	SUPPLY AIR FLOW MEASURING STATION			X	
A	VSMC	SUPPLY FAN START-STOP		X		
B	VSMC	RETURN FAN START-STOP	X			
C	D-3	MODULATING RELIEF AIR DAMPER			X	
D	D-2	MODULATING RETURN AIR DAMPER			X	
E	D-1	MODULATING OUTSIDE AIR DAMPER			X	
F	V-2	MODULATING PREHEAT COIL VALVE			X	
G	V-1	MODULATING PRE-COOLING COIL VALVE			X	
H	VSMC	SUPPLY FAN VARIABLE SPEED MOTOR CONTROLLER		X		
I	VSMC	RETURN FAN VARIABLE SPEED MOTOR CONTROLLER	X			
J	V-3	TWO POSITION ISOLATION STEAM HUMIDIFIER VALVE	X			
K	V-4	MODULATING STEAM HUMIDIFIER VALVE			X	
L	SD-2	RETURN DUCT ISOLATION SMOKE DAMPER	X			
M	V-5	MODULATING COOLING COIL VALVE			X	
N	SD-1	SUPPLY DUCT ISOLATION SMOKE DAMPER	X			
O	S	EXHAUST FAN 310-EF4 START-STOP		X		
P	VSMC	RETURN FAN START-STOP	X			
Q	VSMC	RETURN FAN VARIABLE SPEED MOTOR CONTROLLER			X	
R	VSMC	RETURN FAN START-STOP	X			
S	VSMC	RETURN FAN VARIABLE SPEED MOTOR CONTROLLER			X	
T	VSMC	SUPPLY FAN START-STOP	X			
U	VSMC	SUPPLY FAN VARIABLE SPEED MOTOR CONTROLLER			X	
V	VSMC	SUPPLY FAN START-STOP	X			
W	VSMC	SUPPLY FAN VARIABLE SPEED MOTOR CONTROLLER			X	
X THRU CC	D-4 THRU D-10	TWO-POSITION RETURN FAN ISOLATION AIR DAMPER (6 TOTAL)	X			
DD	S	PREHEAT COIL BYPASS AIR DAMPER			X	
EE	S	DESICCANT WHEEL START-STOP	X			
FF	D-13	DESICCANT WHEEL BYPASS AIR DAMPER			X	
GG	D-14	DESICCANT WHEEL BYPASS AIR DAMPER			X	
HH	D-15	PREHEAT COIL BYPASS AIR DAMPER			X	
II THRU NN	D-16 THRU D-21	TWO-POSITION SUPPLY FAN ISOLATION AIR DAMPER (6 TOTAL)	X			

NOTE: DDC ZONE CONTROL IS SPECIFIED. PROVIDE ZONE TEMPERATURE SENSOR AND MODULATING OUTPUT FOR EACH ZONE, AS SHOWN IN VVR AND CVR CONTROL TERMINAL DIAGRAM ON THIS SHEET.

SEQUENCE OF OPERATION FOR 310-AHU4

- GENERAL**
- 1.1 UNIT IS NORMALLY STARTED AND STOPPED BY THE DCP OR REMOTELY AT THE ECC. H-O-A SWITCH SHALL BE KEPT IN THE "AUTO" POSITION. "HAND" AND "OFF" POSITIONS SHALL BE USED ONLY FOR STOPPAGE.
- 1.2 WHEN THE UNIT IS "OFF" FOR ANY REASON: OUTSIDE AIR DAMPER D-1, RELIEF AIR DAMPERS D-3, 4, AND AFTER 30 SEC. (ADJUSTABLE) ISOLATION SUPPLY AND RETURN AIR SMOKE DAMPERS SD-1 AND SD-2 SHALL BE FULLY CLOSED. RETURN AIR DAMPER D-2 SHALL BE FULLY OPEN, AND SUPPLY AND RETURN FANS AND DISCHARGE WHEEL SHALL BE OFF.
- 1.3 WHEN THE UNIT IS "ON," ISOLATION SMOKE DAMPERS SD-1 AND SD-2 AND RELIEF DAMPERS D-4 SHALL OPEN, AND ONCE PROVED OPEN, SUPPLY AND RETURN FANS SHALL START, AND IN 1, D-2 AND D-3 SHALL MODULATE IN ACCORDANCE WITH THE FOLLOWING SEQUENCE.
- 2. ZONE HUMIDITY**
- 2.1 COOLING COIL 310-CC4A LEAVING AIR RESET (PRIORITY 1) - THE AIR HANDLING UNIT CONTROLS SHALL PROVIDE DISCHARGE AIR HUMIDITY CONTROL, BASED ON ZONE DEMAND DEVIATION FROM RH SETPOINT. ALL OPERATING ROOMS SHALL BE SAMPLED AND THE ZONE FURTHEST ABOVE SETPOINT SHALL GOVERN. AS THE DEVIATION FROM RH SETPOINT DECREASES THE PRIMARY COIL LEAVING AIR TEMPERATURE AS SENSED BY 1-6 SHALL BE RESET FROM BETWEEN 46 DEGREES F. AND 55 DEGREES F. ALL CONTROL SETPOINTS TO BE FULLY ADJUSTABLE TO MEET JOB CONDITIONS.
- 3. ZONE TEMPERATURE**
- 3.1 COOLING COIL 310-CC4B DISCHARGE AIR RESET (PRIORITY 2) - THE AIR HANDLING UNIT CONTROLS SHALL PROVIDE DISCHARGE AIR TEMPERATURE CONTROL, BASED ON ZONE DEMAND DEVIATION FROM SETPOINT. ALL OPERATING ROOMS SHALL BE SAMPLED AND THE ZONE FURTHEST FROM SPACE TEMPERATURE SETPOINT SHALL GOVERN. AS THE DEVIATION FROM SPACE TEMPERATURE SETPOINT DECREASES THE DISCHARGE AIR AS SENSED BY 1-10 SHALL BE RESET FROM BETWEEN 50 DEGREES F. AND 58 DEGREES F. ALL CONTROL SETPOINTS TO BE FULLY ADJUSTABLE TO MEET JOB CONDITIONS.
- 4. ENTHALPY ECONOMIZER CONTROL**
- 4.1 OUTSIDE AIR TEMPERATURE AND HUMIDITY, AND RETURN AIR TEMPERATURE AND HUMIDITY SHALL BE MEASURED, AND THE ENTHALPY OF EACH DETERMINED. IF THE ENTHALPY OF DISCHARGE AIR IS LESS THAN THE ENTHALPY OF THE RETURN AIR, THE ECONOMIZER SHALL BE ENABLED. WHEN THE OUTSIDE AIR ENTHALPY IS HIGHER THAN THE RETURN AIR ENTHALPY AND MECHANICAL COOLING IS AVAILABLE, THE ECONOMIZER SHALL BE DISABLED.
- 5. ECONOMIZER CYCLE**
- 5.1 WHEN THE UNIT OPERATES IN THE OCCUPIED MODE, MINIMUM OUTSIDE AIR SHALL BE PROVIDED BY OPENING AND MODULATING OUTSIDE AIR DAMPERS D-1 IN RESPONSE TO AIR FLOW CONTROL, DESCRIBED IN PARAGRAPH 5.2 TO SUPPLY MINIMUM OUTSIDE AIR. THE RETURN AIR DAMPERS D-2 SHALL OPEN FULL AND RELIEF AIR DAMPERS D-3 SHALL REMAIN CLOSED. THIS CONDITION IS THE NORMAL POSITION AND SHALL BE MAINTAINED DURING THE OCCUPIED MODE EXCEPT DURING THE "ECONOMIZER" CYCLE. DURING THE "ECONOMIZER" CYCLE, THE AMOUNT OF OUTSIDE AIR AND RELIEF AIR SHALL BE INCREASED AS REQUIRED TO MAINTAIN THE UNIT DISCHARGE AIR TEMPERATURE SETPOINT, AS SENSED BY 1-1. PROVIDE A MIXED AIR SENSOR AND LOW LIMIT CONTROL. (T-5) SET AT 50 DEGREES F. TO PREVENT OVER-OPENING OF THE ECONOMIZER OUTSIDE AIR DAMPERS. ALL CONTROL SETPOINTS SHALL BE FULLY ADJUSTABLE TO MEET JOB CONDITIONS.
- 5.2 RELIEF AIR DAMPER SPACE STATIC PRESSURE CONTROL - WHEN THE AIR HANDLING SYSTEM IS OPERATING IN THE ECONOMIZER MODE THE RELIEF AIR DAMPER D-4 SHALL BE MODULATED TO MAINTAIN A MINIMUM OF 0.5 INCH W.G. POSITIVE STATIC PRESSURE IN THE SPACE.
- 6. TEMPERATURE CONTROL**
- 6.1 COOLING COIL 310-CC4A - WHEN THE ECONOMIZER IS NOT ACTIVE COOLING COIL VALVE V-1 SHALL MODULATE OPEN TO SATISFY THE "ZONE HUMIDITY" LEAVING AIR SETPOINT. HEATING COIL VALVE V-2 SHALL BE FULLY CLOSED BEFORE COOLING COIL VALVE V-1 OPENS UNLESS THE UNIT IS OPERATING IN DEHUMIDIFICATION. 6.2 COOLING COIL 310-CC4B - IN DEHUMIDIFICATION MODE, COOLING COIL VALVE V-5 SHALL MODULATE TO MAINTAIN THE "ZONE TEMPERATURE" DISCHARGE AIR SETPOINT. AS DISCHARGE AIR TEMPERATURE RISES ABOVE SETPOINT, COOLING COIL VALVE V-5 SHALL MODULATE OPEN TO SATISFY THE SETPOINT.
- 6.3 PREHEAT COIL 310-PP4 - THE FACE-BYPASS DAMPERS SHALL BE ENABLED AND DISABLED BASED ON STEAM VALVE V-2 POSITION. IF STEAM VALVE V-2 IS TURNED OFF, COMMAND THE DAMPERS TO FULL BYPASS MODE. ENABLE STEAM HEATING IF THE MIXED AIR TEMPERATURE, AS SENSED BY T-5, IS GREATER THAN SETPOINT BY 5°F (ADJUSTABLE) FOR MORE THAN FIFTEEN MINUTES (ADJUSTABLE) WITH THE OUTSIDE AIR DAMPERS IN MINIMUM POSITION. IF THE LEAVING AIR TEMPERATURE, AS SENSED BY T-3, IS LOWER THAN THE SETPOINT BY 5°F (ADJUSTABLE), SET THE DAMPER IN FULL FACE MODE. IF THE LEAVING AIR TEMPERATURE, AS SENSED BY T-3, IS EQUAL TO OR HIGHER THAN SETPOINT, MODULATE THE FACE/BYPASS DAMPER TO MAINTAIN LEAVING AIR SETPOINT. IF THE FACE/BYPASS DAMPERS ARE MORE THAN 80% (ADJUSTABLE) IN BYPASS MODE FOR MORE THAN FIFTEEN MINUTES, TURN OFF THE STEAM VALVE. PROVIDE A DEAD BAND OF +/-2°F CAN BE GIVEN FOR CONTROL STABILITY.
- 6.4 WHEN THE AIR HANDLING UNIT IS OFF UNDER NORMAL OPERATION, AND THE OUTSIDE AIR TEMPERATURE IS BELOW 40 DEG. F, V-2 SHALL MODULATE TO MAINTAIN COIL LEAVING WATER TEMPERATURE. AS SENSED BY 1-7, AT 70 DEG. F. IF THE UNIT SHUTS DOWN ON ALARM, V-2 SHALL GO FULL OPEN TO THE COIL. COOLING COIL VALVE V-1 SHALL BE FULLY CLOSED BEFORE V-2 OPENS.
- 7. AIR FLOW CONTROL**
- 7.1 THE SUPPLY AIR FLOW SHALL BE CONTROLLED BY THE DCP MODULATING THE SUPPLY FAN VARIABLE SPEED MOTOR CONTROLLER (VSMC) TO MAINTAIN 2.0" OF STATIC PRESSURE (FIELD ADJUSTABLE), SENSED BY SPS-1 AND SPS-2 LOCATED 23 DISTANCE DOWN THE SUPPLY DUCTS.
- 7.2 THE DCP, USING TOTAL SUPPLY AIR AND OUTSIDE AIR FLOW SIGNALS (WPS-1 AND WPS-3), SHALL RESET THE RETURN AIR FAN VARIABLE SPEED MOTOR CONTROLLER (VSMC) USING RETURN AIR FLOW SIGNAL. (WPS-2) TO MAINTAIN A CONSTANT AIR FLOW DIFFERENCE BETWEEN THE SUPPLY AIR AND THE RETURN AIR EQUAL TO MINIMUM OUTSIDE AIR.
- 7.3 THE AIR HANDLING UNIT IS PROVIDED WITH MULTIPLE SUPPLY AND RETURN FANS, EACH WITH AN AUTOMATIC TWO-POSITION ISOLATION DAMPER. THE ISOLATOR DAMPER SHALL BE PROVIDED WITH THE UNIT AND THE ATC SHALL PROVIDE THE DAMPER ACTUATOR. THE DAMPER SHALL CLOSE WHEN ITS RESPECTIVE FAN IS OFF OR FAILED AND SHALL PROVE OPEN PRIOR TO STARTING ITS RESPECTIVE FAN.
- 7.4 VARIABLE SPEED MOTOR CONTROLLERS SHALL RESPOND TO START/STOP COMMANDS AND ALL SAFETIES (FREEZE, SMOKE, ETC.) WHETHER IN THE HAND, AUTOMATIC OR BYPASS MODES.
- 7.5 THE DCP, USING HIGH PRESSURE SENSOR SPS-3 LOCATED AT THE SUPPLY FAN DISCHARGE, SHALL PREVENT THE SUPPLY FAN FROM DEVELOPING OVER 6 INCHES OF POSITIVE STATIC PRESSURE (FIELD ADJUSTABLE). IF STATIC PRESSURE AT SPS-3 EXCEEDS 4 INCHES OF POSITIVE PRESSURE, THE SUPPLY AND RETURN FANS SHALL STOP.
- 7.6 THE DCP, USING HIGH PRESSURE SENSOR SPS-4 LOCATED AT THE RETURN FAN INLET, SHALL PREVENT THE RETURN FAN FROM DEVELOPING OVER 4 INCHES OF NEGATIVE STATIC PRESSURE (FIELD ADJUSTABLE). IF STATIC PRESSURE AT SPS-4 EXCEEDS 2 INCHES OF NEGATIVE PRESSURE, THE SUPPLY AND RETURN FANS SHALL STOP.
- 8. HUMIDITY CONTROL**
- 8.1 WHEN THE DCP IS NOT CALLING FOR HUMIDITY, SENSED BY RETURN AIR HUMIDITY SENSOR H-1, 2-WAY "ON-OFF" CONTROL VALVE V-3 SHALL REMAIN CLOSED. WHEN THE DCP IS CALLING FOR HUMIDITY, V-3 SHALL REMAIN OPEN.
- 8.2 RETURN AIR HUMIDITY SHALL BE MAINTAINED AT SETPOINT OF 42 DEG. F. DEW POINT (ADJUSTABLE) VIA DIGITAL CONTROL PANEL BY MODULATING CONTROL VALVE V-4 TO MAINTAIN THE DESIRED HUMIDITY. THE TEMPERATURE SENSOR T-4 AND HUMIDITY SENSOR H-1 IN RETURN AIR SHALL BE USED TO CALCULATE RETURN AIR DEW POINT TEMPERATURE. V-3 SHALL BE CLOSED WHENEVER THE RETURN AIR DEWPOINT IS > 45 DEG. F. (ADJUSTABLE). DCP SHALL CLOSE VALVE V-3. DISCHARGE AIR HUMIDITY SHALL BE MAINTAINED BY MODULATING DISCHARGE AIR TEMPERATURE. THE DISCHARGE AIR HUMIDITY SWITCH TO KEEP THE HUMIDIFIER OFF UNTIL CONDENSATE TEMPERATURE APPROACHES STEAM TEMPERATURE.
- 8.3 ON-OFF CONTROL VALVE V-3 SHALL REMAIN CLOSED WHENEVER THE OUTSIDE AIR TEMPERATURE IS ABOVE 55 DEG. F.
- 8.4 THE DESICCANT WHEEL BYPASS DAMPERS SHALL OPEN AND THE DESICCANT WHEEL SHALL STOP ROTATING WHEN THE HUMIDIFIER IS OPERATING.
- 9. FREEZE PROTECTION**
- 9.1 IF THE PREHEAT COIL DISCHARGE AIR TEMPERATURE AS SENSED BY T-3 FALLS BELOW 45 DEG.F, AN ALARM SIGNAL SHALL INDICATE AT THE DCP AND ECC. IF THE PREHEAT COIL DISCHARGE AIR TEMPERATURE FALLS BELOW 40 DEG.F AS SENSED BY PREHEAT T-4, THE SUPPLY AND RETURN FANS SHALL SHUT DOWN AND A CRITICAL ALARM SIGNAL SHALL INDICATE AT THE DCP AND ECC. T-8 SHALL BE HARDWIRED TO THE SUPPLY FAN VSMC TO SHUT DOWN THE UNIT IN THE HAND, AUTOMATIC OR BYPASS MODES. T-8 SHALL REQUIRE MANUAL RESET AT THE DEVICE.
- 10. AUTOMATIC SHUTDOWN / RESTART**
- 10.1 WHEN SMOKE IS DETECTED BY ANY DUCT SMOKE DETECTOR, THE SUPPLY AND RETURN AIR FANS AND INTERLOCKED EXHAUST FANS SHALL SHUT "OFF". A SUPERVISORY SIGNAL SHALL BE TRANSMITTED TO THE FIRE ALARM SYSTEM, AND A SUPERVISORY SIGNAL SHALL INDICATE AT THE DCP AND ECC. SUPPLY AND RETURN FANS AND INTERLOCKED EXHAUST FANS SHALL RESTART, SMOKE DAMPERS AND ISOLATION DAMPERS SHALL OPEN AND BE PROVEN OPEN WHEN THE FIRE ALARM CIRCUIT IS RESET.
- 11. DESICCANT WHEEL CONTROL**
- 11.1 THE DESICCANT WHEEL SHALL BE ACTIVE WHEN THE MIXED AIR DEW POINT RISES ABOVE 41° F AND SHALL STOP WHEN THE MIXED AIR DEW POINT FALLS BELOW 31° F. WHEN THE DESICCANT WHEEL IS ACTIVE, THE AIR HANDLING SYSTEM SHALL PRODUCE 34° F DEWPOINT (ADJUSTABLE) SUPPLY AIR. IF WHEEL IS ACTIVE AND DEWPOINT IS NOT MET, MODULATE THE HEATING COIL VALVE, INCREASING HEATING COIL LEAVING AIR TEMPERATURE 1° F EVERY MINUTE UNTIL SUPPLY AIR DEWPOINT IS MET. LIMIT HEATING COIL DISCHARGE AIR TEMP TO 90° F (ADJUSTABLE). ON A FALL IN DEWPOINT BELOW SETPOINT, REVERSE SEQUENCE. MODULATE THE HEATING COIL VALVE OFF. VALVE V-4 SHALL BE INTERLOCKED WITH A TEMPERATURE SWITCH TO KEEP THE HUMIDIFIER OFF UNTIL CONDENSATE WHEEL SHALL STOP ROTATING WHEN THE HUMIDIFIER IS OPERATING.

GENERAL NOTES (APPLIES TO ALL CONTROLS SHEETS)

1. A COMPLETE SYSTEM OF AUTOMATIC TEMPERATURE CONTROLS SHALL BE INSTALLED UNDER THIS CONTRACT AS REQUIRED TO ACCOMPLISH THE SEQUENCE OF CONTROL. FOR FLOOR PLANS OF UNIFORM LAYOUT, THE SEQUENCE OF CONTROL FOR THE ENTIRE SYSTEM SHALL BE A DIRECT DIGITAL CONTROL SYSTEM UTILIZING ELECTRIC ACTUATION.
2. ELECTRICAL WORK INCLUDES A POWER SOURCE TO THE MOTOR STARTERS, ALL HVAC POWER SOURCES REQUIRED BEYOND THESE STARTERS OR BEYOND SOURCES EXPLICITLY SHOWN ON THE ELECTRICAL DRAWINGS, SHALL BE PROVIDED UNDER THE A/C WORK. THIS WORK SHALL INCLUDE BUT NOT BE LIMITED TO WIRING, CONDUIT, TRANSFORMERS, RELAYS AND FUSES.
3. BULB WELD FOR TEMPERATURE SENSING AS INDICATED SHALL BE FURNISHED UNDER THE A/C WORK AND INSTALLED AS PART OF THE HVAC PIPING WORK. PIPING WORK UNDER THE A/C WORK SHALL INCLUDE PROPERLY SIZED WELDEPOUT OR THREADEPOUT FITTINGS PLACED AS DIRECTED BY THE CONTROL SYSTEM SUPPLIER.
4. POINTS LIST IS SHOWN AS AN AID TO THE CONTRACTOR INDICATING THE MINIMUM POINTS REQUIRED FOR CONTROL AND MONITORING. ALL INPUT AND OUTPUT POINTS, AND THEIR INTERFACES TO THE INTERFACE AND CONTROL SYSTEM SHALL BE PROVIDED FOR A COMPLETE AND FUNCTIONAL CONTROL SYSTEM. IF OR WHEN ADDITIONAL POINTS ARE REQUIRED TO ACCOMPLISH THE SEQUENCES OF CONTROL SPECIFIED, THESE POINTS, ALONG WITH ADDITIONAL DIRECT DIGITAL CONTROL PANEL(S) (IF REQUIRED), SHALL ALSO BE PROVIDED.
5. DIAGRAMS, SEQUENCES, AND POINTS LIST SHOWN ON THIS SHEET ARE INTENDED TO ASSIST IN THE SELECTION OF A SINGLE TYPICAL HANDLING SYSTEM. NOT ALL SYSTEMS HAVE THE SAME QUANTITY OF POINTS. REFER TO FLOOR PLANS FOR MORE INFORMATION.

LEGEND

AFM	AIR FLOW MEASURING DEVICE	MONITORS AIR FLOW RATE AND PROVIDES VELOCITY PRESSURE FOR TRANSMITTAL TO DCP
C	CURRENT SENSING RELAY	TRANSMITS MOTOR CURRENT TO DCP TO INDICATE STATUS OF FANS
D-1	MODULATING OUTSIDE AIR DAMPER	PROPORTIONS FLOW OF OUTSIDE AIR IN RESPONSE TO DCP AND CLOSES WHEN SUPPLY FAN STOPS
D-2	MODULATING RETURN AIR DAMPER	PROPORTIONS FLOW OF RETURN AIR IN RESPONSE TO DCP AND OPENS WHEN SUPPLY FAN STOPS
D-3	MODULATING RELIEF AIR DAMPER	PROPORTIONS FLOW OF RELIEF AIR IN RESPONSE TO DCP AND CLOSES WHEN SUPPLY FAN STOPS
D-4 THRU D-9	TWO POSITION ISOLATION DAMPER	CLOSES WHEN RESPECTIVE FAN IS OFF
D-10	TWO POSITION BYPASS DAMPER	OPENS WHEN DESICCANT WHEEL IS NOT ROTATING
DCP	DIRECT DIGITAL CONTROL PANEL	CONTROLS OPERATION OF AIR HANDLING UNIT IN ACCORDANCE WITH THE SEQUENCE OF OPERATION
DP-1 DP-2	DIFFERENTIAL PRESSURE SENSOR	TRANSMITS DIFFERENTIAL PRESSURE TO DCP TO INDICATE FILTER CONDITION
DP-3	DIFFERENTIAL PRESSURE SENSOR	TRANSMITS DIFFERENTIAL PRESSURE TO DCP TO INDICATE SPACE PRESSURE
DSD	DUCT SMOKE DETECTORS (FURNISHED AND WIRED TO FIRE ALARM PANEL BY ELECTRICIAN)	PROVIDE SMOKE SIGNAL TO DCP

LEGEND (CONTINUED)

H-1	ENGINEERING CONTROL CENTER	LOCATED IN ENGINEERING BUILDING FOR MONITORING OF SYSTEM OPERATIONS
H-2	SUPPLY/RETURN AIR HUMIDITY SENSOR	SENSES AND TRANSMITS SUPPLY/RETURN AIR HUMIDITY TO DCP FOR CONTROL AND INDICATION
SD-1	SUPPLY/RETURN DUCT ISOLATION SMOKE DAMPER	CLOSES WHEN THE UNIT IS OFF
SPS-1	SUPPLY DUCT STATIC PRESSURE SENSOR	SENSES AND TRANSMITS DUCT STATIC PRESSURE TO DCP FOR CONTROL AND INDICATION
SPS-3	DUCT HIGH LIMIT STATIC PRESSURE SENSOR	SENSES AND TRANSMITS DUCT STATIC PRESSURE NEAR SUPPLY FAN TO DCP
T-1	SUPPLY AIR TEMPERATURE SENSOR	SENSES AND TRANSMITS SUPPLY AIR DRY BULB TEMPERATURE TO DCP FOR CONTROL AND INDICATION
T-2	OUTSIDE AIR TEMPERATURE SENSOR	SENSES AND TRANSMITS OUTSIDE AIR DRY BULB TEMPERATURE TO DCP FOR CONTROL AND INDICATION
T-3	PREHEAT COIL LEAVING AIR TEMPERATURE SENSOR	SENSES AND TRANSMITS PREHEAT AIR DRY BULB TEMPERATURE TO DCP FOR CONTROL AND INDICATION
T-4	RETURN AIR TEMPERATURE SENSOR	SENSES AND TRANSMITS RETURN AIR DRY BULB TEMPERATURE TO DCP FOR INDICATION ONLY
T-5	MIXED AIR TEMPERATURE SENSOR	SENSES AND TRANSMITS MIXED AIR DRY BULB TEMPERATURE TO DCP FOR CONTROL AND INDICATION
T-6	COOLING COIL LEAVING AIR TEMPERATURE	SENSES AND TRANSMITS COOLING COIL DISCHARGE AIR TEMPERATURE TO DCP FOR INDICATION ONLY
T-7	PREHEAT COIL CABINET TEMPERATURE SENSOR	SENSES AND TRANSMITS PREHEAT COIL CABINET TEMPERATURE TO DCP FOR CONTROL AND INDICATION
T-8	FREEZE/STAT	SHUTS DOWN SUPPLY FAN UPON SENSING FREEZE CONDITION
T-9	DESICCANT WHEEL LEAVING AIR TEMPERATURE SENSOR	SENSES AND TRANSMITS WHEEL AIR DRY BULB TEMPERATURE TO DCP FOR CONTROL AND INDICATION
V-1	MODULATING CHILLED WATER CONTROL VALVE	PROPORTIONS FLOW OF CHILLED WATER TO COOLING COIL IN RESPONSE TO DCP
V-2	MODULATING STEAM CONTROL VALVE	PROPORTIONS FLOW OF STEAM TO PREHEAT COIL IN RESPONSE TO DCP
V-3	TWO-POSITION ISOLATION STEAM CONTROL VALVE	CONTROLS STEAM FLOW TO HUMIDIFIER
V-4	MODULATING STEAM CONTROL VALVE	PROPORTIONS FLOW OF STEAM TO HUMIDIFIER IN RESPONSE TO DCP
VPS	VELOCITY PRESSURE SENSOR	SENSES AND TRANSMITS VELOCITY PRESSURE TO DCP
VSMC	VARIABLE SPEED MOTOR CONTROLLER WITH MOTOR STARTER	CONTROLS SUPPLY AND RETURN FAN MOTOR SPEEDS IN RESPONSE TO DCP
OAH	OUTSIDE AIR HUMIDITY SENSOR	SENSES AND TRANSMITS OUTSIDE AIR ENTHALPHY TO DCP FOR CONTROL AND INDICATION

Revised By:	

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