AIR HANDLER SCHEDULE (EXTERIOR) DRAWING CODE BASIS OF DESIGN BASIS OF ALTERNATE (IDU/ODU) MANUFACTURER DESIGN APPROVED AIRFLOW MAX OA VENT OA MIN OA BHP PER MOTOR ESP AIRFLOW BHP PER MOTOR ESP AIRFLOW MAX AIRFLOW MAX AIRFLOW MIN VELOCITY TOTAL CAP SENSIBLE CAP EAT (°F) LAT (°F) POWER SUPPLY CIRCUIT 1 (FAN) CIRCUIT 2 (FAN) CIRCUIT 3 (HEAT) (LBS) MODEL MANUFACTURERS | (CFM) | (CFM) | (CFM) | (CFM) | (FM) | (CFM) (CFM) (FPM) (KW)
 FLA (A)
 MOCP (A)
 FLA (A)
 MOCP (A)
 MCA (A)
 MOCP (A)

 60
 4.2
 2.9
 28.1
 30

 64.8
 73.6 / 63.7
 52.7 / 52.1
 6.0
 42.0
 52.0
 18.9

 146.0
 79.9 / 68.6
 54.7 / 54.0
 0.5
 42.0
 52.0
 47.9
 CSAA006 YORK, DAIKIN 460/3/60 4.2 CSAA012 YORK, DAIKIN 1 REFER TO SPECIFICATIONS FOR FURTHER INFORMATION. 2 COIL, DRAIN AND MOTOR SIDE ACCESS TO BE FIELD CONFIRMED PRIOR TO SUBMITTING FOR APPROVAL 3 MAXIMUM COIL FACE VELOCITY SHALL NOT EXCEED SCHEDULED VALUES 4 ALL CONTROLS SENSORS, ACTUATORS AND WIRING PROVIDED AND INSTALLED BY DDC CONTRACTOR ACCESSORIES: A 2" INSULATED DOUBLE WALL CONSTRUCTION WITH GALVANIZED STEEL EXTERIOR PANELS AND STAINLESS STEEL INTERIOR PANELS. B COOLING COIL SECTIONS SHALL BE PROVIDED WITH AN INSULATED, DOUBLE WALL, 201 STAINLESS STEEL DRAIN PAN WITH POSITVE DRAINAGE MEETING INDOOR AIR QUALITY (IAQ) IN ACCORDANCE WITH ASHRAE 62.1. C FAN SHALL BE DIRECT DRIVE PLENUM FAN TYPE. SEE EQUIPMENT SCHEDULE FOR SIZES AND QUANTITIES. D PROVIDE 2" MERV 8 PLEATED MEDIA FILTERS, THREE SETS OF EACH TYPE. PROVIDE ONE SET IN UNIT, PROVIDE ONE SET FOR INSTALLATION AFTER SYSTEM IS BALANCED AND BUILDING IS CLEANED, AND ONE SET FOR TURN OVER TO OWNER. E UNIT PANELS SHALL BE MINIMUM 2" DOUBLE WALL FOAM R-13 CONSTRUCTION WITH ASHRAE 111 CLASS 6 CASING LEAKAGE. F PROVIDE WITH COASTAL ENVIRONMENT ALUMINUM LOW LEAK DAMPERS. G PROVIDE INLET AND EXHAUST HOODS. H PROVIDE FAN VFDS MOUNTED TO UNIT EXTERIOR.

POWER VENTILATOR SCHEDULE

DRAWING CODE BASIS OF DESIGN MANUFACTURERS

DRAWING CODE BASIS OF DESIGN MANUFACTURERS

DRAWING CODE BASIS OF DESIGN MANUFACTURERS

FAN TYPE

FAN WHEEL SERVICE DRIVE TYPE DAMPER MOTOR ENCLOSURE AIRFLOW (CFM) (IN. WG.) RPM TYPE SIZE (HP)

PV01 COOK 90C17DH (VF) GREENHECK, PENNBARRY CENTRIFUGAL VENTILATORS - ROOF DOWNBLAST ALUMINUM HUB AND BLADES EXHAUST DIRECT BACKDRAFT OPEN DRIPPROOF 450 0.50 1.658 ECM 1/8 1201//60 1.9 6.8 22 1.2 A.B.C.D.

2 CONTROLLED VIA DIC

ACCESSORIES: A FACTORY MOUNTED DISCONNECT SWITCH (NEMA 3R)

B MOTORIZED BACKDRAFT DAMPER

C PERMATECTOR COASTAL DUTY COATING.

SINGLE	DUCT TERMI	NAL UI	NIT SCHEDU	ILE																			
DRAWING CODE	BASIS OF DESIGN	BASIS OF	ALTERNATE	PRIMARY AII	RFLOW					HEATING COIL							NO	ISE CRITER	IA OPERATIN	G UNIT	NOTES	Α	CCESSORIES
	MANUFACTURER	DESIGN MODEL	APPROVED MANUFACTURERS	COOLING MAX (CFM)			INLET DIA.	COOLING INLET VELOCITY (FT/MIN)	AIR PRESSURE DROP (IN H2O)	CAPACITY (KW) ELEC			_AT (°F)	VOLTAGE (V/PH/HZ)	FLA	MCA M	OCP DIS			B) SERVED FROM			
VAV01	TRANE	VCEF05	PRICE, TITUS	285	170	170	5	2,090	0.02	2.0	1	55.0	92.0	460/3/60	2.4	3.0	15	26	18	95 AH02		1,2	A,B,C,D,E,F,G
VAV02	TRANE	VCEF10	PRICE, TITUS	890	270	270	10	1,632	0.02	3.5	1	55.0	95.8	460/3/60	4.2	5.3	15	22	21	120 AH02		1,2	A,B,C,D,E,F,G
VAV03	TRANE	VCEF06	PRICE, TITUS	315	95	95	6	1,604	0.09	1.0	1	55.0	88.1	460/3/60	1.2	1.5	15	24	18	95 AH02		1,2	A,B,C,D,E,F,G
VAV04	TRANE	VCEF06	PRICE, TITUS	315	95	95	6	1,604	0.09	1.0	1	55.0	88.1	460/3/60	1.2	1.5	15	24	18	95 AH02		1,2	A,B,C,D,E,F,G
VAV05	TRANE	VCEF05	PRICE, TITUS	285	85	85	5	2,090	0.02	1.0	1	55.0	92.0	460/3/60	1.2	1.5	15	26	18	95 AH02		1,2	A,B,C,D,E,F,G
VAV06	TRANE	VCEF05	PRICE, TITUS	295	90	90	5	2,163	0.02	1.0	1	55.0	90.0	460/3/60	1.2	1.5	15	28	18	95 AH02		1,2	A,B,C,D,E,F,G
VAV07	TRANE	VCEF05	PRICE, TITUS	295	90	90	5	2,163	0.02	1.0	1	55.0	90.0	460/3/60	1.2	1.5	15	28	18	95 AH02		1,2	A,B,C,D,E,F,G
VAV08	TRANE	VCEF05	PRICE, TITUS	285	125	125	5	2,090	0.02	1.5	1	55.0	92.8	460/3/60	1.8	2.3	15	26	18	95 AH02		1,2	A,B,C,D,E,F,G
VAV09	TRANE	VCEF04	PRICE, TITUS	140	85	85	4	1,604	0.01	1.0	1	55.0	92.0	460/3/60	1.2	1.5	15	23	15	95 AH02		1,2	A,B,C,D,E,F,G
VAV10	TRANE	VCEF04	PRICE, TITUS	85	85	85	4	974	0.01	1.0	1	55.0	92.0	460/3/60	1.2	1.5	15	17	-	95 AH02		1,2	A,B,C,D,E,F,G
VAV11	TRANE	VCEF05	PRICE, TITUS	200	85	85	5	1,467	0.01	1.0	1	55.0	92.0	460/3/60	1.2	1.5	15	22	15	95 AH02		1,2	A,B,C,D,E,F,G
VAV12	TRANE	VCEF08	PRICE, TITUS	690	205	205	8	1,977	0.06	2.5	1	55.0	93.4	460/3/60	3.0	3.8	15	27	24	98 AH02		1,2	A,B,C,D,E,F,G
VAV13	TRANE	VCEF10	PRICE, TITUS	1,005	300	300	10	1,843	0.03	4.0	1	55.0	97.0	460/3/60	4.8	6.0	15	23	24	120 AH02		1,2	A,B,C,D,E,F,G
VAV14	TRANE	VCEF05	PRICE, TITUS	270	85	85	5	1,980	0.02	1.0	1	55.0	92.0	460/3/60	1.2	1.5	15	25	18	95 AH02		1,2	A,B,C,D,E,F,G
NOTES:	1 REFER TO SPECIFIC2 CONTROLS BY DDC		FURTHER INFORMATION R. CONTROLS SUPPLIE																				
ACCESSORIES:	A FACTORY MOUNTED	DISCONNEC [®]	Т																				
	B ROUND AIR VALVE																						
	C ELECTRIC COIL AS S	CHEDULED																					
	D 480/24 VOLT TRANSF	FORMER																					
	E FOIL-FACED INSULA	TION																					
	F SCR MODULATED EL	ECTRIC HEAT	Γ																				
	G AIRFLOW SWITCH																						

DRAWING CODE	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL	ALTERNATE APPROVED MANUFACTURERS	TYPE	SERVICE	NECK SIZE BRANCH (IN.) CONN. SIZE (IN.)	MODULE SIZE (IN.)	MATERIAL	FINISH	MOUNTING	NOTES	ACCESSORIES
S1	PRICE	ASCD	GREENHECK, TITUS	SQUARE CEILING DIFFUSER	SUPPLY	6Ø	24 X 24	ALUMINUM	WHITE	T-BAR	1-3	A,C
S2	PRICE	ASCD	GREENHECK, TITUS	SQUARE CEILING DIFFUSER	SUPPLY	8Ø	24 X 24	ALUMINUM	WHITE	T-BAR	1-3	A,C
S3	PRICE	ASCD	GREENHECK, TITUS	SQUARE CEILING DIFFUSER	SUPPLY	10Ø	24 X 24	ALUMINUM	WHITE	T-BAR	1-3	A,C
S4	PRICE	SDG	GREENHECK, TITUS	SPIRAL DUCT GRILLE	SUPPLY	12Ø	24 X 24	ALUMINUM	WHITE	DUCT SURFACE	1-3	A,C
R1	PRICE	630	GREENHECK, TITUS	FIXED FACE GRILLE	RETURN	22 X 22	24 X 24	ALUMINUM	WHITE	T-BAR	1-2	
R2	PRICE	630	GREENHECK, TITUS	FIXED FACE GRILLE	RETURN	16 X 46	18 X 48	ALUMINUM	WHITE	DUCT SURFACE	1	E
E1	PRICE	630	GREENHECK, TITUS	FIXED FACE GRILLE	EXHAUST	22 X 22	24 X 24	ALUMINUM	WHITE	T-BAR	1	A,C
NOTES:	1 REFER TO SPECIFI	CATIONS FO	R FURTHER INFORMATION	DN.	,				'			
	2 DUCT BRANCH CO	NNECTION S	SIZE TO BE EQUAL TO TH	NECK SIZE OF DIFFUSER UNLESS NOTED OTHER	WISE ON PLANS.							
	3 PAINT ALL VISIBLE	DUCTWORK	THROUGH GRILLES AND	REGISTERS FLAT BLACK.								
ACCESSORIES:	A PATTERN CONTRO	LLERS										
	B INSULATED PLENU	м вох										
	C MANUAL VOLUME I	DAMPER										

MECHANICAL	LEGEND
	CEILING EXHAUST AIR GRILLE
	CEILING RETURN AIR / TRANSFER AIR GRILLE
	CEILING SUPPLY AIR DIFFUSER / GRILLE
- AIR TYPE DESIGNATOR - AIRFLOW, CFM	DIFFUSER / REGISTER / GRILLE TAG
H	HUMIDISTAT / HUMIDITY SENSOR
<u> </u>	MANUAL VOLUME DAMPER
M	MOTORIZED DAMPER
→	RETURN, EXHAUST OR TRANSFER AIR FLOW
 ►	SUPPLY AIR FLOW
T	THERMOSTAT / TEMPERATURE SENSOR
TH	T-STAT / HUMIDISTAT OR TEMP/HUMIDITY SENSOR

NOTE: ALL ITEMS LISTED MAY NOT BE USED IN THIS PROJECT.

I PROVIDE ACCESS / INSPECTION / TURNING SECTION.

D STAINLESS STEEL FASTENERS.

F ROOF CURB W/ SEAL

E BIRDSCREEN STAINLESS STEEL MESH

MECHANICAL	DUCTWORK LEGEND
	SUPPLY DUCT TURNING UP (ROUND OR RECTANGULAR)
	RETURN DUCT TURNING UP (ROUND OR RECTANGULAR)
	EXHAUST DUCT TURNING UP (ROUND OR RECTANGULAR)
	OUTSIDE AIR DUCT TURNING UP (ROUND OR RECTANGULAR)
	SUPPLY DUCT TURNING DOWN (ROUND OR RECTANGULAR)
	RETURN DUCT TURNING DOWN (ROUND OR RECTANGULAR)
	EXHAUST TURNING DOWN (ROUND OR RECTANGULAR)
	OUTSIDE AIR DUCT TURNING DOWN (ROUND OR RECTANGULAR)
	CONICAL TEE
	DUCT CROSSING
	MITERED ELBOW WITH TURNING VANES
	RADIUS ELBOW
	RECTANGULAR TO ROUND DUCT TRANSITION
	RECTANGULAR DUCT TURNING DOWN WITH CHANGE OF DIRECTION
	ROUND DUCT TURNING DOWN WITH CHANGE OF DIRECTION
	TAKEOFF WITH 45° THROAT
	TERMINATION OF DUCT WITH BRANCH CONNECTIONS

NOTE: ALL ITEMS LISTED MAY NOT BE USED IN THIS PROJECT.

	L PIPE LEGEND
BFW-	BOILER FEED WATER PIPING
(X)BFW	BOILER FEED WATER PIPING - EXISTING
BBD -	BOTTOM BLOW DOWN PIPING
(X)BBD	BOTTOM BLOW DOWN PIPING - EXISTING
CR	CHEMICAL FEED RETURN PIPING
(X)CR —	CHEMICAL FEED RETURN PIPING - EXISTING
CS	CHEMICAL FEED SUPPLY PIPING
(X)CS	CHEMICAL FEED SUPPLY PIPING - EXISTING
CHWR	CHILLED WATER RETURN PIPING
(X)CHWR—	CHILLED WATER CURRING - EXISTING
	CHILLED WATER SUPPLY PIPING
(X)CHWS	CHILLED WATER SUPPLY PIPING - EXISTING
	CONDENSATE PIPING
(X)C	CONDENSATE PIPING - EXISTING
	CONDENSER WATER RETURN PIPING
(X)CWR	CONDENSER WATER CURRY PIPING - EXISTING
-CWS	CONDENSER WATER SUPPLY PIPING
——(X)CWS ——	CONDENSER WATER SUPPLY PIPING - EXISTING
CBD	CONTINUOUS BLOW DOWN PIPING
(X)CBD	CONTINUOUS BLOW DOWN PIPING - EXISTING
DTWR-	DUAL TEMPERATURE SYSTEM RETURN PIPING
(X)DTWR——	DUAL TEMPERATURE SYSTEM RETURN PIPING - EXISTING
DTWS-	DUAL TEMPERATURE SYSTEM SUPPLY PIPING
(X)DTWS	DUAL TEMPERATURE SYSTEM SUPPLY PIPING - EXISTING
GTR-	GEOTHERMAL HEAT PUMP SYSTEM RETURN PIPING
(X)GTR —	GEOTHERMAL HEAT PUMP SYSTEM RETURN PIPING EXISTING
GTS	GEOTHERMAL HEAT PUMP SYSTEM SUPPLY PIPING
(X)GTS	GEOTHERMAL HEAT PUMP SYSTEM SUPPLY PIPING EXISTING
HRR——	HEAT RECOVERY RETURN PIPING
(X)HRR—	HEAT RECOVERY RETURN PIPING - EXISTING
——HRS ———	HEAT RECOVERY SUPPLY PIPING
(X)HRS	HEAT RECOVERY SUPPLY PIPING - EXISTING
HWR—	HEATING HOT WATER RETURN PIPING
(X)HWR	HEATING HOT WATER RETURN PIPING - EXISTING
HWS——	HEATING HOT WATER SUPPLY PIPING
(X)HWS	HEATING HOT WATER SUPPLY PIPING - EXISTING
——HPC ———	HIGH PRESSURE CONDENSATE PIPING
(X)HPC	HIGH PRESSURE CONDENSATE PIPING - EXISTING
——HPS ———	HIGH PRESSURE STEAM PIPING
(X)HPS	HIGH PRESSURE STEAM PIPING - EXISTING
LPC —	LOW PRESSURE CONDENSATE PIPING
(X)LPC	LOW PRESSURE CONDENSATE PIPING - EXISTING
MU	MAKE-UP WATER PIPING MAKE-UP WATER PIPING
	MAKE-UP WATER PIPING MAKE-UP WATER PIPING - EXISTING
(X)MU	
NG-	NATURAL GAS PIPING
——(X)NG	NATURAL GAS PIPING - EXISTING
R	REFRIGERANT LINE-SET PIPING
(X)R	REFRIGERANT LINE-SET PIPING - EXISTING

ABBREVIATIONS			
TERM	ABBREVIATIO		ABBREVIATION
ABOVE FINISHED FLOOR ABOVE GROUND	AFF AG	INCH OF WATER GAUGE INDOOR UNIT	INWG IDU
ABOVE SEA LEVEL	ASL	IRON PIPE SIZE	IPS
ACROSS THE LINE	ACL	KILOVOLT-AMP	KVA
AIR ADMITTANCE VALVE	AAV	KILOWATT	KW
AIR CONDITION(-ING, -ED)	AIR COND	KILOWATT HOUR	KWH
AIR-HANDLING UNIT AIR FLOW MEASURING STATION	AHU OR AH AFMA	LEAVING AIR TEMPERATURE LEAVING WATER TEMPERATURE	LWT
AMBIENT	AMB	LENGTH	LG
AMPERE (AMP, AMPS)	AMP	LINEAR FEET	LF
ANALOG INPUT	Al	MAXIMUM	MAX
ANALOG OUTPUT	AO	MAXIMUM OVERCURRENT PROTECTION	MOCP
AND APPARATUS DEW POINT	& ADP	MEDIUM-PRESSURE STEAM MILES PER HOUR	MPS MPH
APPROXIMATE	APPROX	MINIMUM	MIN.
ARCHITECT	ARCH	MINIMUM CIRCUIT AMPERES	MCA
ATMOSPHERE	ATM	MINUTE	MIN
AVERAGE	AVG	MANUFACTURER	MFR
BRAKE HORSEPOWER BROWN & SHARPE WIRE GAGE	BHP B&S	MOTOR CONTROL CENTER NOISE CRITERIA	MCC NC
BRITISH THERMAL UNIT	BTU	NON-STANDARD PART LOAD	NPLV
BRITISH THERMAL UNIT PER HOUR	MBH	NORMALLY OPEN	NO
000 BRITISH THERMAL UNIT	MBH	NORMALLY CLOSED	NC
BUILDING	BLDG	NOT APPLICABLE	N/A
BUILDING AUTOMATION SYSTEM	BAS	NOT IN CONTRACT	NIC
CELSIUS CHILLED WATER RETURN	°C CHWR	NOT TO SCALE NUMBER	NTS NO
CHILLED WATER RETURN CHILLED WATER SUPPLY	CHWR	ON CENTER	OC
COEFFICIENT, VALVE FLOW	CV	OUNCE	OZ
COEFFICIENT OF PERFORMANCE FACTOR	COP	OUTDOOR UNIT	ODU
COMPRESSOR	COMP	OUTSIDE AIR	OA
CONCRETE	CONC	PACKAGE UNIT	PU
CONDENS(-ER, -ING, -ATION) CONNECTION	COND	PACKAGE TERMINAL AIR CONDITIONER PARTS PER MILLION	PTAC PPM
CONTINUATION	CONN	PERCENT PER MILLION	
COOLING LOAD	CLG LOAD	PHASE	PH
CUBIC FEET	CU FT	POUNDS	LBS
CUBIC INCH	CU IN	POUNDS PER SQUARE FOOT	PSF
CUBIC FEET PER MINUTE	CFM	POWER VENTILATOR	PV
DECIBEL	SCFM DB	PRESSURE PRESSURE REDUCING VALVE	PRESS PRV
DEGREE	DEG OR °	PRESSURE SAFETY VALVE	PSV
DEDICATED OUTDOOR AIR SYSTEM	DOAS	PUMPED CONDENSATE	PC
DEGREES FAHRENHEIT	DEG. F	QUANTITY	QTY
DETAIL	DET	RATED LOAD AMPS	RLA
DEW-POINT TEMPERATURE	DPT	RECIRCULATE	RECIRC
DIAMETER DIAMETER, INSIDE	DIA ID	REDUCED PRESSURE BACKFLOW PREVENTER REFRIGERANT (12, 22, ETC.)	RPZ R22, R410
DIAMETER, OUTSIDE	OD	REFRIGERANT LIQUID	RL RL
DIFFERENCE OR DELTA	DIFF	REFRIGERANT SUCTION	RS
DIGITAL INPUT	DI	REQUIRED	REQD OR REQ'
DIGITAL OUTPUT	DO	RELATIVE HUMIDITY	RH
DOMESTIC HOT WATER DOMESTIC HOT WATER RECIRCULATION	DHWR DHWR	RETURN AIR REVOLUTIONS PER MINUTE	RA RPM
DRY-BULB TEMPERATURE	DBT	REVOLUTIONS PER MINUTE REVOLUTIONS PER SECOND	RPS
DUCTLESS SPLIT SYSTEM AIR HANDLER	DAH	ROOF VENTILATOR	RV
DUCTLESS SPLIT SYSTEM HEAT PUMP	DHP	ROOF TOP UNIT	RTU
NERGY EFFICIENCY RATING	ERR	SAFETY FACTOR	SF
EFFICIENCY	EFF	SEASONAL ENERGY EFFICIENCY RATIO	SEER
ELECTRIC UNIT HEATER ELEVATION	EUH EL	SECOND SHADING COEFFICIENT	S SC
ENTERING	ENT	SPECIFICATION	SPEC
ENTERING WATER TEMPERATURE	EWT	SQUARE	SQ
ENTERING AIR TEMPERATURE	EAT	STANDARD	STD
EXISTING	(X)	STATIC PRESSURE	SP
EXTERNAL AMBIENT TEMPERATURE	EAT	SUPPLY AIR	SPLY
EXTERNAL STATIC PRESSURE EXHAUST AIR	ESP EA	TEMPERATURE	SA TEMP
EXHAUST FAN	EF	TEMPERATURE DIFFERENCE	TD
FACE VELOCITY	FVEL	THERMOSTAT	T STAT
AHRENHEIT	°F	TONS OF REFRIGERATION	TONS
EET PER MINUTE	FPM	TO BE DETERMINED	TBD
EET PER SECOND ELOOR	FPS FLR	TOP OF STEEL TOTAL DYNAMIC HEAD	TOS TDH
OOT OR FEET	FLR	TYPICAL TYPICAL	TYP
FULL LOAD AMPS	FLA	U-FACTOR	U
GAGE OR GAUGE	GA	UNDER GROUND	UG
GALLONS	GAL	UNLESS OTHERWISE NOTED	UON
GALLONS PER HOUR	GPH GPM	UNIT HEATER - ELECTRIC	UH VAV
GALLONS PER MINUTE GALLONS PER DAY	GPM GPD	VARIABLE AIR VOLUME VARIABLE FREQUENCY DRIVE	VAV
GAS UNIT HEATER	GUH	VELOCITY	VEL
GRAINS	GR	VENTILATION, VENT	VENT
IEAD	HD	VENT THRU ROOF	VTR
HEAT EXCHANGER	HX	VERTICAL	VERT
HEATING AND VENTILATION UNIT	HVAC	VOLT AMPERE	V VA
HEATING, VENTILATION AND AIR CONDITIONING HEIGHT	HGT	VOLT AMPERE VOLUME	VA
HERTZ	HZ	WATER PRESSURE DROP	WPD
HIGH DENSITY POLYPROPYLENE	HDPE	WATER GAUGE	WG
HIGH-PRESSURE STEAM	HPS	WATT	W
HORSEPOWER, HEAT PUMP	HP	WATT-HOUR	WH
HOT WATER COIL	HWC	WITH	W/
HOUR(S) HUMIDITY, RELATIVE	HR RH	WEIGHT	WT WB
	IPLV	WET BULB YARD	YD WB
NTEGRATED PART LOAD VALUES	IIPLV	ITARD	1 L <i>J</i>

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	_								//-
	REV		DESC RIPTION	V		BY	CR#	APPROVAL	DATE
				REVI	SIONS				
	SIGN	ATURES		DATE					
REFERENCE DRAWINGS	DRAWN		MEZ -	//		GE VE	RNOVA	GE Hitachi Nuclea Wilmington,	
	CHECKED		DMH -	//				•	
	ENGRG		DMH -	//	TYPE OF DRAWING	3F VFI	RNOVA	A-FMO	
	ENGRG							LEGENDS	VND
	SCALE AS	NOTED		ALL SURF.			•		, AND
		OTHERWISE		/	F	ABBKE	EVIATIO	JNS	
	2 PLACE DE	CIMALS	FRACTIONS +	·	ISSUE 202	25.09.16	DWG NO.	MOC	REV
n 6	3 PLACE DEC	CIMALS	ANGLES	· ·	CONTROLLED BY:	ISSUED TO: N/A	FILE	PIXEL SH	CONT

MAXIMUM LEAKAGE 2% AT 3 IN. WG. . LOCATE IDENTIFYING DEVICES SO THAT THEY ARE READILY VISIBLE FROM THE POINT SECTION 230500 - COMMON WORK RESULTS FOR HVAC C. VALVE SIZES: SAME AS UPSTREAM PIPING UNLESS OTHERWISE INDICATED. 2. BASE: SINGLE, VULCANIZED RUBBER, MOLDED POLYPROPYLENE, OR a. VOLTS: 120 V. POLYCARBONATE. OF NORMAL APPROACH. 2.3 VELOCITY SENSOR: MULTIPOINT ARRAY, FACTORY CALIBRATED. D. VALVE ACTUATOR TYPE: b. PHASE: 1. PART 1 - GENERAL 3. VERTICAL MEMBERS: TWO, GALVANIZED-STEEL, CONTINUOUS-THREAD 1/2-INCH 2.4 ATTENUATOR: INTEGRAL ATTENUATOR SECTION MATCHING CASING. 1. HAND LEVER: FOR QUARTER-TURN BALL VALVES SMALLER THAN NPS 4. c. HERTZ: 60 HZ. 3 INSTALLATION OF EQUIPMENT LABELS d. FULL-LOAD AMPERES: 30 A. E. VALVES IN INSULATED PIPING: A. PERMANENTLY FASTEN LABELS ON EACH ITEM OF MECHANICAL EQUIPMENT. 2.5 CONTROLS: PROVIDE DDC OR ELECTRIC ACTUATORS AS SCHEDULED, 4. HORIZONTAL MEMBER: ADJUSTABLE HEIGHT, GALVANIZED-STEEL PIPE SUPPORT A. SECTION INCLUDES: FACTORY-MOUNTED. PROVIDE 2-INCH EXTENDED NECK STEMS. e. MINIMUM CIRCUIT AMPACITY: 25 A. B. SIGN AND LABEL COLORS: THERMOMETERS, LIQUID IN GLASS. 5. PIPE SUPPORTS: CLEVIS HANGER. 2.6 ELECTRIC RESISTANCE HEAT: INTEGRAL DUCT HEATER WITH NICKEL-CHROMIUM 2. PROVIDE EXTENDED OPERATING HANDLES WITH NONTHERMAL-CONDUCTIVE f. MAXIMUM OVERCURRENT PROTECTION: 30 A. 1. WHITE LETTERS ON AN ANSI Z535.1 SAFETY-BLUE BACKGROUND. COVERING MATERIAL AND PROTECTIVE SLEEVES THAT ALLOW OPERATION OF ELEMENTS, GALVANIZED STEEL CASING, PRIMARY AUTOMATIC HIGH-LIMIT CUTOUT, THERMOWELLS. 6. HARDWARE: GALVANIZED STEEL. C. LOCATE EQUIPMENT LABELS WHERE ACCESSIBLE AND VISIBLE. VALVES WITHOUT BREAKING VAPOR SEALS OR DISTURBING INSULATION. SECONDARY MANUAL-RESET CUTOUT, AND AIRFLOW PROVING SWITCH. 2.2 CONTROLS PRESSURE GAUGES, DIAL TYPE. 7. ACCESSORIES: PROTECTION PADS. 3. PROVIDE MEMORY STOPS THAT ARE FULLY ADJUSTABLE AFTER INSULATION IS A. PIPE-MOUNTED THERMOSTATS FOR FREEZE PROTECTION: 4 INSTALLATION OF PIPE LABELS 4. GAUGE ATTACHMENTS. 8. HEIGHT: 12 INCHES ABOVE ROOF. 1. REMOTE BULB TEMPERATURE-CONTROL UNIT WITH ADJUSTABLE RANGE FROM 30 A. INSTALL PIPE LABELS SHOWING SERVICE AND FLOW DIRECTION WITH PERMANENT PIPE STAND - SINGLE BASE, SINGLE PIPE, HIGH PROFILE: ADHESIVE ON PIPES. .2 ACTION SUBMITTALS 2 BALL VALVES .1 INSTALLATION: INSTALL LEVEL, PLUMB, PER NFPA 90A. PROVIDE FLEXIBLE DUCT 1. DESCRIPTION: SINGLE BASE, VERTICAL AND HORIZONTAL MEMBERS, AND PIPE 2. SNAP ACTION; OPEN-ON-RISE, SINGLE-POLE SWITCH WITH MINIMUM CURRENT B. PIPE-LABEL LOCATIONS: LOCATE PIPE LABELS WHERE PIPING IS EXTERIOR EXPOSED CONNECTORS AT CONNECTIONS. A. PRODUCT DATA. A. BALL VALVES, FLANGED ENDS - STEEL, WITH FULL PORT AND STAINLESS-STEEL TRIM, SUPPORT, FOR ROOF INSTALLATION WITHOUT MEMBRANE PENETRATION. RATING ADEQUATE FOR CONNECTED CABLE. LOCATIONS AS FOLLOWS: CLASS 300: 3.2 ELECTRICAL: PROVIDE FIELD POWER WIRING AND GROUNDING PER NEC. COORDINATE .3 CLOSEOUT SUBMITTALS 2. BASE: SINGLE VULCANIZED RUBBER OR MOLDED POLYPROPYLENE. 3. REMOTE TEMPERATURE-SENSING BULB ON CAPILLARY, RESISTANCE 1. WITHIN 3 FT. OF EACH VALVE AND CONTROL DEVICE. STANDARD: MSS SP-72. TEMPERATURE DEVICE, OR THERMISTOR FOR DIRECTLY SENSING AMBIENT AIR OR A. OPERATION AND MAINTENANCE DATA. 3. VERTICAL MEMBERS: TWO, GALVANIZED-STEEL, CONTINUOUS-THREAD 1/2-INCH 2. WITHIN 3 FT. OF EQUIPMENT ITEMS AND OTHER POINTS OF ORIGINATION AND 2. CWP RATING: 720 PSIG. PIPE-WALL TEMPERATURE. 3.3 IDENTIFICATION: LABEL EACH UNIT WITH SCHEDULE DESIGNATION AND AIRFLOW. 4. CORROSION-RESISTANT, WATERPROOF CONTROL ENCLOSURE. PART 2 - PRODUCTS 3. BODY DESIGN: SPLIT BODY. 3.4 STARTUP: VERIFY PROPER OPERATION, HEATER SAFETIES, AND CONTROL RESPONSE. 4. HORIZONTAL MEMBER: ONE, ADJUSTABLE HEIGHT, GALVANIZED-STEEL OR 3. SPACED AT MAXIMUM INTERVALS OF 25 FT. ALONG EACH RUN. REDUCE INTERVALS STAINLESS STEEL PIPE SUPPORT SLOTTED CHANNEL OR PLATE. 4. BODY MATERIAL: CARBON STEEL, ASTM A216/A216M, TYPE WCB. TO 10 FT. IN AREAS OF CONGESTED PIPING, DUCTWORK, AND EQUIPMENT. 3.5 ADJUSTING: BALANCE AIRFLOWS IN ACCORDANCE WITH SECTION 230593. 2.1 METERS AND GAUGES FOR HVAC PIPING .3 ACCESSORIES 5. PIPE SUPPORTS: CLEVIS HANGER. DO NOT APPLY PLASTIC PIPE LABELS OR PLASTIC TAPES DIRECTLY TO BARE PIPES ENDS: FLANGED. A. THERMOMETERS, LIQUID IN GLASS - METAL CASE, INDUSTRIAL STYLE: A. CABLE INSTALLATION ACCESSORIES: FIBERGLASS TAPE, HEAT-CONDUCTIVE PUTTY, CONVEYING FLUIDS AT TEMPERATURES OF 125 DEG F OR HIGHER. WHERE THESE END OF SECTION 233600 6. HARDWARE: GALVANIZED STEEL 6. SEATS: PTFE. CABLE TIES, SILICONE END SEALS AND SPLICE KITS, AND INSTALLATION CLIPS ALL PIPES ARE TO REMAIN UNINSULATED, USE A SHORT SECTION OF INSULATION OR USE 1. STANDARD: ASME B40.200. FURNISHED BY MANUFACTURER, OR AS RECOMMENDED IN WRITING BY 7. ACCESSORIES: PROTECTION PADS, 1/2-INCH CONTINUOUS-THREAD 7. STEM: STAINLESS STEEL. 2. CASE: CAST ALUMINUM; 7-INCHNOMINAL SIZE UNLESS OTHERWISE INDICATED. GALVANIZED-STEEL ROD. FLOW-DIRECTION ARROWS: USE ARROWS TO INDICATE DIRECTION OF FLOW IN PIPES, 8. BALL: STAINLESS STEEL, VENTED. . WARNING TAPE: CONTINUOUSLY PRINTED "ELECTRICAL TRACING": VINYL. AT LEAST 3 3. CASE FORM: ADJUSTABLE ANGLE UNLESS OTHERWISE INDICATED. 8. HEIGHT: 36 INCHES ABOVE ROOF. INCLUDING PIPES WHERE FLOW IS ALLOWED IN BOTH DIRECTIONS. MILS THICK, AND WITH PRESSURE-SENSITIVE, PERMANENT, WATERPROOF, 9. PORT: FULL. 4. TUBE: GLASS WITH MAGNIFYING LENS AND BLUE OR RED ORGANIC LIQUID. PIPE STAND - MULTIPLE PIPE, HIGH PROFILE: SELF-ADHESIVE BACK. E. PIPE-LABEL COLOR SCHEDULE: 5. TUBE BACKGROUND: NONREFLECTIVE ALUMINUM WITH PERMANENTLY ETCHED BUTTERFLY VALVES 1. DESCRIPTION: ASSEMBLY OF BASES, VERTICAL AND HORIZONTAL MEMBERS, AND 1. WIDTH FOR MARKERS ON PIPES WITH OD, INCLUDING INSULATION, LESS THAN 6 1. CHILLED-WATER PIPING: WHITE LETTERS ON AN ANSI Z535.1 SAFETY-GREEN SCALE MARKINGS GRADUATED IN DEG F. PIPE SUPPORTS, FOR ROOF INSTALLATION WITHOUT MEMBRANE PENETRATION. INCHES: 3/4 INCH MINIMUM. BACKGROUND. A. BUTTERFLY VALVES, SINGLE FLANGE (LUG TYPE) - IRON, WITH STAINLESS STEEL DISC: WINDOW: GLASS. 2. BASES: TWO OR MORE; VULCANIZED RUBBER. STANDARD: MSS SP-67, TYPE I. PART 3 - EXECUTION 7. STEM: ALUMINUM AND OF LENGTH TO SUIT INSTALLATION. 3. VERTICAL MEMBERS: TWO OR MORE, GALVANIZED-STEEL CHANNELS. 2. CWP RATING: 150 PSIG OR 200 PSIG. SEE PART 3 BUTTERFLY VALVE SCHEDULE SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC INSTALLATION a. DESIGN FOR THERMOWELL INSTALLATION: BARE STEM. 4. HORIZONTAL MEMBERS: ONE OR MORE, ADJUSTABLE HEIGHT, GALVANIZED-STEEL PIPE SUPPORT. A. INSTALL ELECTRIC HEATING CABLE AT LOCATIONS INDICATED AND IN ACCORDANCE PART 1 - GENERAL 8. CONNECTOR: 1-1/4 INCHES, WITH ASME B1.1 SCREW THREADS. . BODY DESIGN: SINGLE FLANGE (LUG TYPE), SUITABLE FOR BIDIRECTIONAL DEAD-END SERVICE AT RATED PRESSURE WITHOUT USE OF DOWNSTREAM 5. PIPE SUPPORTS: CLEVIS HANGER. 9. ACCURACY: PLUS OR MINUS 1 PERCENT OF SCALE RANGE OR ONE SCALE . INSTALL ELECTRIC HEATING CABLE ACROSS EXPANSION, CONSTRUCTION, AND DIVISION, TO A MAXIMUM OF 1.5 PERCENT OF SCALE RANGE. 6. HARDWARE: GALVANIZED STEEL. CONTROL JOINTS IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS; 4. BODY MATERIAL: ASTM A126, CAST IRON OR ASTM A536, DUCTILE IRON. A. SECTION INCLUDES: B. THERMOWELLS: 7. ACCESSORIES: PROTECTION PADS, 1/2-INCH CONTINUOUS-THREAD ROD. USE CABLE-PROTECTION CONDUIT AND SLACK CABLE TO ALLOW MOVEMENT 5. SEAT: EPDM OR NBR. SEE PART 3 BUTTERFLY VALVE SCHEDULE ARTICLES. 1. TESTING, ADJUSTING, AND BALANCING OF AIR SYSTEMS: WITHOUT DAMAGE TO CABLE. 1. STANDARD: ASME B40.200. HEIGHT: 36 INCHES ABOVE ROOF. 6. STEM: ONE- OR TWO-PIECE STAINLESS STEEL. a. CONSTANT-VOLUME AIR SYSTEMS. :. INSTALL ELECTRIC HEATING CABLES AFTER PIPING HAS BEEN TESTED AND BEFORE 2. DESCRIPTION: PRESSURE-TIGHT, SOCKET-TYPE FITTING MADE FOR INSERTION IN PIPE STAND - CURB-MOUNTED-TYPE: SHOP- OR FIELD-FABRICATED PIPE SUPPORTS INSULATION IS INSTALLED. PIPING TEE FITTING. DISC: STAINLESS STEEL. 2. TESTING, ADJUSTING, AND BALANCING OF HYDRONIC PIPING SYSTEMS: MADE FROM STRUCTURAL-STEEL SHAPES, CONTINUOUS-THREAD RODS, AND ROLLERS, FOR MOUNTING ON PERMANENT STATIONARY ROOF CURB. D. INSTALL ELECTRIC HEATING CABLES IN ACCORDANCE WITH IEEE 515.1. 3. MATERIAL FOR USE WITH COPPER TUBING: CUNI. a. CONSTANT-FLOW HYDRONIC SYSTEMS. E. INSTALL INSULATION OVER PIPING WITH ELECTRIC CABLES IN ACCORDANCE WITH 4. MATERIAL FOR USE WITH STEEL PIPING: CRES. 3. TESTING, ADJUSTING, AND BALANCING OF EQUIPMENT. THERMAL-HANGER SHIELD INSERTS A. CHECK VALVES, SWING TYPE, FLANGED ENDS - IRON, WITH LEVER- AND SECTION 230719 "HVAC PIPING INSULATION." 5. TYPE: STEPPED SHANK UNLESS STRAIGHT OR TAPERED SHANK IS INDICATED. SPRING-CLOSURE CONTROL, CLASS 125: 4. DUCT LEAKAGE TESTS VERIFICATION. INSULATION-INSERT MATERIAL FOR COLD PIPING: ASTM C591, TYPE VI, GRADE 1 INSTALL WARNING TAPE ON PIPING INSULATION WHERE PIPING IS EQUIPPED WITH POLYISOCYANURATE WITH 125 PSI MINIMUM COMPRESSIVE STRENGTH AND VAPOR 6. EXTERNAL THREADS: NPS 1/2, NPS 3/4, OR NPS 1, ASME B1.20.1 PIPE THREADS. PIPE LEAKAGE TESTS VERIFICATION. STANDARD: MSS SP-71, TYPE I. ELECTRIC HEATING CABLES. 7. INTERNAL THREADS: 1/2, 3/4, AND 1 INCH, WITH ASME B1.1 SCREW THREADS. 2. CWP RATING, NPS 2-1/2 TO NPS 12 (DN 65 TO DN 300): 200 PSIG. 6. HVAC-CONTROL SYSTEM VERIFICATION. SET FIELD-ADJUSTABLE SWITCHES AND CIRCUIT-BREAKER TRIP RANGES. B. FOR TRAPEZE OR CLAMPED SYSTEMS: INSERT AND SHIELD ARE TO COVER ENTIRE 8. BORE: DIAMETER REQUIRED TO MATCH THERMOMETER BULB OR STEM. 3. CWP RATING, NPS 14 TO NPS 24 (DN 350 TO DN 600): 150 PSIG. I. INSTALL TEMPERATURE-CONTROL UNITS IN AN ACCESSIBLE LOCATION AND IN CIRCUMFERENCE OF PIPE. PART 2 - PRODUCTS (NOT APPLICABLE) ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS. LOCATE SENSING INSERTION LENGTH: LENGTH REQUIRED TO MATCH THERMOMETER BULB OR STEM 4. BODY DESIGN: CLEAR OR FULL WATERWAY . FOR CLEVIS OR BAND HANGERS: INSERT AND SHIELD ARE TO COVER BOTTOM PART 3 - EXECUTION BULBS TO SENSE OUTSIDE AIR TEMPERATURE IN A LOCATION WHERE IT WILL NOT BE 180 DEGREES OF PIPE. AFFECTED BY DIRECT SUNLIGHT OR OTHER HEAT SOURCES. 10. LAGGING EXTENSION: INCLUDE ON THERMOWELLS FOR INSULATED PIPING AND 5. BODY MATERIAL: ASTM A126, GRAY IRON WITH BOLTED BONNET. 1 GENERAL PROCEDURES FOR TESTING AND BALANCING). INSERT LENGTH: EXTEND 2 INCHES BEYOND SHEET METAL SHIELD FOR PIPING INSTALL OUTSIDE AIR AND PIPE TEMPERATURE SENSORS. ENDS: FLANGED. OPERATING BELOW AMBIENT AIR TEMPERATURE. . BUSHINGS: FOR CONVERTING SIZE OF THERMOWELL'S INTERNAL SCREW THREAD 7. TRIM: BRONZE. WITH THE PROCEDURES CONTAINED IN AABC'S "NATIONAL STANDARDS FOR TOTAL TO SIZE OF THERMOMETER CONNECTION. 3.2 ELECTRICAL CONNECTIONS 2.6 EQUIPMENT SUPPORTS SYSTEM BALANCE" AND IN THIS SECTION. 8. GASKET: ASBESTOS FREE. 12. HEAT-TRANSFER MEDIUM: MIXTURE OF GRAPHITE AND GLYCERIN. A. GROUND EQUIPMENT IN ACCORDANCE WITH SECTION 260526 "GROUNDING AND A. DESCRIPTION: WELDED, SHOP- OR FIELD-FABRICATED EQUIPMENT SUPPORT MADE BONDING FOR ELECTRICAL SYSTEMS." 9. CLOSURE CONTROL: FACTORY-INSTALLED, EXTERIOR LEVER AND SPRING. .2 DUCT LEAKAGE TESTS . PRESSURE GAUGES, DIAL TYPE - DIRECT MOUNTED, METAL CASE: FROM STRUCTURAL CARBON-STEEL SHAPES. B. CONNECT WIRING IN ACCORDANCE WITH SECTION 260519 "LOW-VOLTAGE ELECTRICAL A. WITNESS THE DUCT LEAKAGE TESTING PERFORMED BY INSTALLER. STANDARD: ASME B40.100. PART 3 - EXECUTION POWER CONDUCTORS AND CABLES." ' MATERIALS B. VERIFY THAT PROPER TEST METHODS ARE USED AND THAT LEAKAGE RATES ARE 2. CASE: LIQUID-FILLED TYPE(S); CAST ALUMINUM OR DRAWN STEEL; [4-1/2-INCH] C. CONNECT TEMPERATURE-CONTROL UNIT TO INTERRUPT POWER SUPPLY TO A. CARBON STEEL: ASTM A1011/A1011M. INSTALLATION OF VALVES WITHIN SPECIFIED LIMITS. NOMINAL DIAMETER. ELECTRIC HEATING CABLE WHEN OUTSIDE AIR IS ABOVE SET POINT. B. STRUCTURAL STEEL: ASTM A36/A36M, CARBON-STEEL PLATES, SHAPES, AND BARS; C. REPORT DEFICIENCIES OBSERVED. A. INSTALL VALVES WITH UNIONS OR FLANGES AT EACH PIECE OF EQUIPMENT 3. PRESSURE-ELEMENT ASSEMBLY: BOURDON TUBE. GALVANIZED. ARRANGED TO ALLOW SERVICE, MAINTENANCE, AND EQUIPMENT REMOVAL WITHOUT .3 FIELD QUALITY CONTROL 4. PRESSURE CONNECTION: BRASS, WITH NPS 1/4 OR NPS 1/2, ASME B1.20.1 PIPE SYSTEM SHUTDOWN. 3 PIPE LEAKAGE TESTS THREADED RODS: CONTINUOUSLY THREADED. ZINC-PLATED OR GALVANIZED STEEL THREADS AND BOTTOM-OUTLET TYPE UNLESS BACK-OUTLET TYPE IS INDICATED. A. PERFORM THE FOLLOWING TESTS AND INSPECTIONS: FOR INDOOR APPLICATIONS AND STAINLESS STEEL FOR OUTDOOR APPLICATIONS. PROVIDE SUPPORT OF PIPING ADJACENT TO VALVES SUCH THAT NO FORCE IS A. WITNESS THE PIPE PRESSURE TESTING PERFORMED BY INSTALLER. 5. MOVEMENT: MECHANICAL, WITH LINK TO PRESSURE ELEMENT AND CONNECTION MATING NUTS AND WASHERS OF SIMILAR MATERIALS AS RODS. 1. PERFORM TESTS AFTER CABLE INSTALLATION BUT BEFORE APPLICATION OF IMPOSED UPON VALVES. B. VERIFY THAT PROPER TEST METHODS ARE USED AND THAT LEAKAGE RATES ARE COVERINGS, SUCH AS INSULATION, WALL OR CEILING CONSTRUCTION, OR : LOCATE VALVES FOR EASY ACCESS AND WHERE NOT BLOCKED BY EQUIPMENT, WITHIN SPECIFIED LIMITS. PART 3 - EXECUTION 6. DIAL: NONREFLECTIVE ALUMINUM WITH PERMANENT SCALE MARKINGS OTHER PIPING, OR BUILDING COMPONENTS. C. REPORT DEFICIENCIES OBSERVED. GRADUATED IN PSI. TEST CABLES FOR ELECTRICAL CONTINUITY AND INSULATION INTEGRITY BEFORE D. FOR VALVES IN HORIZONTAL PIPING, INSTALL VALVES WITH STEM AT OR ABOVE POINTER: DARK-COLORED METAL. CENTER OF PIPE. .4 HVAC CONTROLS VERIFICATION . STRENGTH OF SUPPORT ASSEMBLIES: WHERE NOT INDICATED, SELECT SIZES OF 3. TEST CABLES TO VERIFY RATING AND POWER INPUT. ENERGIZE AND MEASURE 8. WINDOW: SAFETY GLASS. . INSTALL VALVES IN POSITION THAT DOES NOT PROJECT INTO AISLES OR BLOCK COMPONENTS SO STRENGTH WILL BE ADEQUATE TO CARRY STATIC LOADS WITHIN VOLTAGE AND CURRENT SIMULTANEOUSLY. A. IN CONJUNCTION WITH SYSTEM BALANCING, PERFORM THE FOLLOWING: ACCESS TO OTHER EQUIPMENT. SPECIFIED LOADING LIMITS. MINIMUM STATIC DESIGN LOAD USED FOR STRENGTH RING: STAINLESS STEEL. B. REPEAT TESTS FOR CONTINUITY, INSULATION RESISTANCE, AND INPUT POWER AFTER 1. VERIFY HVAC CONTROL SYSTEM IS OPERATING WITHIN THE DESIGN LIMITATIONS. DETERMINATION IS TO INCLUDE WEIGHT OF SUPPORTED COMPONENTS PLUS 200 LB. . INSTALL VALVES IN POSITION TO ALLOW FULL STEM AND ACTUATOR OR MANUAL APPLYING THERMAL INSULATION ON PIPE-MOUNTED CABLES. 10. ACCURACY: GRADE B, PLUS OR MINUS 2 PERCENT OF MIDDLE HALF OF SPAN. OPERATOR MOVEMENT. 2. CONFIRM THAT THE SEQUENCES OF OPERATION ARE IN COMPLIANCE WITH INSTALLATION OF HANGERS AND SUPPORTS C. CABLES WILL BE CONSIDERED DEFECTIVE IF THEY DO NOT PASS TESTS AND CONTRACT DOCUMENTS. D. GAUGE ATTACHMENTS: G. VERIFY THAT JOINTS OF EACH VALVE HAVE BEEN PROPERLY INSTALLED AND SEALED INSPECTIONS. . INSTALL HANGERS AND SUPPORTS TO ALLOW CONTROLLED THERMAL MOVEMENT OF 1. VALVES: BRASS BALL, WITH NPS 1/4 OR NPS 1/2, ASME B1.20.1 PIPE THREADS. 3. VERIFY THAT CONTROLLERS ARE CALIBRATED AND FUNCTION AS INTENDED. TO ENSURE THAT THERE IS NO LEAKAGE OR DAMAGE. PIPING SYSTEMS, TO PERMIT FREEDOM OF MOVEMENT BETWEEN PIPE ANCHORS, AND D. PREPARE TEST AND INSPECTION REPORTS. 4. VERIFY THAT CONTROLLER SET POINTS ARE AS INDICATED. H. INSTALL CHECK VALVES FOR PROPER DIRECTION OF FLOW AND AS FOLLOWS TO FACILITATE ACTION OF EXPANSION JOINTS, EXPANSION LOOPS, EXPANSION PART 3 - EXECUTION BENDS, AND SIMILAR UNITS. .4 PROTECTION CHECK VALVES, SWING TYPE: IN HORIZONTAL POSITION WITH HINGE PIN LEVEL. 5. VERIFY THE OPERATION OF LOCKOUT OR INTERLOCK SYSTEMS. . PIPE STAND INSTALLATION: 1 INSTALLATION OF METERS AND GAUGES A. PROTECT INSTALLED HEATING CABLES, INCLUDING NONHEATING LEADS, FROM VALVE TAGS: COMPLY WITH REQUIREMENTS FOR VALVE TAGS AND SCHEDULES IN 6. VERIFY THE OPERATION OF VALVE AND DAMPER ACTUATORS. SECTION 230553 "IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT." 1. PIPE STAND TYPES EXCEPT CURB-MOUNTED TYPE: ASSEMBLE COMPONENTS AND A. INSTALL THERMOWELLS WITH SOCKET EXTENDING ONE-THIRD OF PIPE DIAMETER AND 7. VERIFY THAT CONTROLLED DEVICES ARE PROPERLY INSTALLED AND CONNECTED MOUNT ON SMOOTH ROOF SURFACE. DO NOT PENETRATE ROOF MEMBRANE. IN VERTICAL POSITION IN PIPING TEES. B. REMOVE AND REPLACE DAMAGED HEAT-TRACING CABLES. ADHERE TO MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS. TO CORRECT CONTROLLER. 2. CURB-MOUNTED-TYPE PIPE STANDS: ASSEMBLE COMPONENTS OR FABRICATE B. INSTALL THERMOWELLS OF SIZES REQUIRED TO MATCH THERMOMETER 8. VERIFY THAT CONTROLLED DEVICES TRAVEL FREELY AND ARE IN POSITION 2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS PIPE STAND AND MOUNT ON PERMANENT, STATIONARY ROOF CURB. SEE END OF SECTION 230533 CONNECTORS. INCLUDE BUSHINGS IF REQUIRED TO MATCH SIZES. INDICATED BY CONTROLLER: OPEN, CLOSED, OR MODULATING. SECTION 077200 "ROOF ACCESSORIES" FOR CURBS. C. INSTALL THERMOWELLS WITH EXTENSION ON INSULATED PIPING. A. IF VALVES WITH SPECIFIED SWP CLASSES OR CWP RATINGS ARE UNAVAILABLE, THE 9. VERIFY LOCATION AND INSTALLATION OF SENSORS TO ENSURE THAT THEY SENSE INSTALL HANGERS AND SUPPORTS COMPLETE WITH NECESSARY ATTACHMENTS, SAME TYPES OF VALVES WITH HIGHER SWP CLASSES OR CWP RATINGS MAY BE ONLY INTENDED TEMPERATURE, HUMIDITY, OR PRESSURE. D. FILL THERMOWELLS WITH HEAT-TRANSFER MEDIUM. INSERTS, BOLTS, RODS, NUTS, WASHERS, AND OTHER ACCESSORIES. SUBSTITUTED. SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT B. REPORTING: INCLUDE A SUMMARY OF VERIFICATIONS PERFORMED, REMAINING E. INSTALL DIRECT-MOUNTED THERMOMETERS IN THERMOWELLS AND ADJUST VERTICAL). EQUIPMENT SUPPORT INSTALLATION: SELECT VALVES WITH THE FOLLOWING END CONNECTIONS: DEFICIENCIES, AND VARIATIONS FROM INDICATED CONDITIONS. AND TILTED POSITIONS. PART 1 - GENERAL FABRICATE FROM WELDED-STRUCTURAL-STEEL SHAPES. FOR STEEL PIPING, NPS 2-1/2 TO NPS 4 (DN 65 TO DN 100): FLANGED ENDS EXCEPT . INSTALL DIRECT-MOUNTED PRESSURE GAUGES IN PIPING TEES WITH PRESSURE WHERE THREADED VALVE-END OPTION IS INDICATED IN VALVE SCHEDULES. .5 TOLERANCES SUMMARY 2. FABRICATE STRUCTURAL-STEEL STANDS TO SUSPEND EQUIPMENT FROM GAUGE LOCATED ON PIPE AT THE MOST READABLE POSITION. STRUCTURE OVERHEAD OR TO SUPPORT EQUIPMENT ABOVE FLOOR. WAFER-TYPE VALVES: FLANGED CONNECTIONS. A. SET HVAC SYSTEM'S AIRFLOW RATES AND WATER FLOW RATES WITHIN THE A. SECTION INCLUDES: G. INSTALL VALVE IN PIPING FOR EACH PRESSURE GAUGE FOR FLUIDS. FOLLOWING TOLERANCES: 3. GROUTING: PLACE GROUT UNDER SUPPORTS FOR FLOOR-MOUNTED EQUIPMENT, EQUIPMENT LABELS H. INSTALL CONNECTION FITTINGS IN ACCESSIBLE LOCATIONS FOR ATTACHMENT TO AND MAKE BEARING SURFACE SMOOTH. 1. SUPPLY, RETURN, AND EXHAUST FANS AND EQUIPMENT WITH FANS: PLUS 10 PORTABLE INDICATORS. PIPE LABELS. PERCENT OR MINUS 5 PERCENT. IF DESIGN VALUE IS LESS THAN 100 CFM, WITHIN 4. PROVIDE LATERAL BRACING, TO PREVENT SWAYING. INSTALL THERMOMETERS IN THE FOLLOWING LOCATIONS: SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT .2 ACTION SUBMITTALS 2. AIR OUTLETS AND INLETS: PLUS 10 PERCENT OR MINUS 5 PERCENT. IF DESIGN 3 METAL FABRICATIONS 1. INLET AND OUTLET OF EACH HYDRONIC COIL IN AIR-HANDLING UNITS. PART 1 - GENERAL VALUE IS LESS THAN 100 CFM, WITHIN 10 CFM. A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT. A. CUT, DRILL, AND FIT MISCELLANEOUS METAL FABRICATIONS FOR TRAPEZE PIPE INSTALL PRESSURE GAUGES IN THE FOLLOWING LOCATIONS: 3. CHILLED-WATER FLOW RATE: PLUS OR MINUS 5 PERCENT. IF DESIGN VALUE IS HANGERS AND EQUIPMENT SUPPORTS. SUMMARY PART 2 - PRODUCTS INLET AND OUTLET OF EACH HYDRONIC COIL IN AIR-HANDLING UNITS. LESS THAN 10 GPM, WITHIN 10 PERCENT. A. SECTION INCLUDES: 4 ADJUSTING . MAINTAINING PRESSURE RELATIONSHIPS AS DESIGNED SHALL HAVE PRIORITY OVER 3.2 CONNECTIONS 1 EQUIPMENT LABELS THE TOLERANCES SPECIFIED ABOVE. PIPE HANGERS AND SUPPORTS - METAL. . HANGER ADJUSTMENTS: ADJUST HANGERS TO DISTRIBUTE LOADS EQUALLY ON A. PLASTIC LABELS FOR EQUIPMENT: A. INSTALL METERS AND GAUGES ADJACENT TO MACHINES AND EQUIPMENT TO ALLOW ATTACHMENTS AND TO ACHIEVE INDICATED SLOPE OF PIPE. 2. PIPE HANGERS - METAL, TRAPEZE TYPE. SPACE FOR SERVICE AND MAINTENANCE OF METERS, GAUGES, MACHINES, AND .6 VERIFICATION OF TAB REPORT 1. MATERIAL AND THICKNESS: MULTILAYER, MULTICOLOR, PLASTIC LABELS FOR EQUIPMENT. 3. STRUT SUPPORT SYSTEMS - ROOFTOP MOUNTED. .5 HANGER AND SUPPORT SCHEDULE MECHANICAL ENGRAVING, 1/16 INCH THICK, WITH PREDRILLED HOLES FOR A. THE TAB SPECIALIST'S TEST AND BALANCE ENGINEER SHALL CONDUCT THE ATTACHMENT HARDWARE. 4. THERMAL-HANGER SHIELD INSERTS. INSPECTION IN THE PRESENCE OF THE CONSTRUCTION MANAGER. A. COMPLY WITH MSS SP-58 FOR PIPE-HANGER SELECTIONS AND APPLICATIONS THAT 3.3 ADJUSTING ARE NOT SPECIFIED IN PIPING SYSTEM SECTIONS. 2. LETTER AND BACKGROUND COLOR: AS INDICATED FOR SPECIFIC APPLICATION B. THE CONSTRUCTION MANAGER SHALL RANDOMLY SELECT MEASUREMENTS, EQUIPMENT SUPPORTS. A. AFTER INSTALLATION, CALIBRATE METERS ACCORDING TO MANUFACTURER'S UNDER PART 3. DOCUMENTED IN THE FINAL REPORT, TO BE RECHECKED. RECHECKING SHALL BE WRITTEN INSTRUCTIONS. END OF SECTION 230529 LIMITED TO THE LESSER OF EITHER 10 PERCENT OF THE TOTAL MEASUREMENTS PART 2 - PRODUCTS 3. MAXIMUM TEMPERATURE: ABLE TO WITHSTAND TEMPERATURES OF UP TO 160 B. ADJUST FACES OF METERS AND GAUGES TO PROPER ANGLE FOR BEST VISIBILITY. RECORDED OR THE EXTENT OF MEASUREMENTS THAT CAN BE ACCOMPLISHED IN A NORMAL 8-HOUR BUSINESS DAY. 1 PERFORMANCE REQUIREMENTS 4. MINIMUM LABEL SIZE: LENGTH AND WIDTH VARY FOR REQUIRED LABEL CONTENT, 3.4 THERMOMETER APPLICATION . IF RECHECKS YIELD MEASUREMENTS THAT DIFFER FROM THE MEASUREMENTS BUT NOT LESS THAN 2-1/2 BY 3/4 INCH. A. STRUCTURAL PERFORMANCE: HANGERS AND SUPPORTS FOR HVAC PIPING AND DOCUMENTED IN THE FINAL REPORT BY MORE THAN THE TOLERANCES ALLOWED, THE A. THERMOMETER STEMS ARE TO BE OF LENGTH TO MATCH THERMOWELL INSERTION **SECTION 230533 - HEAT TRACING FOR HVAC PIPING** EQUIPMENT ARE TO WITHSTAND THE EFFECTS OF GRAVITY LOADS AND STRESSES 5. MINIMUM LETTER SIZE: 1/4 INCH FOR NAME OF UNITS IF VIEWING DISTANCE IS LESS MEASUREMENTS SHALL BE NOTED AS "FAILED." WITHIN LIMITS AND UNDER CONDITIONS INDICATED IN ACCORDANCE WITH ASCE/SEI 7. THAN 24 INCHES, 1/2 INCH FOR VIEWING DISTANCES OF UP TO 72 INCHES, AND D. IF THE NUMBER OF "FAILED" MEASUREMENTS IS GREATER THAN 10 PERCENT OF THE PROPORTIONATELY LARGER LETTERING FOR GREATER VIEWING DISTANCES. 1. DESIGN SUPPORTS FOR MULTIPLE PIPES, INCLUDING PIPE STANDS, CAPABLE OF 3.5 THERMOMETER SCALE-RANGE APPLICATION TOTAL MEASUREMENTS CHECKED DURING THE FINAL INSPECTION, THE TAB SHALL BE INCLUDE SECONDARY LETTERING TWO-THIRDS TO THREE-FOURTHS THE SIZE OF SUPPORTING COMBINED WEIGHT OF SUPPORTED SYSTEMS, SYSTEM CONTENTS, CONSIDERED INCOMPLETE AND SHALL BE REJECTED. A. SCALE RANGE FOR CHILLED-WATER PIPING: PRINCIPAL LETTERING. A. SECTION INCLUDES HEAT TRACING FOR FREEZE PREVENTION OF HVAC PIPING WITH E. IF RECHECK MEASUREMENTS FIND THE NUMBER OF FAILED MEASUREMENTS 6. FASTENERS: STAINLESS STEEL RIVETS OR SELF-TAPPING SCREWS. 0 TO 150 DEG F. 2. DESIGN EQUIPMENT SUPPORTS CAPABLE OF SUPPORTING COMBINED OPERATING SELF-REGULATING. PARALLEL-RESISTANCE. ELECTRIC HEATING CABLES: NONCOMPLIANT WITH REQUIREMENTS INDICATED, PROCEED AS FOLLOWS: WEIGHT OF SUPPORTED EQUIPMENT AND CONNECTED SYSTEMS AND ADHESIVE: CONTACT-TYPE PERMANENT ADHESIVE, COMPATIBLE WITH LABEL AND 3.6 PRESSURE-GAUGE APPLICATION COMPONENTS. TAB SPECIALISTS SHALL RECHECK ALL MEASUREMENTS AND MAKE ADJUSTMENTS. 2 ACTION SUBMITTALS REVISE THE FINAL REPORT AND BALANCING DEVICE SETTINGS TO INCLUDE ALL A. PRESSURE GAUGES AT INLET AND OUTLET OF EACH CHILLER CHILLED-WATER . LABEL CONTENT: INCLUDE EQUIPMENT'S DRAWING DESIGNATION OR UNIQUE CHANGES: RESUBMIT THE FINAL REPORT AND REQUEST A SECOND FINAL PIPE HANGERS AND SUPPORTS - METAL A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT CONNECTION . EQUIPMENT NUMBER, DRAWING NUMBERS WHERE EQUIPMENT IS INDICATED (PLANS, INSPECTION. ALL CHANGES SHALL BE TRACKED TO SHOW CHANGES MADE TO A. PIPE HANGERS AND SUPPORTS - CARBON STEEL: B. SHOP DRAWINGS: FOR ELECTRIC HEATING CABLE. DETAILS, AND SCHEDULES), AND THE SPECIFICATION SECTION NUMBER AND TITLE 3.7 PRESSURE-GAUGE SCALE-RANGE APPLICATION WHERE EQUIPMENT IS SPECIFIED. 1. DESCRIPTION: MSS SP-58, TYPES 1 THROUGH 58, FACTORY-FABRICATED 2. IF THE SECOND FINAL INSPECTION ALSO FAILS, OWNER MAY PURSUE OTHERS WARRANTY A. SCALE RANGE FOR CHILLED-WATER PIPING: CONTRACT OPTIONS TO COMPLETE TAB WORK. 2 PIPE LABELS SPECIAL WARRANTY: MANUFACTURER AGREES TO REPAIR OR REPLACE ELECTRIC 0 TO 160 PSI. 2. GALVANIZED METALLIC COATINGS: PREGALVANIZED, HOT-DIP GALVANIZED, OR PREPARE TEST AND INSPECTION REPORTS. HEATING CABLE THAT FAILS IN MATERIALS OR WORKMANSHIP WITHIN SPECIFIED A. GENERAL REQUIREMENTS FOR MANUFACTURED PIPE LABELS: PREPRINTED, COLOR ELECTRO-GALVANIZED. CODED, WITH LETTERING INDICATING SERVICE AND SHOWING FLOW DIRECTION IN ADDITIONAL TESTS 3. NONMETALLIC COATINGS: PLASTIC COATED, OR EPOXY POWDER COATED. ACCORDANCE WITH ASME A13.1. 1. WARRANTY PERIOD: THREE YEARS FROM DATE OF SUBSTANTIAL COMPLETION. A. WITHIN 90 DAYS OF COMPLETING TAB, PERFORM ADDITIONAL TAB TO VERIFY THAT 4. PADDED HANGERS: HANGER WITH FIBERGLASS OR OTHER PIPE INSULATION PAD B. LETTER AND BACKGROUND COLOR: AS INDICATED FOR SPECIFIC APPLICATION UNDER SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING BALANCED CONDITIONS ARE BEING MAINTAINED THROUGHOUT AND TO CORRECT OR CUSHION TO SUPPORT BEARING SURFACE OF PIPING. PART 2 - PRODUCTS UNUSUAL CONDITIONS. 5. HANGER RODS: CONTINUOUS-THREAD ROD, NUTS, AND WASHERS MADE OF :. SELF-ADHESIVE PIPE LABELS: PRINTED PLASTIC WITH CONTACT-TYPE, PART 1 - GENERAL SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES B. SEASONAL PERIODS: IF INITIAL TAB PROCEDURES WERE NOT PERFORMED DURING CARBON STEEL. PERMANENT-ADHESIVE BACKING. NEAR-PEAK SUMMER AND WINTER CONDITIONS. PERFORM ADDITIONAL TAB DURING A. STANDARD: IEEE 515.1. 1 SUMMARY D. PIPE LABEL CONTENTS: INCLUDE IDENTIFICATION OF PIPING SERVICE USING SAME NEAR-PEAK SUMMER AND WINTER CONDITIONS. 3 PIPE HANGERS - METAL, TRAPEZE TYPE DESIGNATIONS OR ABBREVIATIONS AS USED ON DRAWINGS. ALSO INCLUDE: 3. HEATING ELEMENT: PAIR OF PARALLEL NO. 16 AWG, TINNED, STRANDED COPPER BUS A. SECTION INCLUDES: A. DESCRIPTION: MSS SP-58. TYPE 59. SHOP- OR FIELD-FABRICATED PIPE-SUPPORT WIRES EMBEDDED IN CROSSLINKED CONDUCTIVE POLYMER CORE. WHICH VARIES END OF SECTION 230593 BALL VALVES. ASSEMBLY MADE FROM STRUCTURAL CARBON-STEEL SHAPES WITH MSS SP-58 HEAT OUTPUT IN RESPONSE TO TEMPERATURE ALONG ITS LENGTH. CARBON-STEEL HANGER RODS, NUTS, SADDLES, AND U-BOLTS. 2. FLOW-DIRECTION ARROWS: INCLUDE FLOW-DIRECTION ARROWS ON MAIN 2. BUTTERFLY VALVES. C. ELECTRICAL INSULATING JACKET: FLAME-RETARDANT POLYOLEFIN. DISTRIBUTION PIPING, ARROWS MAY BE EITHER INTEGRAL WITH LABEL OR APPLIED SECTION 233600 - MODULATING SINGLE-DUCT AIR TERMINAL UNITS (ABBREVIATED) CHECK VALVES. 4 STRUT SUPPORT SYSTEMS - ROOFTOP MOUNTED D. GROUNDING COVER: TINNED-COPPER BRAID. A. GENERAL REQUIREMENTS: SHOP-FABRICATED ASSEMBLIES MADE OF MANUFACTURED 3. LETTERING SIZE: SIZE LETTERS IN ACCORDANCE WITH ASME A13.1 FOR PIPING. E. CABLE COVER: TINNED-COPPER BRAID. 1.2 ACTION SUBMITTALS PART 1 - GENERAL CORROSION-RESISTANT COMPONENTS TO SUPPORT ROOF-MOUNTED PIPING. TERMINATE WITH WATERPROOF, FACTORY-ASSEMBLED, NONHEATING LEADS WITH A. PRODUCT DATA. PART 3 - EXECUTION 1 SUMMARY B. PIPE STAND - COMPACT: CONNECTORS AT ONE END, AND SEAL THE OPPOSITE END WATERTIGHT. CABLE IS TO BE CAPABLE OF CROSSING OVER ITSELF ONCE WITHOUT OVERHEATING. 1. DESCRIPTION: SINGLE BASE UNIT WITH INTEGRAL-ROD ROLLER, PIPE CLAMPS, OR PART 2 - PRODUCTS 1 PREPARATION A. SECTION INCLUDES: MODULATING SINGLE-DUCT AIR TERMINAL UNITS WITH ELECTRIC V-SHAPED CRADLE TO SUPPORT PIPE, FOR ROOF INSTALLATION WITHOUT 3. MAXIMUM OPERATING TEMPERATURE (POWER ON): 150 DEG F. RESISTANCE REHEAT. A. CLEAN PIPING AND EQUIPMENT SURFACES OF INCOMPATIBLE PRIMERS, PAINTS, AND 2.1 PERFORMANCE REQUIREMENTS I. MAXIMUM EXPOSURE TEMPERATURE (POWER OFF): 185 DEG F. ENCAPSULANTS, AS WELL AS DIRT, OIL, GREASE, RELEASE AGENTS, AND OTHER B. SUBMITTALS: PRODUCT DATA AND SHOP DRAWINGS. 2. BASE: SINGLE, VULCANIZED RUBBER, MOLDED POLYPROPYLENE, OR SUBSTANCES THAT COULD IMPAIR BOND OF IDENTIFICATION DEVICES. A. ASME COMPLIANCE: ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS POLYCARBONATE. DEFINED IN NFPA 70. BY A QUALIFIED TESTING AGENCY. AND MARKED FOR INTENDED 1. ASME B1.20.1 FOR THREADS FOR THREADED-END VALVES. PART 2 - PRODUCTS .2 INSTALLATION, GENERAL REQUIREMENTS 3. HARDWARE: GALVANIZED STEEL OR POLYCARBONATE. LOCATION AND APPLICATION. 2. ASME B16.5 FOR FLANGES ON STEEL VALVES. A. COORDINATE INSTALLATION OF IDENTIFYING DEVICES WITH COMPLETION OF 2.1 UNITS: FACTORY-FABRICATED GALVANIZED STEEL CASING WITH REMOVABLE ACCESS 4. ACCESSORIES: PROTECTION PADS. CAPACITIES AND CHARACTERISTICS: COVERING AND PAINTING OF SURFACES WHERE DEVICES ARE TO BE APPLIED. 3. ASME B16.34 FOR FLANGED- AND THREADED-END CONNECTIONS. PANELS AND GASKETS. : PIPE STAND - SINGLE BASE, SINGLE PIPE, LOW PROFILE: 1. MAXIMUM HEAT OUTPUT: 8 W/FT.. B. COORDINATE INSTALLATION OF IDENTIFYING DEVICES WITH LOCATIONS OF ACCESS 4. ASME B31.9 FOR BUILDING SERVICES PIPING VALVES. 2 DAMPER: GALVANIZED STEEL WITH GASKETED EDGES, SELF-LUBRICATING BEARINGS. 1. DESCRIPTION: SINGLE BASE WITH VERTICAL AND HORIZONTAL MEMBERS, AND 2. ELECTRICAL CHARACTERISTICS FOR SINGLE-CIRCUIT CONNECTION: PANELS AND DOORS. B. VALVE PRESSURE-TEMPERATURE RATINGS: NOT LESS THAN INDICATED AND AS PIPE SUPPORT, FOR ROOF INSTALLATION WITHOUT MEMBRANE PENETRATION. REQUIRED FOR SYSTEM PRESSURES AND TEMPERATURES. SIGNATURES 24199 REFERENCE DRAWINGS CBHF DMH DMH SCALE AS NOTED

MECHANICAL SPECIFICATIONS

DESCRIPTION APPROVAL CR# REVISIONS DATE GE Hitachi Nuclear Energy **GE VERNOVA** Wilmington, NC DRAWING GE VERNOVA-FMO

PLACE DECIMALS.

PLACE DECIMALS.

NORTH NORTH







NC# P-0506

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MECHANICAL SPECIFICATIONS WRITTEN INSTRUCTIONS. LOCATION AND APPLICATION. A. EXPOSED, DUCT AND PLENUM INSULATION: POLYISOCYANURATE BOARD, 2 INCHES, 2 A. FABRICATE DUCTS WITH GALVANIZED SHEET STEEL EXCEPT AS OTHERWISE SECTION 230713 - DUCT INSULATION E. INNER DUCT: MINIMUM 24-GAUGE SOLID GALVANIZED SHEET STEEL. LB/CU. FT. NOMINAL DENSITY. 2. OUTLET: TYPE K, ANNEALED-TEMPER COPPER TUBING WITH SOLDERED OR INDICATED AND AS FOLLOWS: INTERSTITIAL INSULATION, 2-INCH THICK FIBROUS GLASS: DUCT LINER COMPLYING PART 1 - GENERAL WITH ASTM C1071, NFPA 90A, OR NFPA 90B; AND WITH NAIMA AH124, "FIBROUS GLASS 1. FABRICATE ALL DUCTS TO ACHIEVE SMACNA PRESSURE CLASS, SEAL CLASS, AND 3.9 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE DUCT LINER STANDARD." MAXIMUM THERMAL CONDUCTIVITY: 0.27 BTU X IN./H X SQ. LEAKAGE CLASS AS INDICATED BELOW. INSTALLATION OF PIPING PART 3 - EXECUTION FT. X DEG F AT 75 DEG F MEAN TEMPERATURE. A. INSTALL JACKET OVER INSULATION MATERIAL. FOR INSULATION WITH B. DUCTWORK (SUPPLY, RETURN, EXHAUST) SHALL BE CONSTRUCTED TO SMACNA SEAL FACTORY-APPLIED JACKET, INSTALL THE FIELD-APPLIED JACKET OVER THE DRAWING PLANS, SCHEMATICS, AND DIAGRAMS INDICATE GENERAL LOCATION AND A. SECTION INCLUDES INSULATING THE FOLLOWING DUCT SERVICES: 3.1 INSTALLATION OF OUTDOOR, SEMI-CUSTOM AIR-HANDLING UNITS FACTORY-APPLIED JACKET. ARRANGEMENT OF PIPING SYSTEMS. INDICATED LOCATIONS AND ARRANGEMENTS 4 SHEET METAL MATERIALS INDOOR, CONCEALED SUPPLY AND RETURN AIR. ARE USED TO SIZE PIPE AND CALCULATE FRICTION LOSS, EXPANSION, AND OTHER 1. ALL DUCTWORK SHALL BE LEAK-TESTED TO DEMONSTRATE LEAKAGE LESS THAN 3. DUCTS AND PLENUMS, EXPOSED, UP TO 48 INCHES IN DIAMETER OR WITH FLAT A. GENERAL MATERIAL REQUIREMENTS: COMPLY WITH SMACNA'S "HVAC DUCT DESIGN CONSIDERATIONS. INSTALL PIPING AS INDICATED UNLESS DEVIATIONS TO 0.5% OF SYSTEM DESIGN FLOW AT 1.5X OPERATING PRESSURE FOR EXHAUST AND 2. OUTDOOR, EXPOSED SUPPLY AND RETURN. CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" FOR ACCEPTABLE MATERIALS, SURFACES UP TO 72 INCHES: LAYOUT ARE APPROVED ON COORDINATION DRAWINGS. RETURN DUCTWORK, OR AS OTHERWISE REQUIRED BY ASME AG-1 OR ASME N510. CONNECTIONS BEFORE INSTALLATION. MATERIAL THICKNESSES, AND DUCT CONSTRUCTION METHODS UNLESS OTHERWISE 1. ALUMINUM, STUCCO EMBOSSED: 0.020 INCH THICK. 1.2 ACTION SUBMITTALS INDICATED. SHEET METAL MATERIALS ARE TO BE FREE OF PITTING, SEAM MARKS, 2. ALL LONGITUDINAL SEAMS, TRANSVERSE JOINTS, ACCESS DOORS, AND INSTALLATION OF DIELECTRIC FITTINGS 3.2 PIPING CONNECTIONS CONNECTIONS SHALL BE SEALED WITH NUCLEAR-GRADE OR EQUIVALENT ROLLER MARKS, STAINS, DISCOLORATIONS, AND OTHER IMPERFECTIONS. DUCTS AND PLENUMS, EXPOSED, LARGER THAN 48 INCHES IN DIAMETER OR WITH A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED. SEALANT COMPATIBLE. FLAT SURFACES LARGER THAN 72 INCHES: A. INSTALL DIELECTRIC FITTINGS IN PIPING AT CONNECTIONS OF DISSIMILAR METAL B. GALVANIZED SHEET STEEL: COMPLY WITH ASTM A653/A653M. PIPING AND TUBING. PART 2 - PRODUCTS 1. ALUMINUM, STUCCO EMBOSSED: 0.020 INCH THICK. 1. GALVANIZED COATING DESIGNATION: G90. END OF SECTION 233113 . DIELECTRIC FITTINGS FOR NPS 2-1/2 TO NPS 4 (DN 65 TO DN 100): USE DIELECTRIC C. STAINLESS STEEL SHEETS: COMPLY WITH ASTM A480/A480M, TYPE 304 OR 316, AS FLANGES OR NIPPLES. .1 PERFORMANCE REQUIREMENTS END OF SECTION 230713 INDICATED IN "DUCT SCHEDULE" ARTICLE: COLD ROLLED. ANNEALED. SHEET. A. SURFACE-BURNING CHARACTERISTICS: FOR INSULATION AND RELATED MATERIALS, EXPOSED SURFACE FINISH IS TO BE NO. 2B, NO. 2D, NO. 3, OR NO. 4 AS INDICATED IN **SECTION 233300 - AIR DUCT ACCESSORIES** INSTALLATION OF HANGERS AND SUPPORTS AS DETERMINED BY TESTING IDENTICAL PRODUCTS IN ACCORDANCE WITH ASTM E84. "DUCT SCHEDULE" ARTICLE. BY A TESTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION. A. CONTRACTORS SHALL PROVIDE ALL NECESSARY PIPE SUPPORTS, HANGERS, GUIDES, SECTION 230719 - HVAC PIPING INSULATION PART 1 - GENERAL ALUMINUM SHEETS: COMPLY WITH ASTM B209 ALLOY 3003, H14 TEMPER; WITH MILL FACTORY LABEL INSULATION, JACKET MATERIALS, ADHESIVE, MASTIC, TAPES, AND AND ANCHORS FOR CHILLED WATER PIPING IN ACCORDANCE WITH INDUSTRY FINISH FOR CONCEALED DUCTS, AND STANDARD, ONE-SIDE BRIGHT FINISH FOR DUCT CEMENT MATERIAL CONTAINERS WITH APPROPRIATE MARKINGS OF APPLICABLE STANDARDS, APPLICABLE CODES, AND MANUFACTURER RECOMMENDATIONS. PART 1 - GENERAL SUPPORTS AND ATTACHMENT METHODS SHALL BE SUITABLE FOR EXTERIOR SURFACES EXPOSED TO VIEW. SUMMARY TESTING AGENCY. ROOFTOP INSTALLATION, ACCOUNTING FOR WIND LOADS, THERMAL EXPANSION, REINFORCEMENT SHAPES AND PLATES: ASTM A36/A36M, STEEL PLATES, SHAPES, AND 1. ALL INSULATION INSTALLED INDOORS AND OUTDOORS: FLAME-SPREAD INDEX OF A. SECTION INCLUDES: INSULATION THICKNESS, AND CONTINUOUS HEAT TRACING AND JACKETING. BARS; BLACK AND GALVANIZED. 25 OR LESS, AND SMOKE-DEVELOPED INDEX OF 50 OR LESS. COORDINATE SUPPORT SPACING AND METHOD TO MAINTAIN INTEGRITY OF MANUAL VOLUME DAMPERS. A. SECTION INCLUDES INSULATION FOR HVAC PIPING SYSTEMS COIL RETURN CONNECTION. INSULATION, HEAT TRACE, AND WEATHERPROOF JACKET. ALL SUPPORTS SHALL BE . WHERE BLACK- AND GALVANIZED-STEEL SHAPES AND PLATES ARE USED TO FLANGE CONNECTORS. 2.2 INSULATION MATERIALS REINFORCE ALUMINUM DUCTS, ISOLATE THE DIFFERENT METALS WITH BUTYL DESIGNED AND INSTALLED TO AVOID DAMAGE TO ROOFING SYSTEMS AND MAINTAIN ACTION SUBMITTALS 3.3 ELECTRICAL CONNECTIONS ROOF WARRANTIES. RUBBER, NEOPRENE, OR EPDM GASKET MATERIALS. A. COMPLY WITH REQUIREMENTS IN "DUCT INSULATION SCHEDULE, GENERAL," "INDOOR TURNING VANES. PRODUCT DATA: FOR EACH TYPE OF PRODUCT. DUCT AND PLENUM INSULATION SCHEDULE." AND "ABOVEGROUND, OUTDOOR DUCT . TIE RODS: GALVANIZED STEEL. 1/4-INCH-MINIMUM DIAMETER FOR LENGTHS 36 INCHES 4. DUCT-MOUNTED ACCESS DOORS END OF SECTION 232113 AND PLENUM INSULATION SCHEDULE" ARTICLES FOR WHERE INSULATING MATERIALS MOUNTED, ACCORDING TO NFPA 70 AND NECA 1. OR LESS: 3/8-INCH-MINIMUM DIAMETER FOR LENGTHS LONGER THAN 36 INCHES. INFORMATIONAL SUBMITTALS ARE APPLIED. DUCT ACCESSORY HARDWARE. A. SATISFACTORY TEST RESULTS. 5 SEALANT AND GASKETS B. GLASS-FIBER BLANKET: GLASS FIBERS BONDED WITH A THERMOSETTING RESIN; 2 ACTION SUBMITTALS SUITABLE FOR MAXIMUM USE TEMPERATURE UP TO 450 DEG F IN ACCORDANCE WITH A. GENERAL SEALANT AND GASKET REQUIREMENTS: SURFACE-BURNING ASTM C411. COMPLY WITH ASTM C553, TYPE II, AND ASTM C1290, TYPE III WITH PART 2 - PRODUCTS SECTION 232116 - HYDRONIC PIPING SPECIALTIES A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT CHARACTERISTICS FOR SEALANTS AND GASKETS ARE TO BE A MAXIMUM FACTORY-APPLIED FSK JACKET. FACTORY-APPLIED JACKET REQUIREMENTS ARE FLAME-SPREAD INDEX OF 25 AND A MAXIMUM SMOKE-DEVELOPED INDEX OF 50 WHEN SPECIFIED IN "FACTORY-APPLIED JACKETS" ARTICLE. PART 1 - GENERAL INSULATION MATERIALS TESTED IN ACCORDANCE WITH UL 723; CERTIFIED BY AN NRTL. PART 2 - PRODUCTS 3.4 CONTROL CONNECTIONS . POLYISOCYANURATE BOARD: RIGID CLOSED-CELL INSULATION SHALL BE PERMITTED A. POLYISOCYANURATE PREFORMED PIPE INSULATION: ORGANIC, RIGID, CLOSED-CELL B. WATER-BASED JOINT AND SEAM SEALANT: 1 SUMMARY FOR OUTDOOR DUCTWORK RECEIVING ALUMINUM JACKET. BOARD SHALL BE ASTM 1 PERFORMANCE REQUIREMENTS POLYISOCYANURATE FOAM INSULATION WITH FACTORY-APPLIED VAPOR RETARDER C1289 TYPE I, CLASS 1 OR EQUIVALENT, WITH MINIMUM DENSITY 2.0 PCF AND AGED APPLICATION METHOD: BRUSH ON. FACING OR SEPARATE VAPOR BARRIER AS REQUIRED. COMPLY WITH ASTM C591. A. SECTION INCLUDES: A. COMPLY WITH NFPA 90A AND NFPA 90B. R-VALUE NOT LESS THAN 6.0 PER INCH. INSULATION SHALL BE INSTALLED IN TYPE IV (FOR PREFORMED PIPE INSULATION). PROVIDE INSULATION WITH MINIMUM 2. SOLIDS CONTENT: MINIMUM 65 PERCENT. SEGMENTS TO FIT DUCT GEOMETRY, WITH ALL SEAMS SEALED VAPOR-TIGHT. HYDRONIC SPECIALTY VALVES. AGED R-VALUE OF 6.0 PER INCH AND NOMINAL DENSITY OF 2.0 PCF. B. COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND PROVIDE 0.016 INCH ALUMINUM JACKET OVER INSULATION WITH LONGITUDINAL AND FLEXIBLE" FOR ACCEPTABLE MATERIALS, MATERIAL THICKNESSES, AND DUCT 3. SHORE A HARDNESS: MINIMUM 20. AIR VENTS. CIRCUMFERENTIAL BANDS MAXIMUM 9 INCHES APART. CONSTRUCTION METHODS UNLESS OTHERWISE INDICATED. SHEET METAL MATERIALS SEALANTS WATER RESISTANT. STRAINERS. SHALL BE FREE OF PITTING. SEAM MARKS, ROLLER MARKS, STAINS, DISCOLORATIONS. . MATERIALS SHALL BE AS RECOMMENDED BY THE INSULATION MANUFACTURER AND AND OTHER IMPERFECTIONS. MOLD AND MILDEW RESISTANT. SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES. 2 ACTION SUBMITTALS A. MATERIALS ARE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND VOC: MAXIMUM 75 G/L (LESS WATER). MANUAL VOLUME DAMPERS A. ADJUST DAMPER LINKAGES FOR PROPER DAMPER OPERATION. B. JOINT SEALANTS: SUBSTRATES AND FOR BONDING INSULATION TO ITSELF AND TO SURFACES TO BE A. PRODUCT DATA. 7. MAXIMUM STATIC-PRESSURE CLASS: 10-INCH WG, POSITIVE AND NEGATIVE. INSULATED UNLESS OTHERWISE INDICATED. A. STANDARD, STEEL, MANUAL VOLUME DAMPERS: FOR SUPPLY AIR DIFFUSER 1. PERMANENTLY FLEXIBLE, ELASTOMERIC SEALANT. PART 2 - PRODUCTS 8. SERVICE: INDOOR OR OUTDOOR. B. GLASS-FIBER ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A. . METAL JACKET FLASHING SEALANTS: B. PROVIDE INDUSTRIAL-GRADE ALUMINUM MANUAL VOLUME DAMPERS SUITABLE FOR 9. SUBSTRATE: COMPATIBLE WITH GALVANIZED SHEET STEEL (BOTH PVC COATED C. FSK JACKET ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A FOR BONDING 1. FIRE- AND WATER-RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT. 2.1 HYDRONIC SPECIALTY VALVES USE IN CRITICAL EXHAUST SYSTEMS SERVING POST-HEPA FILTRATION. DAMPERS AND BARE), STAINLESS STEEL, OR ALUMINUM SHEETS. INSULATION JACKET LAP SEAMS AND JOINTS. SHALL BE LOW-LEAKAGE TYPE, WITH TIGHT-SHAVING BLADE EDGE SEALS AND FRAME . BRONZE-BODY BALANCING VALVES, BALL OR PLUG TYPE, WITH CALIBRATED ORIFICE 2. SERVICE TEMPERATURE RANGE: MINUS 40 TO PLUS 250 DEG F 10. MAXIMUM STATIC-PRESSURE CLASS: 10-INCH WG, POSITIVE OR NEGATIVE. SEALS TO MINIMIZE AIR LEAKAGE THROUGH CLOSED DAMPER BLADES. DAMPER OR VENTURI. BALLS SHALL BE BRASS OR STAINLESS STEEL: PLUGS SHALL BE RESIN. 2.4 MASTICS AND COATINGS 3. COLOR: ALUMINUM. CONSTRUCTION SHALL BE FULLY COMPATIBLE WITH THE ALUMINUM DUCTWORK SEATS SHALL BE PTFE. PROVIDE VALVES WITH THREADED OR SOCKET END 11. SERVICE: INDOOR OR OUTDOOR. A. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SYSTEM, AS ACCEPTED BY THE OWNER. ALL DAMPERS SHALL BE PROVIDED WITH CONNECTIONS. INCLUDE INTEGRAL SEALS SUITABLE FOR CONNECTION TO A 12. SUBSTRATE: COMPATIBLE WITH GALVANIZED SHEET STEEL (BOTH PVC COATED LOCKABLE MANUAL POSITION INDICATORS AND SHALL BE ADJUSTABLE FROM FIELD-APPLIED JACKETS PORTABLE DIFFERENTIAL PRESSURE METER. HANDLES SHALL BE LEVER TYPE WITH AND BARE), STAINLESS STEEL, OR ALUMINUM SHEETS. OUTSIDE THE DUCT WITHOUT DISASSEMBLY. MEMORY STOP TO RETAIN SET POSITION. VALVES SHALL HAVE A MINIMUM COLD B. VAPOR-RETARDER MASTIC, WATER BASED, INTERIOR USE: SUITABLE FOR INDOOR USE A. FIELD-APPLIED JACKETS SHALL COMPLY WITH ASTM C1136, TYPE I, UNLESS WORKING PRESSURE (CWP) RATING OF 125 PSIG AND A MAXIMUM OPERATING C. FLANGED JOINT SEALANT: COMPLY WITH ASTM C920. ON BELOW AMBIENT SERVICES. OTHERWISE INDICATED. 3 TURNING VANES TEMPERATURE OF 250°F.: GENERAL: SINGLE-COMPONENT, ACID-CURING, SILICONE, ELASTOMERIC WATER-VAPOR PERMEANCE: COMPLY WITH ASTM C755, SECTION 7.2.2, TABLE 2, B. METAL JACKET A. GENERAL REQUIREMENTS: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION FOR INSULATION TYPE AND SERVICE CONDITIONS. AIR VENTS 2. TYPE: S. STANDARDS - METAL AND FLEXIBLE"; FIGURE 4-3, "VANES AND VANE RUNNERS," AND 1. ALUMINUM JACKET: COMPLY WITH ASTM B209, ALLOY 3003, 3005, 3105, OR 5005, FIGURE 4-4 "VANE SUPPORT IN FI BOWS" 2. SERVICE TEMPERATURE RANGE: MINUS 20 TO PLUS 180 DEG F. . MANUAL AIR VENTS SHALL HAVE BRONZE BODIES WITH NONFERROUS INTERNAL GRADE: NS COMPONENTS AND BE OPERATED BY SCREWDRIVER OR THUMBSCREW. EACH VENT COLOR: WHITE. a. FINISH AND THICKNESS ARE INDICATED IN FIELD-APPLIED JACKET SCHEDULES. 4. CLASS: 25. 4 DUCT-MOUNTED ACCESS DOORS 3.8 FIELD QUALITY CONTROL SHALL HAVE A 1/2-INCH NPS INLET CONNECTION AND A 1/8-INCH NPS DISCHARGE b. MOISTURE BARRIER FOR OUTDOOR APPLICATIONS: 3-MIL-THICK POLYSURLYN. CONNECTION. VALVES SHALL BE RATED FOR A MINIMUM COLD WORKING PRESSURE USE: O. 2.5 SEALANTS A. DUCT-MOUNTED ACCESS DOORS: FABRICATE ACCESS PANELS IN ACCORDANCE WITH (CWP) OF 150 PSIG AND A MAXIMUM OPERATING TEMPERATURE OF 225°F. FACTORY-AUTHORIZED SERVICE REPRESENTATIVE. SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE": D. FLANGE GASKETS: BUTYL RUBBER, NEOPRENE, OR EPDM POLYMER WITH A. FSK AND METAL JACKET FLASHING SEALANTS: 1 SECUREMENTS FIGURE 7-2 (7-2M). "DUCT ACCESS DOORS AND PANELS." AND FIGURE 7-3. "ACCESS 3 STRAINERS POLYISOBUTYLENE PLASTICIZER. DOORS - ROUND DUCT." 3.9 DEMONSTRATION 1. MATERIALS ARE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND A. BANDS: E. ROUND DUCT JOINT O-RING SEALS: SUBSTRATES. A. Y-PATTERN STRAINERS SHALL HAVE ASTM A126 CLASS B CAST IRON BODIES WITH 1. ALUMINUM: ASTM B209, ALLOY 3003, 3005, 3105, OR 5005. 5 DUCT ACCESSORY HARDWARE BOLTED COVERS AND BOTTOM DRAIN CONNECTIONS. STRAINERS SHALL HAVE 1. SEAL IS TO PROVIDE MAXIMUM LEAKAGE CLASS OF 3 CFM/100 SQ. FT. AT 1-INCH 2. FIRE- AND WATER-RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT. THREADED END CONNECTIONS FOR SIZES 2 INCHES NPS AND SMALLER, AND FLANGED . SPRINGS: TWIN SPRING SET CONSTRUCTED OF STAINLESS STEEL, WITH ENDS WG AND IS TO BE RATED FOR10-INCH WG STATIC-PRESSURE CLASS, POSITIVE OR A. INSTRUMENT TEST HOLES: CAST IRON OR CAST ALUMINUM TO SUIT DUCT MATERIAL. END CONNECTIONS FOR SIZES 2-1/2 INCHES NPS AND LARGER. STRAINER SCREENS 3. SERVICE TEMPERATURE RANGE: MINUS 40 TO PLUS 250 DEG F. FLAT AND SLOTTED TO ACCEPT METAL BANDS. SPRING SIZE IS DETERMINED BY INCLUDING SCREW CAP AND GASKET. SIZE TO ALLOW INSERTION OF PITOT TUBE AND SHALL BE STAINLESS STEEL, EITHER 20-MESH OR PERFORATED BASKET TYPE. MANUFACTURERS FOR APPLICATION. OTHER TESTING INSTRUMENTS AND OF LENGTH TO SUIT DUCT-INSULATION END OF SECTION 237343.16 COLOR: ALUMINUM. STRAINERS SHALL BE RATED FOR A MINIMUM COLD WORKING PRESSURE (CWP) OF 2. EPDM O-RING TO SEAL IN CONCAVE BEAD IN COUPLING OR FITTING SPIGOT. PART 3 - EXECUTION 3. DOUBLE-LIPPED, EPDM O-RING SEAL, MECHANICALLY FASTENED TO 2.6 FACTORY-APPLIED JACKETS B. ADHESIVES: HIGH STRENGTH, QUICK SETTING, NEOPRENE BASED, WATERPROOF, AND FACTORY-FABRICATED COUPLINGS AND FITTING SPIGOTS. **SECTION 233713.13 - AIR DIFFUSERS (ABBREVIATED** RESISTANT TO GASOLINE AND GREASE. PART 3 - EXECUTION A. INSULATION SYSTEM SCHEDULES INDICATE FACTORY-APPLIED JACKETS ON VARIOUS I PREPARATION APPLICATIONS. WHEN FACTORY-APPLIED JACKETS ARE INDICATED, COMPLY WITH THE .6 HANGERS AND SUPPORTS A. CLEAN AND DRY SURFACES TO RECEIVE INSULATION. REMOVE MATERIALS THAT WILL PART 3 - EXECUTION 1 INSTALLATION OF VALVES FOLLOWING: PART 1 - GENERAL ADVERSELY AFFECT INSULATION APPLICATION. HANGER RODS FOR NONCORROSIVE ENVIRONMENTS: GALVANIZED-STEEL RODS AND A. INSTALL CALIBRATED-ORIFICE BALANCING VALVE AT EACH BRANCH CONNECTION TO 1. FSK JACKET: ALUMINUM-FOIL, FIBERGLASS-REINFORCED SCRIM WITH INSTALLATION COORDINATE INSULATION INSTALLATION WITH THE TRADESMAN INSTALLING HEAT 1 SUMMARY RETURN MAIN. KRAFT-PAPER BACKING; COMPLYING WITH ASTM C1136, TYPE II. TRACING. COMPLY WITH REQUIREMENTS FOR HEAT TRACING THAT APPLY TO B. STRAP AND ROD SIZES: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION A. INSTALL DUCT ACCESSORIES IN ACCORDANCE WITH APPLICABLE DETAILS IN INSULATION. A. SECTION INCLUDES: STANDARDS - METAL AND FLEXIBLE," TABLE 5-1, "RECTANGULAR DUCT HANGERS SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" FOR HYDRONIC SPECIALTIES INSTALLATION .7 FIELD-APPLIED JACKETS MINIMUM SIZE," AND TABLE 5-2, "MINIMUM HANGER SIZES FOR ROUND DUCT." METAL DUCTS AND IN NAIMA AH116 FOR FIBROUS-GLASS DUCTS. DIFFUSERS. . INSTALL MANUAL AIR VENTS AT HIGH POINTS IN PIPING, AT HEAT-TRANSFER COILS, A. FIELD-APPLIED JACKETS COMPLY WITH ASTM C921, TYPE I, UNLESS OTHERWISE GENERAL INSTALLATION REQUIREMENTS : STEEL CABLES FOR GALVANIZED-STEEL DUCTS: GALVANIZED STEEL COMPLYING WITH B. INSTALL DUCT ACCESSORIES OF MATERIALS SUITED TO DUCT MATERIALS; USE AND ELSEWHERE AS REQUIRED FOR SYSTEM AIR VENTING. A. INSTALL INSULATION MATERIALS, ACCESSORIES, AND FINISHES WITH SMOOTH, ASTM A603. GALVANIZED-STEEL ACCESSORIES IN GALVANIZED-STEEL AND FIBROUS-GLASS B. INSTALL MANUAL VENTS AT HEAT-TRANSFER COILS AND ELSEWHERE AS REQUIRED STRAIGHT, AND EVEN SURFACES; FREE OF VOIDS THROUGHOUT THE LENGTH OF B. ALUMINUM JACKET: COMPLY WITH ASTM B209, ALLOY 3003, 3005, 3105, OR 5005, DUCTS, STAINLESS STEEL ACCESSORIES IN STAINLESS STEEL DUCTS, AND ALUMINUM . STEEL CABLES FOR STAINLESS STEEL DUCTS: STAINLESS STEEL COMPLYING WITH FOR AIR VENTING. PIPING, INCLUDING FITTINGS, VALVES, AND SPECIALTIES. TEMPER H-14. ACCESSORIES IN ALUMINUM DUCTS. ASTM A492 SHEET AND ROLL STOCK READY FOR SHOP OR FIELD SIZING. END OF SECTION 232116 .3 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE . STEEL CABLE END CONNECTIONS: GALVANIZED-STEEL ASSEMBLIES WITH BRACKETS, END OF SECTION 233300 2. FINISH AND THICKNESS ARE INDICATED IN FIELD-APPLIED JACKET SCHEDULES SWIVEL, AND BOLTS DESIGNED FOR DUCT HANGER SERVICE; WITH AN A. CHILLED WATER: ALL PIPE SIZES: INSULATION SHALL BE THE FOLLOWING: AUTOMATIC-LOCKING AND CLAMPING DEVICE. 3. MOISTURE BARRIER FOR OUTDOOR APPLICATIONS: 3-MIL-THICK POLYSURLYN. POLYISOCYANURATE: 3 INCHES THICK. SECTION 233113 - METAL DUCTS DUCT ATTACHMENTS: SHEET METAL SCREWS, BLIND RIVETS, OR SELF-TAPPING METAL SECTION 233346 - FLEXIBLE DUCTS 2.8 TAPES SCREWS; COMPATIBLE WITH DUCT MATERIALS. PART 2 - PRODUCTS 3.4 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE PART 1 - GENERAL PART 1 - GENERAL A. FSK TAPE: FOIL-FACE, VAPOR-RETARDER TAPE MATCHING FACTORY-APPLIED JACKET A. INSTALL JACKET OVER INSULATION MATERIAL. FOR INSULATION WITH G. TRAPEZE AND RISER SUPPORTS: 2.1 DIFFUSERS WITH ACRYLIC ADHESIVE; COMPLYING WITH ASTM C1136. 1 SUMMARY FACTORY-APPLIED JACKET, INSTALL THE FIELD-APPLIED JACKET OVER THE 1. SUPPORTS FOR GALVANIZED-STEEL DUCTS: GALVANIZED-STEEL SHAPES AND SUMMARY FACTORY-APPLIED JACKET. A. FURNISH DIFFUSERS AS SCHEDULED ON DRAWINGS WIDTH: 3 INCHES. A. SECTION INCLUDES: PLATES. A. SECTION INCLUDES: B. IF MORE THAN ONE MATERIAL IS LISTED, SELECTION FROM MATERIALS LISTED IS 2. SUPPORTS FOR STAINLESS STEEL DUCTS: STAINLESS STEEL SHAPES AND PLATES. 2. THICKNESS: 6.5 MILS. 1. SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS. B. PROVIDE OPPOSED-BLADE DAMPERS WHERE INDICATED CONTRACTOR'S OPTION. 1. FLEXIBLE DUCTS, INSULATED. 3. SUPPORTS FOR ALUMINUM DUCTS: ALUMINUM OR GALVANIZED STEEL COATED 3. ADHESION: 90 OUNCES FORCE/INCH IN WIDTH. 2. SINGLE-WALL ROUND DUCTS AND FITTINGS . PIPING, EXPOSED: PART 3 - EXECUTION WITH ZINC CHROMATE. 2 ACTION SUBMITTALS 4. ELONGATION: 2 PERCENT. 3. DOUBLE-WALL ROUND DUCTS AND FITTINGS. 1. ALUMINUM, CORRUGATED: 0.020 INCH THICK 5. TENSILE STRENGTH: 40 LBF/INCH IN WIDTH. 4. SHEET METAL MATERIALS. PART 3 - EXECUTION A. PRODUCT DATA. 3.1 INSTALLATION 6. FSK TAPE DISKS AND SQUARES: PRECUT DISKS OR SQUARES OF FSK TAPE. SEALANTS AND GASKETS. SECTION 232113 - HYDRONIC PIPING .1 DUCT INSTALLATION PART 2 - PRODUCTS HANGERS AND SUPPORTS. A. DRAWING PLANS. SCHEMATICS. AND DIAGRAMS INDICATE GENERAL LOCATION AND 2.9 SECUREMENTS PART 1 - GENERAL 2.1 ASSEMBLY DESCRIPTION B. PROVIDE AIRTIGHT CONNECTION TO DUCTWORK. ARRANGEMENT OF DUCT SYSTEM. INDICATED DUCT LOCATIONS, CONFIGURATIONS, PART 2 - PRODUCTS A. ALUMINUM BANDS: ASTM B209, ALLOY 3003, 3005, 3105, OR 5005; TEMPER H-14, 0.020 AND ARRANGEMENTS WERE USED TO SIZE DUCTS AND CALCULATE FRICTION LOSS A. COMPLY WITH NFPA 90A AND NFPA 90B. INSTALL TO ALLOW SERVICE AND MAINTENANCE OF DAMPERS. INCH THICK, 3/4 INCH WIDE WITH WING SEAL OR CLOSED SEAL. 1 SUMMARY FOR AIR-HANDLING EQUIPMENT SIZING AND FOR OTHER DESIGN CONSIDERATIONS. B. COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND PERFORMANCE REQUIREMENTS INSTALL DUCT SYSTEMS AS INDICATED UNLESS DEVIATIONS TO LAYOUT ARE B. INSULATION PINS AND HANGERS: A. SECTION INCLUDES: FLEXIBLE" FOR ACCEPTABLE MATERIALS, MATERIAL THICKNESSES, AND DUCT APPROVED ON SHOP DRAWINGS AND COORDINATION DRAWINGS. 3.2 ADJUSTING A. DELEGATED DUCT DESIGN: DUCT CONSTRUCTION, INCLUDING SHEET METAL CONSTRUCTION METHODS UNLESS OTHERWISE INDICATED. SHEET METAL MATERIALS 1. METAL, ADHESIVELY ATTACHED, PERFORATED-BASE INSULATION HANGERS: STEEL PIPE AND FITTINGS. THICKNESSES. SEAM AND JOINT CONSTRUCTION, REINFORCEMENTS, AND HANGERS B. INSTALL DUCTS IN ACCORDANCE WITH SMACNA'S "HVAC DUCT CONSTRUCTION MUST BE FREE OF PITTING. SEAM MARKS, ROLLER MARKS, STAINS, DISCOLORATIONS. BASEPLATE WELDED TO PROJECTING SPINDLE THAT IS CAPABLE OF HOLDING AND SUPPORTS, COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS -2. DIELECTRIC FITTINGS. STANDARDS - METAL AND FLEXIBLE" UNLESS OTHERWISE INDICATED. AND OTHER IMPERFECTIONS. INSULATION, OF THICKNESS INDICATED, SECURELY IN POSITION INDICATED WHEN METAL AND FLEXIBLE" AND WITH PERFORMANCE REQUIREMENTS AND DESIGN SELF-LOCKING WASHER IS IN PLACE. CRITERIA INDICATED IN "DUCT SCHEDULE" ARTICLE. **END OF SECTION 237343.13** ACTION SUBMITTALS 2 INSTALLATION OF EXPOSED DUCTWORK .2 FLEXIBLE DUCTS, INSULATED INSULATION-RETAINING WASHERS: SELF-LOCKING WASHERS FORMED FROM STRUCTURAL PERFORMANCE: DUCT HANGERS AND SUPPORTS ARE TO WITHSTAND A. PRODUCT DATA. A. PROTECT DUCTS EXPOSED IN FINISHED SPACES FROM BEING DENTED, SCRATCHED, 0.016-INCH-THICK. STAINLESS STEEL SHEET. WITH BEVELED EDGE SIZED AS A. FLEXIBLE DUCTS, INSULATED - CLASS 1, MULTIPLE LAYERS OF ALUMINUM LAMINATE THE EFFECTS OF GRAVITY LOADS AND STRESSES WITHIN LIMITS AND UNDER SECTION 233713.23 - REGISTERS AND GRILLES (ABBREVIATED) REQUIRED TO HOLD INSULATION SECURELY IN PLACE BUT NOT LESS THAN 1-1/2 SUPPORTED BY HELICALLY WOUND, SPRING-STEEL WIRE; FIBROUS-GLASS CONDITIONS DESCRIBED IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS PART 2 - PRODUCTS INCHES IN DIAMETER. B. GRIND WELDS TO PROVIDE SMOOTH SURFACE FREE OF BURRS. SHARP EDGES. AND METAL AND FLEXIBLE" AND ASCE/SEI 7. SMACNA'S "SEISMIC RESTRAINT MANUAL: WELD SPLATTER. WHEN WELDING STAINLESS STEEL WITH A NO. 3 OR 4 FINISH, GRIND GUIDELINES FOR MECHANICAL SYSTEMS PART 1 - GENERAL PRESSURE RATING: 10 INCH WG POSITIVE AND 1.0 INCH WG NEGATIVE. PART 3 - EXECUTION 1 PERFORMANCE REQUIREMENTS THE WELDS FLUSH, POLISH THE EXPOSED WELDS, AND TREAT THE WELDS TO WIND PERFORMANCE: DUCTS ARE TO WITHSTAND THE EFFECTS OF WIND 2. MAXIMUM AIR VELOCITY: 4000 FPM. REMOVE DISCOLORATION CAUSED BY WELDING. I.1 SUMMARY . HYDRONIC PIPING COMPONENTS AND INSTALLATION ARE TO BE CAPABLE OF DETERMINED IN ACCORDANCE WITH TO ASCE/SEI 7. .1 GENERAL INSTALLATION REQUIREMENTS WITHSTANDING THE FOLLOWING MINIMUM WORKING PRESSURES AND 3. TEMPERATURE RANGE: MINUS 20 TO PLUS 210 DEG F. MAINTAIN CONSISTENCY, SYMMETRY, AND UNIFORMITY IN ARRANGEMENT AND A. SECTION INCLUDES TEMPERATURES UNLESS OTHERWISE INDICATED: AIRSTREAM SURFACES: SURFACES IN CONTACT WITH AIRSTREAM COMPLY WITH A. INSTALL INSULATION MATERIALS. ACCESSORIES. AND FINISHES WITH SMOOTH. FABRICATION OF FITTINGS, HANGERS AND SUPPORTS, DUCT ACCESSORIES, AND AIR 4. INSULATION R-VALUE: R8. **REQUIREMENTS IN ASHRAE 62.1.** STRAIGHT, AND EVEN SURFACES; FREE OF VOIDS THROUGHOUT THE LENGTH OF REGISTERS. 1. CHILLED-WATER PIPING: 150 PSIG AT 73 DEG F. DUCTS AND FITTINGS. VAPOR-BARRIER FILM: ALUMINIZED ASHRAE COMPLIANCE: APPLICABLE REQUIREMENTS IN ASHRAE 62.1, SECTION 5 -. REPAIR OR REPLACE DAMAGED SECTIONS AND FINISHED WORK THAT DOES NOT 2. AIR-VENT PIPING: 180 DEG F GRILLES. "SYSTEMS AND EQUIPMENT." AND SECTION 7 - "CONSTRUCTION AND SYSTEM COMPLY WITH THESE REQUIREMENTS. 3.2 PENETRATIONS PART 3 - EXECUTION A. INSULATION INSTALLATION AT ROOF PENETRATIONS: INSTALL INSULATION 1.2 SUBMITTALS 3.3 DUCT SEALING F. ASHRAE/IES COMPLIANCE: APPLICABLE REQUIREMENTS IN ASHRAE/IES 90.1, 1 INSTALLATION OF FLEXIBLE DUCTS STEEL PIPE: ASTM A53/A53M BLACK STEEL WITH PLAIN ENDS; WELDED AND SEAMLESS, CONTINUOUSLY THROUGH ROOF PENETRATIONS SECTION 6.4.4 - "HVAC SYSTEM CONSTRUCTION AND INSULATION. A. SEAL DUCTS FOR DUCT STATIC-PRESSURE, SEAL CLASSES, AND LEAKAGE CLASSES GRADE B, AND SCHEDULE NUMBER AS INDICATED IN PART 3,"PIPING APPLICATIONS" A. CONNECT DIFFUSERS TO DUCTS DIRECTLY OR WITH MAXIMUM 60-INCH LENGTHS OF SEAL PENETRATIONS WITH FLASHING SEALANT. SPECIFIED IN "DUCT SCHEDULE" ARTICLE IN ACCORDANCE WITH SMACNA'S "HVAC . DUCT DIMENSIONS: UNLESS OTHERWISE INDICATED, ALL DUCT DIMENSIONS TYPE SCHEDULED. FLEXIBLE DUCT CLAMPED OR STRAPPED IN PLACE. DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE." INDICATED ON DRAWINGS ARE INSIDE CLEAR DIMENSIONS AND DO NOT INCLUDE 2. FOR APPLICATIONS REQUIRING ONLY INDOOR INSULATION, TERMINATE MALLEABLE-IRON THREADED FITTINGS: ASME B16.3. CLASSES 150 AND 300 AS INSULATION OR DUCT WALL THICKNESS. B. CONNECT FLEXIBLE DUCTS TO METAL DUCTS USING A DRAW BAND OVER THE DUCT INSULATION ABOVE ROOF SURFACE AND SEAL WITH JOINT SEALANT. FOR 3. SEAL DUCTS AT A MINIMUM TO THE FOLLOWING SEAL CLASSES IN ACCORDANCE WITH INDICATED IN PART 3, "PIPING APPLICATIONS" ARTICLE. COLLAR, WITH MASTIC (UL 181B-M) APPLIED TO THE COLLAR BEFORE INSERTION. APPLICATIONS REQUIRING INDOOR AND OUTDOOR INSULATION, INSTALL SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE": ENSURE THE INNER LINER IS SECURED OVER THE COLLAR AND SEALED, THEN COVER SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS INSULATION FOR OUTDOOR APPLICATIONS TIGHTLY JOINED TO INDOOR MALLEABLE-IRON UNIONS: ASME B16.39; CLASSES 150, 250, AND 300 AS INDICATED IN 1. COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND WITH INSULATION AND SECURE THE OUTER JACKET WITH A SECOND DRAW BAND.. PART 2 - PRODUCTS INSULATION ENDS. SEAL JOINT WITH JOINT SEALANT. PART 3, "PIPING APPLICATIONS" ARTICLE. . GENERAL FABRICATION REQUIREMENTS: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" BASED ON INDICATED SUPPORTING FLEXIBLE DUCTS: SUPPORT FLEXIBLE DUCT AT MANUFACTURER'S 3. EXTEND JACKET OF OUTDOOR INSULATION OUTSIDE ROOF FLASHING AT LEAST 2 STEEL PIPE NIPPLES: ASTM A733, MADE OF SAME MATERIALS AND WALL THICKNESSES 2.1 REGISTERS AND GRILLES 2. SUPPLY-AIR DUCTS: SEAL CLASS A. STATIC-PRESSURE CLASS UNLESS OTHERWISE INDICATED. RECOMMENDED INTERVALS, BUT AT NO GREATER DISTANCE THAN 4 FT.. PROVIDE INCHES BELOW TOP OF ROOF FLASHING. AS PIPE IN WHICH THEY ARE INSTALLED. SUFFICIENT SUPPORT SO THAT MAXIMUM CENTERLINE SAG IS 1/2 IN. PER FT. 3. RETURN-AIR DUCTS: SEAL CLASS A A. FURNISH REGISTERS AND GRILLES AS SCHEDULED ON DRAWINGS. 4. SEAL JACKET TO ROOF FLASHING WITH FLASHING SEALANT. BETWEEN SUPPORTS. A CONNECTION TO RIGID DUCT OR EQUIPMENT MAY BE SINGLE-WALL ROUND DUCTS AND FITTINGS 3 DIELECTRIC FITTINGS CONSIDERED A SUPPORT JOINT. B. PROVIDE OPPOSED-BLADE DAMPERS WHERE INDICATED. 4 HANGER AND SUPPORT INSTALLATION A. GENERAL FABRICATION REQUIREMENTS: COMPLY WITH SMACNA'S "HVAC DUCT 3.3 INSTALLATION OF GLASS-FIBER INSULATION A. GENERAL REQUIREMENTS: ASSEMBLY OF COPPER ALLOY AND FERROUS MATERIALS CONSTRUCTION STANDARDS - METAL AND FLEXIBLE." CH. 3. "ROUND, OVAL, AND WITH SEPARATING NONCONDUCTIVE INSULATING MATERIAL. INCLUDE END END OF SECTION 233346 A. COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND A. BLANKET INSULATION INSTALLATION ON DUCTS AND PLENUMS: SECURE WITH FLEXIBLE DUCT," BASED ON INDICATED STATIC-PRESSURE CLASS UNLESS OTHERWISE PART 3 - EXECUTION CONNECTIONS COMPATIBLE WITH PIPES TO BE JOINED. FLEXIBLE," CHAPTER 5, "HANGERS AND SUPPORTS." ADHESIVE AND INSULATION PINS. INDICATED. B. DIELECTRIC FLANGES: 3.1 INSTALLATION B. COMPLY WITH MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS. .5 FIELD QUALITY CONTROL SECTION 237343.16 - OUTDOOR, SEMI-CUSTOM AIR-HANDLING UNITS 4 DOUBLE-WALL ROUND DUCTS AND FITTINGS DESCRIPTION: A. PERFORM TESTS AND INSPECTIONS. 3.4 INSTALLATION OF POLYISICYANURATE INSULATION . OUTER DUCT: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - a. STANDARD: ASSE 1079. CEILING SURFACES. PART 1 - GENERAL METAL AND FLEXIBLE," CH. 3, "ROUND, OVAL, AND FLEXIBLE DUCT," BASED ON B. LEAKAGE TESTS: A. COMPLY WITH MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS. b. FACTORY-FABRICATED, BOLTED, COMPANION-FLANGE ASSEMBLY. B. PROVIDE AIRTIGHT CONNECTION TO DUCTWORK. STATIC-PRESSURE CLASS UNLESS OTHERWISE INDICATED. CONSTRUCT DUCTS OF 1. COMPLY WITH SMACNA'S "HVAC AIR DUCT LEAKAGE TEST MANUAL." SUBMIT A 1 SUMMARY GALVANIZED SHEET STEEL. c. PRESSURE RATING: 150 PSIG 3.5 FIELD-APPLIED JACKET INSTALLATION TEST REPORT FOR EACH TEST. C. INSTALL TO ALLOW SERVICE AND MAINTENANCE OF DAMPERS. A. SECTION INCLUDES: . TRANSVERSE JOINTS: SELECT JOINT TYPES AND FABRICATE IN ACCORDANCE WITH d. END CONNECTIONS: SOLDER-JOINT COPPER ALLOY AND THREADED FERROUS; A. WHERE METAL JACKETS ARE INDICATED, INSTALL WITH 2-INCH OVERLAP AT 2. TEST ENTIRE DUCTWORK ASSEMBLY. SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE." FIGURE 1. OUTDOOR, SEMI-CUSTOM AIR-HANDLING UNITS. THREADED SOLDER-JOINT COPPER ALLOY AND THREADED FERROUS. LONGITUDINAL SEAMS AND END JOINTS. OVERLAP LONGITUDINAL SEAMS ARRANGED 3-1, "ROUND DUCT TRANSVERSE JOINTS," FOR STATIC-PRESSURE CLASS, APPLICABLE 3.2 ADJUSTING C. DUCT SYSTEM CLEANLINESS TESTS: TO SHED WATER, SEAL END JOINTS WITH WEATHERPROOF SEALANT RECOMMENDED SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND .2 ACTION SUBMITTALS BY INSULATION MANUFACTURER. SECURE JACKET WITH STAINLESS STEEL BANDS 12 PART 3 - EXECUTION 1. VISUALLY INSPECT DUCT SYSTEM TO ENSURE THAT NO VISIBLE CONTAMINANTS A. ADJUST AIR PATTERNS TO MATCH DESIGN INTENT BEFORE TESTING AND BALANCING. OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL INCHES O.C. AND AT END JOINTS. ARE PRESENT. AND FLEXIBLE." A. PRODUCT DATA: FOR EACH AIR-HANDLING UNIT. .1 PIPING APPLICATIONS END OF SECTION 233713.23 DUCT SYSTEM WILL BE CONSIDERED DEFECTIVE IF IT DOES NOT PASS TESTS AND LONGITUDINAL SEAMS: SELECT SEAM TYPES AND FABRICATE IN ACCORDANCE WITH B. SHOP DRAWINGS: FOR EACH OUTDOOR, SEMI-CUSTOM AIR-HANDLING UNIT. 3.6 DUCT INSULATION SCHEDULE, GENERAL A. CHILLED-WATER PIPING, ABOVEGROUND, NPS 2-1/2 (DN 65) AND LARGER, TO BE ANY SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE." FIGURE INSPECTIONS. A. PLENUMS AND DUCTS REQUIRING INSULATION: OF THE FOLLOWING: 3-2, "ROUND DUCT LONGITUDINAL SEAMS," FOR STATIC-PRESSURE CLASS, 3 CLOSEOUT SUBMITTALS E. PREPARE TEST AND INSPECTION REPORTS. APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INDOOR, CONCEALED SUPPLY AND RETURN AIR. 1. SCHEDULE 40, GRADE B, STEEL PIPE, PLAIN-END MECHANICAL JOINT COUPLINGS A. OPERATION AND MAINTENANCE DATA: FOR AIR-HANDLING UNITS TO INCLUDE IN INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION AND FITTINGS; AND PLAIN-END MECHANICAL JOINTS. .6 STARTUP EMERGENCY, OPERATION, AND MAINTENANCE MANUALS. 2. OUTDOOR, EXPOSED SUPPLY AND RETURN AIR. STANDARDS - METAL AND FLEXIBLE." 3. CONDENSATE-DRAIN PIPING INSTALLED ABOVEGROUND TO BE ANY OF THE A. AIR BALANCE: COMPLY WITH REQUIREMENTS IN SECTION 230593 "TESTING, TEES AND LATERALS: SELECT TYPES AND FABRICATE IN ACCORDANCE WITH FOLLOWING: 7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE ADJUSTING, AND BALANCING FOR HVAC." SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE." FIGURE 1. SCHEDULE 40, PVC PLASTIC PIPE AND FITTINGS AND SOLVENT-WELDED JOINTS. 3-5, "90 DEGREE TEES AND LATERALS." AND FIGURE 3-6, "CONICAL TEES," FOR A. CONCEALED, DUCT AND PLENUM INSULATION: GLASS-FIBER BLANKET, 2 INCHES THICK 1 PERFORMANCE REQUIREMENTS 3.7 DUCT SCHEDULE STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS AND 0.75 LB/CU. FT. NOMINAL DENSITY. AIR-VENT PIPING: INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC A. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE.' 1. INLET: SAME AS SERVICE WHERE INSTALLED WITH METAL-TO-PLASTIC TRANSITION DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED 3.8 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE FITTINGS FOR PLASTIC PIPING SYSTEMS, ACCORDING TO PIPING MANUFACTURER'S 24199 REFERENCE DRAWINGS CBHF

. REFER TO AIR HANDLING UNIT SCHEDULE ON DESIGN DRAWINGS FOR FURTHER A. EXAMINE ROUGHING-IN FOR STEAM, HYDRONIC, AND CONDENSATE DRAINAGE PIPING SYSTEMS AND ELECTRICAL SERVICES TO VERIFY ACTUAL LOCATIONS OF A. PIPING INSTALLATION REQUIREMENTS ARE SPECIFIED IN OTHER SECTIONS. DRAWINGS INDICATE GENERAL ARRANGEMENT OF PIPING, FITTINGS, AND 3. WHERE INSTALLING PIPING ADJACENT TO AIR-HANDLING UNIT, ALLOW SPACE FOR CONNECT CONDENSATE DRAIN PANS USING NPS 1-1/4, ASTM B88, TYPE M COPPER TUBING. EXTEND TO NEAREST ROOF DRAIN. CONSTRUCT DEEP TRAP AT CONNECTION TO DRAIN PAN AND INSTALL CLEANOUTS AT CHANGES IN DIRECTION. . CHILLED-WATER PIPING: COMPLY WITH APPLICABLE REQUIREMENTS IN SECTION 232113 "HYDRONIC PIPING" AND SECTION 232116 "HYDRONIC PIPING SPECIALTIES." INSTALL SHUTOFF VALVE AND UNION OR FLANGE AT EACH COIL SUPPLY CONNECTION. INSTALL BALANCING VALVE AND UNION OR FLANGE AT EACH A. INSTALL ELECTRICAL DEVICES FURNISHED BY MANUFACTURER, BUT NOT FACTORY 3. INSTALL NAMEPLATE FOR EACH ELECTRICAL CONNECTION. INDICATING ELECTRICAL EQUIPMENT DESIGNATION AND CIRCUIT NUMBER FEEDING CONNECTION. NAMEPLATE SHALL BE LAMINATED ACRYLIC OR MELAMINE PLASTIC SIGNS WITH A BLACK BACKGROUND AND ENGRAVED WHITE LETTERS AT LEAST 1/2 INCH HIGH. A. INSTALL CONTROL AND ELECTRICAL POWER WIRING TO FIELD-MOUNTED CONTROL . ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO PERFORM STARTUP B. COMPLY WITH REQUIREMENTS IN SECTION 230593 "TESTING, ADJUSTING, AND BALANCING FOR HVAC" FOR AIR-HANDLING SYSTEM TESTING, ADJUSTING, AND : OCCUPANCY ADJUSTMENTS: WHEN REQUESTED WITHIN 12 MONTHS FROM DATE OF SUBSTANTIAL COMPLETION, PROVIDE ON-SITE ASSISTANCE IN ADJUSTING SYSTEM TO SUIT ACTUAL OCCUPIED CONDITIONS. PROVIDE UP TO TWO VISITS TO PROJECT DURING OTHER-THAN-NORMAL OCCUPANCY HOURS FOR THIS PURPOSE. A. AFTER COMPLETING SYSTEM INSTALLATION AND TESTING, ADJUSTING, AND BALANCING AIR-HANDLING UNIT AND AIR-DISTRIBUTION SYSTEMS AND AFTER OMPLETING STARTUP SERVICE. CLEAN AIR-HANDLING UNITS INTERNALLY REMOVE FOREIGN MATERIAL AND CONSTRUCTION DIRT AND DUST. CLEAN FAN WHEELS, CABINETS, DAMPERS, COILS, AND FILTER HOUSINGS, AND INSTALL NEW, A. PERFORM THE FOLLOWING TESTS AND INSPECTIONS WITH THE ASSISTANCE OF A A. ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO TRAIN OWNER'S MAINTENANCE PERSONNEL TO ADJUST, OPERATE, AND MAINTAIN AIR-HANDLING A. PRODUCT DATA: SUBMIT MANUFACTURER'S DATA FOR EACH DIFFUSER TYPE B. SHOP DRAWINGS: INDICATE DIMENSIONS, MOUNTING DETAILS, AND CONNECTION A. INSTALL DIFFUSERS LEVEL, PLUMB, AND IN ALIGNMENT WITH WALL OR CEILING A. ADJUST AIR PATTERNS TO MATCH DESIGN INTENT BEFORE TESTING AND BALANCING. A. PRODUCT DATA: SUBMIT MANUFACTURER'S DATA FOR EACH REGISTER AND GRILLE B. SHOP DRAWINGS: INDICATE DIMENSIONS. MOUNTING DETAILS. AND CONNECTION A. INSTALL REGISTERS AND GRILLES LEVEL, PLUMB, AND IN ALIGNMENT WITH WALL OR

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REVISIONS SIGNATURES DATE **GE VERNOVA** CHECKED DMH DRAWING GE VERNOVA-FMO DMH SCALE AS NOTED *UNLESS OTHERWISE SPECIFIED PLACE DECIMALS.

PLACE DECIMALS.

DESCRIPTION

APPROVAL

GE Hitachi Nuclear Energy

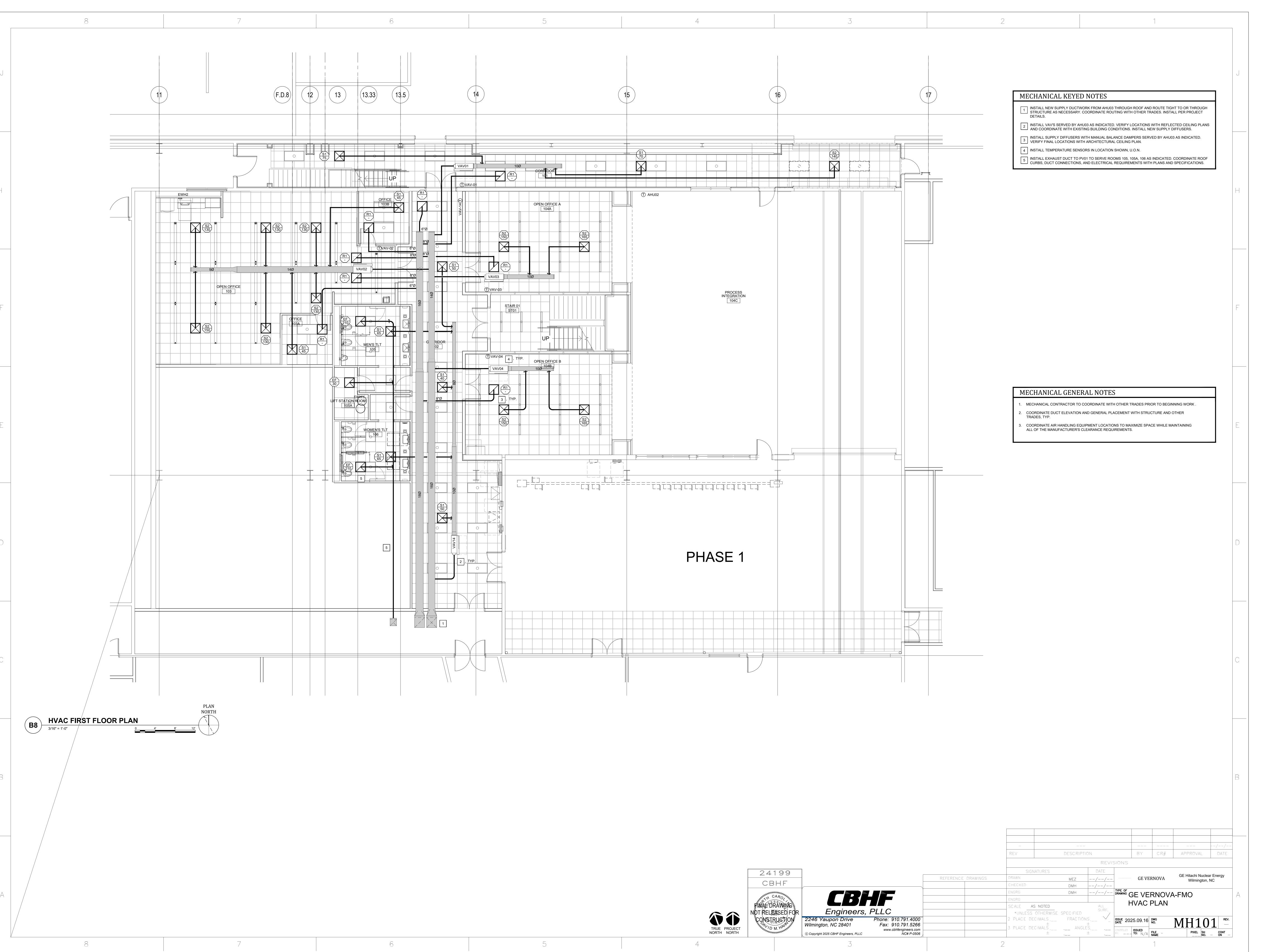
Wilmington, NC

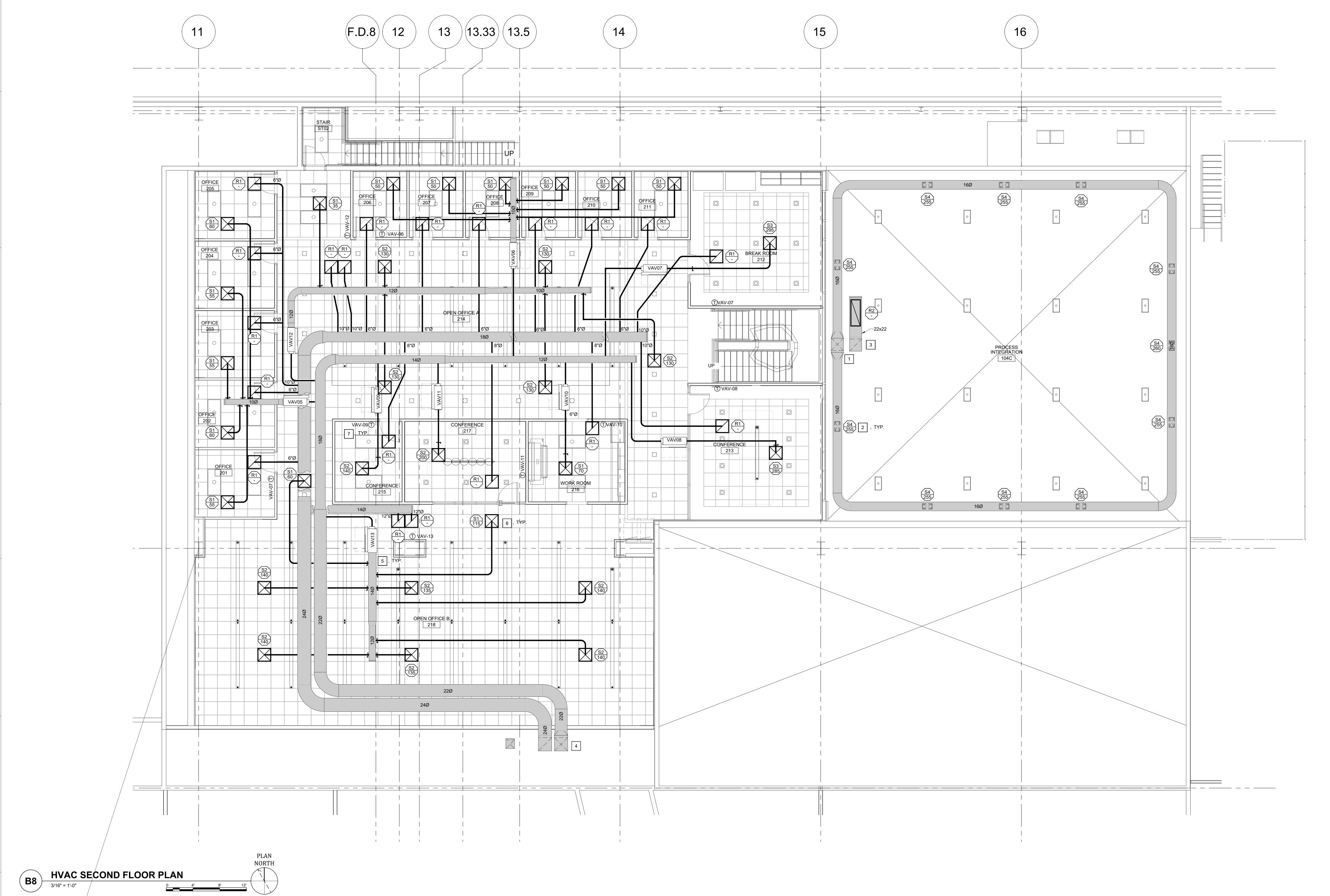
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NORTH NORTH

TRELEASED FO





MECHANICAL KEYED NOTES

INSTALL NEW SUPPLY DUCTWORK FROM AHU02 THROUGH ROOF AND ROUTE TIGHT TO STRUCTURE. COORDINATE ROUTING WITH OTHER TRADES. INSTALL PER PROJECT DETAILS.

2 INSTALL SUPPLY DIFFUSERS SERVED BY AHU02 TO THE UNDERSIDE OF DUCT.

3 INSTALL NEW RETURN DUCTWORK TO AHU02 THROUGH ROOF. INSTALL NEW RETURN GRILLE ON TOP OF DUCT AS INDICATED BY PLANS.

INSTALL NEW SUPPLY DUCTWORK FROM AHU03 THROUGH ROOF AND ROUTE TIGHT TO STRUCTURE. COORDINATE ROUTING WITH OTHER TRADES. INSTALL PER PROJECT DETAILS.

INSTALL VAV'S SERVED BY AHU03 AS INDICATED. VERIFY LOCATIONS WITH REFLECTED CEILING PLANS AND COORDINATE WITH EXISTING BUILDING CONDITIONS. INSTALL NEW SUPPLY DIFFUSERS.

AND COORDINATE WITH EXISTING BUILDING CONDITIONS. INSTALL NEW SUPPLY DIPPOSERS.

6 INSTALL SUPPLY DIFFUSERS WITH MANUAL BALANCE DAMPERS SERVED BY AHU03 AS INDICATED. VERIFY FINAL LOCATIONS WITH ARCHITECTURAL CEILING PLAN.

7 INSTALL THERMOSTATS IN LOCATION SHOWN, U.O.N.

MECHANICAL GENERAL NOTES

MECHANICAL CONTRACTOR TO COORDINATE WITH OTHER TRADES PRIOR TO BEGINNING WORK .

2. COORDINATE DUCT ELEVATION AND GENERAL PLACEMENT WITH STRUCTURE AND OTHER TRADES, TYP.

3. COORDINATE AIR HANDLING EQUIPMENT LOCATIONS TO MAXIMIZE SPACE WHILE MAINTAINING ALL OF THE MANUFACTURER'S CLEARANCE REQUIREMENTS.

REV DESCRIPTION

SIGNATURES

REFERENCE DRAWINGS

DRAWN

MEZ

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CHECKED

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SCALE AS NOTED

*UNLESS OTHERWISE SPECIFIED

2 PLACE DECIMALS ... FRACTIONS ... - ANGLES

ANGLES

ANGLES

TYPE OF DRAWING GE VERNOVA-FMO HVAC ROOF PLAN

SURF.

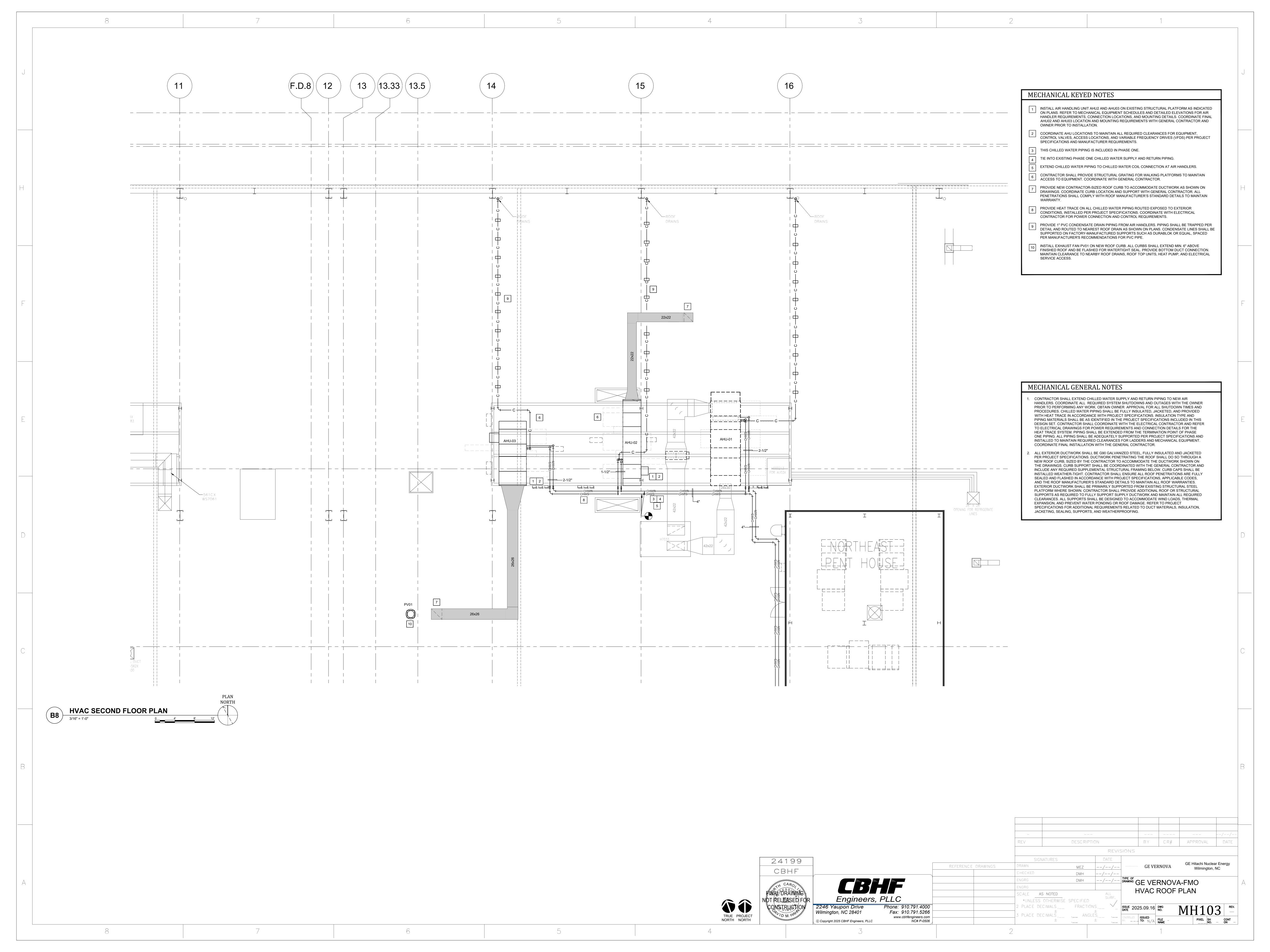
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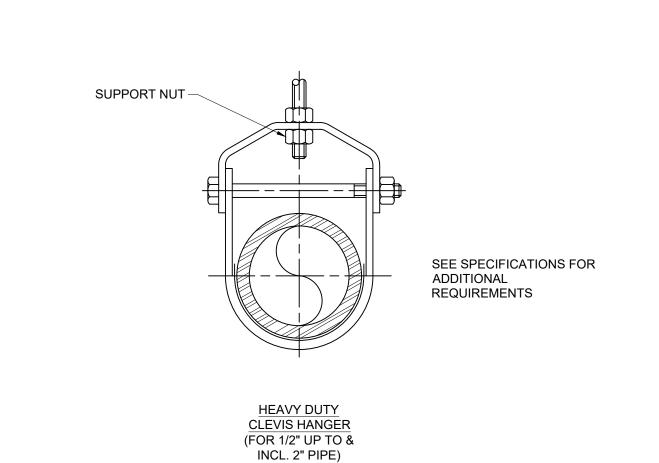
REVISIONS

CR# APPROVAL

GE Hitachi Nuclear Energy Wilmington, NC

TRUE PROJECT

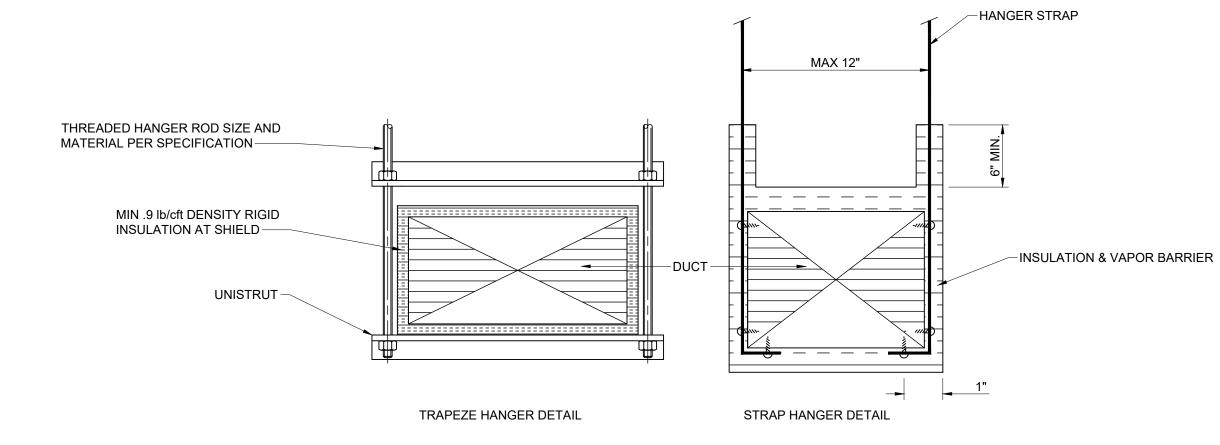




NOTES: 1. THIS DETAIL MUST BE USED AS A GUIDE. ALL HANGERS MUST MEET THE REQUIREMENTS OF THE SPECIFICATION. 2. PIPE 6" AND LARGER MUST HAVE ROLLER SUPPORTED WITH DUAL RODS. 3. FOR CHW SERVICE OVER 3" REPLACE SADDLE WITH 12" LONG 14 GA SHIELD WITH RIGID INSULATION BETWEEN PIPE AND SHIELD. 4. WHERE TRAPEZE HANGERS ARE USED FOR HEATING HOT WATER PROVIDE ROLLERS.

PIPE HANGER SUPPORT DETAIL

5. PIPE SUBJECT TO DAMAGE MUST HAVE PADDED HANGER.



NOTES: 1. TRAPEZE HANGERS SHALL BE PROVIDED FOR ALL DUCT WORK. TRAPEZE HANGERS CANNOT BE USED FOR BRANCH DUCT WORK 12" IN WIDTH AND SHORTER REFER TO STRAP HANGER DETAIL. SUPPORTS SHALL BE SPACED AND SIZED AS PER SPECIFICATIONS. RIGID INSULATION SHALL EXTEND MINIMUM OF 3" BEYOND STRUT ON BOTH SIDES. MAINTAIN VAPOR BARRIER ACROSS STRUT.

DUCT SUPPORT DETAIL

FLOW

ALTERNATE RECTANGULAR TO ROUND

DUCT BRANCH CONNECTIONS

(BRANCH FLOW LESS THEN 25% OF MAIN FLOW)

4" MINIMUM

-STANDARD RECTANGULAR BOOT

WITH RECTANGULAR TO ROUND

—45° RECTANGULAR TO

15° MAXIMUM BOTH SIDES

STANDARD RECTANGULAR BRANCH

TAKE-OFF

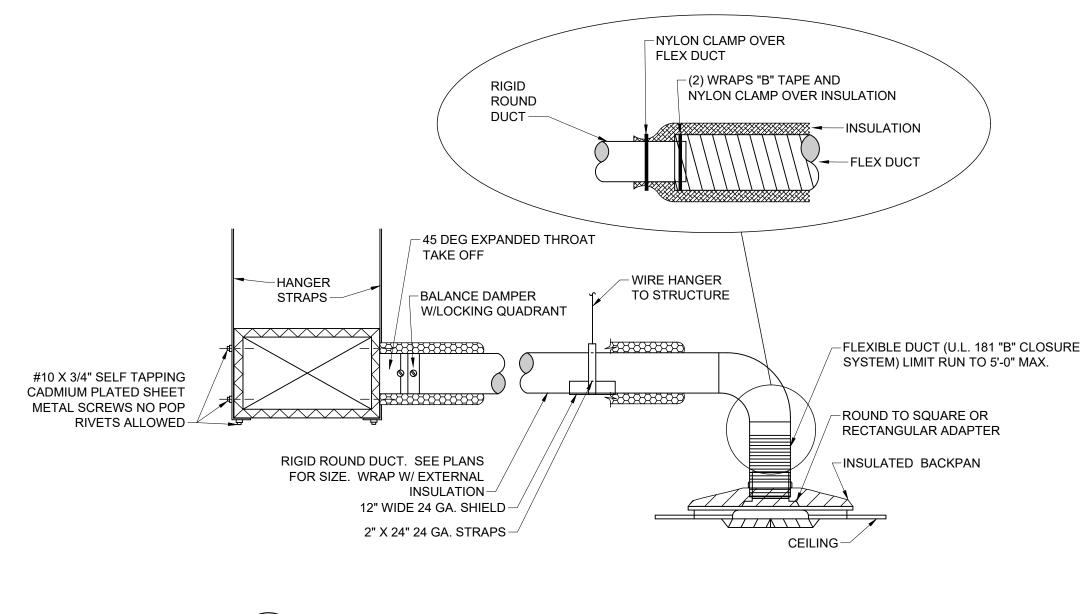
(BRANCH FLOW GREATER THAN 25% OF MAIN FLOW)

ROUND BOOT CONNECTION

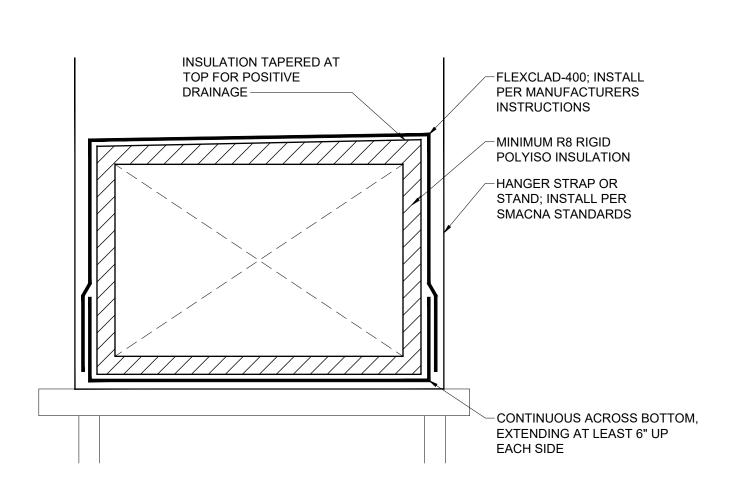
ELBOW WITH DOUBLE

- VOLUME DAMPER

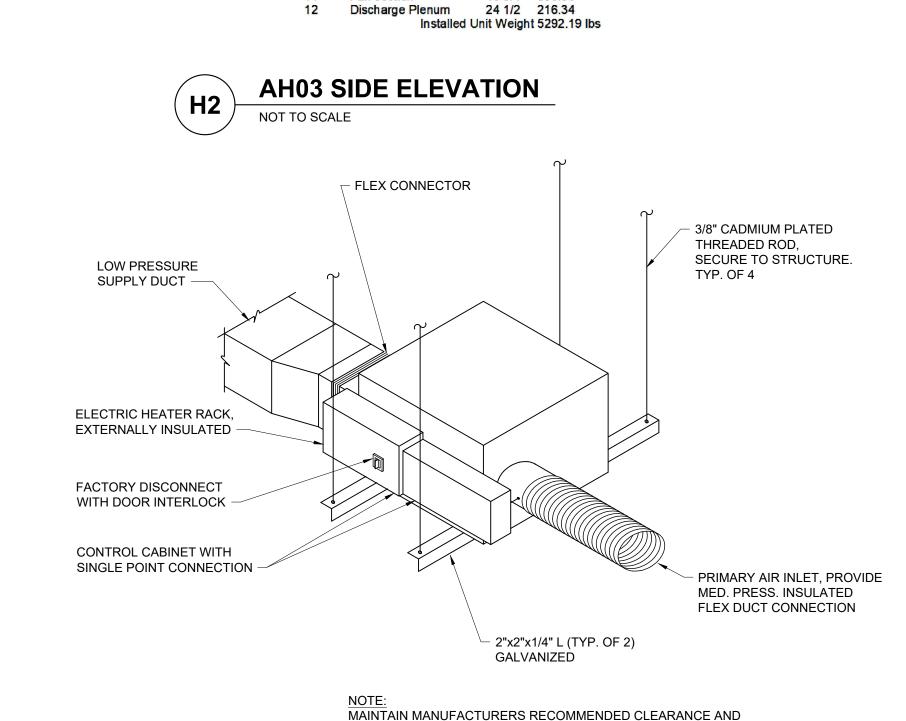
THICKNESS TURNING VANES



TYPICAL DIFFUSER CONNECTION DETAIL



EXTERIOR WEATHER PROOFING DUCT INSTALLATION DETAIL



Access section

Air mixing section

Coil section

Access section

Access section

Coil section

Fan section

Custom length section 37 7/8 288.06

Fan section 36 1/4 857.67 Custom length section 91 3/8 688.78

Air mixing section 36 1/8 361.39

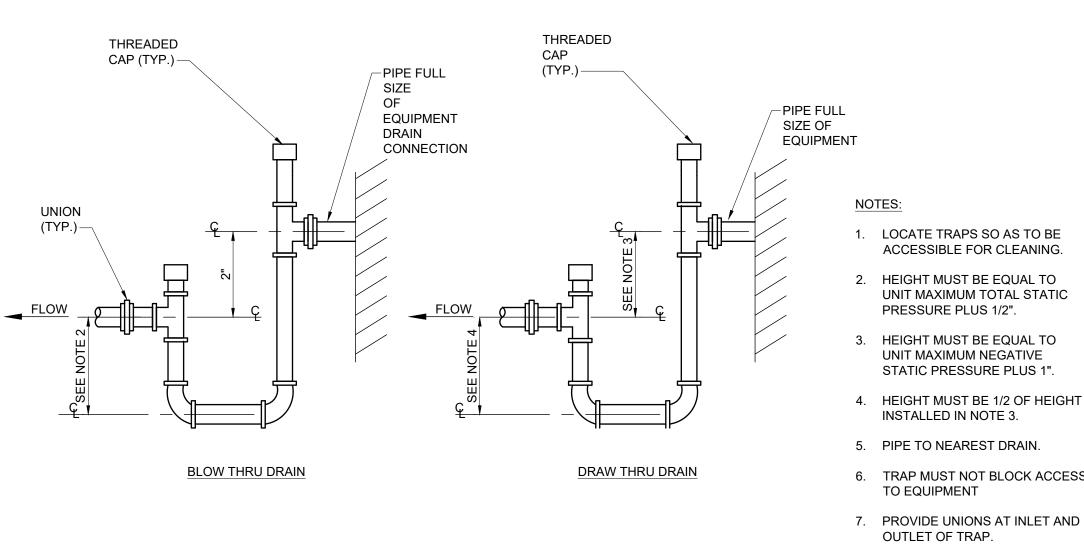
26 5/8 177.88

40 3/4 800.56

TYPICAL SINGLE DUCT TERMINAL w/ELECTRIC HEAT DETAIL

VERIFY INSTALLATION INSTRUCTIONS FOR HANGING SO THAT

ALL NECESSARY ACCESS PANELS ARE NOT OBSTRUCTED.



C8 CONDENSATE TYPICAL ROOF SUPPORT DETAIL

NOT TO SCALE

-LOW CAPACITY AUTO

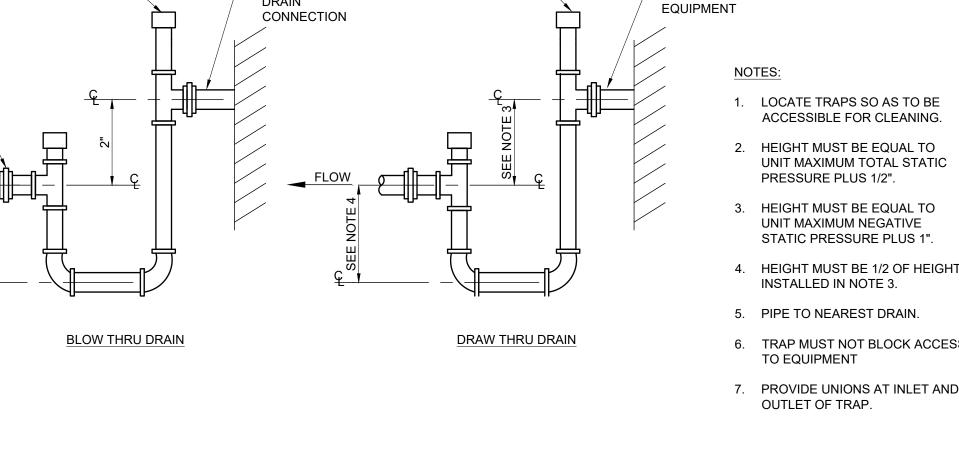
PRESSURE/TEMPERATURE PORT (TYPICAL)

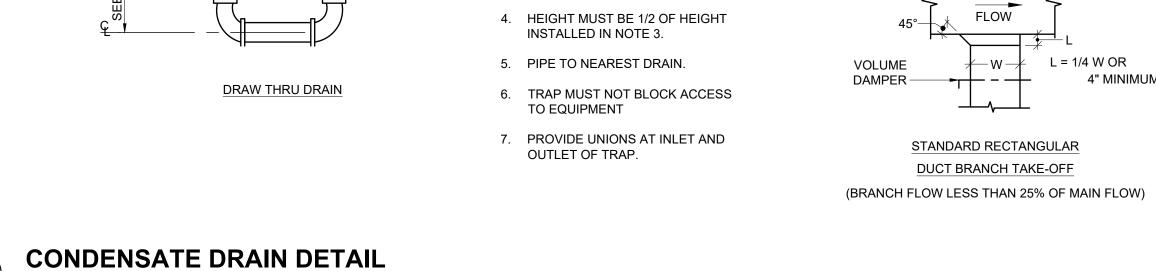
—3-WAY CONTROL VALVE (UNLESS OTHERWISE NOTED)

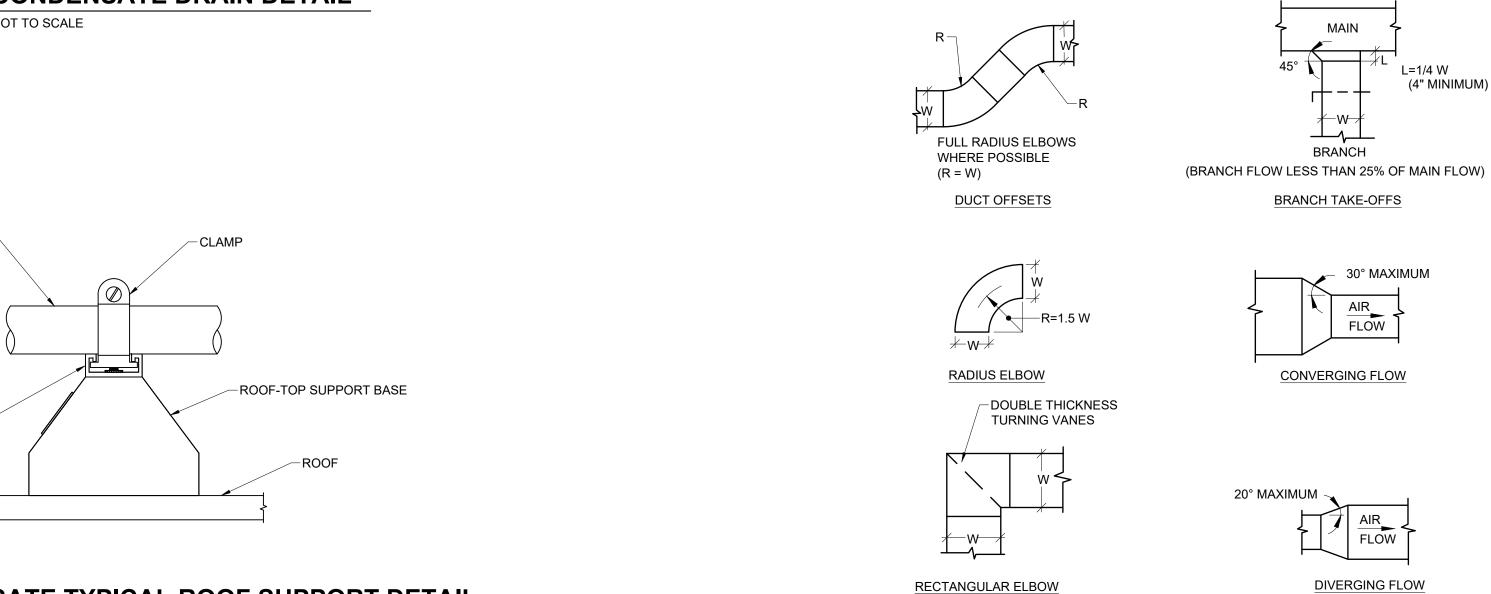
-UNIONS FOR COIL

REMOVAL (TYPICAL)

AIR VENT (TYPICAL)







BELL MOUTH CONNECTION WHERE

HEIGHT OF MAIN DUCT PERMITS —

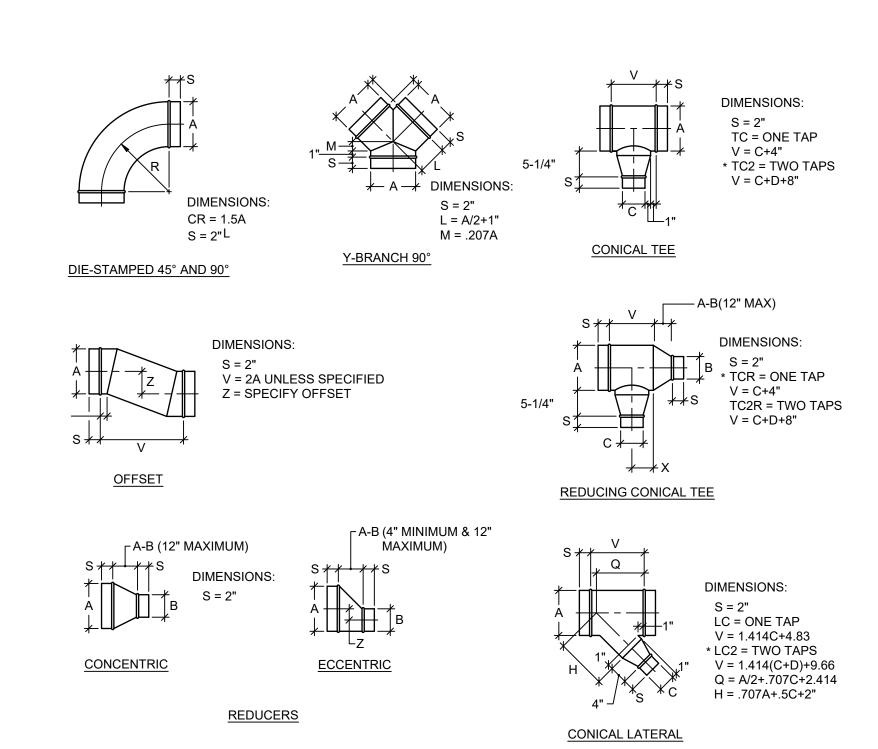
90° RECTANGULAR TO

VOLUME DAMPER —

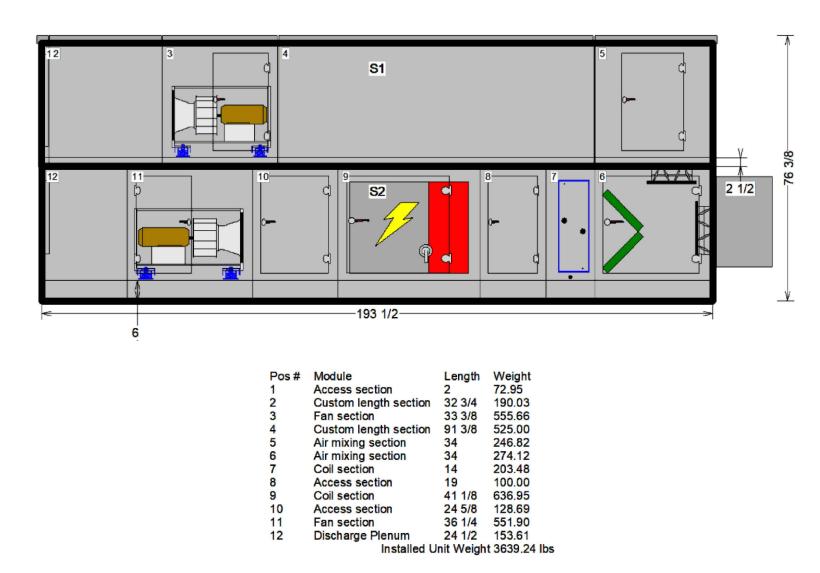
ROUND BOOT CONNECTION-

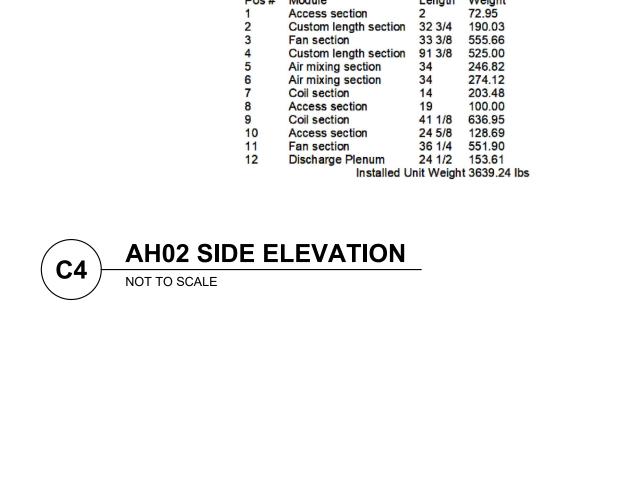
FLOW

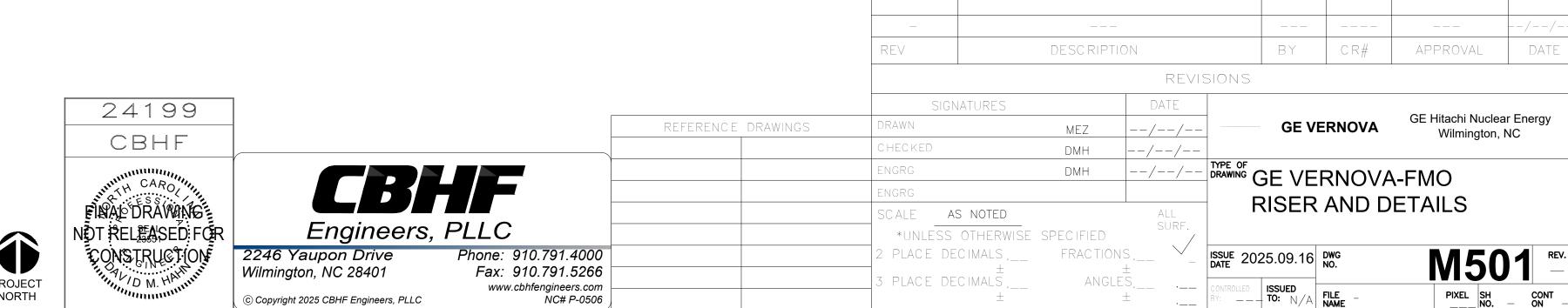
RECTANGULAR ELBOW











CHILLED WATER COIL PIPING 3-WAY DETAIL

B22 CHANNEL —

VALVE —

CIRCUIT SETTER

STRAINER W/ BLOWDOWN VALVE

3/4" DRAIN VALVE WITH

SCREW CAP & CHAIN—

Point Name				P	OINT	s						ALA	RMS		
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	
COIL LEAVING AIR LOW TEMP CUTOUT ALARM	Ť	1	Х	_		0,		_				ш	X	0)	Ť
CONDENSATE OVERFLOW DETECTION LOCAL	X		X									Х	Х		
CND OVRFL COOLING COIL LEAVING TEMPERATURE	$\frac{1}{x}$	X								Х	X			Х	
CC LAT COOLING OUTPUT COMMAND	X			Х						^					
CLG HEAT ENABLE	X				X										
HEATING OUTPUT COMMAND	$\frac{1}{x}$			X											
HTG HIGH STATIC ALARM	_			^									_		
HSP ALM HIGH STATIC ALARM INTERLOCK	X		X									Х	X		_
HSP INTLK MIXED AIR LOW TEMPERATURE CUTOUT ALARM	_		_				X								
MA LLT MIXED AIR TEMPERATURE LOCAL	_		X										X		
MAT OUTDOOR AIR DAMPER COMMAND	Х	Х									Х			Х	
OUTDOOR AIR DAMPER COMMAND OAD OUTDOOR AIR RELATIVE HUMIDITY LOCAL	X			Х											
HAC	Х	Х													
OUTDOOR AIR TEMPERATURE LOCAL OAT	Х	Х													
REHEAT LEAVING COIL TEMPERATURE LOCAL RH LAT	Х	Х								Х	Х			Х	
RELIEF AIR DAMPER COMMAND RLF DPR	Х				Х										
RELIEF AIR FAN SPEED OUTPUT COMMAND RLF	Х			х											
RELIEF AIR FAN START STOP RLF	х				х										
RELIEF AIR FAN STATUS RLF	Х		Х												
RETURN AIR HUMIDITY LOCAL RAH	Х	Х								Х					
RETURN AIR TEMPERATURE LOCAL RAT	х	х													
RETURN SMOKE DETECTOR INPUT RA SD							Х								
SPACE HUMIDITY LOCAL SPH	Х	Х								Х					
SPACE STATIC PRESSURE LOCAL SPP	×	Х								Х	Х				
SPACE TEMPERATURE LOCAL SPT	x	X								Х	Х			Х	
SPACE TEMPERATURE SETPOINT LOCAL	X	Х													
SPT SP SUPPLY AIR HUMIDITY LOCAL	X	X								Х	Х			Х	
SA HUM SUPPLY FAN AIR FLOW LOCAL	$\frac{1}{x}$	X								•				-	
SF FLW SUPPLY FAN SPEED COMMAND	$\frac{1}{x}$			X											
SAF SUPPLY FAN START STOP COMMAND															-
SAF SUPPLY FAN STATUS	X				X										-
SAF BAS COMMUNICATION STATE	X		X												
BAS COM DISCHARGE AIR COOLING SETPOINT	_					X									>
DA CL SP DISCHARGE AIR COOLING SETPOINT DISCHARGE AIR HEATING SETPOINT	_					X									
DA HT SP MAINTENANCE REQUIRED	_					Х									
MNT REQ						Х						Х			
MIXED AIR TEMPERATURE LOW LIMIT SETPOINT MA LLT STPT	_					Х									
OCCUPIED COOLING SETPOINT OCC CLG STPT	Х					Х									
OCCUPIED HEATING SETPOINT OCC HTG STPT	Х					х									
RELIEF AIR FAN FAILURE RLF FAIL	х					х						Х			L
SUPPLY FAN FAILURE SF FAIL	х					Х						х			
JNOCCUPIED COOLING SETPOINT JNOCC CLG STPT	х					х									
JNOCCUPIED HEATING SETPOINT	X					X									

Point Name				P	OINT	s						ALAI	ALARMS						
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	COMMINICATION FAIL				
EXHAUST FAN SPEED COMMAND EAF				Х															
EXHAUST FAN STATUS EAF	х		х																
EXHAUST FAN START STOP COMMAND EAF	х				х														
OCCUPANCY OCC			Х																
BAS COMMUNICATION STATE BAS COM						Х													

FLOW DIAGRAM: AH02

Point Name				P	OINT	S						ALAI	RMS	
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL
COIL LEAVING AIR LOW TEMP CUTOUT ALARM	Ť	`	X	`	111	υ,	<u> </u>	-	_			12-	X	U.
CONDENSATE OVERFLOW DETECTION LOCAL	Х		X									х	х	
CND OVRFL COOLING COIL LEAVING TEMPERATURE	X	X	•							х	Х	-		X
CC LAT COOLING OUTPUT COMMAND	X			X							, , , , , , , , , , , , , , , , , , ,			
CLG HEAT ENABLE	X				Х									
HT ENA HEATING OUTPUT COMMAND	X			X										
HTG HIGH STATIC ALARM				^										
HSP ALM HIGH STATIC ALARM INTERLOCK	X		X									Х	Х	
HSP INTLK MIXED AIR LOW TEMPERATURE CUTOUT ALARM							Х							
MA LLT MIXED AIR TEMPERATURE LOCAL			Х										Х	
MAT OUTDOOR AIR DAMPER COMMAND	Х	Х									Х			Х
OUTDOOR AIR DAMPER COMMAND OAD OUTDOOR AIR RELATIVE HUMIDITY LOCAL	Х			Х										
OUTDOOR AIR RELATIVE HUMIDITY LOCAL OAH OUTDOOR AIR TEMPERATURE LOCAL	Х	Х												
OAT	Х	Х												
REHEAT LEAVING COIL TEMPERATURE LOCAL RH LAT	Х	Х								Х	Х			Х
RELIEF AIR DAMPER COMMAND RLF DPR	Х				Х									
RELIEF AIR FAN SPEED OUTPUT COMMAND RLF	Х			Х										
RELIEF AIR FAN START STOP RLF	Х				Х									
RELIEF AIR FAN STATUS RLF	Х		Х											
RETURN AIR HUMIDITY LOCAL RAH	Х	Х								х				
RETURN AIR TEMPERATURE LOCAL RAT	Х	Х												
RETURN SMOKE DETECTOR INPUT RA SD							Х							
SPACE STATIC PRESSURE LOCAL SPP	Х	Х								х	х			
SUPPLY AIR HUMIDITY LOCAL SA HUM	Х	х								х	х			Х
SUPPLY FAN AIR FLOW LOCAL SF FLW	Х	Х												
SUPPLY FAN SPEED COMMAND SAF	х			х										
SUPPLY FAN START STOP COMMAND SAF	х				х									
SUPPLY FAN STATUS SAF	Х		Х											
BAS COMMUNICATION STATE BAS COM						Х								
DISCHARGE AIR COOLING SETPOINT DA CL SP						Х								
DISCHARGE AIR HEATING SETPOINT						Х								
DA HT SP MAINTENANCE REQUIRED						Х						Х		
MNT REQ MIXED AIR TEMPERATURE LOW LIMIT SETPOINT						X								
MA LLT STPT OCCUPIED COOLING SETPOINT	X					X								
OCC CLG STPT OCCUPIED HEATING SETPOINT	X					X								
OCC HTG STPT RELIEF AIR FAN FAILURE	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \					X						Х		
RLF FAIL SUPPLY FAN FAILURE	^ x					X						^ х		
SF FAIL UNOCCUPIED COOLING SETPOINT	X X					X						^		
UNOCC CLG STPT UNOCCUPIED HEATING SETPOINT	X					X								

Point Name				P	OINT	S						ALAI	RMS		
		E INPUT (AI)	INPUT (BI)	E OUTPUT (AO)	OUTPUT (BO)	SFT)	эск (нрм)								
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	
AIR VALVE MODULATION COMMAND AIR VLV	х			Х											
DISCHARGE AIR TEMPERATURE DAT	х	Х								Х	Х			Х	
LOCAL HEAT ELECTRIC SCR OUTPUT EH	Х			х											
SPACE OCCUPANCY INPUT SP OCC	Х		х												
SPACE TEMPERATURE LOCAL SPT	Х	Х													
SPACE TEMPERATURE SETPOINT LOCAL SPT SP	Х	Х													
SUPPLY AIRFLOW DA FLW	Х	Х								Х	Х				
BAS COMMUNICATION STATE BAS COM						х									
DESIGN HEAT DISCHARGE AIR TEMP SETPOINT DSNG HT DAT SP						Х									
MAXIMUM COOLING AIRFLOW SETPOINT MAX CLG FLW SP						х									
MINIMUM COOLING AIRFLOW SETPOINT MIN CLG FLW SP						х									
MAXIMUM HEATING AIRFLOW SETPOINT MAX HTG FLW SP						Х									
MINIMUM HEATING AIRFLOW SETPOINT MIN HTG FLW SP						х									
OCCUPIED BYPASS TIMER OCC TMR	Х					х									
OCCUPIED COOLING SETPOINT OCC CLG SP	Х					х									
OCCUPIED HEATING SETPOINT OCC HTG SP	Х					х									
JNOCCUPIED COOLING SETPOINT JNOCC CLG SP	Х					х									
SPACE OCCUPANCY (COMMUNICATED) OCC SP	Х								Х						
UNOCCUPIED HEATING SETPOINT UNOCC HTG SP	х					Х									

SEQUENCE OF OPERATION: AIR HANDLER UNIT 02

BUILDING AUTOMATION SYSTEM INTERFACE:

THE BUILDING AUTOMATION SYSTEM (BAS) SHALL SEND THE CONTROLLER OCCUPIED BYPASS, MORNING WARM-UP/PRE-COOL, OCCUPIED/UNOCCUPIED AND HEAT/COOL MODES. IF A BAS IS NOT PRESENT, OR COMMUNICATION IS LOST WITH THE BAS THE CONTROLLER SHALL OPERATE USING DEFAULT MODES AND SETPOINTS.

DURING OCCUPIED PERIODS. THE SUPPLY FAN SHALL RUN CONTINUOUSLY AND THE MIXED AIR DAMPERS SHALL OPEN TO MAINTAIN MINIMUM VENTILATION REQUIREMENTS.

IN THE COOLING MODE THE CHILLED WATER VALVE SHALL MODULATE TO CONTROL THE ACTIVE SPACE TEMPERATURE SETPOINT. IN THE HEATING MODE THE ELECTRIC HEAT SHALL STAGE UP AND DOWN TO CONTROL THE ACTIVE

SPACE TEMPERATURE SETPOINT. IF THE SPACE TEMPERATURE SENSOR FAILS, THE CHILLED WATER VALVE SHOULD CLOSE, THE OUTDOOR AIR SHOULD CLOSE, AND AN ALARM SHOULD ANNUNCIATE AT THE BAS

DURING THE UNOCCUPIED PERIODS, THE SUPPLY FAN SHALL BE DISABLED, THE RELIEF FAN SHALL BE DISABLED, THE OUTSIDE AIR DAMPER SHALL CLOSE, THE MECHANICAL COOLING SHALL BE DISABLED, THE MECHANICAL HEATING SHALL BE DISABLED, TO CONSERVE ENERGY. WHEN THE SPACE TEMPERATURE IS ABOVE THE UNOCCUPIED COOLING SETPOINT OF 85 DEG F

(ADJ.) THE SUPPLY FAN SHALL START, THE OUTDOOR DAMPER SHALL REMAIN CLOSED, THE OUTDOOR DAMPER SHALL MODULATE IF ECONOMIZING IS ENABLED AND REMAIN CLOSED IF NOT ECONOMIZING, AND THE MECHANICAL COOLING SHALL BE ENABLED. WHEN THE SPACE TEMPERATURE FALLS BELOW THE UNOCCUPIED COOLING SETPOINT OF 85.0 DEG

F (ADJ.) MINUS THE UNOCCUPIED DIFFERENTIAL OF 4.0 DEG. F (ADJ.) THE SUPPLY FAN SHALL STOP, THE OUTDOOR DAMPER SHALL REMAIN CLOSED, AND THE MECHANICAL COOLING SHALL BE

(ADJ.) THE SUPPLY FAN SHALL START, THE OUTDOOR DAMPER SHALL REMAIN CLOSED, AND THE MECHANICAL HEATING SHALL BE ENABLED. WHEN THE SPACE TEMPERATURE IS ABOVE THE UNOCCUPIED HEATING SETPOINT OF 60.0 DEG. F (ADJ.) PLUS THE UNOCCUPIED DIFFERENTIAL OF 4.0 DEG. F (ADJ.) THE SUPPLY FAN SHALL STOP, THE OUTDOOR DAMPER SHALL REMAIN CLOSED, AND THE MECHANICAL HEATING SHALL BE

WHEN THE SPACE TEMPERATURE IS BELOW THE UNOCCUPIED HEATING SETPOINT OF 60.0 DEG. F

DISABLED. OPTIMAL START: THE BAS SHALL MONITOR THE SCHEDULED OCCUPIED TIME, OCCUPIED SPACE SETPOINTS AND SPACE TEMPERATURE TO CALCULATE WHEN THE OPTIMAL START OCCURS.

OPTIMAL STOP: THE BAS SHALL MONITOR THE SCHEDULED UNOCCUPIED TIME, OCCUPIED SETPOINTS AND SPACE TEMPERATURE TO CALCULATE WHEN THE OPTIMAL STOP OCCURS. WHEN THE OPTIMAL STOP MODE IS ACTIVE THE UNIT CONTROLLER SHALL SWITCH TO THE UNOCCUPIED MODE. OUTSIDE AIR

DAMPER SHALL REMAIN ENABLED TO PROVIDE MINIMUM VENTILATION. OCCUPIED BYPASS: THE BAS SHALL MONITOR THE STATUS OF THE ON AND CANCEL BUTTONS OF THE SPACE TEMPERATURE SENSOR. WHEN AN OCCUPIED BYPASS REQUEST IS RECEIVED FROM A SPACE

SENSOR, THE UNIT SHALL TRANSITION FROM ITS CURRENT OCCUPANCY MODE TO OCCUPIED BYPASS MODE AND THE UNIT SHALL MAINTAIN THE SPACE TEMPERATURE TO THE OCCUPIED SETPOINTS (ADJ.). **HEAT/COOL MODE:**

WHEN THE SPACE TEMPERATURE RISES ABOVE THE OCCUPIED COOLING SETPOINT THE MODE SHALL TRANSITION TO COOLING. WHEN THE SPACE TEMPERATURE FALLS BELOW THE OCCUPIED HEATING SETPOINT THE MODE SHALL TRANSITION TO HEATING. WHEN THE SPACE TEMPERATURE IS BELOW THE OCCUPIED COOLING SETPOINT AND ABOVE THE OCCUPIED HEATING SETPOINT THE MODE SHALL REMAIN IN ITS LAST STATE. IF THE SPACE TEMPERATURE SENSOR FAILS THE MODE SHALL REMAIN IN ITS LAST STATE AND AN ALARM SHALL ANNUNCIATE AT THE BAS. IF THE LOCAL AND COMMUNICATED SETPOINTS FAIL THE CONTROLLER SHALL DISABLE THE SUPPLY FAN AND AN ALARM SHALL ANNUNCIATE AT THE BAS.

DURING OPTIMAL START, IF THE SPACE TEMPERATURE IS BELOW THE OCCUPIED HEATING SETPOINT A MORNING WARM-UP MODE SHALL BE ACTIVATED. WHEN MORNING WARM-UP IS INITIATED THE UNIT SHALL ENABLE THE HEATING AND FAN(S). THE OUTSIDE AIR DAMPER SHALL

SEQUENCE OF OPERATION: AIR HANDLER UNIT 03

THE BUILDING AUTOMATION SYSTEM (BAS) SHALL SEND THE CONTROLLER OCCUPIED BYPASS.

ALSO SEND THE DISCHARGE AIR TEMPERATURE SETPOINT AND THE DUCT STATIC PRESSURE

DURING OCCUPIED PERIODS, THE SUPPLY FAN SHALL RUN CONTINUOUSLY AND THE MIXED AIR

SETPOINT. IF A BAS IS NOT PRESENT, OR COMMUNICATION IS LOST WITH THE BAS THE

IN THE COOLING MODE THE CHILLED WATER VALVE SHALL MODULATE TO CONTROL THE

IN THE HEATING MODE THE ELECTRIC HEAT SHALL STAGE UP AND DOWN TO CONTROL THE

IF THE DISCHARGE AIR TEMPERATURE SENSOR FAILS, THE COOLING AND HEATING SHALL

FALLBACK TO CONTROL TO THE ACTIVE SPACE TEMPERATURE SETPOINT AND AN ALARM SHALL BE

IF THE DISCHARGE AIR TEMPERATURE SENSOR FAILS, AND THE SPACE TEMPERATURE SENSOR

FAILS. THE CHILLED WATER VALVE SHOULD CLOSE, THE OUTDOOR AIR SHOULD CLOSE, AND AN

DURING THE UNOCCUPIED PERIODS, THE SUPPLY FAN SHALL BE DISABLED, THE RELIEF FAN SHALL

BE DISABLED, THE OUTSIDE AIR DAMPER SHALL CLOSE, THE MECHANICAL COOLING SHALL BE

THE OUTDOOR DAMPER SHALL MODULATE IF ECONOMIZING IS ENABLED AND REMAIN CLOSED IF

THE BAS SHALL MONITOR THE SCHEDULED OCCUPIED TIME, OCCUPIED SPACE SETPOINTS AND

THE BAS SHALL MONITOR THE SCHEDULED UNOCCUPIED TIME, OCCUPIED SETPOINTS AND SPACE

MODE IS ACTIVE THE UNIT CONTROLLER SHALL SWITCH TO THE UNOCCUPIED MODE. OUTSIDE AIR

TEMPERATURE TO CALCULATE WHEN THE OPTIMAL STOP OCCURS. WHEN THE OPTIMAL STOP

THE BAS SHALL MONITOR THE STATUS OF THE ON AND CANCEL BUTTONS OF THE SPACE

TEMPERATURE SENSOR. WHEN AN OCCUPIED BYPASS REQUEST IS RECEIVED FROM A SPACE

SENSOR, THE UNIT SHALL TRANSITION FROM ITS CURRENT OCCUPANCY MODE TO OCCUPIED

BYPASS MODE AND THE UNIT SHALL MAINTAIN THE SPACE TEMPERATURE TO THE OCCUPIED

WHEN THE SPACE TEMPERATURE RISES ABOVE THE OCCUPIED COOLING SETPOINT THE MODE

SHALL TRANSITION TO COOLING. WHEN THE SPACE TEMPERATURE FALLS BELOW THE OCCUPIED

HEATING SETPOINT THE MODE SHALL TRANSITION TO HEATING. WHEN THE SPACE TEMPERATURE

IS BELOW THE OCCUPIED COOLING SETPOINT AND ABOVE THE OCCUPIED HEATING SETPOINT THE

MODE SHALL REMAIN IN ITS LAST STATE. IF THE SPACE TEMPERATURE SENSOR FAILS THE MODE

SHALL REMAIN IN ITS LAST STATE AND AN ALARM SHALL ANNUNCIATE AT THE BAS. IF THE LOCAL

AND COMMUNICATED SETPOINTS FAIL THE CONTROLLER SHALL DISABLE THE SUPPLY FAN AND AN

DURING OPTIMAL START, IF THE AVERAGE SPACE TEMPERATURE IS BELOW THE OCCUPIED HEATING SETPOINT A MORNING WARM-UP MODE SHALL BE ACTIVATED. WHEN MORNING WARM-UP IS INITIATED THE UNIT SHALL ENABLE THE HEATING AND FAN(S). THE OUTSIDE AIR DAMPER SHALL

DISABLED, THE MECHANICAL HEATING SHALL BE DISABLED, TO CONSERVE ENERGY.

SPACE TEMPERATURE TO CALCULATE WHEN THE OPTIMAL START OCCURS.

DAMPER SHALL REMAIN ENABLED TO PROVIDE MINIMUM VENTILATION.

CONTROLLER SHALL OPERATE USING DEFAULT MODES AND SETPOINTS.

DAMPERS SHALL OPEN TO MAINTAIN MINIMUM VENTILATION REQUIREMENTS.

MORNING WARM-UP/PRE-COOL, OCCUPIED/UNOCCUPIED AND HEAT/COOL MODES. THE BAS SHALL

MORNING WARM-UP MODE:

DISCHARGE AIR SETPOINT.

DISCHARGE AIR SETPOINT.

ANNUNCIATED AT THE BAS

NOT ECONOMIZING,

OPTIMAL START:

OCCUPIED BYPASS:

SETPOINTS (ADJ.).

HEAT/COOL MODE:

ALARM SHALL ANNUNCIATE AT THE BAS.

MORNING WARM-UP MODE:

ALARM SHOULD ANNUNCIATE AT THE BAS

BUILDING AUTOMATION SYSTEM INTERFACE:

REMAIN CLOSED. WHEN THE SPACE TEMPERATURE REACHES THE OCCUPIED HEATING SETPOINT (ADJ.), THE UNIT SHALL TRANSITION TO THE OCCUPIED MODE.

DAYTIME WARM-UP CONTROL: DURING OCCUPIED PERIODS, WHEN THE SPACE TEMPERATURE IS BELOW THE DAYTIME WARM-UP INITIATE SETPOINT, A DAYTIME WARM-UP SEQUENCE SHALL BE ACTIVATED. THE OUTSIDE AIR DAMPER SHALL MODULATE TO MAINTAIN MINIMUM VENTILATION REQUIREMENTS, AND THE HEATING

SHALL ENABLE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE HEATING SETPOINT. DAYTIME WARM-UP SHALL TERMINATE WHEN THE AVERAGE SPACE TEMPERATURE REACHES THE OCCUPIED HEATING SETPOINT.

PRE-COOL MODE:

DURING OPTIMAL START, IF THE SPACE TEMPERATURE IS ABOVE THE OCCUPIED COOLING SETPOINT, PRE-COOL MODE SHALL BE ACTIVATED. WHEN PRE-COOL IS INITIATED THE UNIT SHALL ENABLE THE FAN AND COOLING OR ECONOMIZER. THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED, UNLESS ECONOMIZING. WHEN THE SPACE TEMPERATURE REACHES OCCUPIED COOLING

SETPOINT (ADJ.), THE UNIT SHALL TRANSITION TO THE OCCUPIED MODE. **ECONOMIZER MODE:** THE OUTSIDE AIR (OA) TEMPERATURE SHALL BE COMPARED WITH A REFERENCE DRY BULB

SETPOINT. THE ECONOMIZER SHALL ENABLE WHEN THE OA TEMPERATURE IS LESS THAN

IS GREATER THAN REFERENCE DRY BULB SETPOINT + 2.0 DEG. F. WHEN ECONOMIZING IS ENABLED AND THE UNIT IS OPERATING IN THE COOLING MODE. THE ECONOMIZER DAMPER SHALL BE MODULATED BETWEEN ITS MINIMUM POSITION AND 100% OPEN TO MAINTAIN THE SPACE TEMPERATURE SETPOINT. THE ECONOMIZER DAMPER SHALL MODULATE TOWARD MINIMUM POSITION IN THE EVENT THE MIXED AIR TEMPERATURE FALLS BELOW THE LOW TEMPERATURE LIMIT SETTING.

REFERENCE DRY BULB SETPOINT. THE ECONOMIZER SHALL BE DISABLED WHEN OA TEMPERATURE

OCCUPIED HUMIDITY CONTROL: IF THE SPACE RELATIVE HUMIDITY IS GREATER THAN 50% (ADJ.), THE CHILLED WATER VALVE SHALL MODULATE TO MAINTAIN SPACE RELATIVE HUMIDITY SETPOINT OF 50% (ADJ.) AND THE ELECTRIC HEAT SHALL CONTROL TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT. MODE SHALL

DISCHARGE AIR TEMPERATURE CONTROL:

ALSO, THE BAS SHALL COMMUNICATE THE MINIMUM SUPPLY FAN SPEED TO THE UNIT CONTROLLER. THE SUPPLY FAN SPEED SHALL MODULATE FROM MINIMUM (50% ADJ.) TO MAXIMUM (OR DESIGN) AIR FLOW TO MAINTAIN SPACE HEATING/COOLING TEMPERATURE SETPOINT. ALSO, THE BAS SHALL OVERRIDE THIS RESET FUNCTION WHENEVER OUTDOOR DEW POINT IS HIGHER THAN 60.0 DEG. F (ADJ.) OR INDOOR HUMIDITY (MEASURED AT THE SOURCE OF CONTROL) IS HIGHER THAN 60% RH

TERMINATE WHEN THE SPACE RELATIVE HUMIDITY FALLS BELOW THE RELATIVE HUMIDITY

SETPOINT OF 50% (ADJ.) MINUS 3% (ADJ.). IF THE SPACE RELATIVE HUMIDITY SENSOR FAILS THE

DEHUMIDIFICATION SEQUENCE SHALL BE TERMINATED AND AN ALARM SHALL ANNUNCIATE AT THE

ON A RISE IN SPACE TEMPERATURE (+2.0 DEG. F ADJ. OR GREATER) ABOVE THE SPACE COOLING SETPOINT (74.0 DEG. F ADJ.); THE SUPPLY FAN SPEED SHALL MODULATE FROM MINIMUM (50% ADJ.) TO MAXIMUM (OR DESIGN) AIR FLOW TO MAINTAIN SPACE COOLING TEMPERATURE SETPOINT WHILE KEEPING THE DISCHARGE AIR TEMPERATURE SETPOINT AT MINIMUM (55.0 DEG. F ADJ.).

AS SPACE TEMPERATURE DECREASES BELOW 76.0 DEG. F (SPACE COOLING SETPOINT 74.0 DEG. F + 2.0 DEG. F): THE FAN SPEED SHALL BE LOCKED AT MINIMUM AIR FLOW AND THE DISCHARGE AIR TEMPERATURE SETPOINT REMAINS AT MINIMUM. WHEN SPACE TEMPERATURE DECREASES TO 75.0 DEG. F (COOLING SETPOINT OF 74.0 DEG. F ADJ. +

1.0 DEG. F) OR BELOW FOR A PERIOD OF TIME (DEFAULT 1 MIN. ADJ.); THE FAN SPEED SHALL REMAIN AT MINIMUM, THE DISCHARGE AIR TEMPERATURE SETPOINT REMAINS AT MINIMUM, AND CONTROL ENTERS INTO DISCHARGE AIR TEMPERATURE SETPOINT RESET MODE. AS SPACE TEMPERATURE CONTINUES TO DROP BELOW 75.0 DEG. F (SPACE TEMPERATURE

COOLING SETPOINT + 1.0 DEG. F); THE FAN SPEED SHALL REMAIN AT MINIMUM AND THE DISCHARGE

AIR TEMPERATURE SETPOINT SHALL BE RESET FROM MINIMUM (55.0 DEG. F ADJ.) TO MAXIMUM (65.0 DEG. F ADJ.) AS SPACE TEMPERATURE DROPS FROM 75.0 DEG. F TO 74.0 DEG. F TO MAINTAIN THE SPACE COOLING TEMPERATURE SETPOINT. ON A CONTINUED DROP OF SPACE TEMPERATURE BELOW THE SPACE COOLING TEMPERATURE

SETPOINT (74.0 DEG. F ADJ.) THROUGH (71.0 DEG. F ADJ.) THE SPACE TEMPERATURE CONTROL SHALL BE WITHIN ITS DEADBAND: THE FAN SPEED REMAINS AT MINIMUM AND DISCHARGE AIR SETPOINT OF (65.0 DEG. F ADJ.) FOR COOLING.

AS SPACE TEMPERATURE DECREASES TOWARDS THE HEATING SETPOINT (71.0 DEG. F ADJ.) THE

REMAIN CLOSED. WHEN THE SPACE TEMPERATURE REACHES THE OCCUPIED HEATING SETPOINT

DURING OCCUPIED PERIODS, WHEN THE SPACE TEMPERATURE IS BELOW THE DAYTIME WARM-UP

DAMPER SHALL MODULATE TO MAINTAIN MINIMUM VENTILATION REQUIREMENTS, AND THE HEATING

WARM-UP SHALL TERMINATE WHEN THE AVERAGE SPACE TEMPERATURE REACHES THE OCCUPIED

SHALL ENABLE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE HEATING SETPOINT. DAYTIME

INITIATE SETPOINT, A DAYTIME WARM-UP SEQUENCE SHALL BE ACTIVATED. THE OUTSIDE AIR

DURING OPTIMAL START, IF THE AVERAGE SPACE TEMPERATURE IS ABOVE THE OCCUPIED

THE OUTSIDE AIR (OA) TEMPERATURE SHALL BE COMPARED WITH A REFERENCE DRY BULB

SETPOINT. THE ECONOMIZER SHALL ENABLE WHEN THE OA TEMPERATURE IS LESS THAN

WHEN ECONOMIZING IS ENABLED AND THE UNIT IS OPERATING IN THE COOLING MODE, THE

COOLING SETPOINT (ADJ.), THE UNIT SHALL TRANSITION TO THE OCCUPIED MODE.

IS GREATER THAN REFERENCE DRY BULB SETPOINT + 2.0 DEG. F.

COOLING SETPOINT, PRE-COOL MODE SHALL BE ACTIVATED. WHEN PRE-COOL IS INITIATED THE

UNIT SHALL ENABLE THE FAN AND COOLING OR ECONOMIZER. THE OUTSIDE AIR DAMPER SHALL

REMAIN CLOSED, UNLESS ECONOMIZING. WHEN THE SPACE TEMPERATURE REACHES OCCUPIED

REFERENCE DRY BULB SETPOINT. THE ECONOMIZER SHALL BE DISABLED WHEN OA TEMPERATURE

ECONOMIZER DAMPER SHALL BE MODULATED BETWEEN ITS MINIMUM POSITION AND 100% OPEN TO

MAINTAIN THE DISCHARGE TEMPERATURE SETPOINT. THE ECONOMIZER DAMPER SHALL MODULATE

TOWARD MINIMUM POSITION IN THE EVENT THE MIXED AIR TEMPERATURE FALLS BELOW THE LOW

IF THE RETURN AIR RELATIVE HUMIDITY IS GREATER THAN 50% (ADJ.), THE CHILLED WATER VALVE

SHALL MODULATE TO MAINTAIN RELATIVE HUMIDITY SETPOINT OF 50% (ADJ.) AND THE ELECTRIC

HEAT SHALL CONTROL TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT. MODE SHALL

SETPOINT OF 50% (ADJ.) MINUS 3% (ADJ.). IF THE RETURN AIR RELATIVE HUMIDITY SENSOR FAILS

THE DEHUMIDIFICATION SEQUENCE SHALL BE TERMINATED AND AN ALARM SHALL ANNUNCIATE AT

TERMINATE WHEN THE SPACE RELATIVE HUMIDITY FALLS BELOW THE RELATIVE HUMIDITY

THE DISCHARGE AIR TEMPERATURE SETPOINT SHALL BE RESET TO THE OPTIMAL SETPOINT

COMMUNICATED BY THE BAS. THE SPACE TEMPERATURE BAS AND THE SPACE TEMPERATURE

AIR TEMPERATURE SETPOINT SHALL BE RESET BASED UPON THE DEVIATION OF THE SPACE

TEMPERATURE BAS FROM THE SPACE TEMPERATURE SETPOINT BAS. ALSO, THE BAS SHALL

(ADJ.). IF THE DISCHARGE AIR TEMPERATURE DROPS BELOW THE MINIMUM LIMIT, A LOW

AIR TEMPERATURE RISES ABOVE THE MAXIMUM LIMIT, A HIGH TEMPERATURE ALARM SHALL

SETPOINT BAS SHALL BE COMMUNICATED TO THE UNIT CONTROLLER BY THE BAS. THE DISCHARGE

OVERRIDE THIS RESET FUNCTION WHENEVER OUTDOOR DEW POINT IS HIGHER THAN 60.0 DEG. F.

(ADJ.) OR INDOOR HUMIDITY (MEASURED AT THE SOURCE OF CONTROL) IS HIGHER THAN 60% RH

TEMPERATURE ALARM SHALL ANNUNCIATE, AND THE UNIT SHALL SHUT DOWN. IF THE DISCHARGE

THE SUPPLY FAN SHALL BE OFF IN THE UNOCCUPIED MODE. THE SUPPLY FAN SHALL BE ON IF THE

CONTROL IS HEATING OR COOLING IN THE UNOCCUPIED MODE. WHEN THE CONTROLLER IS IN THE

OCCUPIED MODE, THE SUPPLY FAN SHALL OPERATE CONTINUOUSLY. THE SUPPLY FAN SPEED

SHALL BE MODULATED TO MAINTAIN THE DUCT STATIC PRESSURE SETPOINT. THE DUCT STATIC PRESSURE SETPOINT SHALL BE SENT BY THE BAS AND IS RESET BETWEEN THE MINIMUM AND

(ADJ.), THE UNIT SHALL TRANSITION TO THE OCCUPIED MODE.

DAYTIME WARM-UP CONTROL:

HEATING SETPOINT.

PRE-COOL MODE:

ECONOMIZER MODE:

TEMPERATURE LIMIT SETTING.

OCCUPIED HUMIDITY CONTROL:

DISCHARGE AIR TEMPERATURE CONTROL:

THE BAS.

ANNUNCIATE.

SUPPLY FAN:

THROUGH THE DRY CONTACTS OF THE SMOKE DETECTOR. A MANUAL RESET OF THE SMOKE DETECTOR SHALL BE REQUIRED TO RESTART THE UNIT.

CONTROL SHALL SWITCH TO THE HEATING DISCHARGE AIR TEMPERATURE RESET. IN THE HEATING MODE, THE HEAT SHALL BE ENABLED; THE SUPPLY FAN SHALL REMAIN AT MINIMUM AIR FLOW AND

THE DISCHARGE AIR TEMPERATURE SETPOINT SHALL BE RESET FROM 70.0 DEG. F TO 90.0 DEG. F AS THE SPACE TEMPERATURE DROPS FROM 71.0 DEG. F TO 70.0 DEG. F. AS SPACE TEMPERATURE CONTINUES TO DECREASE TOWARDS THE HEATING SETPOINT (71.0 DEG F ADJ.) - 1.0 DEG. F; THE DISCHARGE AIR TEMPERATURE SETPOINT SHALL REMAIN AT MAXIMUM (90.0

DEG. F ADJ.), THE FAN SHALL BE MODULATED FROM MINIMUM TO MAXIMUM AIR FLOW TO MAINTAIN THE SPACE TEMPERATURE HEATING SETPOINT. WHEN THE SPACE TEMPERATURE INCREASES THE REVERSE CONTROL SHALL BE IMPLEMENTED.

THE SUPPLY FAN SHALL BE OFF IN THE UNOCCUPIED MODE. WHEN THE CONTROLLER IS IN THE

OCCUPIED MODE, THE SUPPLY FAN SHALL OPERATE CONTINUOUSLY. THE UNIT CONTROLLER SHALL VARY THE SUPPLY FAN SPEED TO OPTIMIZE MINIMUM FAN SPEED IN ALL COOLING AND

HEATING MODES. IF THE SUPPLY FAN FAILS TO PROVE STATUS FOR 30 SECONDS (ADJ.), THE FAN SHALL BE COMMANDED OFF, THE OUTSIDE AIR DAMPER SHALL CLOSE, COOLING SHALL BE DISABLED, ALL HEATING SHALL BE DISABLED, AND AN ALARM SHALL ANNUNCIATE AT THE BAS. A MANUAL RESET

SHALL BE REQUIRED TO RESTART THE FAN. A HARDWIRED, HIGH STATIC PRESSURE CUT-OFF SWITCH SHALL BE ELECTRICALLY INTERLOCKED WITH THE VARIABLE SPEED DRIVE. IF THE HIGH STATIC PRESSURE CUT-OFF SWITCH IS TRIPPED THE FAN SHALL BE COMMANDED OFF, HEATING SHALL BE DISABLED, COOLING SHOULD BE

DISABLED, THE OUTSIDE AIR DAMPER SHALL CLOSE, AND AN ALARM SHALL ANNUNCIATE AT THE BAS. A MANUAL RESET OF THE HIGH STATIC PRESSURE CUT-OFF SWITCH SHALL BE REQUIRED TO RESTART THE FAN.

THE RELIEF AIR DAMPER SHALL BE CLOSED. IF THE RELIEF FAN FAILS TO PROVE STATUS FOR 30 SECONDS (ADJ.), THE FAN SHALL BE COMMANDED OFF, AND AN ALARM SHALL ANNUNCIATE AT THE BAS.

IF THE SUPPLY FAN STATUS IS CONFIRMED TO BE OFF. THE RELIEF FAN SHALL BE DISABLED AND

THE RELIEF FAN SPEED SHALL BE MODULATED TO MATCH THE CURRENT SUPPLY FAN SPEED MINUS A USER-SELECTED OFFSET.

RELIEF DAMPER CONTROL WHEN THE SUPPLY FAN OPERATING STATUS IS CONFIRMED, THE RELIEF DAMPER SHALL WHEN THE

SUPPLY FAN STATUS IS CONFIRMED OFF, THE RELIEF DAMPER SHALL CLOSE. MIXED AIR LOW LIMIT:

THE INITIAL DAMPER OPENING RATE SHALL BE LIMITED TO 2% PER MINUTE (ADJ.) UNTIL THE DAMPER HAS REACHED ITS MINIMUM VENTILATION POSITION. THE OUTSIDE AIR DAMPER SHALL MODULATE TO A POSITION LESS THAN THE MINIMUM DAMPER POSITION IF THE MIXED AIR TEMPERATURE DROPS BELOW 50.0 DEG. F (ADJ.). IF THE MIXED AIR TEMPERATURE SENSOR FAILS AN ALARM SHALL ANNUNCIATE AT THE BAS AND THE OUTSIDE AIR DAMPER SHALL RETURN TO THE

MINIMUM POSITION. FREEZE PROTECTION: A HARDWIRED, LOW LIMIT TEMPERATURE SWITCH SHALL BE ELECTRICALLY INTERLOCKED WITH

THE VARIABLE SPEED DRIVE. IF THE LOW LIMIT TEMPERATURE SWITCH IS TRIPPED 38.0 DEG. F (ADJ.), THE FAN SHALL BE COMMANDED OFF AND THE OUTSIDE AIR DAMPER SHALL CLOSE. ALL VALVES SHALL BE COMMANDED OPEN TO 100% OPEN (ADJUST PER CLIMATE). THE ELECTRIC HEATING SHALL BE DISABLED. AN ALARM SHALL ANNUNCIATE AT THE BAS AND MANUAL RESET OF THE LOW LIMIT TEMPERATURE SWITCH SHALL BE REQUIRED TO RESTART THE FAN.

ONDENSATE OVERFLOW MONITORING: IF THE CONDENSATE LEVEL REACHES THE TRIP POINT, A CONDENSATE OVERFLOW DIAGNOSTIC

SHALL ANNUNCIATE AT THE BAS. TO PREVENT THE CONDENSATE DRAIN PAN FROM OVERFLOWING AND CAUSING WATER DAMAGE TO THE BUILDING THE FAN SHALL BE DISABLED AND THE CHILLED WATER VALVE SHALL CLOSE.

POSITION BETWEEN 65% AND 75% OPEN.

SHALL BE REQUIRED TO RESTART THE FAN.

THE RELIEF AIR DAMPER SHALL BE CLOSED.

A USER-SELECTED OFFSET.

RELIEF DAMPER CONTROL

MIXED AIR LOW LIMIT:

MINIMUM POSITION.

FREEZE PROTECTION:

CONDENSATE OVERFLOW MONITORING:

DETECTOR SHALL BE REQUIRED TO RESTART THE UNIT.

WATER VALVE SHALL CLOSE.

SMOKE DETECTOR SHUTDOWN:

RELIEF FAN:

DISABLED, THE OUTSIDE AIR DAMPER SHALL CLOSE,

CUT-OFF SWITCH SHALL BE REQUIRED TO RESTART THE FAN.

COMMANDED OFF, AND AN ALARM SHALL ANNUNCIATE AT THE BAS.

SUPPLY FAN STATUS IS CONFIRMED OFF, THE RELIEF DAMPER SHALL CLOSE.

SMOKE DETECTOR SHUTDOWN: THE UNIT SHALL SHUT DOWN IN RESPONSE TO A SIGNAL FROM THE SMOKE DETECTOR INDICATING THE PRESENCE OF SMOKE. THE SMOKE DETECTOR SHALL BE INTERLOCKED TO THE UNIT

MAXIMUM STATIC PRESSURE LIMITS TO MAINTAIN THE CRITICAL ZONE VAV AIR DAMPER IN A

COMMANDED OFF, THE OUTSIDE AIR DAMPER SHALL CLOSE, COOLING SHALL BE DISABLED, ALL

HEATING SHALL BE DISABLED, AND AN ALARM SHALL ANNUNCIATE AT THE BAS. A MANUAL RESET

A HARDWIRED, HIGH STATIC PRESSURE CUT-OFF SWITCH SHALL BE ELECTRICALLY INTERLOCKED

WITH THE VARIABLE SPEED DRIVE. IF THE HIGH STATIC PRESSURE CUT-OFF SWITCH IS TRIPPED

AND AN ALARM SHALL ANNUNCIATE AT THE BAS. A MANUAL RESET OF THE HIGH STATIC PRESSURE

IF THE SUPPLY FAN STATUS IS CONFIRMED TO BE OFF, THE RELIEF FAN SHALL BE DISABLED AND

THE RELIEF FAN SPEED SHALL BE MODULATED TO MATCH THE CURRENT SUPPLY FAN SPEED MINUS

WHEN THE SUPPLY FAN OPERATING STATUS IS CONFIRMED, THE RELIEF DAMPER SHALL WHEN THE

THE INITIAL DAMPER OPENING RATE SHALL BE LIMITED TO 2% PER MINUTE (ADJ.) UNTIL THE

MODULATE TO A POSITION LESS THAN THE MINIMUM DAMPER POSITION IF THE MIXED AIR

DAMPER HAS REACHED ITS MINIMUM VENTILATION POSITION. THE OUTSIDE AIR DAMPER SHALL

TEMPERATURE DROPS BELOW 50.0 DEG. F (ADJ.). IF THE MIXED AIR TEMPERATURE SENSOR FAILS

AN ALARM SHALL ANNUNCIATE AT THE BAS AND THE OUTSIDE AIR DAMPER SHALL RETURN TO THE

A HARDWIRED, LOW LIMIT TEMPERATURE SWITCH SHALL BE ELECTRICALLY INTERLOCKED WITH

THE VARIABLE SPEED DRIVE. IF THE LOW LIMIT TEMPERATURE SWITCH IS TRIPPED 38.0 DEG. F

(ADJ.), THE FAN SHALL BE COMMANDED OFF AND THE OUTSIDE AIR DAMPER SHALL CLOSE. ALL

HEATING SHALL BE DISABLED. AN ALARM SHALL ANNUNCIATE AT THE BAS AND MANUAL RESET OF

IF THE CONDENSATE LEVEL REACHES THE TRIP POINT, A CONDENSATE OVERFLOW DIAGNOSTIC

SHALL ANNUNCIATE AT THE BAS. TO PREVENT THE CONDENSATE DRAIN PAN FROM OVERFLOWING

AND CAUSING WATER DAMAGE TO THE BUILDING THE FAN SHALL BE DISABLED AND THE CHILLED

THE UNIT SHALL SHUT DOWN IN RESPONSE TO A SIGNAL FROM THE SMOKE DETECTOR INDICATING

THE PRESENCE OF SMOKE. THE SMOKE DETECTOR SHALL BE INTERLOCKED TO THE UNIT

THROUGH THE DRY CONTACTS OF THE SMOKE DETECTOR. A MANUAL RESET OF THE SMOKE

VALVES SHALL BE COMMANDED OPEN TO 100% OPEN (ADJUST PER CLIMATE). THE ELECTRIC

THE LOW LIMIT TEMPERATURE SWITCH SHALL BE REQUIRED TO RESTART THE FAN.

IF THE RELIEF FAN FAILS TO PROVE STATUS FOR 30 SECONDS (ADJ.), THE FAN SHALL BE

THE FAN SHALL BE COMMANDED OFF, HEATING SHALL BE DISABLED, COOLING SHOULD BE

IF THE SUPPLY FAN FAILS TO PROVE STATUS FOR 30 SECONDS (ADJ.), THE FAN SHALL BE

OCCUPIED COOLING SETPOINT 74.0 DEG. F UNOCCUPIED COOLING SETPOINT 85.0 DEG. F

OCCUPIED STANDBY COOLING SETPOINT OCCUPIED MIN COOLING AIRFLOW SETPOINT SEE VAV SCHEDULE OCCUPIED MAX COOLING AIRFLOW SETPOINT SEE VAV SCHEDULE

ELECTRIC SILICON CONTROLLED RECTIFIER REHEAT (SCR):

SETPOINT EXIST, THE VAV SHALL USE THE COMMUNICATED VALUE.

REHEAT SHALL ONLY BE ALLOWED WHEN THE SUPPLY AIR TEMPERATURE IS 5.0 DEG. F BELOW THE CONFIGURED REHEAT ENABLE SETPOINT OF 70.0 DEG. F (ADJ.). THE REHEAT SHALL BE ENABLED

SEQUENCE OF OPERATION: VAV TERMINAL UNIT

THE BUILDING AUTOMATION SYSTEM (BAS) SHALL SEND THE CONTROLLER OCCUPIED, AND

IS LOST WITH THE BAS, THE CONTROLLER SHALL OPERATE USING ITS LOCAL SETPOINTS.

TEMPERATURE AT THE ACTIVE OCCUPIED HEATING OR COOLING SETPOINT. APPLICABLE

ENFORCED. THE OCCUPIED MODE SHALL BE THE DEFAULT MODE OF THE VAV.

DEFAULT MODE OF THE VAV. APPLICABLE VENTILATION AND AIRFLOW SETPOINTS SHALL BE

THE OCCUPANCY MODE SHALL BE COMMUNICATED OR HARDWIRED TO THE CONTROLLER VIA A

OCCUPIED STANDBY MODE, THE ACTIVE COOLING AND HEATING SETPOINTS SHALL BE RELAXED

(SEE COOLING AND HEATING MODE) AND BOTH THE VENTILATION AIRFLOW AND MINIMUM AIRFLOW

NORMAL OPERATING MODE FOR UNOCCUPIED SPACES OR NIGHTTIME OPERATION. WHEN THE UNIT

THE STORED UNOCCUPIED HEATING OR COOLING SETPOINT REGARDLESS OF THE PRESENCE OF A

HARDWIRED OR COMMUNICATED SETPOINT. WHEN THE SPACE TEMPERATURE DROPS BELOW ITS

UNOCCUPIED HEATING SETPOINT, THE CONTROLLER SHALL MODULATE THE AIR DAMPER AND THE

UNOCCUPIED SETPOINT THE HOT WATER VALVE SHALL THE AIR DAMPER AND HOT WATER VALVE

MODE USED TO TEMPORARILY PLACE THE UNIT INTO THE OCCUPIED OPERATION. TENANTS SHALL

BE ABLE TO OVERRIDE THE UNOCCUPIED MODE FROM THE SPACE SENSOR. THE OVERRIDE SHALL

LAST FOR A MAXIMUM OF 4 HOURS (ADJ.). THE TENANTS SHALL BE ABLE TO CANCEL THE OVERRIDE

FROM THE SPACE SENSOR AT ANY TIME. DURING THE OVERRIDE THE UNIT SHALL OPERATE IN

THUMBWHEEL) SETPOINT, THE VAV DEFAULT SETPOINT OR A COMMUNICATED VALUE. THE VAV

SHALL USE THE LOCALLY STORED DEFAULT SETPOINTS WHEN NEITHER A LOCAL SETPOINT NOR

COMMUNICATED SETPOINT IS PRESENT. IF BOTH A LOCAL SETPOINT AND COMMUNICATED

WHEN THE UNIT IS IN COOLING MODE, THE VAV CONTROLLER SHALL MAINTAIN THE SPACE

TEMPERATURE AT THE ACTIVE COOLING SETPOINT BY MODULATING THE AIRFLOW BETWEEN THE

ACTIVE COOLING MINIMUM AIRFLOW SETPOINT TO THE MAXIMUM COOLING AIRFLOW SETPOINT.

TO DETERMINE THE REQUESTED COOLING CAPACITY OF THE UNIT. THE OUTPUTS SHALL BE

CONTROLLED BASED ON THE UNIT CONFIGURATION AND THE REQUESTED COOLING CAPACITY.

BASED ON THE VAV CONTROLLER OCCUPANCY MODE, THE ACTIVE COOLING SETPOINT SHALL BE

DEFAULT VALUE

THE VAV SHALL USE THE MEASURED SPACE TEMPERATURE AND THE ACTIVE COOLING SETPOINT

THE SPACE TEMPERATURE SETPOINT SHALL BE DETERMINED EITHER BY A LOCAL (E.G.,

HOT WATER VALVE UNTIL THE ZONE TEMPERATURE RISES BACK TO 2.0 DEG. F ABOVE THE

UNOCCUPIED HEATING SETPOINT. WHEN THE SPACE TEMPERATURE EXCEEDS THE ACTIVE

IS IN UNOCCUPIED MODE THE VAV CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT

BINARY INPUT, EVEN THOUGH THE BAS HAS SCHEDULED THE SPACE AS OCCUPIED. IN THE

UNOCCUPIED COMMANDS. THE BAS MAY ALSO SEND A HEAT/COOL MODE, PRIORITY SHUTDOWN

THE OCCUPANCY MODE SHALL BE COMMUNICATED OR HARDWIRED TO THE CONTROLLER VIA A

BINARY INPUT. WHEN THE UNIT IS IN THE OCCUPIED MODE THE VAV SHALL MAINTAIN THE SPACE

VENTILATION AND AIRFLOW SETPOINTS SHALL BE ENFORCED. THE OCCUPIED MODE SHALL BE THE

COMMANDS, SPACE TEMPERATURE AND/OR SPACE TEMPERATURE SETPOINT. IF COMMUNICATION

SEQUENCE OF OPERATION: VAV TERMINAL UNIT

SETPOINTS SHALL BE LOWERED (SEE VAV SCHEDULE).

BUILDING AUTOMATION SYSTEM INTERFACE:

OCCUPIED STANDBY:

SHALL MODULATE FULLY CLOSED.

OCCUPIED MODE.

COOLING MODE:

HEAT/COOL SETPOINT:

ONE OF THE FOLLOWING:

SETPOINT

WHEN THE SPACE TEMPERATURE DROPS BELOW THE ACTIVE HEATING SETPOINT AND THE MINIMUM AIRFLOW REQUIREMENTS ARE MET. DURING REHEAT THE VAV SHALL OPERATE AT ITS MINIMUM HEATING AIRFLOW SETPOINT AND ENERGIZE THE HEAT AS FOLLOWS:

OCCUPIED HEATING SETPOINT UNOCCUPIED HEATING SETPOINT OCCUPIED STANDBY HEATING SETPOINT OCCUPIED MIN HEATING AIRFLOW SETPOINT OCCUPIED MAX HEATING AIRFLOW SETPOINT

71.0 DEG. F 60.0 DEG. F 67.0 DEG. F SEE VAV SCHEDULE SEE VAV SCHEDULE

DEFAULT VALUE

LOCAL REHEAT CONTROL: REHEAT SHALL ONLY BE ALLOWED WHEN THE PRIMARY AIR TEMPERATURE IS 5.0 DEG. F BELOW THE CONFIGURED REHEAT ENABLE SETPOINT OF 70.0 DEG. F (ADJ.). THE REHEAT SHALL BE ENABLED WHEN THE SPACE TEMPERATURE DROPS BELOW THE ACTIVE HEATING SETPOINT AND THE MINIMUM AIRFLOW REQUIREMENTS ARE MET. DURING REHEAT THE VAV SHALL OPERATE AT ITS MINIMUM HEATING AIRFLOW SETPOINT AND ENERGIZE THE HEAT AS FOLLOWS:

IF THE SPACE TEMPERATURE IS AT THE HEATING SETPOINT, THE ELECTRIC HEATER SHALL MODULATE AS REQUIRED TO MAINTAIN SPACE TEMPERATURE AT THE ACTIVE HEATING SETPOINT WHILE THE VAV OPERATES AT ITS MINIMUM HEATING AIRFLOW SETPOINT. IF THE DISCHARGE AIR TEMPERATURE REACHES THE DESIGN HEATING DISCHARGE AIR TEMPERATURE SETPOINT (ADJ.), THE VAV SHALL MODULATE AIRFLOW BETWEEN THE MINIMUM HEATING AIRFLOW SETPOINT AND THE MAXIMUM HEATING AIRFLOW SETPOINT AS REQUIRED TO MAINTAIN SPACE TEMPERATURE AT THE ACTIVE HEATING SETPOINT, WHILE THE ELECTRIC HEATER MODULATES TO MAINTAIN DISCHARGE AIR TEMPERATURE AT THE DESIGN HEATING DISCHARGE AIR TEMPERATURE SETPOINT. IF THE AIRFLOW REACHES THE MAXIMUM HEATING AIRFLOW SETPOINT, THE VAV SHALL MODULATE THE ELECTRIC HEATER AS REQUIRED TO MAINTAIN SPACE TEMPERATURE AT THE ACTIVE HEATING

SETPOINT, WHILE THE VAV OPERATES AT ITS MAXIMUM HEATING AIRFLOW SETPOINT **SPACE SENSOR FAILURE:**

IF THERE IS A FAULT WITH THE OPERATION OF THE ZONE SENSOR AN ALARM SHALL BE ANNUNCIATED AT THE BAS. SPACE SENSOR FAILURE SHALL CAUSE THE VAV TO DRIVE THE DAMPER TO MINIMUM AIR FLOW IF THE VAV IS IN THE OCCUPIED MODE, OR DRIVE IT CLOSED IF THE VAV IS IN THE UNOCCUPIED MODE.

SEQUENCE OF OPERATION: POWER VENTILATOR 01

BUILDING AUTOMATION SYSTEM INTERFACE: THE BUILDING AUTOMATION SYSTEM (BAS) SHALL SEND THE CONTROLLER AN OCCUPIED OR UNOCCUPIED COMMAND. IF A BAS IS NOT PRESENT, OR COMMUNICATION IS LOST WITH THE BAS, THE CONTROLLER SHALL OPERATE IN THE OCCUPIED MODE.

DURING OCCUPIED PERIODS, THE EXHAUST FAN SHALL RUN CONTINUOUSLY.

DURING UNOCCUPIED PERIODS THE EXHAUST FAN SHALL BE DISABLED.

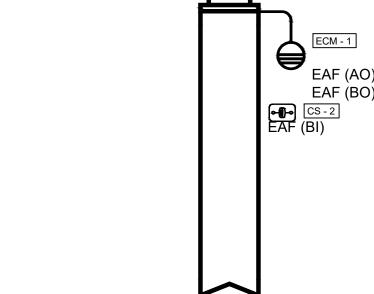
THE OCCUPANCY SENSOR SHALL BE USED TO INDICATE THAT THE SPACE IS OCCUPIED/UNOCCUPIED.

THE FAN STATUS SHALL BE MONITORED BY A CURRENT SENSING SWITCH. IF THE FAN IS SIGNALED TO START,

FLOW DIAGRAM: PV01

AND STATUS IS NOT PROVEN WITHIN 30 SECONDS (ADJ.), AN ALARM SHALL ANNUNCIATE AT THE BAS.

▶ PT-3 EH (AO)



DESCRIPTION APPROVAL CR# | REVISIONS DATE DRAWING GE VERNOVA-FMO

SIGNATURES REFERENCE DRAWINGS CONTROLS SCALE AS NOTED *UNLESS OTHERWISE SPECIFIED Fax: 910.791.5266

OCC SP (NET)

FLOW DIAGRAM: VAV TERMINAL UNIT

FLOW DIAGRAM: AH03

SPT (AI)
SPT SP (AI)
SPT SP (AI)





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CBHF

2246 Yaupon Drive *Wilmington, NC 28401*

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