AIR HANDLER SCHEDULE (EXTERIOR)

DRAWING CODE (IDU/ODU)	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL	ALTERNATE APPROVED MANUFACTURERS	SYSTEM TYPE	SUPPLY FAN						RETURN FAN					COOLING COIL CHILLED WATER														HEATING COIL (ELECTRIC, SSR STAGING)						ELECTRICAL						WEIGHT (LBS)	NOTES	ACCESSORIES
					AIRFLOW (CFM)	MAX OA (CFM)	VENT OA (CFM)	MIN OA (CFM)	BHP PER FAN (HP)	MOTOR (QTY)	ESP (IN.WG.)	AIRFLOW (CFM)	BHP PER FAN (HP)	MOTOR (QTY)	ESP (IN.WG.)	AIRFLOW MAX (CFM)	AIRFLOW MIN (CFM)	VELOCITY (FPM)	TOTAL CAP (MBH)	SENSIBLE CAP (MBH)	EAT (°F db/wb)	LAT (°F db/wb)	APD (IN. H20)	EWT (°F)	LWT (°F)	FLOW (GPM)	WPD (FT. H20)	PIPE CONN. (IN)	AIRFLOW (CFM)	VELOCITY (FPM)	TOTAL CAP (KW)	EAT (°F)	LAT (°F)	POWER SUPPLY (V/PH/HZ)	CIRCUIT 1 (FAN)		CIRCUIT 2 (FAN)		CIRCUIT 3 (HEAT)							
																																				FLA (A)	MOCP (A)	FLA (A)	MOCP (A)	MCA (A)	MOCP (A)			
AH02	TRANE	CSAA006	YORK, DAIKIN	2-PIPE	2,810	2,810	570	-	2.73	1	2.00	2,810	1.5	2	1.00	2,810	1,405	460	95.0	64.8	73.6 / 63.7	52.7 / 52.1	6.0	42.0	52.0	18.9	3.2	1.5	2,810	594	17.7	55.0	75.0	460/3/60	4.2	-	2.9	-	28.1	30	3,640	1 - 4	A - I
AH03	TRANE	CSAA012	YORK, DAIKIN	2-PIPE	5,240	5,240	1,710	-	5.14	1	2.00	5,240	1.84	1	1.00	5,240	2,620	426	240.4	146.0	79.9 / 68.6	54.7 / 54.0	0.5	42.0	52.0	47.9	6.1	2	-	-	-	-	-	460/3/60	9.8	-	4.6	-	-	-	3,760	1 - 4	A - I

NOTES:
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.
I PROVIDE ACCESS / INSPECTION / TURNING SECTION.

POWER VENTILATOR SCHEDULE

DRAWING CODE	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL	ALTERNATE APPROVED MANUFACTURERS	FAN TYPE	FAN WHEEL	SERVICE	DRIVE TYPE	DAMPER	MOTOR ENCLOSURE	CAPACITIES			ELECTRICAL				SONES	WEIGHT (LBS.)	NOTES	ACCESSORIES
										AIRFLOW (CFM)	ESP (IN. WG.)	FAN RPM	MOTOR TYPE	MOTOR SIZE (HP)	V/PH/HZ	RLA				
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	120/1/60	1.9	6.8	22	1,2	A,B,C,D,E,F

1 REFER TO SPECIFICATIONS FOR FURTHER INFORMATION.
2 CONTROLLED VIA DDC

ACCESSORIES:
A FACTORY MOUNTED DISCONNECT SWITCH (NEMA 3R)
B MOTORIZED BACKDRAFT DAMPER
C PERMATECTOR COASTAL DUTY COATING.
D STAINLESS STEEL FASTENERS.
E BIRDSCREEN STAINLESS STEEL MESH
F ROOF CURB W/ SEAL

SINGLE DUCT TERMINAL UNIT SCHEDULE

DRAWING CODE	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL	ALTERNATE APPROVED MANUFACTURERS	PRIMARY AIRFLOW						HEATING COIL								NOISE CRITERIA		OPERATING WEIGHT (LB)	UNIT SERVED FROM	NOTES	ACCESSORIES
				COOLING MAX (CFM)	COOLING MIN (CFM)	HEATING (CFM)	INLET DIA. (IN)	COOLING INLET VELOCITY (FT/MIN)	AIR PRESSURE DROP (IN H2O)	CAPACITY (KW)	ELECTRIC HEATER STAGES	EAT (°F)	LAT (°F)	VOLTAGE (V/PH/HZ)	FLA	MCA	MOCP	DISCH (NC)	RAD (NC)				
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	AH03	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	AH03	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	AH03	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	AH03	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	AH03	1,2	A,B,C,D,E,F,G
VAV06	TRANE	VCEF05	PRICE, TITUS	300	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	AH03	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	AH03	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	AH03	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	AH03	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	AH03	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	AH03	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	AH03	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	AH03	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	AH03	1,2	A,B,C,D,E,F,G

NOTES:
1 REFER TO SPECIFICATIONS FOR FURTHER INFORMATION.
2 CONTROLS BY DDC CONTRACTOR. CONTROLS SUPPLIER

ACCESSORIES:
A FACTORY MOUNTED DISCONNECT
B ROUND AIR VALVE
C ELECTRIC COIL AS SCHEDULED
D 480/24 VOLT TRANSFORMER
E FOIL-FACED INSULATION
F SCR MODULATED ELECTRIC HEAT
G AIRFLOW SWITCH

DIFFUSERS, REGISTERS AND GRILLES SCHEDULE

DRAWING CODE	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL	ALTERNATE APPROVED MANUFACTURERS	TYPE	SERVICE	NECK SIZE (IN.)	BRANCH CONN. SIZE (IN.)	MODULE SIZE (IN.)	MATERIAL	FINISH	MOUNTING	NOTES	ACCESSORIES
S1	PRICE	ASPD	GREENHECK, TITUS	SQUARE PLAQUE DIFFUSER	SUPPLY	6Ø		24 X 24	ALUMINUM	WHITE	T-BAR	1,2	A
S2	PRICE	ASPD	GREENHECK, TITUS	SQUARE PLAQUE DIFFUSER	SUPPLY	8Ø		24 X 24	ALUMINUM	WHITE	T-BAR	1,2	A
S3	PRICE	ASPD	GREENHECK, TITUS	SQUARE PLAQUE DIFFUSER	SUPPLY	10Ø		24 X 24	ALUMINUM	WHITE	T-BAR	1,2	A
S4	PRICE	SDG	GREENHECK, TITUS	DOUBLE DEFLECTION SPIRAL DUCT GRILLE	SUPPLY	-		16 X 8	ALUMINUM	WHITE	DUCT SURFACE	1,2,3	A
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	48 X 20		50 X 22	ALUMINUM	WHITE	DUCT SURFACE	1	B
E1	PRICE	630	GREENHECK, TITUS	FIXED FACE GRILLE	EXHAUST	22 X 22		24 X 24	ALUMINUM	WHITE	T-BAR	1,2,3	A

NOTES:
1 REFER TO SPECIFICATIONS FOR FURTHER INFORMATION.
2 DUCT BRANCH CONNECTION SIZE TO BE EQUAL TO THE NECK SIZE OF DIFFUSER UNLESS NOTED OTHERWISE ON PLANS.
3 PAINT ALL VISIBLE DUCTWORK THROUGH GRILLES AND REGISTERS FLAT BLACK.

ACCESSORIES:
A MANUAL VOLUME DAMPER
B INSULATED PLENUM BOX

ABBREVIATIONS

TERM	ABBREVIATION	TERM	ABBREVIATION
ABOVE FINISHED FLOOR	AFF	INCH OF WATER GAUGE	INWG
ABOVE GROUND	AG	INDOOR UNIT	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	AHU OR AH	LEAVING AIR TEMPERATURE	LAT
AIR FLOW MEASURING STATION	AFMA	LEAVING WATER TEMPERATURE	LWT
AMBIENT	AMB	LENGTH	LG
AMPERE (AMP, AMPS)	AMP	LINEAR FEET	LF
ANALOG INPUT	AI	MAXIMUM	MAX
ANALOG OUTPUT	AO	MAXIMUM OVERCURRENT PROTECTION	MOCP
AND	&	MEDIUM-PRESSURE STEAM	MPS
APPARATUS DEW POINT	ADP	MILES PER HOUR	MPH
APPROXIMATE	APPROX	MINIMUM	MIN.
ARCHITECT	ARCH	MINIMUM CIRCUIT AMPERES	MCA
ATMOSPHERE	ATM	MINUTE	MIN
AVERAGE	AVG	MANUFACTURER	MFR
BRAKE HORSEPOWER	BHP	MOTOR CONTROL CENTER	MCC
BROWN & SHARPE WIRE GAGE	B&S	NOISE CRITERIA	NC
BRITISH THERMAL UNIT	BTU	NON-STANDARD PART LOAD	NPLV
BRITISH THERMAL UNIT PER HOUR	MBH	NORMALLY OPEN	NO
1000 BRITISH THERMAL UNIT	MBH	NORMALLY CLOSED	NC
BUILDING	BLDG	NOT APPLICABLE	N/A
BUILDING AUTOMATION SYSTEM	BAS	NOT IN CONTRACT	N I C
CELSIUS	°C	NOT TO SCALE	NTS
CHILLED WATER RETURN	CHWR	NUMBER	NO
CHILLED WATER SUPPLY	CHWS	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)	COND	PACKAGE TERMINAL AIR CONDITIONER	PTAC
CONNECTION	CONN	PARTS PER MILLION	PPM
CONTINUATION	CONT	PERCENT	%
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
CFM, STANDARD CONDITIONS	SCFM	PRESSURE	PRESS
DECIBEL	DB	PRESSURE REDUCING VALVE	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	DIA	REDUCED PRESSURE BACKFLOW PREVENTER	RPZ
DIAMETER, INSIDE	ID	REFRIGERANT (12, 22, ETC.)	R22, R410
DIAMETER, OUTSIDE	OD	REFRIGERANT LIQUID	RL
DIFFERENCE OR DELTA	DIFF	REFRIGERANT SUCTION	RS
DIGITAL INPUT	DI	REQUIRED	REQD OR REQ'D
DIGITAL OUTPUT	DO	RELATIVE HUMIDITY	RH
DOMESTIC HOT WATER	DHW	RETURN AIR	RA
DOMESTIC HOT WATER RECIRCULATION	DHWR	REVOLUTIONS PER MINUTE	RPM
DRY-BULB TEMPERATURE	DBT	REVOLUTIONS PER SECOND	RPS
DUCTLESS SPLIT SYSTEM AIR HANDLER	DAH	ROOF VENTILATOR	RV
DUCTLESS SPLIT SYSTEM HEAT PUMP	DHP	ROOF TOP UNIT	RTU
ENERGY EFFICIENCY RATING	ERR	SAFETY FACTOR	SF
EFFICIENCY	EFF	SEASONAL ENERGY EFFICIENCY RATIO	SEER
ELECTRIC UNIT HEATER	EUH	SECOND	S
ELEVATION	EL	SHADING COEFFICIENT	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	SPLY
EXTERNAL STATIC PRESSURE	ESP	SUPPLY AIR	SA
EXHAUST AIR	EA	TEMPERATURE	TEMP
EXHAUST FAN	EF	TEMPERATURE DIFFERENCE	TD
FACE VELOCITY	FVEL	THERMOSTAT	T STAT
FAHRENHEIT	°F	TONS OF REFRIGERATION	TONS
FEET PER MINUTE	FPM	TO BE DETERMINED	TBD
FEET PER SECOND	FPS	TOP OF STEEL	TOS
FLOOR	FLR	TOTAL DYNAMIC HEAD	TDH
FOOT OR FEET	FT	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	UNIT HEATER - ELECTRIC	UH
GALLONS PER MINUTE	GPM	VARIABLE AIR VOLUME	VAV
GALLONS PER DAY	GPD	VARIABLE FREQUENCY DRIVE	VFD
GAS UNIT HEATER	GUH	VELOCITY	VEL
GRAINS	GR	VENTILATION, VENT	VENT
HEAD	HD	VENT THRU ROOF	VTR
HEAT EXCHANGER	HX	VERTICAL	VERT
HEATING AND VENTILATION UNIT	HV	VOLT	V
HEATING, VENTILATION AND AIR CONDITIONING	HVAC	VOLT AMPERE	VA
HEIGHT	HGT	VOLUME	VOL
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)	HR	WEIGHT	WT
HUMIDITY, RELATIVE	RH	WET BULB	WB
INTEGRATED PART LOAD VALUES	IPLV	YARD	YD
INCH	IN.	YEAR	YR

NOTE: ALL ABBREVIATIONS MAY NOT BE USED IN PROJECT.

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
	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.

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.

MECHANICAL 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 RETURN PIPING - EXISTING
CHWS	CHILLED WATER SUPPLY PIPING
(X)CHWS	CHILLED WATER SUPPLY PIPING - EXISTING
C C	CONDENSATE PIPING
(X)C	CONDENSATE PIPING - EXISTING
CWR	CONDENSER WATER RETURN PIPING
(X)CWR	CONDENSER WATER RETURN 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
(X)MU	MAKE-UP WATER PIPING - EXISTING
NG	NATURAL GAS PIPING
(X)NG	NATURAL GAS PIPING - EXISTING
R	REFRIGERANT LINE-SET PIPING
(X)R	REFRIGERANT LINE-SET PIPING - EXISTING

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

MECHANICAL DEMOLITION NOTES

1. THE MECHANICAL CONTRACTOR SHALL REVIEW THE DRAWINGS AND SPECIFICATIONS FOR DEMOLITION REQUIREMENTS AND LAYOUT HIS WORK IN A COMPATIBLE AND COMPLEMENTARY MANNER. REMOVE ALL EQUIPMENT, DUCTWORK, SUPPORTS, CONTROLS, ACCESSORIES, ETC.... AND MECHANICAL ITEMS MADE OBSOLETE BY THESE ALTERATIONS AS SHOWN IN THE MECHANICAL DRAWINGS. ALL ITEMS TO BE REMOVED OR MODIFIED MAY NOT BE SHOWN, HOWEVER, THIS CONTRACTOR SHALL REMOVE ANY MECHANICAL WORK AS REQUIRED BY THE CONSTRUCTION OR AS DIRECTED BY THE OWNER OR THE ENGINEER. SURVEY THE AFFECTED AREAS BEFORE SUBMITTING A BID.
2. SCHEDULING OF DEMOLITION - COORDINATE SCHEDULING OF MECHANICAL DEMOLITION WORK WITH THE OWNER AND GENERAL CONTRACTOR SO AS TO MINIMIZE DISRUPTION OF THE OWNER'S USE OF THE FACILITIES AND MAINTAIN THE CONSTRUCTION SEQUENCE OF THE GENERAL CONTRACTOR. SEE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL INSTRUCTIONS CONCERNING PHASING AND SEQUENCE OF WORK.
3. EXISTING MECHANICAL SYSTEMS - VERIFY CONDITION OF EXISTING MECHANICAL SYSTEMS TO BE REUSED SO THAT COMPLETE, FULLY OPERATIONAL AND RELIABLE SYSTEMS ARE OBTAINED AT THE COMPLETION OF THE WORK. NOTIFY ARCHITECT/ENGINEER OF ANY SYSTEMS FOUND TO BE OF QUESTIONABLE CONDITION.
4. ALL EXISTING MECHANICAL EQUIPMENT AND DEVICES SHALL REMAIN UNLESS SPECIFICALLY NOTED TO BE REMOVED.
5. DEMOLISHED MATERIALS - UNLESS SPECIFICALLY REQUESTED BY THE OWNER, ALL DEMOLISHED MECHANICAL MATERIALS SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE AND DISPOSED OF PROPERLY.
6. CUTTING AND PATCHING - PERFORM CUTTING AND PATCHING FOR MECHANICAL WORK SO AS TO MINIMIZE DAMAGE TO CEILINGS, FLOORS AND WALLS. REFER TO ARCHITECTURAL DRAWINGS AND GENERAL SPECIFICATIONS SECTIONS FOR SPECIFIC RESPONSIBILITIES REGARDING CUTTING AND PATCHING.
7. THESE DRAWINGS ARE COMPILED BY THE ARCHITECT/ENGINEER FROM THE OWNER'S AS-BUILT RECORD DRAWINGS AND LIMITED FIELD VERIFICATION OF EXISTING CONDITIONS FOR THE PURPOSE OF INDICATING THE WORK REQUIRED AND ARE BELIEVED TO BE CORRECT. NOTWITHSTANDING, THE CONTRACTOR SHALL VERIFY ALL DUCTWORK, EQUIPMENT LOCATIONS, DIMENSIONS AND ALL FIELD CONDITIONS AFFECTING HIS WORK.
8. WHERE MECHANICAL SYSTEMS PASS THROUGH THE DEMOLITION AREAS TO SERVE OTHER PORTIONS OF THE PREMISES, THEY SHALL REMAIN OR BE SUITABLY RELOCATED AND THE SYSTEM RESTORED TO NORMAL OPERATION. ADVISE THE ARCHITECT/ENGINEER IMMEDIATELY IF SUCH CONDITIONS ARE UNCOVERED BEFORE PROCEEDING WITH ADDITIONAL WORK.
9. PROTECT ALL EXISTING LIFE SAFETY SYSTEMS, FIRE ALARM AND PUBLIC ADDRESS SYSTEMS AND MAINTAIN THEM IN OPERATION THROUGHOUT THE PROGRESS OF THE WORK. NOTIFY THE OWNER AND ARCHITECT/ENGINEER IN WRITING OF SHUTDOWNS ARE REQUIRED PRIOR TO ANY OUTAGE OF SERVICE. WHERE THE DURATION OF A PROPOSED OUTAGE CANNOT BE TOLERATED BY THE OWNER, PROVIDE TEMPORARY CONNECTIONS AS REQUIRED MAINTAINING SERVICE.
10. SURVEY THE EFFECTED AREAS BEFORE SUBMITTING A BID AS ALL EXISTING CONDITIONS CANNOT BE COMPLETELY DEPICTED ON THE DRAWINGS AND SOME UNUSUAL CONDITIONS EXIST.
11. IF ANY UNUSUAL STRUCTURAL OR ARCHITECTURAL CONDITIONS ARE ENCOUNTERED DURING DEMOLITION, CONTACT THE ARCHITECT/ENGINEER.
12. REMOVE AIR CONDITIONING, REFRIGERATION, AND OTHER EQUIPMENT CONTAINING REFRIGERANTS WITHOUT RELEASING CHLOROFLUOROCARBON REFRIGERANTS TO THE ATMOSPHERE IN ACCORDANCE WITH THE CLEAN AIR ACT AMENDMENT OF 1990. RECOVER ALL REFRIGERANTS PRIOR TO REMOVING AIR CONDITIONING, REFRIGERATION, AND OTHER EQUIPMENT CONTAINING REFRIGERANTS AND DISPOSE OF IN ACCORDANCE WITH THE PARAGRAPH ENTITLED "DISPOSAL OF OZONE DEPLETING SUBSTANCE (ODS)." TURN IN SALVAGED CLASS I ODS REFRIGERANTS AS SPECIFIED IN PARAGRAPH, "SALVAGED MATERIALS AND EQUIPMENT."

TRUE NORTH PROJECT NORTH

24199
CBHF
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 23551 TIMOTHY M HIMES
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REFERENCE DRAWINGS

REV.	DESCRIPTION	BY	CR#	APPROVAL	DATE
-	---	---	---	---	--/--/--

REVISIONS

SIGNATURES		DATE
DRAWN	MEZ	--/--/--
CHECKED	DMH	--/--/--
ENGR'G	DMH	--/--/--
ENGR'G		

SCALE AS NOTED
*UNLESS OTHERWISE SPECIFIED
2 PLACE DECIMALS ± FRACTIONS ± ALL SURF.
3 PLACE DECIMALS ± ANGLES ±

GE VERNOVA
GE Hitachi Nuclear Energy
Wilmington, NC

TYPE OF DRAWING: GE VERNOVA-FMO SCHEDULES, LEGENDS, AND ABBREVIATIONS

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MECHANICAL SPECIFICATIONS

SECTION 230000 - GENERAL MECHANICAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. THE WORK SHALL INCLUDE FURNISHING, INSTALLING AND TESTING THE EQUIPMENT AND MATERIALS SPECIFIED IN OTHER SECTIONS OF THE MECHANICAL SPECIFICATIONS AND SHOWN ON THE DRAWINGS. IT IS THE INTENT OF THESE SPECIFICATIONS THAT THE MECHANICAL SYSTEMS SHALL BE SUITABLE IN EVERY WAY FOR THE INTENDED USAGE. ALL MATERIAL AND ALL WORK WHICH MAY BE REASONABLY IMPLIED AS BEING INCIDENTAL TO THE WORK OF THIS DIVISION SHALL BE FURNISHED AT NO EXTRA COST.

B. FURNISH ALL LABOR, MATERIALS AND EQUIPMENT AND INCIDENTALS REQUIRED TO MAKE READY FOR USE COMPLETE MECHANICAL SYSTEMS AS SHOWN ON THE DRAWINGS AND SPECIFIED HEREIN.

C. WHERE SUB-CONTRACTS ARE USED TO PERFORM PORTIONS OF THE WORK, DIVISION OF LABOR BETWEEN SUB TRADES IS THE RESPONSIBILITY OF THE CONTRACTOR.

D. THE GENERAL SCOPE WORK INCLUDES, BUT IS NOT LIMITED TO, FURNISHING, COORDINATING, AND INSTALLING THE FOLLOWING:

1. HEATING, AIR CONDITIONING AND VENTILATION EQUIPMENT.
2. DUCTWORK, AIR DISTRIBUTION.
3. HVAC PIPING, SPECIALTIES AND EQUIPMENT.
4. CONTROLS AND WIRING.
5. COMMISSIONING, TESTING AND BALANCING.

E. VISIT ALL AREAS OF THE SITE, BUILDINGS AND STRUCTURES (AS APPLICABLE) IN WHICH WORK UNDER THESE SECTIONS IS TO BE PERFORMED. INSPECT CAREFULLY THE EXISTING CONDITIONS PRIOR TO BIDDING. BID SUBMISSION IS EVIDENCE THAT THE CONTRACTOR HAS EXAMINED THE SITE AND EXISTING CONDITIONS, UNDERSTANDS CONDITIONS UNDER WHICH THE WORK WILL BE PERFORMED, AND TAKES FULL RESPONSIBILITY FOR COMPLETE KNOWLEDGE OF ALL FACTORS GOVERNING THE WORK.

F. SCHEDULE ALL SERVICE INTERRUPTIONS IN EXISTING FACILITIES AT THE OWNER'S CONVENIENCE WITH 24 HOURS (MINIMUM) NOTICE. OBTAIN PRIOR APPROVAL FOR EACH INTERRUPTION.

G. THOROUGHLY TEST ALL MECHANICAL SYSTEMS AT THE COMPLETION OF WORK AND MAKE ANY MINOR CORRECTION CHANGES OR ADJUSTMENTS NECESSARY FOR ALL THE PROPER FUNCTIONING OF THE SYSTEM AND EQUIPMENT. ALL WORKMANSHIP SHALL BE OF THE HIGHEST QUALITY; SUBSTANDARD WORK WILL BE REJECTED.

1.2 SUBMITTALS

A. PROCEDURES FOR SUBMITTALS: SUBMIT UNDER PROVISIONS OF RELEVANT SECTIONS OF THE GENERAL AND SUPPLEMENTAL GENERAL CONDITIONS AND DIVISION 1 SPECIFICATIONS SECTIONS.

TRANSMIT EACH SHOP DRAWING SUBMITTAL WITH PROVIDED SHOP DRAWING SUBMITTAL COVER FORM, ATTACHED AS APPENDIX B, FOR EACH ITEM OF EQUIPMENT/MATERIAL OR EACH SPECIFICATION SECTION/PARAGRAPH.

B. CLEARLY INDICATE PROPOSED EQUIPMENT AND/OR MATERIALS SUBSTITUTIONS IN SHOP DRAWINGS. SUMMARIZE ALL DEVIATIONS FROM THE SPECIFIED QUALITY, FUNCTIONALITY, APPEARANCE OR PERFORMANCE OF PROPOSED EQUIPMENT AND/OR MATERIALS IN THE PREFACE OF EACH SUBMITTAL. INCLUDE DOCUMENTATION TO SUPPORT DEVIATIONS.

C. PROVIDE DESCRIPTIVE DATA ON ALL MATERIALS AND EQUIPMENT AS REQUIRED TO ASCERTAIN COMPLIANCE WITH SPECIFICATIONS.

D. DESIGN LAYOUT SHOWN ON DRAWINGS IS BASED ON PHYSICAL SIZES OF REPUTABLE EQUIPMENT MANUFACTURERS. IF EQUIPMENT OTHER THAN MODELS INDICATED IS INSTALLED, ANY RESULTING CONFLICTS WITH SPACE, MAINTENANCE ACCESS, CLEARANCES OR CODES ARE THE RESPONSIBILITY OF THE CONTRACTOR TO CORRECT AT HIS EXPENSE.

E. WHERE SPECIFIC MODELS AND MANUFACTURERS OF MATERIALS AND EQUIPMENT ARE SPECIFIED, SUBSTITUTIONS AS ALLOWED BY THE SPECIFICATIONS AND STATE LAW WILL BE CONSIDERED. SUBSTITUTIONS MUST BE EQUIVALENT IN QUALITY, FUNCTION, SUITABILITY AND ARRANGEMENT TO SPECIFIED EQUIPMENT. ARCHITECT/ENGINEER TO HAVE FINAL AUTHORITY AS TO EQUIVALENCY OF SUBSTITUTIONS.

F. EQUIPMENT MODEL NUMBERS NOTED IN THESE SPECIFICATIONS OR ON THE DRAWINGS ARE INTENDED TO ESTABLISH A MINIMUM STANDARD OF QUALITY AND DO NOT NECESSARILY RELATE TO SPECIFIC OPTIONS OR ARRANGEMENTS AS SHOWN. PROVIDE EQUIPMENT WITH ALL STANDARD FEATURES AND OPTIONAL FEATURES AS STATED AND ARRANGED AS SHOWN ON THE DRAWINGS.

G. WHERE SEISMIC DESIGN FOR SUPPORTS IS REQUIRED, SUBMIT INSTALLATION DETAILS FOR SUPPORTS AND ENGINEERING ANALYSIS AS SPECIFIED.

1.3 REGULATORY REQUIREMENTS

A. PERFORM WORK IN ACCORDANCE WITH ALL APPLICABLE STATE AND LOCAL CODES, STANDARDS AND REGULATIONS.

B. FURNISH ALL MATERIALS AND LABOR WHICH IS REQUIRED FOR COMPLIANCE WITH CODES, STANDARDS AND REGULATIONS, WHETHER SPECIFICALLY MENTIONED IN THESE SPECIFICATIONS OR SHOWN ON THE DRAWINGS.

C. OBTAIN REQUIRED CONSTRUCTION PERMIT FROM THE AUTHORITY HAVING JURISDICTION AND ARRANGE, AT THE PROPER TIME, FOR ALL INSPECTIONS REQUIRED BY SUCH AUTHORITY. PAY ALL PERMIT AND INSPECTION COSTS REQUIRED.

1.4 COORDINATION OF WORK

A. CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF WORK BETWEEN TRADES. PROVIDE FULLY COMPLETE AND FUNCTIONAL SYSTEMS.

B. COMPARE MECHANICAL DRAWINGS AND SPECIFICATIONS WITH THE DRAWINGS AND SPECIFICATIONS FOR OTHER TRADES.

C. COORDINATE MECHANICAL INSTALLATION WITH THE WORK OF OTHER TRADES. REPORT ANY PERTINENT DISCREPANCIES TO THE ARCHITECT/ENGINEER AND OBTAIN WRITTEN INSTRUCTIONS FOR ANY NECESSARY REVISIONS, BEFORE STARTING ANY CONSTRUCTION, MAKE PROPER PROVISIONS TO AVOID INTERFERENCES IN A MANNER APPROVED BY THE ARCHITECT/ENGINEER. NO EXTRAS WILL BE ALLOWED FOR REWORK OF UNCOORDINATED INSTALLATIONS.

D. DETERMINE EXACT ROUTE AND LOCATION OF EACH MECHANICAL ITEM PRIOR TO FABRICATION AND/OR INSTALLATION. ADJUST LOCATION OF DUCTS, PIPING AND EQUIPMENT, ETC., TO ACCOMMODATE INTERFERENCES ANTICIPATED AND ENCOUNTERED.

E. RIGHT OF WAY: GENERAL PRIORITY FOR RIGHT OF WAY IS AS FOLLOWS:

1. ITEMS LOCATED PER REGULATORY REQUIREMENT.
2. PIPING WITH PITCH REQUIREMENT (PLUMBING DRAINS, ETC.).
3. DUCTWORK.
4. PIPING WITHOUT PITCH REQUIREMENT.
5. ELECTRICAL WIRING (CONDUITS, ETC.).

F. ARRANGE ALL WORK TO PERMIT REMOVAL (WITHOUT DAMAGE TO OTHER PARTS) OF ANY EQUIPMENT REQUIRING PERIODIC REPLACEMENT.

G. PROVIDE CLEARANCE AND EASY ACCESS TO ANY EQUIPMENT WHICH REQUIRES PERIODIC MAINTENANCE. ARRANGE DUCTS, PIPING AND EQUIPMENT TO PERMIT READY ACCESS TO VALVES, COCKS, TRAPS, STARTERS, MOTORS, CONTROL COMPONENTS, ETC., AND TO CLEAR THE OPENING OF SWINGING DOORS AND ACCESS PANELS.

1.5 EQUIPMENT AND MATERIALS (GENERAL)

A. PROVIDE ALL NEW MATERIALS UNLESS SPECIFICALLY INDICATED OTHERWISE.

B. MANUFACTURERS AND MODELS LISTED IN DRAWINGS AND SPECIFICATIONS ARE USED FOR LAYOUT AND TO CONVEY TO BIDDERS THE GENERAL STYLE, TYPE, CHARACTER AND QUALITY OF PRODUCT DESIRED. LISTED EXAMPLES ARE USED ONLY TO DENOTE THE QUALITY STANDARD OF PRODUCT DESIRED AND ARE NOT INTENDED TO RESTRICT BIDDERS TO A SPECIFIC BRAND, MAKE, MANUFACTURER OR SPECIFIC NAME.

C. ADJUST LAYOUT, SYSTEM CONNECTIONS AND COORDINATE WITH OTHER TRADES AS REQUIRED TO PROPERLY INSTALL EQUIVALENT PRODUCTS.

D. WHERE EQUIVALENT PRODUCTS ARE SUBMITTED, INCLUDE ALL ASSOCIATED COSTS RELATED TO SUBSTITUTION IN BID.

E. FURNISH MATERIALS BEARING THE MANUFACTURER'S NAME AND TRADE NAME. PROVIDE UL LABEL WHERE A UL STANDARD HAS BEEN ESTABLISHED FOR THE PARTICULAR MATERIAL.

F. FURNISH STANDARD PRODUCTS OF MANUFACTURERS REGULARLY ENGAGED IN PRODUCTION OF EQUIPMENT TYPES REQUIRED FOR THE WORK. USE THE MANUFACTURER'S LATEST APPROVED DESIGN.

G. USE THE SAME MANUFACTURER FOR EQUIPMENT AND MATERIALS OF THE SAME GENERAL TYPE THROUGHOUT THE WORK TO OBTAIN UNIFORM APPEARANCE, OPERATION AND MAINTENANCE.

H. PROTECT EQUIPMENT AND MATERIALS FROM DIRT, WATER, CHEMICAL OR MECHANICAL INJURY AND THEFT AT ALL TIMES DURING CONSTRUCTION. PROVIDE COVERS OR SHELTER AS REQUIRED.

I. IF MATERIALS OR EQUIPMENT ARE DAMAGED AT ANY TIME PRIOR TO FINAL ACCEPTANCE OF THE WORK, REPAIR SUCH DAMAGE AT NO ADDITIONAL COST. IF MATERIALS OR EQUIPMENT ARE DAMAGED BY WATER, PROVIDE REPLACEMENT NO ADDITIONAL COST.

J. FOLLOW MANUFACTURER'S DIRECTIONS COMPLETELY IN THE DELIVERY, STORAGE, PROTECTION AND INSTALLATION OF ALL EQUIPMENT AND MATERIALS. NOTIFY THE ARCHITECT/ENGINEER IN WRITING OF ANY CONFLICTS BETWEEN ANY REQUIREMENTS OF THE CONTRACT DOCUMENTS AND MANUFACTURER'S DIRECTIONS. OBTAIN WRITTEN INSTRUCTIONS BEFORE PROCEEDING WITH THE WORK. THE CONTRACTOR IS RESPONSIBLE FOR CORRECTION OF ANY WORK THAT DOES NOT COMPLY WITH THE MANUFACTURER'S DIRECTIONS OR WRITTEN INSTRUCTIONS FROM THE ARCHITECT/ENGINEER AT NO ADDITIONAL COST.

K. REPAIR ANY DAMAGE TO FACTORY APPLIED PAINT FINISH USING TOUCH_UP PAINT FURNISHED BY THE EQUIPMENT MANUFACTURER. REPAINT ENTIRE DAMAGED PANEL OR SECTION PER THE FIELD PAINTING SPECIFICATIONS IN DIVISION 9 AT NO ADDITIONAL COST.

1.6 PAINTING

A. PROTECT SENSORS, CONTROLLERS, ETC. AGAINST PAINTING. DO NOT INSTALL THERMOSTATS, DEVICES OR TRIM UNTIL PAINTING IS COMPLETE.

1.7 LOCATIONS AND MEASUREMENTS

A. LOCATION OF MECHANICAL WORK IS SHOWN ON THE DRAWINGS AS ACCURATELY AS POSSIBLE. FIELD VERIFY ALL MEASUREMENTS TO INSURE THAT THE WORK SUITS THE SURROUNDING STRUCTURE, TRIM, FINISHES AND/OR CONSTRUCTION. PROVIDE ADJUSTMENT AS NECESSARY.

B. MAKE MINOR RELOCATIONS OF WORK PRIOR TO INSTALLATION AS REQUIRED OR AS DIRECTED BY THE ARCHITECT/ENGINEER AT NO ADDITIONAL COST.

1.8 SUPERVISION

A. CONTRACTOR TO PROVIDE AN AUTHORIZED AND COMPETENT REPRESENTATIVE TO CONSTANTLY SUPERVISE THE WORK FROM THE BEGINNING TO COMPLETION AND FINAL ACCEPTANCE. INSOFAR AS POSSIBLE, KEEP THE SAME FOREMAN AND WORKMEN THROUGHOUT THE PROJECT DURATION.

B. REPRESENTATIVES OF ARCHITECT/ENGINEER, OWNER, AND LOCAL INSPECTION AUTHORITIES WILL MAKE INSPECTIONS DURING THE PROGRESS OF THE WORK. CONTRACTOR TO ACCOMMODATE SUCH INSPECTIONS AND CORRECT DEFICIENCIES NOTED.

1.9 QUALITY AND WORKMANSHIP

A. CONTRACTOR TO EMPLOY SKILLED TRADESMEN, LABORERS AND SUPERVISORS. FINAL PRODUCT TO PRESENT A NEAT, WELL FINISHED, AND PROFESSIONAL INSTALLATION.

B. REMOVE AND REPLACE ANY WORK CONSIDERED SUBSTANDARD QUALITY IN THE JUDGEMENT OF THE ARCHITECT/ENGINEER.

1.10 CLOSING IN WORK

A. DO NOT COVER UP OR ENCLOSE WORK UNTIL IT HAS BEEN INSPECTED, TESTED AND APPROVED BY AUTHORITIES HAVING JURISDICTION OVER THE WORK. UNCOVER ANY SUCH WORK FOR INSPECTION AND/OR TEST AT NO ADDITIONAL COST. RESTORE THE WORK TO ITS ORIGINAL CONDITION AFTER INSPECTION AND/OR TEST AT NO ADDITIONAL COST.

1.11 CUTTING AND PATCHING

A. PERFORM ALL CUTTING AND PATCHING NECESSARY TO INSTALL WORK UNDER THIS DIVISION.

B. PERFORM CUTTING AND PATCHING IN PROFESSIONAL, WORKMANLIKE MANNER.

C. ARRANGE WORK TO MINIMIZE CUTTING AND PATCHING.

D. DO NOT CUT JOISTS, BEAMS, GIRDERS, PLUMBING OR ANY OTHER STRUCTURAL MEMBERS WITHOUT WRITTEN PERMISSION FROM THE ARCHITECT/ENGINEER.

E. CUT OPENING ONLY LARGE ENOUGH TO ALLOW EASY INSTALLATION OF PIPING, WIRING OR DUCTWORK.

F. PATCHING MATERIAL TO MATCH MATERIAL REMOVED.

G. RESTORE PATCHED SURFACE TO ITS ORIGINAL APPEARANCE AT COMPLETION OF PATCHING.

H. WHERE WATERPROOFED SURFACES ARE PATCHED, MAINTAIN INTEGRITY OF WATERPROOFING.

I. REMOVE RUBBLE AND EXCESS PATCHING MATERIALS FROM THE PREMISES.

1.12 INTERPRETATION OF DRAWINGS

A. DRAWINGS AND SPECIFICATIONS UNDER THIS DIVISION ARE COMPLEMENTARY EACH TO THE OTHER. PROVIDE ANY WORK SPECIFIED HEREIN AND/OR INDICATED ON THE DRAWINGS.

B. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERALLY THE LOCATION OF FIXTURES, PIPING, DEVICES, EQUIPMENT, ETC. FOLLOW DRAWINGS AS CLOSELY AS POSSIBLE, BUT ARRANGE WORK TO SUIT THE FINISHED SURROUNDINGS AND/OR TRIM.

C. THE WORDS "FURNISH", "PROVIDE", AND/OR "INSTALL" AS USED IN THESE DRAWINGS AND SPECIFICATIONS ARE INTERPRETED TO INCLUDE ALL MATERIAL AND LABOR NECESSARY TO COMPLETE THE PARTICULAR ITEM, SYSTEM, EQUIPMENT, ETC.

D. ANY OMISSIONS FROM EITHER THE DRAWINGS OR SPECIFICATIONS ARE UNINTENTIONAL. CONTRACTOR IS RESPONSIBLE FOR NOTIFYING THE ARCHITECT/ENGINEER OF ANY PERTINENT OMISSIONS BEFORE SUBMITTING A BID. COMPLETE AND WORKING SYSTEMS ARE REQUIRED, WHETHER EVERY SMALL ITEM OF MATERIAL IS SHOWN AND SPECIFIED OR NOT.

1.13 ACCESSIBILITY

A. LOCATE ALL EQUIPMENT WHICH MUST BE SERVICED, OPERATED, OR MAINTAINED IN FULLY ACCESSIBLE POSITIONS. EQUIPMENT TO INCLUDE, BUT NOT BE LIMITED TO, VALVES, TRAPS, CLEANOUTS, MOTORS, CONTROLLERS AND DAMPERS. IF REQUIRED FOR ACCESSIBILITY, FURNISH ACCESS DOORS FOR THIS PURPOSE. MINOR DEVIATIONS FROM DRAWINGS MAY BE MADE TO ALLOW FOR BETTER ACCESSIBILITY. LACK OF ACCESS DOORS ON DRAWINGS DOES NOT RELIEVE CONTRACTOR OF RESPONSIBILITY TO PROVIDE ACCESS DOORS, IF NEEDED TO PROPERLY SERVICE EQUIPMENT.

1.14 ELECTRICAL WORK IN CONNECTION WITH MECHANICAL CONTRACTS

A. COMPLY WITH DIVISION 26. ANY REQUIRED DIVISION 23 ELECTRICAL WORK NOT SPECIFICALLY SPECIFIED TO BE FURNISHED BY DIVISION 26 CONTRACTOR SHALL BE PROVIDED BY DIVISION 23 CONTRACTOR.

B. ALL ELECTRICAL WORK PERFORMED DIVISION 23 SHALL COMPLY WITH DIVISION 26SPECIFICATION REQUIREMENTS. INSTALL CONTROL WIRING IN CONDUIT.

C. COORDINATE ELECTRICAL INTERFACE OF SUPPLIED MECHANICAL EQUIPMENT WITH ELECTRICAL SYSTEM. DIVISION 26 ELECTRICAL WORK FOR MECHANICAL SYSTEMS IS BASED ON VALUES SCHEDULED ON MECHANICAL DRAWINGS. DIVISION 23 CONTRACTOR IS RESPONSIBLE FOR ANY COSTS TO MODIFY THE CONTRACTED ELECTRICAL WORK TO SERVICE EQUIPMENT WITH ELECTRICAL CHARACTERISTICS DIFFERENT THAN THOSE SCHEDULED.

1.15 MECHANICAL WORK IN CONNECTION WITH OTHER CONTRACTS

A. PROVIDE MECHANICAL SERVICES AS REQUIRED FOR ITEMS FURNISHED BY OTHER CONTRACTORS OR VENDORS AS SHOWN ON THE DRAWINGS. ACTUAL REQUIREMENTS MAY VARY FROM DRAWINGS. COORDINATE WITH EQUIPMENT INSTALLED. MAKE FINAL CONNECTIONS ONLY AFTER APPROVAL OF THE OTHER CONTRACTOR OR VENDOR, IN THE CONTRACTOR'S OR VENDOR'S PRESENCE.

1.16 PROJECT RECORD DRAWINGS

A. SUBMIT UNDER PROVISIONS OF RELEVANT SECTIONS OF THE GENERAL AND SUPPLEMENTAL GENERAL CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS.

B. AS THE WORK PROGRESSES, LEGIBLY RECORD ALL FIELD CHANGES ON A SET OF PROJECT CONTRACT DRAWINGS, HEREIN AFTER CALLED THE "RECORD DRAWINGS."

C. RECORD DRAWINGS SHALL ACCURATELY SHOW THE INSTALLED CONDITION OF MECHANICAL WORK.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

SECTION 230010 - EXISTING CONDITIONS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. PROCEDURES FOR MECHANICAL WORK IN EXISTING BUILDING.

1.2 RELATED WORK

A. CONFORM TO THE REQUIREMENTS OF DIVISION 1 FOR CUTTING AND PATCHING. CONFORM TO THE REQUIREMENTS OF DIVISION 2 AND SECTION 23 00 20 FOR DEMOLITION.

B. CONDUCT WORK TO MINIMIZE INTERFERENCE WITH ADJACENT AND OCCUPIED BUILDING AREAS.

C. CEASE OPERATIONS IMMEDIATELY IF STRUCTURE APPEARS TO BE IN DANGER AND NOTIFY ARCHITECT/ENGINEER. DO NOT RESUME OPERATIONS UNTIL DIRECTED.

PART 2 - PRODUCTS

2.1 PATCHING MATERIALS

A. AS SPECIFIED IN INDIVIDUAL SECTIONS.

PART 3 - EXECUTION

3.1 PREPARATION

A. COORDINATE MECHANICAL SERVICE INTERRUPTIONS WITH THE OWNER.

B. PROVIDE TEMPORARY AND/OR PERMANENT MECHANICAL AS SHOWN AND/OR AS REQUIRED BY CONDITIONS TO MAINTAIN EXISTING SYSTEMS IN SERVICE DURING CONSTRUCTION. USE HOT-TAPPING VALVES IF REQUIRED.

C. EXISTING MECHANICAL SYSTEMS: MAINTAIN EXISTING MECHANICAL SYSTEMS IN SERVICE. DISABLE SYSTEMS OUTSIDE CONSTRUCTION AREA ONLY TO MAKE TIE-INS OR SWITCHOVERS. OBTAIN PERMISSION FROM THE OWNER AT LEAST 24 HOURS BEFORE PARTIALLY OR COMPLETELY DISABLING MECHANICAL. MINIMIZE DURATION. MAKE TEMPORARY CONNECTIONS AS REQUIRED TO MAINTAIN SERVICE IN AREAS ADJACENT TO WORK AREA.

D. DRAWINGS ARE BASED ON CASUAL FIELD OBSERVATION AND EXISTING RECORD DOCUMENTS. SURVEY THE AFFECTED AREAS BEFORE SUBMITTING BID PROPOSAL. REPORT DISCREPANCIES TO THE ARCHITECT/ENGINEER BEFORE DISTURBING THE EXISTING INSTALLATION.

E. FIELD-VERIFY EXISTING CONDITIONS AS RELATED TO INTERCONNECTION OF NEW WORK. DETERMINE EXACT METHODS OF INTERFACE TO OBTAIN PROPER OPERATION.

F. COORDINATE EXISTING AND NEW WORK INTERFACE PRIOR TO BEGINNING ANY WORK. ADJUST WORK TO SUIT EXISTING CONDITIONS. SOME DEVIATIONS IN PLAN LAYOUT VS. ACTUAL CONDITIONS SHOULD BE EXPECTED.

G. PROVIDE, ERECT, AND MAINTAIN TEMPORARY DUST SCREENS, SAFEGUARDS, BARRICADES, SIGNAGE AND SIMILAR MEASURES, FOR PROTECTION OF THE PUBLIC, OWNER, CONTRACTOR'S EMPLOYEES, AND EXISTING CONSTRUCTION TO REMAIN. PROVIDE PROTECTIVE BARRIERS INDICATED IN THE CONTRACT DRAWINGS.

3.2 EXISTING CONDITIONS

A. VERIFY EXISTING CONDITIONS IN FIELD AND DETERMINE WHICH AFFECTS MECHANICAL WORK. SECURE UTILITIES AS REQUIRED TO PREVENT SPILLS, LEAKAGE, ETC.

B. PROTECT EXISTING WORK TO REMAIN. DO NOT CUT OR REMOVE ANY STRUCTURAL MEMBERS.

C. REWORK EXISTING SERVICES TO REMAIN WHICH INTERFERE WITH NEW WORK.

SECTION 230020 - MECHANICAL DEMOLITION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. SELECTIVE MECHANICAL DEMOLITION.

B. CONFORM TO THE REQUIREMENTS OF DIVISION 01 FOR CUTTING AND PATCHING.

C. CONFORM TO THE REQUIREMENTS OF DIVISION 02 FOR SELECTIVE DEMOLITION

1.2 PROJECT CONDITIONS

A. CONDUCT DEMOLITION TO MINIMIZE INTERFERENCE WITH ADJACENT AND OCCUPIED BUILDING AREAS.

B. CEASE OPERATIONS IMMEDIATELY IF STRUCTURE APPEARS TO BE IN DANGER AND NOTIFY ARCHITECT/ENGINEER. DO NOT RESUME OPERATIONS UNTIL DIRECTED.

1.3 DEFINITIONS

A. REMOVE: DETACH ITEMS FROM EXISTING CONSTRUCTION AND DISPOSE OF THEM OFF-SITE UNLESS INDICATED TO BE SALVAGED OR REINSTALLED.

B. REMOVE AND SALVAGE: DETACH ITEMS FROM EXISTING CONSTRUCTION, IN A MANNER TO PREVENT DAMAGE, AND DELIVER TO OWNER READY FOR REUSE.

C. REMOVE AND REINSTALL: DETACH ITEMS FROM EXISTING CONSTRUCTION, IN A MANNER TO PREVENT DAMAGE, PREPARE FOR REUSE, AND REINSTALL WHERE INDICATED.

D. EXISTING TO REMAIN: LEAVE EXISTING ITEMS THAT ARE NOT TO BE REMOVED AND THAT ARE NOT OTHERWISE INDICATED TO BE SALVAGED OR REINSTALLED.

E. DISMANTLE: TO REMOVE BY DISASSEMBLING OR DETACHING AN ITEM FROM A SURFACE, USING GENTLE METHODS AND EQUIPMENT TO PREVENT DAMAGE TO THE ITEM AND SURFACES; DISPOSING OF ITEMS UNLESS INDICATED TO BE SALVAGED OR REINSTALLED.

PART 2 - PRODUCTS

2.1 PATCHING MATERIALS

A. AS SPECIFIED IN INDIVIDUAL SECTIONS.

PART 3 - EXECUTION

3.1 PREPARATION

A. DEMOLITION DRAWINGS ARE BASED ON CASUAL FIELD OBSERVATION. NO RECORD DOCUMENTS ARE AVAILABLE. SURVEY THE AFFECTED AREAS BEFORE SUBMITTING BID PROPOSAL. REPORT DISCREPANCIES TO THE ARCHITECT/ENGINEER BEFORE DISTURBING THE EXISTING INSTALLATION.

B. PROVIDE, ERECT, AND MAINTAIN TEMPORARY DUST SCREENS, SAFEGUARDS, BARRICADES, SIGNAGE AND SIMILAR MEASURES, FOR PROTECTION OF THE PUBLIC, OWNER, CONTRACTOR'S EMPLOYEES, AND EXISTING CONSTRUCTION TO REMAIN. PROVIDE PROTECTIVE BARRIERS INDICATED IN THE CONTRACT DRAWINGS.

C. PROTECT EXISTING MATERIALS AND EXISTING IMPROVEMENTS WHICH ARE NOT TO BE DEMOLISHED.

D. PREVENT MOVEMENT OF STRUCTURE; PROVIDE TEMPORARY BRACING AND SHORING REQUIRED TO ENSURE SAFETY OF EXISTING STRUCTURE.

3.2 DEMOLITION

A. DEMOLISH MECHANICAL WORK AS INDICATED. SECURE UTILITIES AS REQUIRED TO PREVENT SPILLS, LEAKAGE, ETC.

B. DEMOLISH IN AN ORDERLY AND CAREFUL MANNER. PROTECT EXISTING WORK TO REMAIN. DO NOT CUT OR REMOVE ANY STRUCTURAL MEMBERS.

C. TERMINATE ALL DEMOLITION WORK IN A NEAT, FINISHED MANNER.

D. CONCEAL OR ENCLOSE ABANDONED WORK WITHIN BUILDING CONSTRUCTION EXCEPT AS SPECIFICALLY NOTED.

E. REMOVE DEMOLISHED MATERIALS FROM SITE EXCEPT WHERE SPECIFICALLY NOTED OTHERWISE. DO NOT BURN OR BURY MATERIALS ON SITE.

F. REMOVE MATERIALS AS WORK PROGRESSES. UPON COMPLETION OF WORK, LEAVE AREAS IN CLEAN CONDITION.

COORDINATE CUTTING AND PATCHING REQUIREMENTS.

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

1. THERMOMETERS, LIQUID IN GLASS.
2. THERMOWELLS.
3. PRESSURE GAUGES, DIAL TYPE.
4. GAUGE ATTACHMENTS.

1.2 ACTION SUBMITTALS

A. PRODUCT DATA.

1.3 CLOSEOUT SUBMITTALS

A. OPERATION AND MAINTENANCE DATA.

PART 2 - PRODUCTS

2.1 METERS AND GAUGES FOR HVAC PIPING

A. THERMOMETERS, LIQUID IN GLASS - METAL CASE, INDUSTRIAL STYLE:

1. STANDARD: ASME B40.200.
2. CASE: CAST ALUMINUM; 7-INCHNOMINAL SIZE UNLESS OTHERWISE INDICATED.
3. CASE FORM: ADJUSTABLE ANGLE UNLESS OTHERWISE INDICATED.
4. TUBE: GLASS WITH MAGNIFYING LENS AND BLUE OR RED ORGANIC LIQUID.
5. TUBE BACKGROUND: NONREFLECTIVE ALUMINUM WITH PERMANENTLY ETCHED SCALE MARKINGS GRADUATED IN DEG F.
6. WINDOW: GLASS.
7. STEM: ALUMINUM AND OF LENGTH TO SUIT INSTALLATION.
   a. DESIGN FOR THERMOWELL INSTALLATION: BARE STEM.
8. CONNECTOR: 1-1/4 INCHES, WITH ASME B1.1 SCREW THREADS.
9. ACCURACY: PLUS OR MINUS 1 PERCENT OF SCALE RANGE OR ONE SCALE DIVISION, TO A MAXIMUM OF 1.5 PERCENT OF SCALE RANGE.

B. THERMOWELLS:

1. STANDARD: ASME B40.200.
2. DESCRIPTION: PRESSURE-TIGHT, SOCKET-TYPE FITTING MADE FOR INSERTION IN PIPING TEE FITTING.
3. MATERIAL FOR USE WITH COPPER TUBING: CUNI.
4. MATERIAL FOR USE WITH STEEL PIPING: CRES.
5. TYPE: STEPPED SHANK UNLESS STRAIGHT OR TAPERED SHANK IS INDICATED.
6. EXTERNAL THREADS: NPS 1/2, NPS 3/4, OR NPS 1, ASME B1.20.1 PIPE THREADS.
7. INTERNAL THREADS: 1/2, 3/4, AND 1 INCH, WITH ASME B1.1 SCREW THREADS.
8. BORE: DIAMETER REQUIRED TO MATCH THERMOMETER BULB OR STEM.
9. INSERTION LENGTH: LENGTH REQUIRED TO MATCH THERMOMETER BULB OR STEM.
10. LAGGING EXTENSION: INCLUDE ON THERMOWELLS FOR INSULATED PIPING AND TUBING.
11. BUSHINGS: FOR CONVERTING SIZE OF THERMOWELL'S INTERNAL SCREW THREAD TO SIZE OF THERMOMETER CONNECTION.
12. HEAT-TRANSFER MEDIUM: MIXTURE OF GRAPHITE AND GLYCERIN.

C. PRESSURE GAUGES, DIAL TYPE - DIRECT MOUNTED, METAL CASE:

1. STANDARD: ASME B40.100.
2. CASE: LIQUID-FILLED TYPE(S); CAST ALUMINUM OR DRAWN STEEL; [4-1/2-INCH] NOMINAL DIAMETER.
3. PRESSURE-ELEMENT ASSEMBLY: BOURDON TUBE.
4. PRESSURE CONNECTION: BRASS, WITH NPS 1/4 OR NPS 1/2, ASME B1.20.1 PIPE THREADS AND BOTTOM-OUTLET TYPE UNLESS BACK-OUTLET TYPE IS INDICATED.
5. MOVEMENT: MECHANICAL, WITH LINK TO PRESSURE ELEMENT AND CONNECTION TO POINTER.
6. DIAL: NONREFLECTIVE ALUMINUM WITH PERMANENT SCALE MARKINGS GRADUATED IN PSI.
7. POINTER: DARK-COLORED METAL.
8. WINDOW: SAFETY GLASS.
9. RING: STAINLESS STEEL.
10. ACCURACY: GRADE B, PLUS OR MINUS 2 PERCENT OF MIDDLE HALF OF SPAN.

D. GAUGE ATTACHMENTS:

1. VALVES: BRASS BALL, WITH NPS 1/4 OR NPS 1/2, ASME B1.20.1 PIPE THREADS.

PART 3 - EXECUTION

3.1 INSTALLATION OF METERS AND GAUGES

A. INSTALL THERMOWELLS WITH SOCKET EXTENDING ONE-THIRD OF PIPE DIAMETER AND IN VERTICAL POSITION IN PIPING TEES.

B. INSTALL THERMOWELLS OF SIZES REQUIRED TO MATCH THERMOMETER CONNECTORS. INCLUDE BUSHINGS IF REQUIRED TO MATCH SIZES.

C. INSTALL THERMOWELLS WITH EXTENSION ON INSULATED PIPING.

D. FILL THERMOWELLS WITH HEAT-TRANSFER MEDIUM.

E. INSTALL DIRECT-MOUNTED THERMOMETERS IN THERMOWELLS AND ADJUST VERTICAL AND TILTED POSITIONS.

F. INSTALL DIRECT-MOUNTED PRESSURE GAUGES IN PIPING TEES WITH PRESSURE GAUGE LOCATED ON PIPE AT THE MOST READABLE POSITION.

G. INSTALL VALVE IN PIPING FOR EACH PRESSURE GAUGE FOR FLUIDS.

H. INSTALL CONNECTION FITTINGS IN ACCESSIBLE LOCATIONS FOR ATTACHMENT TO PORTABLE INDICATORS.

I. INSTALL THERMOMETERS IN THE FOLLOWING LOCATIONS:

1. INLET AND OUTLET OF EACH HYDRONIC COIL IN AIR-HANDLING UNITS.

J. INSTALL PRESSURE GAUGES IN THE FOLLOWING LOCATIONS:

1. INLET AND OUTLET OF EACH HYDRONIC COIL IN AIR-HANDLING UNITS.

3.2 CONNECTIONS

A. INSTALL METERS AND GAUGES ADJACENT TO MACHINES AND EQUIPMENT TO ALLOW SPACE FOR SERVICE AND MAINTENANCE OF METERS, GAUGES, MACHINES, AND EQUIPMENT.

3.3 ADJUSTING

A. AFTER INSTALLATION, CALIBRATE METERS ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.

B. ADJUST FACES OF METERS AND GAUGES TO PROPER ANGLE FOR BEST VISIBILITY.

3.4 THERMOMETER APPLICATION

A. THERMOMETER STEMS ARE TO BE OF LENGTH TO MATCH THERMOWELL INSERTION LENGTH.

3.5 THERMOMETER SCALE-RANGE APPLICATION

A. SCALE RANGE FOR CHILLED-WATER PIPING:

1. 0 TO 150 DEG F.

3.6 PRESSURE-GAUGE APPLICATION

A. PRESSURE GAUGES AT INLET AND OUTLET OF EACH CHILLER CHILLED-WATER CONNECTION .

3.7 PRESSURE-GAUGE SCALE-RANGE APPLICATION

A. SCALE RANGE FOR CHILLED-WATER PIPING:

1. 0 TO 160 PSI.

SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

1. BALL VALVES.
2. BUTTERFLY VALVES.
3. CHECK VALVES.

1.2 ACTION SUBMITTALS

A.

MECHANICAL SPECIFICATIONS

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

1. TESTING, ADJUSTING, AND BALANCING OF AIR SYSTEMS:
   a. CONSTANT-VOLUME AIR SYSTEMS.
2. TESTING, ADJUSTING, AND BALANCING OF HYDRONIC PIPING SYSTEMS:
   a. CONSTANT-FLOW HYDRONIC SYSTEMS.
3. TESTING, ADJUSTING, AND BALANCING OF EQUIPMENT.
4. DUCT LEAKAGE TESTS VERIFICATION.
5. PIPE LEAKAGE TESTS VERIFICATION.
6. HVAC-CONTROL SYSTEM VERIFICATION.

PART 2 - PRODUCTS (NOT APPLICABLE)
PART 3 - EXECUTION

3.1 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. PERFORM TESTING AND BALANCING PROCEDURES ON EACH SYSTEM IN ACCORDANCE WITH THE PROCEDURES CONTAINED IN AABC'S "NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE" AND IN THIS SECTION.

3.2 DUCT LEAKAGE TESTS

A. WITNESS THE DUCT LEAKAGE TESTING PERFORMED BY INSTALLER.
B. VERIFY THAT PROPER TEST METHODS ARE USED AND THAT LEAKAGE RATES ARE WITHIN SPECIFIED LIMITS.
C. REPORT DEFICIENCIES OBSERVED.

3.3 PIPE LEAKAGE TESTS

A. WITNESS THE PIPE PRESSURE TESTING PERFORMED BY INSTALLER.
B. VERIFY THAT PROPER TEST METHODS ARE USED AND THAT LEAKAGE RATES ARE WITHIN SPECIFIED LIMITS.
C. REPORT DEFICIENCIES OBSERVED.

3.4 HVAC CONTROLS VERIFICATION

A. IN CONJUNCTION WITH SYSTEM BALANCING, PERFORM THE FOLLOWING:
   1. VERIFY HVAC CONTROL SYSTEM IS OPERATING WITHIN THE DESIGN LIMITATIONS.
   2. CONFIRM THAT THE SEQUENCES OF OPERATION ARE IN COMPLIANCE WITH CONTRACT DOCUMENTS.
   3. VERIFY THAT CONTROLLERS ARE CALIBRATED AND FUNCTION AS INTENDED.
   4. VERIFY THAT CONTROLLER SET POINTS ARE AS INDICATED.
   5. VERIFY THE OPERATION OF LOCKOUT OR INTERLOCK SYSTEMS.
   6. VERIFY THE OPERATION OF HVAC DAMPER ACTUATORS.
   7. VERIFY THAT CONTROLLED DEVICES ARE PROPERLY INSTALLED AND CONNECTED TO CORRECT CONTROLLER.
   8. VERIFY THAT CONTROLLED DEVICES TRAVEL FREELY AND ARE IN POSITION INDICATED BY CONTROLLER: OPEN, CLOSED, OR MODULATING.
   9. VERIFY LOCATION AND INSTALLATION OF SENSORS TO ENSURE THAT THEY SENSE ONLY INTENDED TEMPERATURE, HUMIDITY, OR PRESSURE.
B. REPORTING: INCLUDE A SUMMARY OF VERIFICATIONS PERFORMED, REMAINING DEFICIENCIES, AND VARIATIONS FROM INDICATED CONDITIONS.

3.5 TOLERANCES

A. SET HVAC SYSTEM'S AIRFLOW RATES AND WATER FLOW RATES WITHIN THE FOLLOWING TOLERANCES:
   1. SUPPLY, RETURN, AND EXHAUST FANS AND EQUIPMENT WITH FANS: PLUS 10 PERCENT OR MINUS 5 PERCENT. IF DESIGN VALUE IS LESS THAN 100 CFM, WITHIN 10 CFM.
   2. AIR OUTLETS AND INLETS: PLUS 10 PERCENT OR MINUS 5 PERCENT. IF DESIGN VALUE IS LESS THAN 100 CFM, WITHIN 10 CFM.
   3. CHILLED-WATER FLOW RATE: PLUS OR MINUS 5 PERCENT. IF DESIGN VALUE IS LESS THAN 10 GPM, WITHIN 10 PERCENT.
B. MAINTAINING PRESSURE RELATIONSHIPS AS DESIGNED SHALL HAVE PRIORITY OVER THE TOLERANCES SPECIFIED ABOVE.

3.6 VERIFICATION OF TAB REPORT

A. THE TAB SPECIALIST'S TEST AND BALANCE ENGINEER SHALL CONDUCT THE INSPECTION IN THE PRESENCE OF THE CONSTRUCTION MANAGER.
B. THE CONSTRUCTION MANAGER SHALL RANDOMLY SELECT MEASUREMENTS, DOCUMENTED IN THE FINAL REPORT, TO BE RECHECKED. RECHECKING SHALL BE LIMITED TO THE LESSER OF EITHER 10 PERCENT OF THE TOTAL MEASUREMENTS RECORDED OR THE EXTENT OF MEASUREMENTS THAT CAN BE ACCOMPLISHED IN A NORMAL 8-HOUR BUSINESS DAY.
C. IF RECHECKS YIELD MEASUREMENTS THAT DIFFER FROM THE MEASUREMENTS DOCUMENTED IN THE FINAL REPORT BY MORE THAN THE TOLERANCES ALLOWED, THE MEASUREMENTS SHALL BE NOTED AS "FAILED."
D. IF THE NUMBER OF "FAILED" MEASUREMENTS IS GREATER THAN 10 PERCENT OF THE TOTAL MEASUREMENTS CHECKED DURING THE FINAL INSPECTION, THE TAB SHALL BE CONSIDERED INCOMPLETE AND SHALL BE REJECTED.
E. IF RECHECK MEASUREMENTS FIND THE NUMBER OF FAILED MEASUREMENTS NONCOMPLIANT WITH REQUIREMENTS INDICATED, PROCEED AS FOLLOWS:
   1. TAB SPECIALISTS SHALL RECHECK ALL MEASUREMENTS AND MAKE ADJUSTMENTS. REVISE THE FINAL REPORT AND BALANCING DEVICE SETTINGS TO INCLUDE ALL CHANGES; RESUBMIT THE FINAL REPORT AND REQUEST A SECOND FINAL INSPECTION. ALL CHANGES SHALL BE TRACKED TO SHOW CHANGES MADE TO PREVIOUS REPORT.
   2. IF THE SECOND FINAL INSPECTION ALSO FAILS, OWNER MAY PURSUE OTHERS CONTRACT OPTIONS TO COMPLETE TAB WORK.
F. PREPARE TEST AND INSPECTION REPORTS.

3.7 ADDITIONAL TESTS

A. WITHIN 90 DAYS OF COMPLETING TAB, PERFORM ADDITIONAL TAB TO VERIFY THAT BALANCED CONDITIONS ARE BEING MAINTAINED THROUGHOUT AND TO CORRECT UNUSUAL CONDITIONS.
B. SEASONAL PERIODS: IF INITIAL TAB PROCEDURES WERE NOT PERFORMED DURING NEAR-PEAK SUMMER AND WINTER CONDITIONS, PERFORM ADDITIONAL TAB DURING NEAR-PEAK SUMMER AND WINTER CONDITIONS.

END OF SECTION 230593

SECTION 233600 - MODULATING SINGLE-DUCT AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES: MODULATING SINGLE-DUCT AIR TERMINAL UNITS WITH ELECTRIC RESISTANCE REHEAT.
B. SUBMITTALS: PRODUCT DATA AND SHOP DRAWINGS.

PART 2 - PRODUCTS

2.1 UNITS: FACTORY-FABRICATED GALVANIZED STEEL CASING WITH REMOVABLE ACCESS PANELS AND GASKETS.

2.2 DAMPER: GALVANIZED STEEL WITH GASKETED EDGES, SELF-LUBRICATING BEARINGS. MAXIMUM LEAKAGE 2% AT 3 IN. WG.

2.3 VELOCITY SENSOR: MULTIPOINT ARRAY, FACTORY CALIBRATED.

2.4 ATTENUATOR: INTEGRAL ATTENUATOR SECTION MATCHING CASING.

2.5 CONTROLS: PROVIDE DDC OR ELECTRIC ACTUATORS AS SCHEDULED, FACTORY-MOUNTED.

2.6 ELECTRIC RESISTANCE HEAT: INTEGRAL DUCT HEATER WITH NICKEL-CHROMIUM ELEMENTS, GALVANIZED STEEL CASING, PRIMARY AUTOMATIC HIGH-LIMIT CUTOUT, SECONDARY MANUAL-RESET CUTOUT, AND AIRFLOW PROVING SWITCH.

PART 3 - EXECUTION

3.1 INSTALLATION: INSTALL LEVEL, PLUMB, PER NFPA 90A. PROVIDE FLEXIBLE DUCT CONNECTORS AT CONNECTIONS.

3.2 ELECTRICAL: PROVIDE FIELD POWER WIRING AND GROUNDING PER NEC. COORDINATE WITH DIVISION 26.

3.3 IDENTIFICATION: LABEL EACH UNIT WITH SCHEDULE DESIGNATION AND AIRFLOW.

3.4 STARTUP: VERIFY PROPER OPERATION, HEATER SAFETIES, AND CONTROL RESPONSE.

3.5 ADJUSTING: BALANCE AIRFLOWS IN ACCORDANCE WITH SECTION 230593.

END OF SECTION 233600

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES INSULATING THE FOLLOWING DUCT SERVICES:
   1. INDOOR, CONCEALED SUPPLY AND RETURN AIR.
   2. OUTDOOR, EXPOSED SUPPLY AND RETURN.

1.2 ACTION SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. SURFACE-BURNING CHARACTERISTICS: FOR INSULATION AND RELATED MATERIALS, AS DETERMINED BY TESTING IDENTICAL PRODUCTS IN ACCORDANCE WITH ASTM E84, BY A TESTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION. FACTORY LABEL INSULATION, JACKET MATERIALS, ADHESIVE, MASTIC, TAPES, AND CEMENT MATERIAL CONTAINERS WITH APPROPRIATE MARKINGS OF APPLICABLE TESTING AGENCY.
   1. ALL INSULATION INSTALLED INDOORS AND OUTDOORS: FLAME-SPREAD INDEX OF 25 OR LESS, AND SMOKE-DEVELOPED INDEX OF 50 OR LESS.

2.2 INSULATION MATERIALS

A. COMPLY WITH REQUIREMENTS IN "DUCT INSULATION SCHEDULE, GENERAL," "INDOOR DUCT AND PLENUM INSULATION SCHEDULE," AND "ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE" ARTICLES FOR WHERE INSULATING MATERIALS ARE APPLIED.
B. GLASS-FIBER BLANKET: GLASS FIBERS BONDED WITH A THERMOSETTING RESIN; SUITABLE FOR MAXIMUM USE TEMPERATURE UP TO 450 DEG F IN ACCORDANCE WITH ASTM C411. COMPLY WITH ASTM C553, TYPE II, AND ASTM C1290, TYPE III WITH FACTORY-APPLIED FSK JACKET. FACTORY-APPLIED JACKET REQUIREMENTS ARE SPECIFIED IN "FACTORY-APPLIED JACKETS" ARTICLE.
C. POLYISOCYANURATE BOARD: RIGID CLOSED-CELL INSULATION SHALL BE PERMITTED FOR OUTDOOR DUCTWORK RECEIVING ALUMINUM JACKET. BOARD SHALL BE ASTM C1289 TYPE I, CLASS 1 OR EQUIVALENT, WITH MINIMUM DENSITY 2.0 PCF AND AGED R-VALUE NOT LESS THAN 6.0 PER INCH. INSULATION SHALL BE INSTALLED IN SEGMENTS TO FIT DUCT GEOMETRY, WITH ALL SEAMS SEALED VAPOR-TIGHT. PROVIDE 0.016 INCH ALUMINUM JACKET OVER INSULATION WITH LONGITUDINAL AND CIRCUMFERENTIAL BANDS MAXIMUM 9 INCHES APART.

2.3 ADHESIVES

A. MATERIALS ARE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES AND FOR BONDING INSULATION TO ITSELF AND TO SURFACES TO BE INSULATED UNLESS OTHERWISE INDICATED.
B. GLASS-FIBER ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A.
C. FSK JACKET ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A FOR BONDING INSULATION JACKET LAP SEAMS AND JOINTS.

2.4 MASTICS AND COATINGS

A. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES.
B. VAPOR-RETARDER MASTIC, WATER BASED, INTERIOR USE: SUITABLE FOR INDOOR USE ON BELOW AMBIENT SERVICES.
   1. WATER-VAPOR PERMEANCE: COMPLY WITH ASTM C755, SECTION 7.2.2, TABLE 2, FOR INSULATION TYPE AND SERVICE CONDITIONS.
   2. SERVICE TEMPERATURE RANGE: MINUS 20 TO PLUS 180 DEG F.
   3. COLOR: WHITE.

2.5 SEALANTS

A. FSK AND METAL JACKET FLASHING SEALANTS:
   1. MATERIALS ARE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES.
   2. FIRE- AND WATER-RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT.
   3. SERVICE TEMPERATURE RANGE: MINUS 40 TO PLUS 250 DEG F.
   4. COLOR: ALUMINUM.

2.6 FACTORY-APPLIED JACKETS

A. INSULATION SYSTEM SCHEDULES INDICATE FACTORY-APPLIED JACKETS ON VARIOUS APPLICATIONS. WHEN FACTORY-APPLIED JACKETS ARE INDICATED, COMPLY WITH THE FOLLOWING:
   1. FSK JACKET: ALUMINUM-FOIL, FIBERGLASS-REINFORCED SCRIM WITH KRAFT-PAPER BACKING; COMPLYING WITH ASTM C1136, TYPE II.

2.7 FIELD-APPLIED JACKETS

A. FIELD-APPLIED JACKETS COMPLY WITH ASTM C921, TYPE I, UNLESS OTHERWISE INDICATED.
B. ALUMINUM JACKET: COMPLY WITH ASTM B209, ALLOY 3003, 3005, 3105, OR 5005, TEMPER H-14.
   1. SHEET AND ROLL STOCK READY FOR SHOP OR FIELD SIZING.
   2. FINISH AND THICKNESS ARE INDICATED IN FIELD-APPLIED JACKET SCHEDULES.
   3. MOISTURE BARRIER FOR OUTDOOR APPLICATIONS: 3-MIL-THICK POLYSURLYN.

2.8 TAPES

A. FSK TAPE: FOIL-FACE, VAPOR-RETARDER TAPE MATCHING FACTORY-APPLIED JACKET WITH ACRYLIC ADHESIVE; COMPLYING WITH ASTM C1136.
   1. WIDTH: 3 INCHES.
   2. THICKNESS: 6.5 MILS.
   3. ADHESION: 90 OUNCES FORCE/INCH IN WIDTH.
   4. ELONGATION: 2 PERCENT.
   5. TENSILE STRENGTH: 40 LBF/INCH IN WIDTH.
   6. FSK TAPE DISKS AND SQUARES: PRECUT DISKS OR SQUARES OF FSK TAPE.

2.9 SECUREMENTS

A. ALUMINUM BANDS: ASTM B209, ALLOY 3003, 3005, 3105, OR 5005; TEMPER H-14, 0.020 INCH THICK, 3/4 INCH WIDE WITH WING SEAL OR CLOSED SEAL.
B. INSULATION PINS AND HANGERS:
   1. METAL, ADHESIVELY ATTACHED, PERFORATED-BASE INSULATION HANGERS: BASEPLATE WELDED TO PROJECTING SPINDLE THAT IS CAPABLE OF HOLDING INSULATION, OF THICKNESS INDICATED; SECURELY IN POSITION INDICATED WHEN SELF-LOCKING WASHER IS IN PLACE.
   2. INSULATION-RETAINING WASHERS: SELF-LOCKING WASHERS FORMED FROM 0.016-INCH-THICK, STAINLESS STEEL SHEET, WITH BEVELED EDGE SIZED AS REQUIRED TO HOLD INSULATION SECURELY IN PLACE BUT NOT LESS THAN 1-1/2 INCHES IN DIAMETER.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. INSTALL INSULATION MATERIALS, ACCESSORIES, AND FINISHES WITH SMOOTH, STRAIGHT, AND EVEN SURFACES; FREE OF VOIDS THROUGHOUT THE LENGTH OF DUCTS AND FITTINGS.

3.2 PENETRATIONS

A. INSULATION INSTALLATION AT ROOF PENETRATIONS: INSTALL INSULATION CONTINUOUSLY THROUGH ROOF PENETRATIONS.
   1. SEAL PENETRATIONS WITH FLASHING SEALANT.
   2. FOR APPLICATIONS REQUIRING ONLY INDOOR INSULATION, TERMINATE INSULATION ABOVE ROOF SURFACE AND SEAL WITH JOINT SEALANT. FOR APPLICATIONS REQUIRING INDOOR AND OUTDOOR INSULATION, INSTALL INSULATION FOR OUTDOOR APPLICATIONS TIGHTLY JOINED TO INDOOR INSULATION ENDS. SEAL JOINT WITH JOINT SEALANT.
   3. EXTEND JACKET OF OUTDOOR INSULATION OUTSIDE ROOF FLASHING AT LEAST 2 INCHES BELOW TOP OF ROOF FLASHING.
   4. SEAL JACKET TO ROOF FLASHING WITH FLASHING SEALANT.

3.3 INSTALLATION OF GLASS-FIBER INSULATION

A. BLANKET INSULATION INSTALLATION ON DUCTS AND PLENUMS: SECURE WITH ADHESIVE AND INSULATION PINS.
B. COMPLY WITH MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS.

3.4 INSTALLATION OF POLYISICYANURATE INSULATION

A. COMPLY WITH MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS.

3.5 FIELD-APPLIED JACKET INSTALLATION

A. WHERE METAL JACKETS ARE INDICATED, INSTALL WITH 2-INCH OVERLAP AT LONGITUDINAL SEAMS AND END JOINTS. OVERLAP LONGITUDINAL SEAMS ARRANGED TO SHED WATER. SEAL END JOINTS WITH WEATHERPROOF SEALANT RECOMMENDED BY INSULATION MANUFACTURER. SECURE JACKET WITH STAINLESS STEEL BANDS 12 INCHES O.C. AND AT END JOINTS.

3.6 DUCT INSULATION SCHEDULE, GENERAL

A. PLENUMS AND DUCTS REQUIRING INSULATION:
   1. INDOOR, CONCEALED SUPPLY AND RETURN AIR.
   2. OUTDOOR, EXPOSED SUPPLY AND RETURN AIR.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. CONCEALED, DUCT AND PLENUM INSULATION: GLASS-FIBER BLANKET, 2 INCHES THICK AND 0.75 LB/CU. FT. NOMINAL DENSITY.

3.8 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. EXPOSED, DUCT AND PLENUM INSULATION: POLYISOCYANURATE BOARD, 2 INCHES, 2 LB/CU. FT. NOMINAL DENSITY.

3.9 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. INSTALL JACKET OVER INSULATION MATERIAL. FOR INSULATION WITH FACTORY-APPLIED JACKET, INSTALL THE FIELD-APPLIED JACKET OVER THE FACTORY-APPLIED JACKET.
B. DUCTS AND PLENUMS, EXPOSED, UP TO 48 INCHES IN DIAMETER OR WITH FLAT SURFACES UP TO 72 INCHES:
   1. ALUMINUM, STUCCO EMBOSSED: 0.020 INCH THICK.
C. DUCTS AND PLENUMS, EXPOSED, LARGER THAN 48 INCHES IN DIAMETER OR WITH FLAT SURFACES LARGER THAN 72 INCHES:
   1. ALUMINUM, STUCCO EMBOSSED: 0.020 INCH THICK.

END OF SECTION 230713

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES INSULATION FOR HVAC PIPING SYSTEMS.

1.2 ACTION SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT.

1.3 INFORMATIONAL SUBMITTALS

A. SATISFACTORY TEST RESULTS.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. POLYISOCYANURATE PREFORMED PIPE INSULATION: ORGANIC, RIGID, CLOSED-CELL POLYISOCYANURATE FOAM INSULATION WITH FACTORY-APPLIED VAPOR RETARDER FACING OR SEPARATE VAPOR BARRIER AS REQUIRED. COMPLY WITH ASTM C591, TYPE IV (FOR PREFORMED PIPE INSULATION). PROVIDE INSULATION WITH MINIMUM AGED R-VALUE OF 6.0 PER INCH AND NOMINAL DENSITY OF 2.0 PCF.

2.2 SEALANTS

A. MATERIALS SHALL BE AS RECOMMENDED BY THE INSULATION MANUFACTURER AND SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES.
B. JOINT SEALANTS:
   1. PERMANENTLY FLEXIBLE, ELASTOMERIC SEALANT.
C. METAL JACKET FLASHING SEALANTS:
   1. FIRE- AND WATER-RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT.
   2. SERVICE TEMPERATURE RANGE: MINUS 40 TO PLUS 250 DEG F.
   3. COLOR: ALUMINUM.

2.3 FIELD-APPLIED JACKETS

A. FIELD-APPLIED JACKETS SHALL COMPLY WITH ASTM C1136, TYPE I, UNLESS OTHERWISE INDICATED.
B. METAL JACKET:
   1. ALUMINUM JACKET: COMPLY WITH ASTM B209, ALLOY 3003, 3005, 3105, OR 5005, TEMPER H-14.
      a. FINISH AND THICKNESS ARE INDICATED IN FIELD-APPLIED JACKET SCHEDULES.
      b. MOISTURE BARRIER FOR OUTDOOR APPLICATIONS: 3-MIL-THICK POLYSURLYN.

2.4 SECUREMENTS

A. BANDS:
   1. ALUMINUM: ASTM B209, ALLOY 3003, 3005, 3105, OR 5005.
   2. SPRINGS: TWIN SPRING SET CONSTRUCTED OF STAINLESS STEEL, WITH ENDS FLAT AND SLOTTED TO ACCEPT METAL BANDS. SPRING SIZE IS DETERMINED BY MANUFACTURERS FOR APPLICATION.

PART 3 - EXECUTION

3.1 PREPARATION

A. CLEAN AND DRY SURFACES TO RECEIVE INSULATION. REMOVE MATERIALS THAT WILL ADVERSELY AFFECT INSULATION APPLICATION.
B. COORDINATE INSULATION INSTALLATION WITH THE TRADESMAN INSTALLING HEAT TRACING. COMPLY WITH REQUIREMENTS FOR HEAT TRACING THAT APPLY TO INSULATION.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. INSTALL INSULATION MATERIALS, ACCESSORIES, AND FINISHES WITH SMOOTH, STRAIGHT, AND EVEN SURFACES; FREE OF VOIDS THROUGHOUT THE LENGTH OF PIPING, INCLUDING FITTINGS, VALVES, AND SPECIALTIES.

3.3 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. CHILLED WATER: ALL PIPE SIZES: INSULATION SHALL BE THE FOLLOWING: POLYISOCYANURATE: 3 INCHES THICK.

3.4 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. INSTALL JACKET OVER INSULATION MATERIAL. FOR INSULATION WITH FACTORY-APPLIED JACKET, INSTALL THE FIELD-APPLIED JACKET OVER THE FACTORY-APPLIED JACKET.
B. IF MORE THAN ONE MATERIAL IS LISTED, SELECTION FROM MATERIALS LISTED IS CONTRACTOR'S OPTION.
C. PIPING, EXPOSED:
   1. ALUMINUM, CORRUGATED: 0.020 INCH THICK.

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:
   1. STEEL PIPE AND FITTINGS.
   2. DIELECTRIC FITTINGS.

1.2 ACTION SUBMITTALS

A. PRODUCT DATA.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. HYDRONIC PIPING COMPONENTS AND INSTALLATION ARE TO BE CAPABLE OF WITHSTANDING THE FOLLOWING MINIMUM WORKING PRESSURES AND TEMPERATURES UNLESS OTHERWISE INDICATED:
   1. CHILLED-WATER PIPING: 150 PSIG AT 73 DEG F.
   2. AIR-VENT PIPING: 180 DEG F.

2.2 STEEL PIPE AND FITTINGS

A. STEEL PIPE: ASTM A53/A53M BLACK STEEL WITH PLAIN ENDS; WELDED AND SEAMLESS, GRADE B, AND SCHEDULE NUMBER AS INDICATED IN PART 3,"PIPING APPLICATIONS" ARTICLE.
B. MALLEABLE-IRON THREADED FITTINGS: ASME B16.3, CLASSES 150 AND 300 AS INDICATED IN PART 3, "PIPING APPLICATIONS" ARTICLE.
C. MALLEABLE-IRON UNIONS: ASME B16.39; CLASSES 150, 250, AND 300 AS INDICATED IN PART 3, "PIPING APPLICATIONS" ARTICLE.
D. STEEL PIPE NIPPLES: ASTM A733, MADE OF SAME MATERIALS AND WALL THICKNESSES AS PIPE IN WHICH THEY ARE INSTALLED.

2.3 DIELECTRIC FITTINGS

A. GENERAL REQUIREMENTS: ASSEMBLY OF COPPER ALLOY AND FERROUS MATERIALS WITH SEPARATING NONCONDUCTIVE INSULATING MATERIAL. INCLUDE END CONNECTIONS COMPATIBLE WITH PIPES TO BE JOINED.
B. DIELECTRIC FLANGES:
   1. DESCRIPTION:
      a. STANDARD: ASSE 1079.
      b. FACTORY-FABRICATED, BOLTED, COMPANION-FLANGE ASSEMBLY.
      c. PRESSURE RATING: 150 PSIG.
      d. END CONNECTIONS: SOLDER-JOINT COPPER ALLOY AND THREADED FERROUS; THREADED SOLDER-JOINT COPPER ALLOY AND THREADED FERROUS.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. CHILLED-WATER PIPING, ABOVEGROUND, NPS 2-1/2 (DN 65) AND LARGER, TO BE ANY OF THE FOLLOWING:
   1. SCHEDULE 40, GRADE B, STEEL PIPE, PLAIN-END MECHANICAL JOINT COUPLINGS AND FITTINGS; AND PLAIN-END MECHANICAL JOINTS.
B. CONDENSATE-DRAIN PIPING INSTALLED ABOVEGROUND TO BE ANY OF THE FOLLOWING:
   1. SCHEDULE 40, PVC PLASTIC PIPE AND FITTINGS AND SOLVENT-WELDED JOINTS.
C. AIR-VENT PIPING:
   1. INLET: SAME AS SERVICE WHERE INSTALLED WITH METAL-TO-PLASTIC TRANSITION FITTINGS FOR PLASTIC PIPING SYSTEMS, ACCORDING TO PIPING MANUFACTURER'S WRITTEN INSTRUCTIONS.
   2. OUTLET: TYPE K, ANNEALED-TEMPER COPPER TUBING WITH SOLDERED OR FLARED JOINTS.

3.2 INSTALLATION OF PIPING

A. DRAWING PLANS, SCHEMATICS, AND DIAGRAMS INDICATE GENERAL LOCATION AND ARRANGEMENT OF PIPING SYSTEMS. INDICATED LOCATIONS AND ARRANGEMENTS ARE USED TO SIZE PIPE AND CALCULATE FRICTION LOSS, EXPANSION, AND OTHER DESIGN CONSIDERATIONS. INSTALL PIPING AS INDICATED UNLESS DEVIATIONS TO LAYOUT ARE APPROVED ON COORDINATION DRAWINGS.

3.3 INSTALLATION OF DIELECTRIC FITTINGS

A. INSTALL DIELECTRIC FITTINGS IN PIPING AT CONNECTIONS OF DISSIMILAR METAL PIPING AND TUBING.
B. DIELECTRIC FITTINGS FOR NPS 2-1/2 TO NPS 4 (DN 65 TO DN 100): USE DIELECTRIC FLANGES OR NIPPLES.

3.4 INSTALLATION OF HANGERS AND SUPPORTS

A. CONTRACTORS SHALL PROVIDE ALL NECESSARY PIPE SUPPORTS, HANGERS, GUIDES, AND ANCHORS FOR CHILLED WATER PIPING IN ACCORDANCE WITH INDUSTRY STANDARDS, APPLICABLE CODES, AND MANUFACTURER RECOMMENDATIONS. SUPPORTS AND ATTACHMENT METHODS SHALL BE SUITABLE FOR EXTERIOR ROOFTOP INSTALLATION, ACCOUNTING FOR WIND LOADS, THERMAL EXPANSION, INSULATION THICKNESS, AND CONTINUOUS HEAT TRACING AND JACKETING. COORDINATE SUPPORT SPACING AND METHOD TO MAINTAIN INTEGRITY OF INSULATION, HEAT TRACE, AND WEATHERPROOF JACKET. ALL SUPPORTS SHALL BE DESIGNED AND INSTALLED TO AVOID DAMAGE TO ROOFING SYSTEMS AND MAINTAIN ROOF WARRANTIES.

END OF SECTION 232113

SECTION 232116 - HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:
   1. HYDRONIC SPECIALTY VALVES.
   2. AIR VENTS.
   3. STRAINERS.

1.2 ACTION SUBMITTALS

A. PRODUCT DATA.

PART 2 - PRODUCTS

2.1 HYDRONIC SPECIALTY VALVES

A. BRONZE-BODY BALANCING VALVES, BALL OR PLUG TYPE, WITH CALIBRATED ORIFICE OR VENTURI. BALLS SHALL BE BRASS OR STAINLESS STEEL; PLUGS SHALL BE RESIN. SEATS SHALL BE PTFE. PROVIDE VALVES WITH THREADED OR SOCKET END CONNECTIONS. INCLUDE INTEGRAL SEALS SUITABLE FOR CONNECTION TO A PORTABLE DIFFERENTIAL PRESSURE METER. HANDLES SHALL BE LEVER TYPE WITH MEMORY STOP TO RETAIN SET POSITION. VALVES SHALL HAVE A MINIMUM COLD WORKING PRESSURE (CWP) RATING OF 125 PSIG AND A MAXIMUM OPERATING TEMPERATURE OF 250°F.:

2.2 AIR VENTS

A. MANUAL AIR VENTS SHALL HAVE BRONZE BODIES WITH NONFERROUS INTERNAL COMPONENTS AND BE OPERATED BY SCREWDRIVER OR THUMBSCREW. EACH VENT SHALL HAVE A 1/2-INCH NPS INLET CONNECTION AND A 1/8-INCH NPS DISCHARGE CONNECTION. VALVES SHALL BE RATED FOR A MINIMUM COLD WORKING PRESSURE (CWP) OF 150 PSIG AND A MAXIMUM OPERATING TEMPERATURE OF 225°F.

2.3 STRAINERS

A. Y-PATTERN STRAINERS SHALL HAVE ASTM A126 CLASS B CAST IRON BODIES WITH BOLTED COVERS AND BOTTOM DRAIN CONNECTIONS. STRAINERS SHALL HAVE THREADED END CONNECTIONS FOR SIZES 2 INCHES NPS AND SMALLER, AND FLANGED END CONNECTIONS FOR SIZES 2-1/2 INCHES NPS AND LARGER. STRAINER SCREENS SHALL BE STAINLESS STEEL, EITHER 20-MESH OR PERFORATED BASKET TYPE. STRAINERS SHALL BE RATED FOR A MINIMUM COLD WORKING PRESSURE (CWP) OF 125 PSIG.

PART 3 - EXECUTION

3.1 INSTALLATION OF VALVES

A. INSTALL CALIBRATED-ORIFICE BALANCING VALVE AT EACH BRANCH CONNECTION TO RETURN MAIN.

3.2 HYDRONIC SPECIALTIES INSTALLATION

A. INSTALL MANUAL AIR VENTS AT HIGH POINTS IN PIPING, AT HEAT-TRANSFER COILS, AND ELSEWHERE AS REQUIRED FOR SYSTEM AIR VENTING.
B. INSTALL MANUAL VENTS AT HEAT-TRANSFER COILS AND ELSEWHERE AS REQUIRED FOR AIR VENTING.

END OF SECTION 232116

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:
   1. SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS.
   2. SINGLE-WALL ROUND DUCTS AND FITTINGS.
   3. SHEET METAL MATERIALS.
   4. SEALANTS AND GASKETS.
   5. HANGERS AND SUPPORTS.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

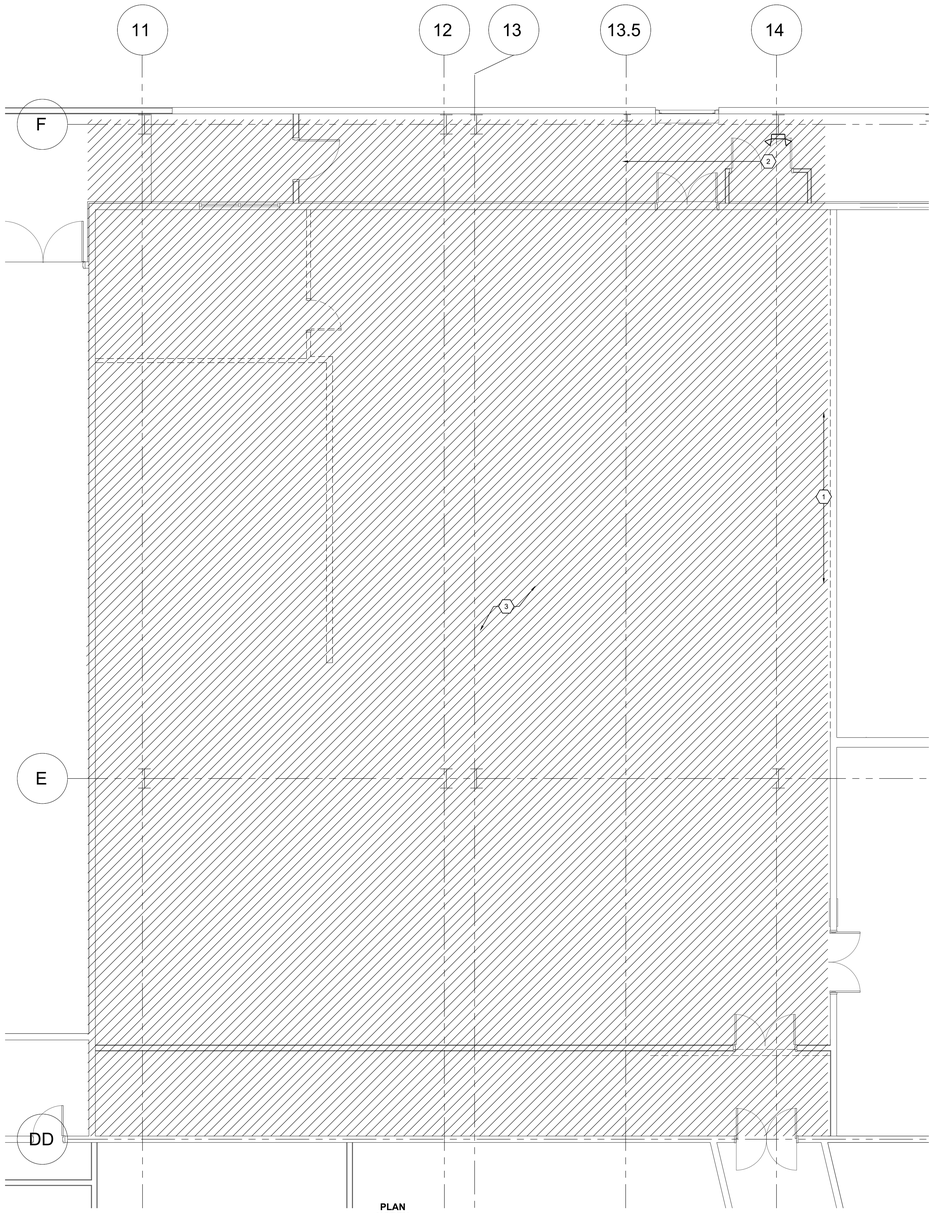
A. DELEGATED DUCT DESIGN: DUCT CONSTRUCTION, INCLUDING SHEET METAL THICKNESSES, SEAM AND JOINT CONSTRUCTION, REINFORCEMENTS, AND HANGERS AND SUPPORTS, COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" AND WITH PERFORMANCE REQUIREMENTS AND DESIGN CRITERIA INDICATED IN "DUCT SCHEDULE" ARTICLE.
B. STRUCTURAL PERFORMANCE: DUCT HANGERS AND SUPPORTS ARE TO WITHSTAND THE EFFECTS OF GRAVITY LOADS AND STRESSES WITHIN LIMITS AND UNDER CONDITIONS DESCRIBED IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" AND ASCE/SEI 7, SMACNA'S "SEISMIC RESTRAINT MANUAL: GUIDELINES FOR MECHANICAL SYSTEMS."
C. WIND PERFORMANCE: DUCTS ARE TO WITHSTAND THE EFFECTS OF WIND DETERMINED IN ACCORDANCE WITH TO ASCE/SEI 7.
D. AIRSTREAM SURFACES: SURFACES IN CONTACT WITH AIRSTREAM COMPLY WITH REQUIREMENTS IN ASHRAE 62.1.
E. ASHRAE COMPLIANCE: APPLICABLE REQUIREMENTS IN ASHRAE 62.1, SECTION 5 - "SYSTEMS AND EQUIPMENT," AND SECTION 7 - "CONSTRUCTION AND SYSTEM STARTUP."
F. ASHRAE/IES COMPLIANCE: APPLICABLE REQUIREMENTS IN ASHRAE/IES 90.1, SECTION 6.4.4 - "HVAC SYSTEM CONSTRUCTION AND INSULATION."
G. DUCT DIMENSIONS: UNLESS OTHERWISE INDICATED, ALL DUCT DIMENSIONS INDICATED ON DRAWINGS ARE INSIDE CLEAR DIMENSIONS AND DO NOT INCLUDE INSULATION OR DUCT WALL THICKNESS.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. GENERAL FABRICATION REQUIREMENTS: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," CH. 3, "ROUND, OVAL AND FLEXIBLE DUCT," BASED ON INDICATED STATIC-PRESSURE CLASS UNLESS OTHERWISE INDICATED.

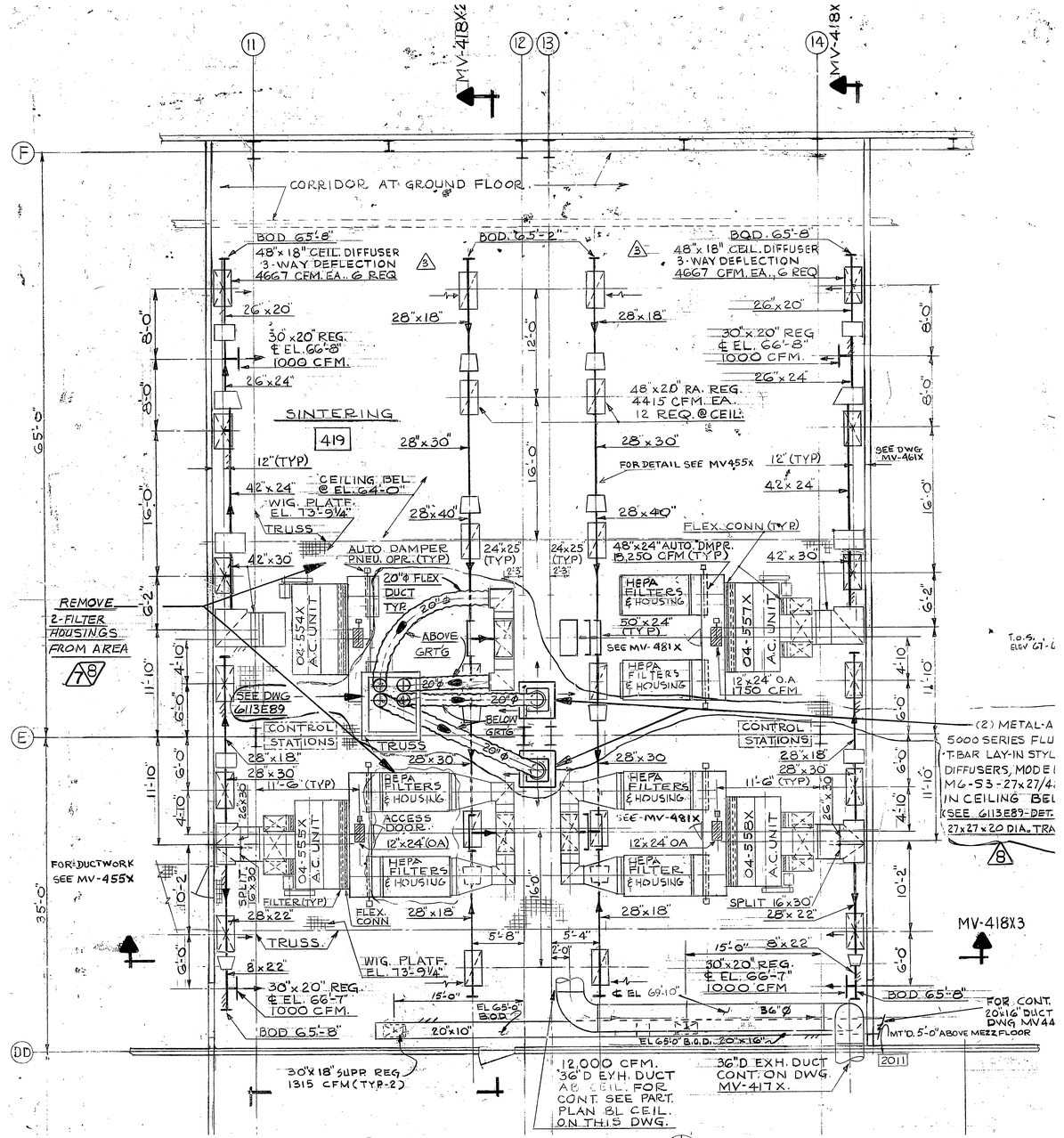
2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. GENERAL FABRICATION REQUIREMENTS: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," CH. 3, "ROUND, OVAL AND FLEXIBLE DUCT," BASED ON INDICATED STATIC-PRESSURE CLASS UNLESS OTHERWISE INDICATED. CONSTRUCT DUCTS OF GALVANIZED SHEET STEEL.
B. TRANSVERSE JOINTS: SELECT JOINT TYPES AND FABRICATE IN ACCORDANCE WIT



C8 **HVAC PLAN - DEMOLITION**
3/16" = 1'-0"

PLAN NORTH



C3 **6868-MV-418X PLAN - DEMOLITION**
3/16" = 1'-0"

HATCHED AREA INDICATES THE FULL EXTENT OF MECHANICAL DEMOLITION. ALL EXISTING MECHANICAL SYSTEMS LOCATED WITHIN THIS AREA — INCLUDING DUCTWORK, PIPING, EQUIPMENT, AND ANY CURRENTLY ACTIVE SYSTEMS — SHALL BE REMOVED AND DISPOSED OF IN THEIR ENTIRETY TO ACCOMMODATE NEW CONSTRUCTION. CONTRACTOR SHALL COORDINATE SYSTEM SHUTDOWN, ISOLATION, AND SAFE REMOVAL PROCEDURES WITH THE OWNER. ENSURE ALL WORK IS PERFORMED IN ACCORDANCE WITH APPLICABLE CODES AND SAFETY STANDARDS. NO MECHANICAL SYSTEMS WITHIN THIS AREA ARE TO REMAIN. ALL ACTIVE AND ABANDONED SYSTEMS SHALL BE FULLY REMOVED. COORDINATE WITH OTHER TRADES TO MAINTAIN CLEARANCES FOR NEW WORK.

DEMOLITION KEYED NOTES

1. REMOVE AND DISPOSE OF ABANDONED REFRIGERANT PIPING MOUNTED ALONG WALL AS PART OF MECHANICAL DEMOLITION. CONTRACTOR SHALL FIELD-VERIFY WITH OWNER THAT PIPING IS NOT PART OF ANY ACTIVE SYSTEM AND IS INCLUDED IN THE SCOPE OF DEMOLITION. ALL ASSOCIATED SUPPORTS, INSULATION, AND CONNECTIONS SHALL BE REMOVED AND DISPOSED OF IN ACCORDANCE WITH APPLICABLE CODES AND ENVIRONMENTAL REQUIREMENTS. CAP OR SEAL ANY OPEN CONNECTIONS AS REQUIRED TO PREVENT LEAKAGE DURING REMOVAL.
2. REMOVE AND DISPOSE OF EXISTING DUCTED SPLIT SYSTEM IN ITS ENTIRETY, INCLUDING INDOOR AIR HANDLER, OUTDOOR CONDENSING UNIT (IF PRESENT), ALL ASSOCIATED REFRIGERANT PIPING, DUCTWORK, DAMPERS, AIR DISTRIBUTION DEVICES, INSULATION, SUPPORTS, CONDENSATE DRAIN LINES, CONTROL WIRING, AND POWER CONNECTIONS. THIS SYSTEM APPEARS TO BE SERVED BY THE ABANDONED REFRIGERANT PIPING IDENTIFIED IN KEYNOTE 1. CONTRACTOR SHALL FIELD-VERIFY FULL SYSTEM EXTENT AND CONFIRM WITH OWNER THAT THE SYSTEM IS TO BE DEMOLISHED.
3. REMOVE AND DISPOSE OF ABANDONED DUCTWORK LOCATED ABOVE THE LAY-IN CEILING IN THIS AREA. EXISTING DUCTWORK APPEARS TO BE PART OF A LEGACY HVAC SYSTEM THAT INCLUDED HEPA FILTER HOUSINGS AND AIR CONDITIONING EQUIPMENT, LIKELY ASSOCIATED WITH FORMER SINTERING OPERATIONS. REFER TO GE DRAWING 6868-MV-418X AND PLAN C3 (SNIPPET INCLUDED ON THIS SHEET) FOR GENERAL ROUTING AND DUCT SIZING. CONTRACTOR SHALL FIELD-VERIFY ALL CONDITIONS AND IS RESPONSIBLE FOR DETERMINING THE FULL EXTENT OF DUCTWORK TO BE REMOVED. REMOVE ALL ASSOCIATED SUPPORTS, INSULATION, ACCESS PANELS, AND FILTRATION HOUSINGS. COORDINATE REMOVAL TO AVOID DAMAGE TO SURROUNDING ARCHITECTURAL ELEMENTS AND ACTIVE SYSTEMS OUTSIDE OF DEMOLITION SCOPE.

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UNLESS OTHERWISE SPECIFIED:
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3 PLACE DECIMALS ± ANGLES ±

REFERENCE DRAWINGS

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GE VERNOVA
GE Hitachi Nuclear Energy
Wilmington, NC

TYPE OF DRAWING: GE VERNOVA-FMO
HVAC DEMOLITION PLAN

ISSUE DATE 2025.09.18 | DWG NO. MD101 | REV. —

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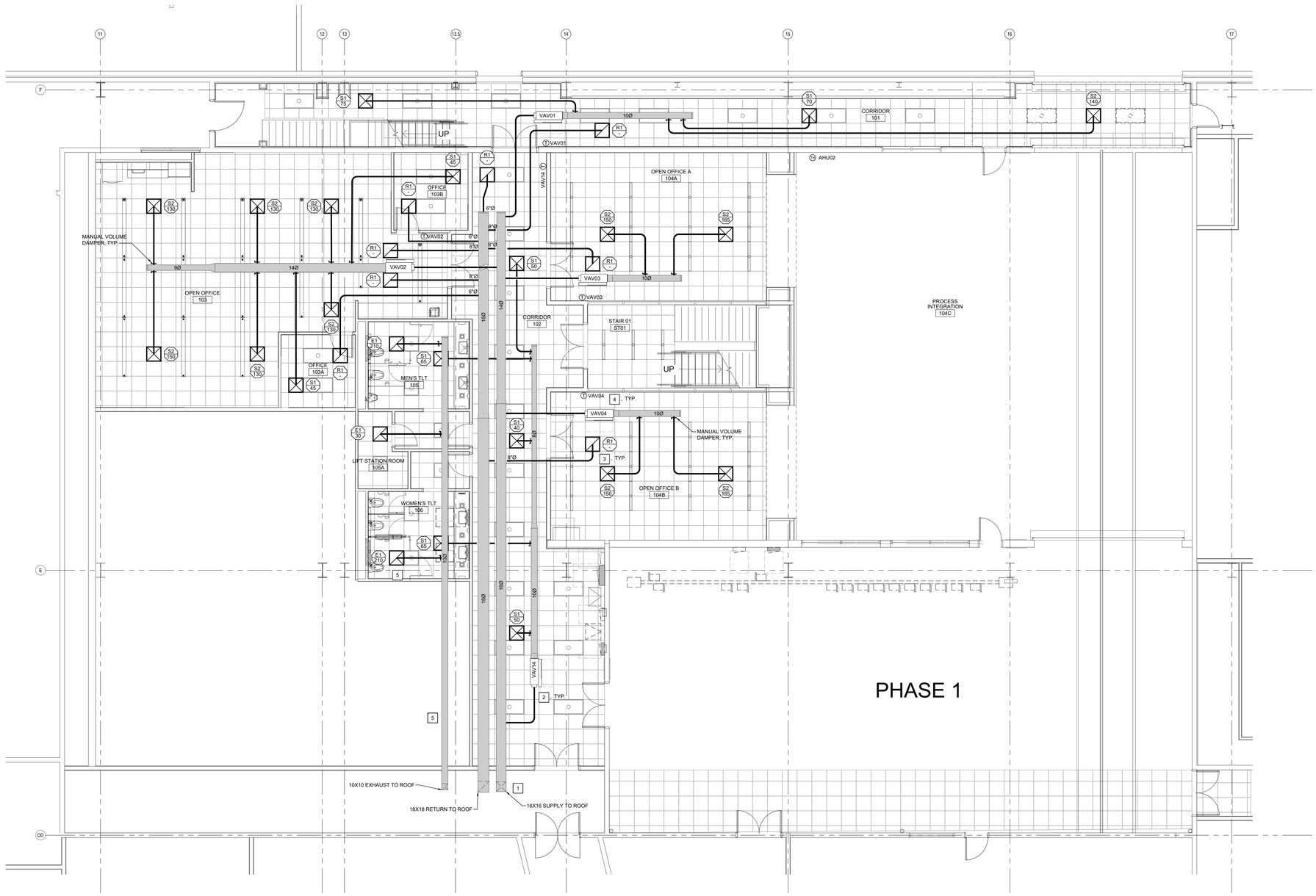

MECHANICAL KEYED NOTES

1. INSTALL NEW SUPPLY DUCTWORK FROM AHU03 THROUGH ROOF AND ROUTE TIGHT TO OR THROUGH STRUCTURE AS NECESSARY. COORDINATE ROUTING WITH OTHER TRADES. INSTALL PER PROJECT DETAILS.
2. INSTALL VAV'S SERVED BY AHU03 AS INDICATED. VERIFY LOCATIONS WITH REFLECTED CEILING PLANS AND COORDINATE WITH EXISTING BUILDING CONDITIONS. INSTALL NEW SUPPLY DIFFUSERS.
3. INSTALL SUPPLY DIFFUSERS WITH MANUAL BALANCE DAMPERS SERVED BY AHU03 AS INDICATED. VERIFY FINAL LOCATIONS WITH ARCHITECTURAL CEILING PLAN.
4. INSTALL TEMPERATURE SENSORS IN LOCATION SHOWN, U.O.N.
5. INSTALL EXHAUST DUCT TO PV01 TO SERVE ROOMS 105, 105A, 106 AS INDICATED. COORDINATE ROOF CURBS, DUCT CONNECTIONS, AND ELECTRICAL REQUIREMENTS WITH PLANS AND SPECIFICATIONS.

MECHANICAL GENERAL NOTES

1. 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.
4. CONTRACTOR MAY USE EITHER ROUND OR RECTANGULAR DUCTWORK IN THE FIELD, PROVIDED DUCT SIZING IS ADJUSTED BASED ON SMACNA STANDARDS TO MAINTAIN EQUIVALENT AIRFLOW AND FRICTION LOSS. ALL DUCT DIMENSIONS SHOWN ON DRAWINGS SHALL BE CONSIDERED NOMINAL AND SHALL BE VERIFIED AND COORDINATED IN FIELD.

B8 HVAC FIRST FLOOR PLAN
3/16" = 1'-0"

PLAN NORTH

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3. PLACE DECIMALS ___ ± ANGLES ___ ±
ALL SURF.

GE VERNOVA
GE Hitachi Nuclear Energy
Wilmington, NC

TYPE OF DRAWING: GE VERNOVA-FMO
HVAC NEW WORK
FIRST FLOOR PLAN

ISSUE DATE 2025.09.18
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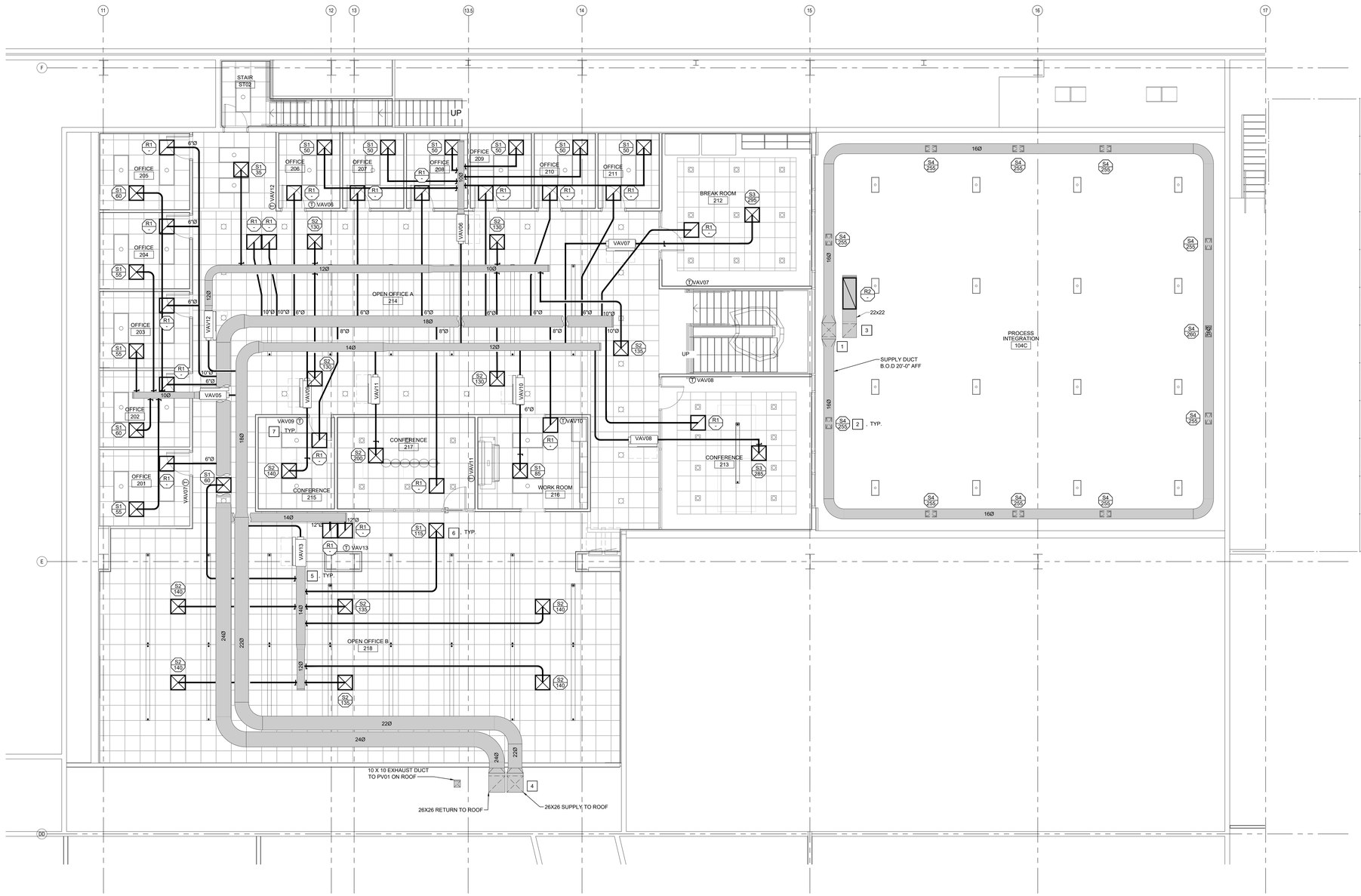

MECHANICAL KEYED NOTES

1. 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.
4. INSTALL NEW SUPPLY DUCTWORK FROM AHU03 THROUGH ROOF AND ROUTE TIGHT TO STRUCTURE. COORDINATE ROUTING WITH OTHER TRADES. INSTALL PER PROJECT DETAILS.
5. INSTALL VAV'S SERVED BY AHU03 AS INDICATED. VERIFY LOCATIONS WITH REFLECTED CEILING PLANS AND COORDINATE WITH EXISTING BUILDING CONDITIONS. INSTALL NEW SUPPLY DIFFUSERS.
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

1. 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.
4. CONTRACTOR MAY USE EITHER ROUND OR RECTANGULAR DUCTWORK IN THE FIELD, PROVIDED DUCT SIZING IS ADJUSTED BASED ON SMACNA STANDARDS TO MAINTAIN EQUIVALENT AIRFLOW AND FRICTION LOSS. ALL DUCT DIMENSIONS SHOWN ON DRAWINGS SHALL BE CONSIDERED NOMINAL AND SHALL BE VERIFIED AND COORDINATED IN FIELD.

B8 **HVAC SECOND FLOOR PLAN**
3/16" = 1'-0"

PLAN NORTH

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ENGRG DMH --/--/--
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SCALE AS NOTED
* UNLESS OTHERWISE SPECIFIED
2 PLACE DECIMALS ± FRACTIONS ±
3 PLACE DECIMALS ± ANGLES ±
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GE VERNOVA
GE Hitachi Nuclear Energy
Wilmington, NC

TYPE OF DRAWING: GE VERNOVA-FMO
HVAC NEW WORK
SECOND FLOOR PLAN

ISSUE DATE: 2025.09.16
DWG NO.: MH102
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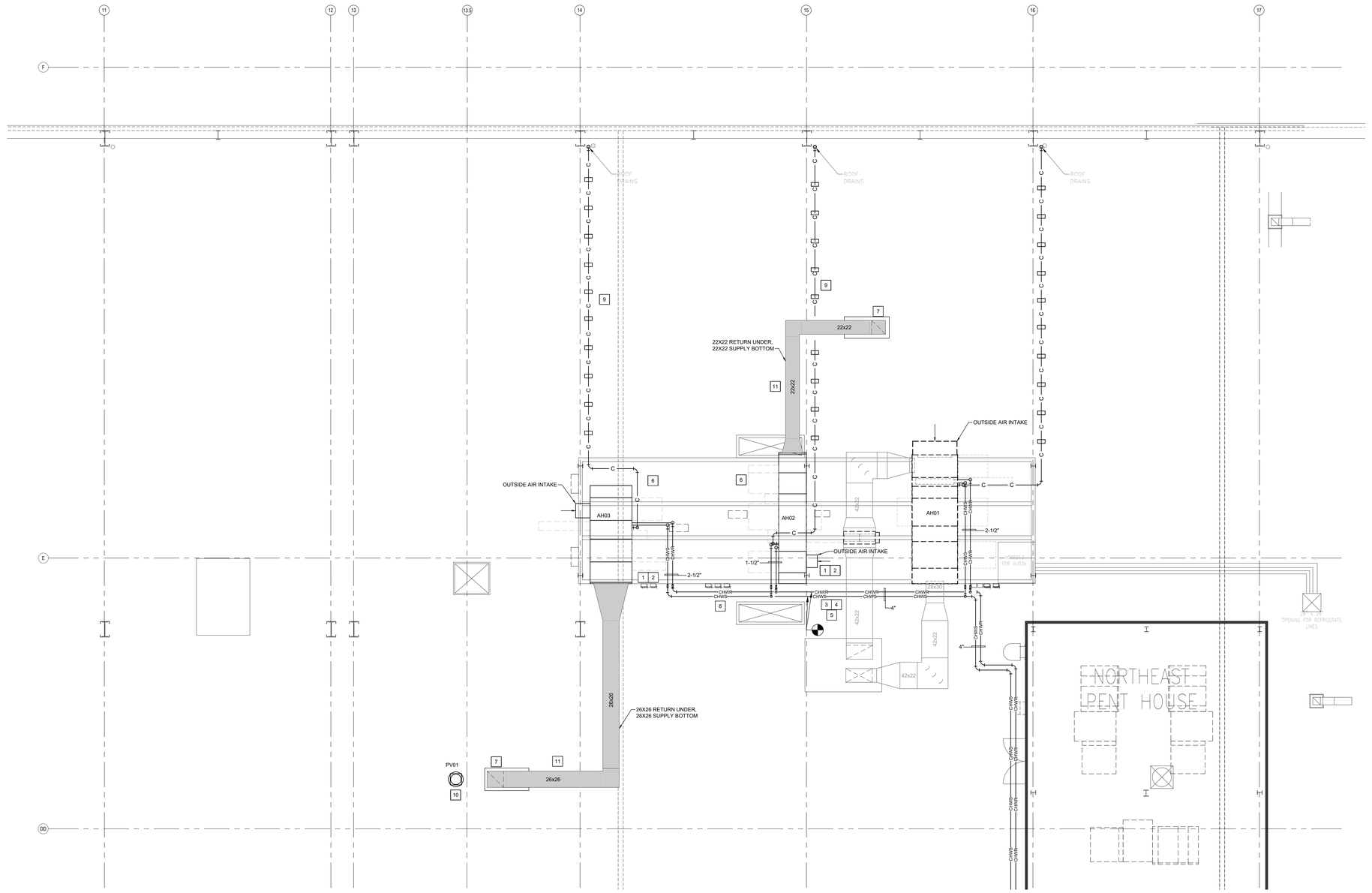

MECHANICAL KEYED NOTES

1. INSTALL AIR HANDLING UNIT AHU2 AND AHU03 ON EXISTING STRUCTURAL PLATFORM AS INDICATED ON PLANS. REFER TO MECHANICAL EQUIPMENT SCHEDULES AND DETAILED ELEVATIONS FOR AIR HANDLER REQUIREMENTS, CONNECTION LOCATIONS, AND MOUNTING DETAILS. COORDINATE FINAL AHU02 AND AHU03 LOCATION AND MOUNTING REQUIREMENTS WITH GENERAL CONTRACTOR AND OWNER PRIOR TO INSTALLATION.
2. COORDINATE AHU LOCATIONS TO MAINTAIN ALL REQUIRED CLEARANCES FOR EQUIPMENT, CONTROL VALVES, ACCESS LOCATIONS, AND VARIABLE FREQUENCY DRIVES (VFDS) PER PROJECT SPECIFICATIONS AND MANUFACTURER REQUIREMENTS.
3. THIS CHILLED WATER PIPING IS INCLUDED IN PHASE ONE.
4. TIE INTO EXISTING PHASE ONE CHILLED WATER SUPPLY AND RETURN PIPING.
5. EXTEND CHILLED WATER PIPING TO CHILLED WATER COIL CONNECTION AT AIR HANDLERS.
6. CONTRACTOR SHALL PROVIDE STRUCTURAL GRATING FOR WALKING PLATFORMS TO MAINTAIN ACCESS TO EQUIPMENT. COORDINATE WITH GENERAL CONTRACTOR.
7. PROVIDE NEW CONTRACTOR-SIZED ROOF CURB TO ACCOMMODATE DUCTWORK AS SHOWN ON DRAWINGS. COORDINATE CURB LOCATION AND SUPPORT WITH GENERAL CONTRACTOR. ALL PENETRATIONS SHALL COMPLY WITH ROOF MANUFACTURER'S STANDARD DETAILS TO MAINTAIN WARRANTY.
8. PROVIDE HEAT TRACE ON ALL CHILLED WATER PIPING ROUTED EXPOSED TO EXTERIOR CONDITIONS. INSTALLED PER PROJECT SPECIFICATIONS. COORDINATE WITH ELECTRICAL CONTRACTOR FOR POWER CONNECTION AND CONTROL REQUIREMENTS.
9. PROVIDE 1" PVC CONDENSATE DRAIN PIPING FROM AIR HANDLERS. PIPING SHALL BE TRAPPED PER DETAIL AND ROUTED TO NEAREST ROOF DRAIN AS SHOWN ON PLANS. CONDENSATE LINES SHALL BE SUPPORTED ON FACTORY-MANUFACTURED SUPPORTS SUCH AS DURABLOK OR EQUAL, SPACED PER MANUFACTURER'S RECOMMENDATIONS FOR PVC PIPE.
10. INSTALL EXHAUST FAN PV01 ON NEW ROOF CURB. ALL CURBS SHALL EXTEND MIN. 6" ABOVE FINISHED ROOF AND BE FLASHED FOR WATERTIGHT SEAL. PROVIDE BOTTOM DUCT CONNECTION. MAINTAIN CLEARANCE TO NEARBY ROOF DRAINS, ROOF TOP UNITS, HEAT PUMP, AND ELECTRICAL SERVICE ACCESS.
11. PROVIDE SUPPORTS FOR STACKED SUPPLY AND RETURN DUCTWORK INSTALLED ON ROOF SURFACE. DUCT SUPPORT SYSTEM SHALL BE A PRE-MANUFACTURED, NON-PENETRATING ROOFTOP SUPPORT SYSTEM (SUCH AS DURABLOCK OR EQUAL), SUITABLE FOR ROOFING CONDITIONS AND MAINTAINING ROOF WARRANTY. SPACE DUCT SUPPORTS IN ACCORDANCE WITH SMACNA STANDARDS AND MANUFACTURER REQUIREMENTS, TYPICALLY NOT TO EXCEED 10 FEET ON CENTER FOR METAL DUCTWORK. PROVIDE ADDITIONAL SUPPORTS AT ALL CHANGES IN DIRECTION AND WITHIN 12 INCHES OF CONNECTIONS, TRANSITIONS, AND FLEX JOINTS. COORDINATE DUCT STACKING CLEARANCES TO ALLOW FULL DRAINAGE AND MAINTENANCE ACCESS TO BOTH SUPPLY AND RETURN LINES.

MECHANICAL GENERAL NOTES

1. CONTRACTOR SHALL EXTEND CHILLED WATER SUPPLY AND RETURN PIPING TO NEW AIR HANDLERS. COORDINATE ALL REQUIRED SYSTEM SHUTDOWNS AND OUTAGES WITH THE OWNER PRIOR TO PERFORMING ANY WORK. OBTAIN OWNER APPROVAL FOR ALL SHUTDOWN TIMES AND PROCEDURES. CHILLED WATER PIPING SHALL BE FULLY INSULATED, JACKETED, AND PROVIDED WITH HEAT TRACE IN ACCORDANCE WITH PROJECT SPECIFICATIONS. INSULATION TYPE AND PIPING MATERIALS SHALL BE AS IDENTIFIED IN THE PROJECT SPECIFICATIONS INCLUDED IN THIS DESIGN SET. CONTRACTOR SHALL COORDINATE WITH THE ELECTRICAL CONTRACTOR AND REFER TO ELECTRICAL DRAWINGS FOR POWER REQUIREMENTS AND CONNECTION DETAILS FOR THE HEAT TRACE SYSTEM. PIPING SHALL BE EXTENDED FROM THE TERMINATION POINT OF PHASE ONE PIPING. ALL PIPING SHALL BE ADEQUATELY SUPPORTED PER PROJECT SPECIFICATIONS AND INSTALLED TO MAINTAIN REQUIRED CLEARANCES FOR LADDERS AND MECHANICAL EQUIPMENT. COORDINATE FINAL INSTALLATION WITH THE GENERAL CONTRACTOR.
2. ALL EXTERIOR DUCTWORK SHALL BE G90 GALVANIZED STEEL, FULLY INSULATED AND JACKETED PER PROJECT SPECIFICATIONS. DUCTWORK PENETRATING THE ROOF SHALL DO SO THROUGH A NEW ROOF CURB, SIZED BY THE CONTRACTOR TO ACCOMMODATE THE DUCTWORK SHOWN ON THE DRAWINGS. CURB SUPPORT SHALL BE COORDINATED WITH THE GENERAL CONTRACTOR AND INCLUDE ANY REQUIRED SUPPLEMENTAL STRUCTURAL FRAMING BELOW. CURB CAPS SHALL BE INSTALLED WEATHER-TIGHT. CONTRACTOR SHALL ENSURE ALL ROOF PENETRATIONS ARE FULLY SEALED AND FLASHED IN ACCORDANCE WITH PROJECT SPECIFICATIONS, APPLICABLE CODES, AND THE ROOF MANUFACTURER'S STANDARD DETAILS TO MAINTAIN ALL ROOF WARRANTIES. EXTERIOR DUCTWORK SHALL BE PRIMARILY SUPPORTED FROM EXISTING STRUCTURAL STEEL PLATFORM WHERE SHOWN. CONTRACTOR SHALL PROVIDE ADDITIONAL ROOF OR STRUCTURAL SUPPORTS AS REQUIRED TO FULLY SUPPORT SUPPLY DUCTWORK AND MAINTAIN ALL REQUIRED CLEARANCES. ALL SUPPORTS SHALL BE DESIGNED TO ACCOMMODATE WIND LOADS, THERMAL EXPANSION, AND PREVENT WATER PONDING OR ROOF DAMAGE. REFER TO PROJECT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS RELATED TO DUCT MATERIALS, INSULATION, JACKETING, SEALING, SUPPORTS, AND WEATHERPROOFING.

B8 HVAC ROOF PLAN
3/16" = 1'-0"

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CBHF

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18-Sep-25

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REV.	DESCRIPTION	BY	CK'd	APPROVAL	DATE
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REVISIONS

REFERENCE DRAWINGS

SIGNATURES		DATE
DRAWN	MEZ	--/--/--
CHECKED	DMH	--/--/--
ENGR'G	DMH	--/--/--
ENGR'G		

SCALE: AS NOTED

1. *UNLESS OTHERWISE SPECIFIED
2. PLACE DECIMALS ___ FRACTIONS ___
3. PLACE DECIMALS ___ ANGLES ___

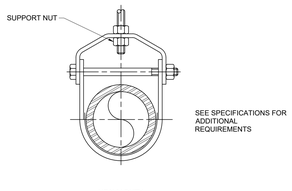
ALL SURF. ✓

GE VERNOVA
GE Hitachi Nuclear Energy
Wilmington, NC

TYPE OF DRAWING: GE VERNOVA-FMO
HVAC NEW WORK
ROOF PLAN

ISSUE DATE: 2025.09.18
DWG NO.: MH103
REV.: —

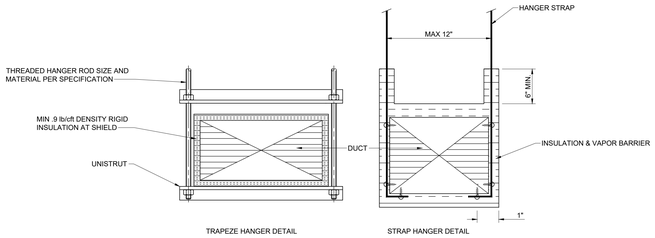
DRAWING STATUS: –
ISSUED TO: N/A
FILE NAME: –
PIXEL: –
SH NO.: –
CONT ON: –



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.
5. PIPE SUBJECT TO DAMAGE MUST HAVE PADDED HANGER.

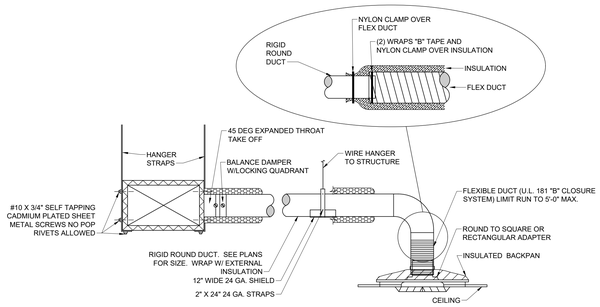
H8 PIPE HANGER SUPPORT DETAIL
NOT TO SCALE



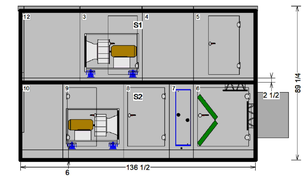
NOTES:

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.
2. SUPPORTS SHALL BE SPACED AND SIZED AS PER SPECIFICATIONS.
3. RIGID INSULATION SHALL EXTEND MINIMUM OF 3" BEYOND STRUT ON BOTH SIDES. MAINTAIN VAPOR BARRIER ACROSS STRUT.

H6 DUCT SUPPORT DETAIL
NOT TO SCALE



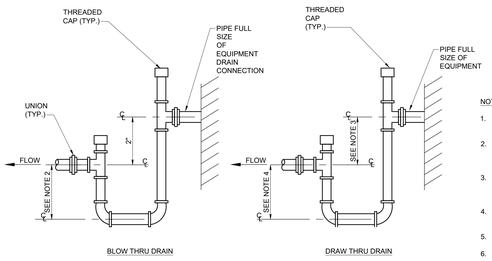
H4 TYPICAL DIFFUSER CONNECTION DETAIL
NOT TO SCALE



Pos #	Module	Length	Weight
1	Access section	2	112.53
2	Custom length section	32 1/2	247.42
3	Fan section	36 1/4	857.67
4	Custom length section	29 3/4	227.06
5	Air mixing section	36	361.39
6	Air mixing section	36	406.54
7	Coil section	14	332.84
8	Access section	26 1/2	187.37
9	Fan section	35 5/8	817.37
10	Discharge Plenum	24 5/8	226.84

Installed Unit Weight 3757.04 lbs

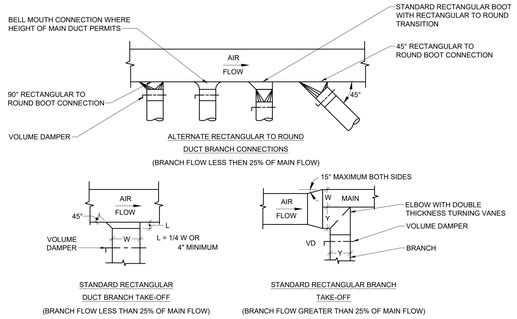
H2 AH03 SIDE ELEVATION
NOT TO SCALE



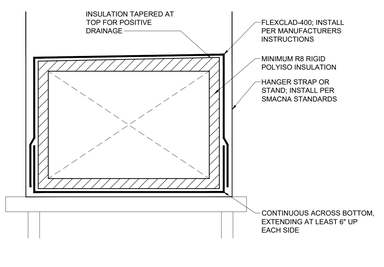
NOTES:

1. LOCATE TRAPS SO AS TO BE ACCESSIBLE FOR CLEANING.
2. HEIGHT MUST BE EQUAL TO UNIT MAXIMUM TOTAL STATIC PRESSURE PLUS 1/2".
3. HEIGHT MUST BE EQUAL TO UNIT MAXIMUM NEGATIVE STATIC PRESSURE PLUS 1".
4. HEIGHT MUST BE 1/2 OF HEIGHT INSTALLED IN NOTE 3.
5. PIPE TO NEAREST DRAIN.
6. TRAP MUST NOT BLOCK ACCESS TO EQUIPMENT
7. PROVIDE UNIONS AT INLET AND OUTLET OF TRAP.

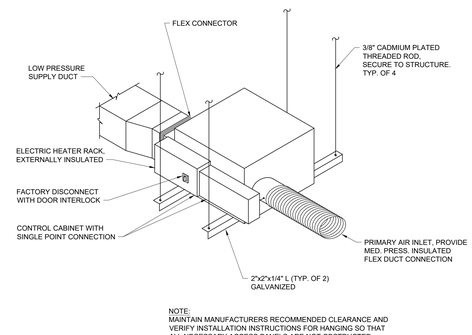
D8 CONDENSATE DRAIN DETAIL
NOT TO SCALE



A6 TYPICAL DUCT FITTING DETAILS
NOT TO SCALE

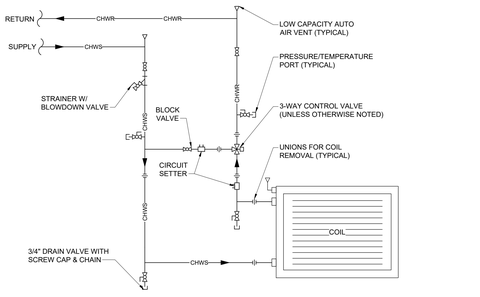


E4 EXTERIOR WEATHER PROOFING DUCT INSTALLATION DETAIL
NOT TO SCALE

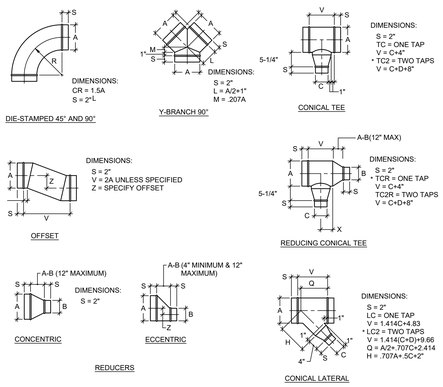


NOTE:
MAINTAIN MANUFACTURERS RECOMMENDED CLEARANCE AND VERIFY INSTALLATION INSTRUCTIONS FOR HANGING SO THAT ALL NECESSARY ACCESS PANELS ARE NOT OBSTRUCTED.

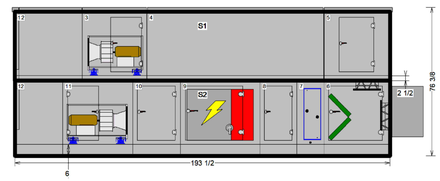
E2 TYPICAL SINGLE DUCT TERMINAL w/ELECTRIC HEAT DETAIL
NOT TO SCALE



A8 CHILLED WATER COIL PIPING 3-WAY DETAIL
NOT TO SCALE



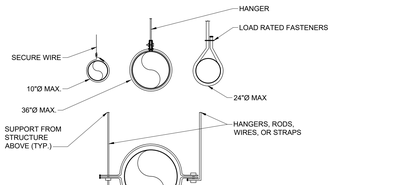
A6 TYPICAL DUCT FITTING DETAILS
NOT TO SCALE



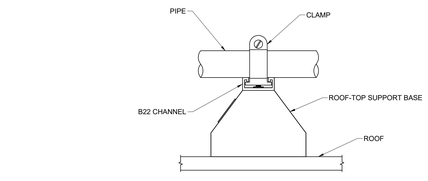
Pos #	Module	Length	Weight
1	Access section	2	72.95
2	Custom length section	32 3/4	190.03
3	Fan section	33 3/8	555.66
4	Custom length section	91 3/8	525.00
5	Air mixing section	34	246.82
6	Air mixing section	34	274.12
7	Coil section	14	203.48
8	Access section	19	100.00
9	Coil section	41 1/8	636.95
10	Access section	24 5/8	128.69
11	Fan section	36 1/4	551.90
12	Discharge Plenum	24 1/2	153.61

Installed Unit Weight 3639.24 lbs

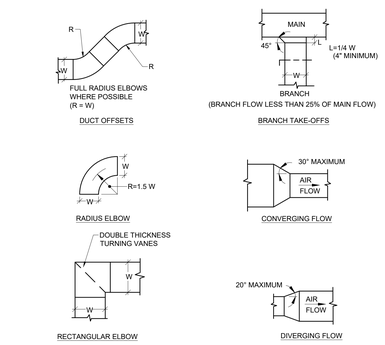
C4 AH02 SIDE ELEVATION
NOT TO SCALE



C2 ROUND DUCT SUPPORT DETAIL
NOT TO SCALE



C8 CONDENSATE TYPICAL ROOF SUPPORT DETAIL
NOT TO SCALE



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ENGR'G	DMH	--/--/--
ENGR'G		

SCALE AS NOTED — ALL SURF. ✓
*UNLESS OTHERWISE SPECIFIED
2 PLACE DECIMALS ± .__ — FRACTIONS ± __
3 PLACE DECIMALS ± .___ — ANGLES ± __

REFERENCE DRAWINGS

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18-Sep-25
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GE VERNOVA
GE Hitachi Nuclear Energy
Wilmington, NC

TYPE OF DRAWING: GE VERNOVA-FMO MECHANICAL DETAILS

ISSUE DATE: 2025.09.18 | DWG NO.: M-501 | REV.: —

ISSUED TO: N/A | FILE NAME: — | PIXEL: — | SH NO.: — | CONT ON: —

POINTS LIST - AH02

Point Name	POINTS								ALARMS				
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HOW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	COMMUNICATION FAIL
COIL LEAVING AIR LOW TEMP CUTOUT ALARM LLT			X									X			
CONDENSATE OVERFLOW DETECTION LOCAL CND OVRFL	X		X								X	X			
COOLING COIL LEAVING TEMPERATURE CC LAT	X	X								X	X			X	
COOLING OUTPUT COMMAND CLG	X			X											
HEAT ENABLE HT ENA	X				X										
HEATING OUTPUT COMMAND HTG	X			X											
HIGH STATIC ALARM HSP ALM	X		X								X	X			
HIGH STATIC ALARM INTERLOCK HSP INTLK						X									
MIXED AIR LOW TEMPERATURE CUTOUT ALARM MA LLT			X									X			
MIXED AIR TEMPERATURE LOCAL MAT	X	X									X			X	
OUTDOOR AIR DAMPER COMMAND OAD	X			X											
OUTDOOR AIR RELATIVE HUMIDITY LOCAL OAH	X	X													
OUTDOOR AIR TEMPERATURE LOCAL OAT	X	X													
REHEAT LEAVING COIL TEMPERATURE LOCAL RH LAT	X	X								X	X			X	
RELIEF AIR DAMPER COMMAND RLF DPR	X				X										
RELIEF AIR FAN SPEED OUTPUT COMMAND RLF	X			X											
RELIEF AIR FAN START STOP RLF	X				X										
RELIEF AIR FAN STATUS RLF	X		X												
RETURN AIR HUMIDITY LOCAL RAH	X	X								X					
RETURN AIR TEMPERATURE LOCAL RAT	X	X													
RETURN SMOKE DETECTOR INPUT RA SD							X								
SPACE HUMIDITY LOCAL SPH	X	X								X					
SPACE STATIC PRESSURE LOCAL SPP	X	X								X	X				
SPACE TEMPERATURE LOCAL SPT	X	X								X	X			X	
SPACE TEMPERATURE SETPOINT LOCAL SPT SP	X	X													
SUPPLY AIR HUMIDITY LOCAL SA HUM	X	X								X	X			X	
SUPPLY FAN AIR FLOW LOCAL SF FLW	X	X													
SUPPLY FAN SPEED COMMAND SAF	X			X											
SUPPLY FAN START STOP COMMAND SAF	X				X										
SUPPLY FAN STATUS SAF	X	X													
BAS COMMUNICATION STATE BAS COM						X									X
DISCHARGE AIR COOLING SETPOINT DA CL SP						X									
DISCHARGE AIR HEATING SETPOINT DA HT SP						X									
MAINTENANCE REQUIRED MNT REQ						X						X			
MIXED AIR TEMPERATURE LOW LIMIT SETPOINT MA LLT STPT						X									
OCCUPIED COOLING SETPOINT OCC CLG STPT	X					X									
OCCUPIED HEATING SETPOINT OCC HTG STPT	X					X									
RELIEF AIR FAN FAILURE RLF FAIL	X					X						X			
SUPPLY FAN FAILURE SF FAIL	X					X						X			
UNOCCUPIED COOLING SETPOINT UNOCC CLG STPT	X					X									
UNOCCUPIED HEATING SETPOINT UNOCC HTG STPT	X					X									

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.

OCCUPIED:

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

UNOCCUPIED:

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 DISABLED.

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

MORNING WARM-UP MODE:

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

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 TERMINATE WHEN THE SPACE RELATIVE HUMIDITY FALLS BELOW THE RELATIVE HUMIDITY SETPOINT OF 50% (ADJ.) MINUS 5% (ADJ.). IF THE SPACE RELATIVE HUMIDITY SENSOR FAILS THE DEHUMIDIFICATION SEQUENCE SHALL BE TERMINATED AND AN ALARM SHALL ANNUNCIATE AT THE BAS.

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 (ADJ.).

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 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 71.0 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.

SUPPLY FAN:

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.

RELIEF FAN:

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

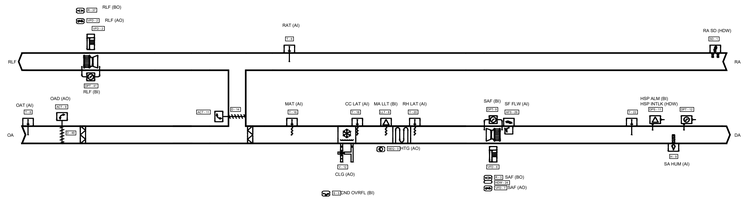
CONDENSATE OVERFLOW MONITORING:

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.

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

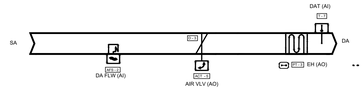
FLOW DIAGRAM: AH02



POINTS LIST - VAV TERMINAL UNIT

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

FLOW DIAGRAM: VAV TERMINAL UNIT



SEQUENCE OF OPERATION: VAV TERMINAL UNIT

SEQUENCE OF OPERATION: VAV TERMINAL UNIT

BUILDING AUTOMATION SYSTEM INTERFACE:

THE BUILDING AUTOMATION SYSTEM (BAS) SHALL SEND THE CONTROLLER OCCUPIED, AND UNOCCUPIED COMMANDS. THE BAS MAY ALSO SEND A HEAT/COOL MODE, PRIORITY SHUTDOWN COMMANDS, SPACE TEMPERATURE AND/OR SPACE TEMPERATURE SETPOINT. IF COMMUNICATION IS LOST WITH THE BAS, THE CONTROLLER SHALL OPERATE USING ITS LOCAL SETPOINTS.

OCCUPIED:

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 TEMPERATURE AT THE ACTIVE OCCUPIED HEATING OR COOLING SETPOINT. APPLICABLE VENTILATION AND AIRFLOW SETPOINTS SHALL BE ENFORCED. THE OCCUPIED MODE SHALL BE THE DEFAULT MODE OF THE VAV. APPLICABLE VENTILATION AND AIRFLOW SETPOINTS SHALL BE ENFORCED. THE OCCUPIED MODE SHALL BE THE DEFAULT MODE OF THE VAV.

OCCUPIED STANDBY:

THE OCCUPANCY MODE SHALL BE COMMUNICATED OR HARDWIRED TO THE CONTROLLER VIA A BINARY INPUT, EVEN THOUGH THE BAS HAS SCHEDULED THE SPACE AS OCCUPIED. IN THE 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 SETPOINTS SHALL BE LOWERED (SEE VAV SCHEDULE).

UNOCCUPIED:

NORMAL OPERATING MODE FOR UNOCCUPIED SPACES OR NIGHTTIME OPERATION. WHEN THE UNIT IS IN UNOCCUPIED MODE THE VAV CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT 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 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 UNOCCUPIED SETPOINT THE HOT WATER VALVE SHALL THE AIR DAMPER AND HOT WATER VALVE SHALL MODULATE FULLY CLOSED.

OCCUPIED BYPASS:

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 OCCUPIED MODE.

HEAT/COOL SETPOINT:

THE SPACE TEMPERATURE SETPOINT SHALL BE DETERMINED EITHER BY A LOCAL (E.G., 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 SETPOINT EXIST, THE VAV SHALL USE THE COMMUNICATED VALUE.

COOLING MODE:

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. THE VAV SHALL USE THE MEASURED SPACE TEMPERATURE AND THE ACTIVE COOLING 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 ONE OF THE FOLLOWING:

SETPOINT	DEFAULT VALUE
OCCUPIED COOLING SETPOINT	74.0 DEG. F
UNOCCUPIED COOLING SETPOINT	85.0 DEG. F
OCCUPIED STANDBY COOLING SETPOINT	78.0 DEG. F
OCCUPIED MIN COOLING AIRFLOW SETPOINT	SEE VAV SCHEDULE
OCCUPIED MAX COOLING AIRFLOW SETPOINT	SEE VAV SCHEDULE

HEATING MODE:

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 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:

SETPOINT	DEFAULT VALUE
OCCUPIED HEATING SETPOINT	71.0 DEG. F
UNOCCUPIED HEATING SETPOINT	60.0 DEG. F
OCCUPIED STANDBY HEATING SETPOINT	67.0 DEG. F
OCCUPIED MIN HEATING AIRFLOW SETPOINT	SEE VAV SCHEDULE
OCCUPIED MAX HEATING AIRFLOW SETPOINT	SEE VAV SCHEDULE

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:

ELECTRIC SILICON CONTROLLED RECTIFIER REHEAT (SCR):

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 CLOS