Town of Poland



Request for Proposals Town Office HVAC

The Town of Poland is requesting bid proposals for replacing the Town Office HVAC system. Companies submitting bids must submit them in sealed envelopes with "Town Office HVAC" clearly printed on the exterior. Proposals must include vendor's name, address, phone(s), contact person, and total cost. The enclosed bid form must be used, and bidders must observe all required state and federal laws and policies.

All inquiries regarding bids should be directed to the Town Manager at (207) 998-4601; email mgarside@polandtownoffice.org. Proposals must be delivered and clearly marked "Town Office HVAC" to Town Manager, Town of Poland, 1231 Maine Street, Poland, ME, 04274 or by email at mgarside@polandtownoffice.org no later than 11:00 AM, Thursday, September 1, 2022, at which time they will be opened and read publicly in the Town Office conference room. The Board of Selectpersons will consider proposals on Tuesday, September 6, 2022 at 7:00 PM in the Town Office conference room. The Town of Poland reserves the right to reject any or all bids.

Companies submitting bids must be registered with Efficiency Maine. Companies must also use the equipment detailed in the specification sheet. The Town intends to apply for Efficiency Maine rebates for the project and these two items are a requirement to apply for those rebates. The contractor shall coordinate with the Town prior to the purchase of equipment to ensure any rebates are realized.

The project will consist of several phases – all outlined in the attached documents.

Removal of the existing system and ducting.

Installation of the new system.

Repair of the roof over the Town Office Conference Room where the roof unit was removed.

The project should be completed before the start of the 2022 heating season.

LIABILITY INSURANCE – Successful Bidder must agree to procure and maintain at its expense, Commercial General Liability insurance for protection from claims under workers' compensation acts, claims for damages because of bodily injury including personal injury, sickness or disease or death of any and all employees or of any other such employees, and from claims for damages because of injury to or destruction of property including loss of use resulting therefrom, which may arise from the performance of services hereunder. The minimum amounts of coverage are:

Type of Insurance	Each Occurrence	Aggregate
General Liability – Combined	\$1,000,000	\$2,000,000
Bodily Injury and Property		
Damage		
Automobile Liability –	\$1,000,000	
Combined Bodily Injury and		
Property Damage		
Umbrella/Excess Liability	\$1,000,000	\$1,000,000
Worker's Compensation &	\$500,000 (Each Accident)	
Employer's Liability	\$500,000 (Disease Policy Limit)	
	\$500,000 (Disease Each Employee)	

Each such certificate shall list the Town as an additional insured and contain a statement of the insurer's obligation to notify the Town at least fifteen (15) days prior to cancellation of any policy covered there under. The Town shall be furnished with a Certificate of Insurance. In the event the Town is required to defend itself, the Successful Bidder shall reimburse the Town's costs, including reasonable attorneys' fees for defense of such liabilities which arise out of the Successful Bidder's negligence. In any claim which may arise as a result of intentional or negligent acts or omissions of the Successful Bidder, the Comprehensive General liability insurance policy provided by successful Bidder shall be deemed primary protection against such claims and the Town shall not be called upon to contribute to a loss otherwise payable by the Successful Bidder's insurer due to its insured's act or omission.

INDEMNIFICATION – To the fullest extent permitted by law, Successful Bidder does agree to defend, indemnify and hold harmless the Town, its officers, agents and employees, from and against all claims, damages, losses or expenses, just or unjust, including but not limited to costs of defense, arising out of or resulting from the performance of services hereunder, provided that any such claim, damage, loss or expense is caused in whole or in part by any negligent act or omission of Successful Bidder, its officers, agents or employees, anyone directly employed by it, or anyone for whose act it may be liable, except to the extent that said claim, damage, loss or expense is caused by the Town, its officers, or employees.

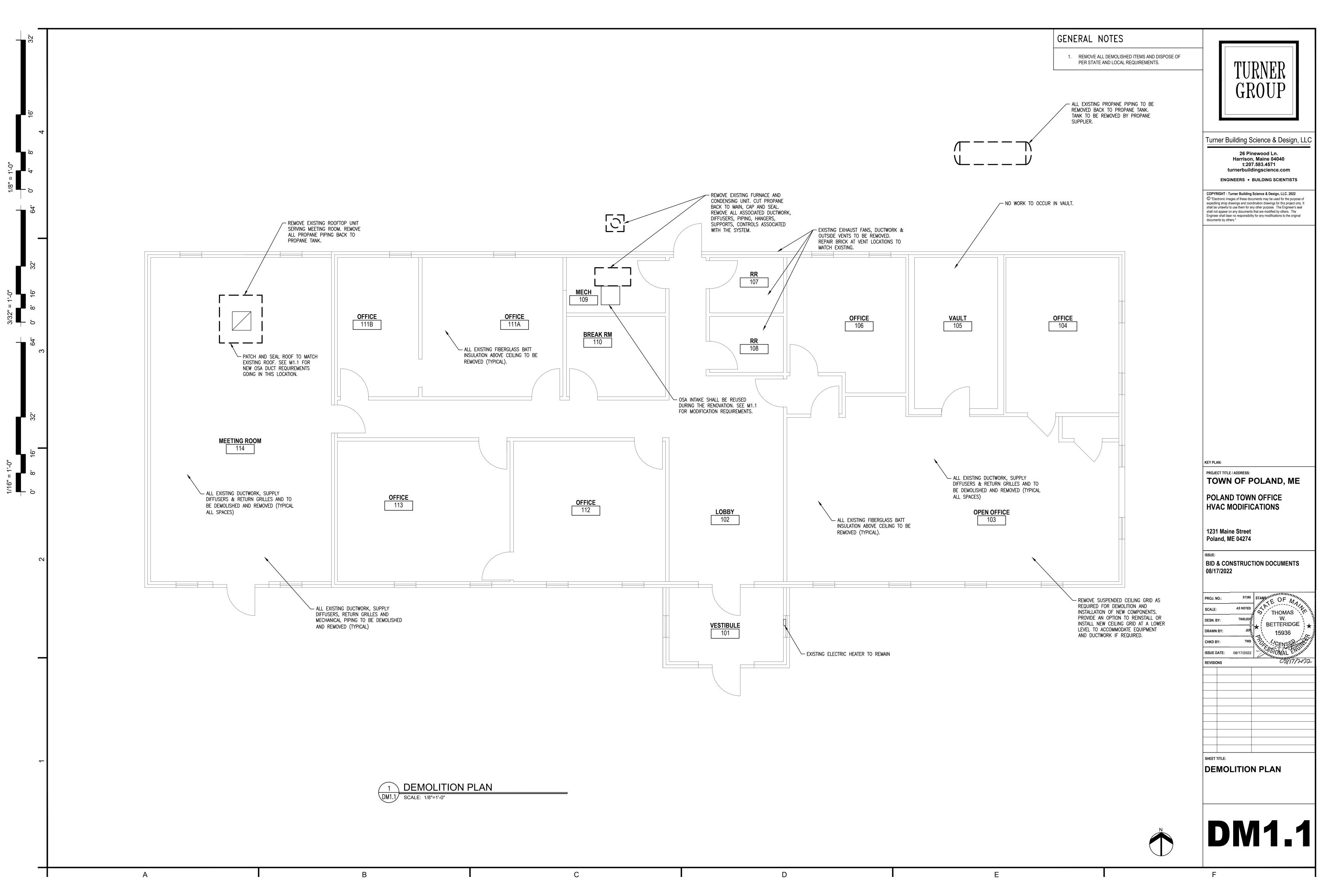
Town Office HVAC Official Bid Form

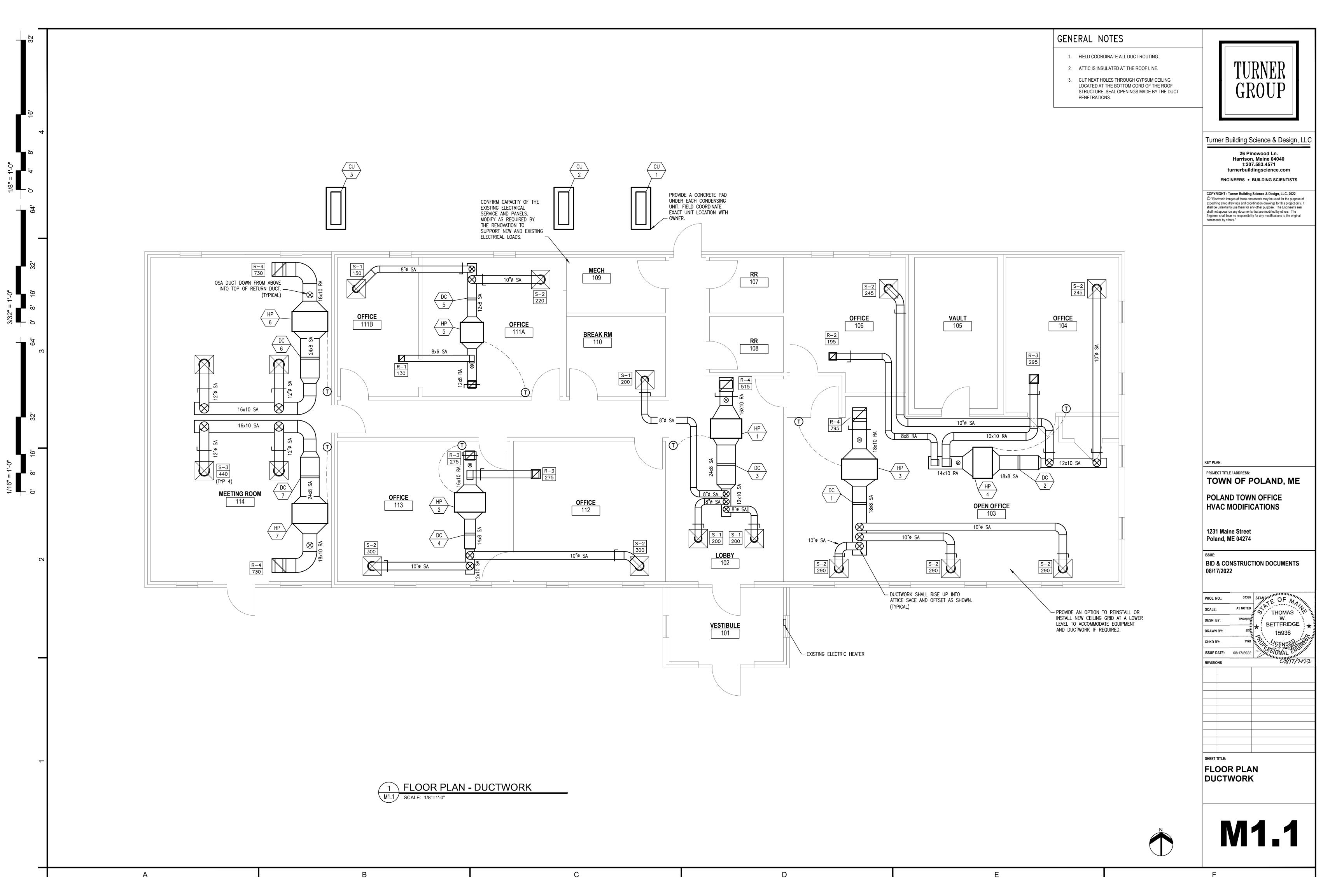
COMPANY NAME:
ADDRESS:
PHONE NUMBER(S):
EMAIL:
CONTACT PERSON:
Include proof of standard liability insurance, which names the Town of Poland as an additional insured in an amount no less than \$1,000,000.
A. TOTAL NET PRICE:
B. Guaranteed Delivery Date:
C. Confirm that your firm is on the Efficiency Maine list of certified contractors: Yes / No

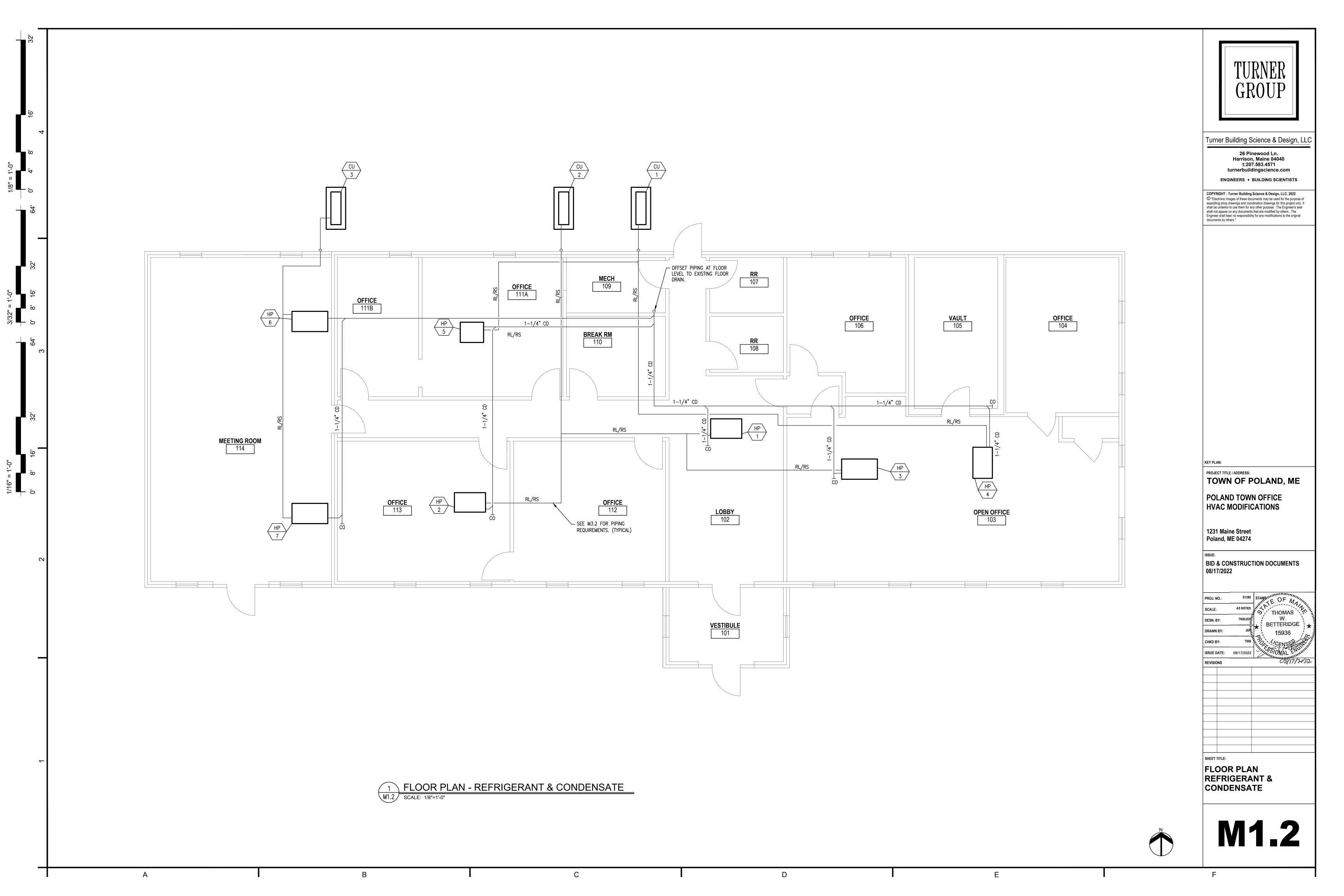
The Town of Poland reserves the right to reject any or all bids in whole or in part as it is deemed in the best interest of the Town, renegotiate any contract and waive any informality which does not compromise the actual bid.

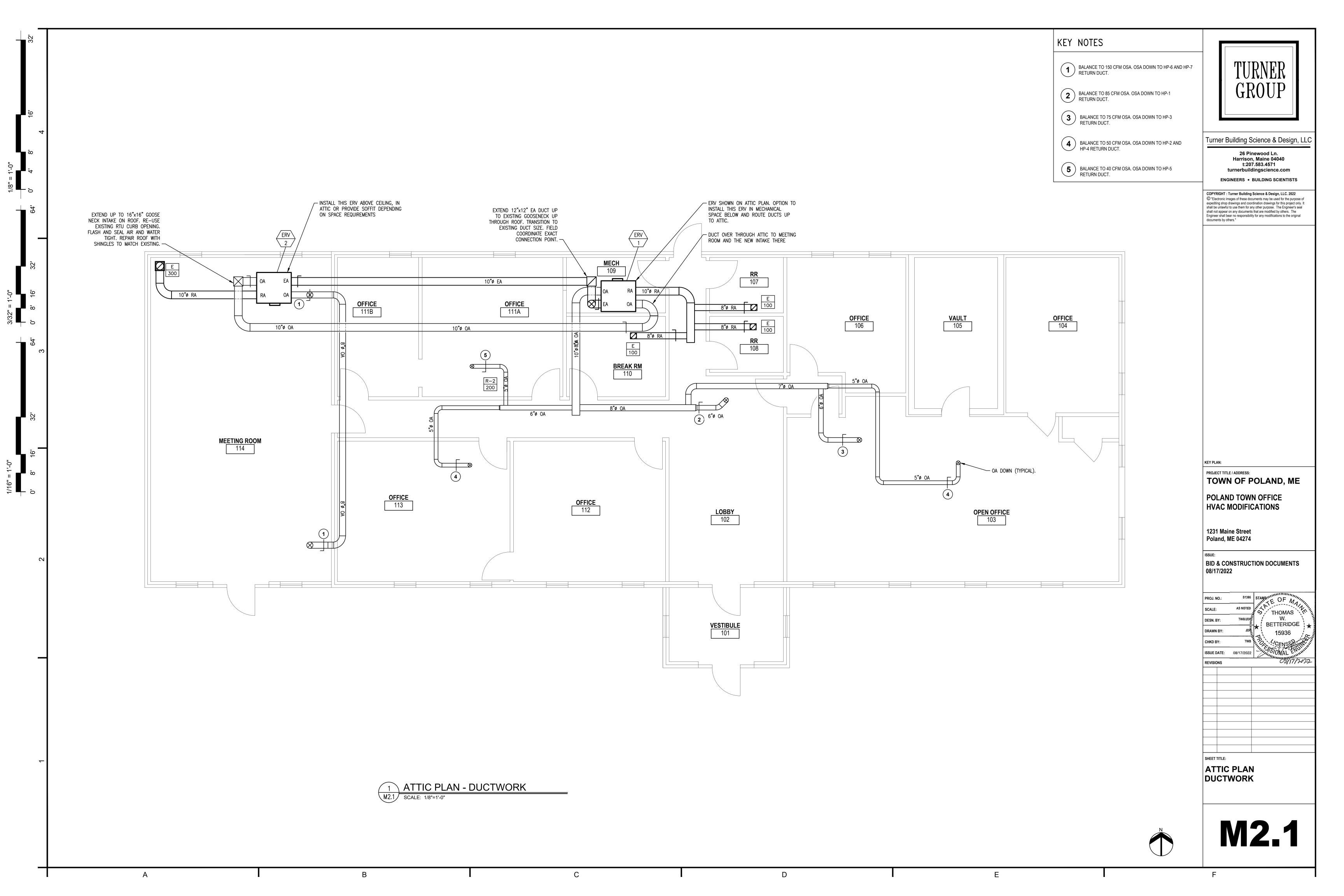
		·	MECHANICAL	LEGEND				DRAWING LIST — MECHANICAL	
_	ABBREVIATION		APPARATUS		SHEET METAL		PIPING	NO. TITLE MO GENERAL NOTES AND LEGEND	
MBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	DM1.1 DEMOLITION PLAN M1.1 FLOOR PLAN — DUCTWORK	TURN
4V	AUTOMATIC AIR VENT AIR CONDITIONING				DOUBLE-LINE CONVENTION	∤	ANGLE GLOBE VALVE	M1.2 FLOOR PLAN — REFRIGERANT & CONDENSATE M2.1 ATTIC PLAN	
v	AUTOMATIC CONTROL VALVE ACCESS DOOR		SMOKE DETECTOR		DOUBLE-LINE CONVENTION		AUTOMATIC AIR VENT	M3.1 DETAILS SHEET 1 OF 2 M3.2 DETAILS SHEET 2 OF 2	GRO
<i>1</i>	AIR FLOW MEASURING DEVICE ABOVE FINISHED FLOOR		PRESSURE GAUGE — INSTALL WITH BALL VALVE	<u>s</u>	SUPPLY DUCT UP - SIZE IN INCHES (WxH)		BALANCING VALVE	M4.1 SCHEDULES M5.1 SPECIFICATIONS SHEET 1 OF 3	
U D	AIR HANDLING UNIT ACOUSTICALLY LINED DUCT	\mathbb{H}	HUMIDISTAT		SUPPLY DUCT DOWN	—ф—	BALL VALVE	M5.2 SPECIFICATIONS SHEET 2 OF 3 M5.3 SPECIFICATIONS SHEET 3 OF 3	
J D	ALL SERVICE JACKET BACKDRAFT DAMPER		THERMOSTAT	R or E	EXHAUST OR RETURN DUCT UP	<u></u> ———Ó—□	BALL VALVE WITH HOSE END	MO.5 SPECIFICATIONS SHEET 5 OF 5	-
n D	BOTTOM OF DUCT BRITISH THERMAL UNIT	T	TEMPERATURE SENSOR		EXHAUST OR RETURN DUCT DOWN		BUCKET TRAP		Turner Building Scie
UH UH	BRITISH THERMAL UNIT PER HOUR BRITISH THERMAL UNIT PER HOUR	M	MOTOR				BUTTERFLY VALVE		26 Pinew
BD D	COUNTERBALANCED DAMPER CEILING FIRE DAMPER (RADIATION DAMPER)	\bigcirc	THERMOMETER (DIAL TYPE) IN WELL		FLEXIBLE DUCTWORK		CAPPED PIPE CHEMICAL TREATMENT		Harrison, Ma t:207.58
IWS	CHILLED WATER SUPPLY CENTERLINE		, ,		CHANGE OF ELEVATION R = RISE	——CHWS ——			turnerbuilding ENGINEERS • BUIL
2	CARBON MONOXIDE CARBON DIOXIDE CONDENSING UNIT		CARBON DIOXIDE SENSOR	- D	D = DROP	——CHWR ——	CHILLED WATER RETURN		
M	CONDENSING UNIT CONSTANT VOLUME CUBIC FEET PER MINUTE	Р	PRESSURE SENSOR			─ \\ \tag{\tag{\tag{\tag{\tag{\tag{\tag{	COMBINATION BALANCING, FLOW MEASURING, AND SHUT OFF VALVE (CIRCUIT SETTER)		COPYRIGHT: Turner Building Scier © "Electronic images of these documen expediting shop drawings and coordination."
E /	CONNECT TO EXISTING COLD WATER	T	TEMPERATURE SENSOR		TURNING VANES (TYP FOR MITERED ELBOWS)	CD	, , , , , , , , , , , , , , , , , , , ,		shall be unlawful to use them for any oth shall not appear on any documents that a Engineer shall bear no responsibility for a
R S	CONDENSATE WATER RETURN CONDENSATE WATER SUPPLY	F	FLOW SENSOR		DUCT SILENCER		CONNECTION ON BOTTOM OF PIPE		documents by others."
`	DAMPER DRY BULB TEMPERATURE, *F		HUMIDITY SENSOR			——	CONNECTION ON TOP OF PIPE		
G	DECIBELS DEGREES				FLEXIBLE CONNECTION		DIRECTION OF FLOW	CENTEDAL NIOTES	
G. F	DEGREES FAHRENHEIT DUCT FURNACE	S	SWITCH	AD }	ACCESS DOOR		DIRECTION OF PITCH	GENERAL NOTES	
\	DIAMETER DOWN	M ///	PARALLEL BLADE MOTORIZED DAMPER			DW	DOMESTIC WATER	1. GENERAL NOTES, SYMBOLS LIST AND DETAILS ARE APPLICABLE TO DRAWINGS MARKED M-#. ABBREVIATIONS AND SYMBOLS MAY NOT BE APPLICABLE TO THIS PARTICULAR PROJECT; THEY ARE PROVIDED FOR GENERAL REFERENCE ONLY.	
	DOWN DEW POINT TEMPERATURE, *F DIRECT EXPANSION	M / \ /	OPPOSED BLADE MOTORIZED DAMPER		CAP DUCT	D	DRAIN LINE	2. COORDINATE WORK OF THIS SECTION WITH THAT OF OTHER SECTIONS.	
	EXISTING, EXHAUST EXHAUST AIR				LOUVER	E	ELECTRICAL LINE	COORDINATE WORK OF THIS SECTION WITH THAT OF OTHER SECTIONS. COORDINATE WORK WITH ALL TRADES INVOLVED. PROVIDE OFFSETS IN PIPING AND DUCTS (INCLUDING DIVIDED DUCTS) AND TRANSITIONS AROUND OBSTRUCTIONS AT	
r B	EXHAUST AIR ENTERING AIR TEMPERATURE ELECTRIC BASEBOARD HEATER		VOLUME DAMPER					3. COORDINATE WORK WITH ALL TRADES INVOLVED. PROVIDE OFFSETS IN PIPING AND DUCTS (INCLUDING DIVIDED DUCTS) AND TRANSITIONS AROUND OBSTRUCTIONS AT NO ADDITIONAL COST TO THE OWNER.	
3	ELECTRIC BASEBOARD HEATER ELECTRIC COIL, EVAPORATOR COIL ENTERING DRY BULB		EQUIPMENT TAGS		SINCLE LINE CONVENTION	F—F	TILL	4. VERIFY EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. VERIFY AND PROVIDE DUCT TRANSITIONS TO FURNISHED EQUIPMENT. FIELD VERIFY	
, ,	ENTERING DRY BULB EXHAUST FAN ENERGY RECOVERY VENTILATOR				SINGLE-LINE CONVENTION		FLEXIBLE CONNECTION FLOAT & THERMOSTATIC TRAP	AND COORDINATE DIMENSIONS BEFORE FABRICATION.	
, 3	ENERGY RECOVERY VENTILATOR EXTERNAL STATIC PRESSURE (INCHES WATER GAUGE) ENTERING DRY BULB	XX #	SHOWN IN HEXAGON BELOW REQUIRE ELECTRICAL POWER		CEILING SUPPLY DIFFUSER	FOR		5. DRAWINGS ARE NOT INTENDED TO SHOW EVERY DETAIL. DUCT AND PIPING LOCATIONS INDICATED ARE APPROXIMATE. DETERMINE EXACT LOCATIONS IN THE FIELD.	
	ELECTRIC HEATER EXPANSION TANK		LOWER VALUE — EQUIPMENT TAG NUMBER UPPER VALUE — EQUIPMENT DESIGNATION		CEILING RETURN OR EXHAUST GRILLE	——FOS —	, san	6. INSTALL EQUIPMENT, PIPING AND DUCTWORK AS REQUIRED TO PROVIDE A VIBRATION FREE INSTALLATION, AND TO FACILITATE EQUIPMENT ACCESS AS REQUIRED BY EQUIPMENT MANUFACTURER.	
H B	ELECTRIC UNIT HEATER ENTERING WET BULB						FUSIBLE LINK VALVE	7. PROVIDE ACCESS PANELS WHERE REQUIRED, TO SERVICE DAMPERS, HEATERS, VALVES, AND CONCEALED MECHANICAL EQUIPMENT.	
T H	ENTERING WATER TEMPERATURE EXHAUST	$\langle AC \rangle$	AIR CONDITIONER		EXHAUST OR RETURN DOWN	G		8. PROVIDE ACCESS DOORS IN DUCTS AS REQUIRED BY CODE, AND AT SERVICE AND INSPECTION LOCATIONS INCLUDING UPSTREAM OF EACH ELBOW WITH TURNING	
ST	EXISTING EXISTING	AHU	AIR HANDLING UNIT		EXHAUST OR RETURN UP			VANES.	
	FAHRENHEIT FLEXIBLE CONNECTOR	B	BOILER	─	SUPPLY DUCT DOWN			9. DUCTWORK, UNLESS NOTED OTHERWISE, SHALL BE GALVANIZED STEEL, CONSTRUCTED AND INSTALLED ACCORDING TO LATEST SMACNA STANDARDS FOR 2 INCH WATER	
	FIRE DAMPER FULL LOAD AMPS	CP CP		│	SUPPLY DUCT UP	CWR		COLUMN STATIC PRESSURE RATING.	
`	FURNACE FEET PER MINUTE	1	CONDENSATE PUMP	l	CAP DUCT	CWX—CWS—	SOURCE WILL WEIGHT	10. INTERNAL CLEAR AIR FLOW DIMENSIONS ARE INDICATED FOR DUCTS. INCREASE SIZE OF EXTERNAL SHEET METAL TO ACCOMMODATE LININGS AND OTHER OBSTRUCTIONS.	
Κ	FOIL—SCRIM—KRAFT FEET		CONDENSING UNIT			——————————————————————————————————————	GLYCOL RETURN	11. PROVIDE 45-DEGREE OR BELLMOUTH TAKE-OFFS FOR DUCT RUNOUTS.	
. WG :T	FEET WATER GAUGE FLOAT & THERMOSTAT	DF 1	DUCT FURNACE		LINE TYPES			12. DUCT ELBOWS SHALL BE RADIUS ELBOWS WITH INSIDE RADIUS EQUAL TO THE WIDTH OF THE DUCT IN THE PLANE OF THE TURN, EXCEPT WHERE SPACE DOES NOT	
R I	FIN TUBE RADIATION GALLON(S)	EBB 1	ELECTRIC BASEBOARD HEATER		EXISTING ITEM TO REMAIN	GS	GLYCOL SUPPLY	PERMIT OR AS SPECIFICALLY INDICATED OTHERWISE.	
LV PH	GALLON(3) GALVANIZED GALLONS PER HOUR	EF	EXHAUST FAN			HWS		13. PROVIDE FLEXIBLE DUCT CONNECTIONS ON DUCTS CONNECTING TO FANS, AND TO AIR HANDLING UNITS WHOSE FANS ARE NOT INTERNALLY ISOLATED BY FLEXIBLE	PROJECT TITLE / ADDRESS:
M R	GALLONS PER HOUR GALLONS PER MINUTE GEOTHERMAL SOURCE RETURN	EH 1	ELECTRIC HEATER	* * *	EXISTING ITEM TO BE REMOVED	—— HWR——	HEATING WATER RETURN LOW PRESSURE STEAM		TOWN OF PO
is	GEOTHERMAL SOURCE SUPPLY HOT GAS PIPING	1 /FRV	ENERGY RECOVERY VENTILATOR		NEW ITEM	LPC			DOLAND TOWN
RU RV	HEAT RECOVERY UNIT HEAT RECOVERY VENTILATOR	1			HIDDEN ITEM	<u></u>	MANUAL AIR VENT		POLAND TOWN O
VP VR	HOT WATER PUMP HEATING WATER RETURN	EUH)	ELECTRIC UNIT HEATER		CONTROL WIRING	───	NON-SLAM CHECK VALVE	TO. TAINT THE INSIDE OF BOOTWORK VISIBLE THROUGH A REDISTER, OR OTHER OF ENING, FEAT BEACK.	
VS	HEATING WATER SUPPLY HORSEPOWER; HEAT PUMP	$\left\langle \frac{F}{1}\right\rangle$	FAN - CEILING PADDLE TYPE			\dashv _ $\!$	OS&Y VALVE	17. SEAL DUCT JOINTS, SEAMS AND PENETRATIONS WITH WATER BASED FLEXIBLE DUCT SEALANT OR SILICONE DUCT SEALANT PER SMACNA SEAL CLASS A AND PER APPLICABLE CODES.	1231 Maine Street
<i>'</i>	HOT WATER INCHES	$\langle FC \rangle$	FAN COIL UNIT		OTHER SYMBOLS		PIPE ANCHOR		Poland, ME 04274
WG	INCHES WATER GAUGE LOUVER	FN	FURNACE	ø	DIAMETER	е	PIPE DROP	19. PROVIDE AT LEAST THREE-ELBOW SWINGS FOR PIPE TAKE-OFFS. BRANCH TAKE-OFFS SHALL BE FROM THE BOTTOM OF MAINS TO KEEP AIR BUBBLES FLOWING IN	ISSUE
T IS	LEAVING AIR TEMPERATURE POUNDS	GUH\	GAS UNIT HEATER				PIPE RISER	THE MAINS	BID & CONSTRUCTION
)В /Т	LEAVING DRY BULB LEAVING WATER TEMPERATURE			-√-	RETURN/EXHAUST AIR FLOW DIRECTION	_=	PIPE GUIDE	20. PITCH HYDRONIC PIPING 1 INCH PER 20 FEET IN DIRECTION OF FLOW TO DRAINS AND VENTS. PITCH CONDENSATE PIPING AS REQUIRED BY CODE AND AS INDICATED. PITCH REFRIGERANT SUCTION AND HOT GAS PIPING TO RETURN OIL TO COMPRESSORS, AND AS REQUIRED BY EQUIPMENT MANUFACTURER.	08/17/2022
X BH	MAXIMUM THOUSAND BTU PER HOUR	1	HEAT PUMP		SUPPLY AIR FLOW DIRECTION	A ——	PNEUMATIC AIR LINE		
A	MINIMUM CIRCUIT AMPACITY MOTORIZED DAMPER	$\frac{\langle HRU \rangle}{1}$	HEAT RECOVERY UNIT		UNDERCUT DOOR			21. INSULATE PIPING AS SPECIFIED. PERFORM TESTS SPECIFIED BEFORE INSULATING.	PROJ. NO.: \$1386 STA
R N	MANUFACTURER MINIMUM	(HRV)	HEAT RECOVERY VENTILATOR		-		PUMP		SCALE: AS NOTED
CP IA	MAXIMUM OVER CURRENT PROTECTION MAKE-UP AIR	MUA	MAKE UP AIR UNIT				NEI MOEINANT EIGOID	PROVIDE ACCESSIBILITY. 48 INCHES IS THE HEIGHT FOR UNOBSTRUCTED FORWARD ACCESS; FOR OTHER ACCESS CONDITIONS MODIFY THE HEIGHT ACCORDINGLY PER CODE; SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION. MOUNT ON WALL BOX ATTACHED TO RIGID WALL FRAMING, WITH CONDUIT.	DESN. BY: TWB/JDP
	NOISE CRITERIA NORMALLY CLOSED	<u>1</u>	PUMP			—— RS ——	REFRIGERANT SUCTION	23. ROOM HEATING AND COOLING THERMOSTATS AND SENSORS SHALL INCLUDE A DEADBAND OF AT LEAST 2 DEG. F BETWEEN HEATING AND COOLING SETPOINTS, TO	DRAWN BY: JDF
c ;	NATIONAL ELECTRIC CODE NOT IN CONTRACT	1 RF					REDUCER - CONCENTRIC	-	CHKD BY: TWB ISSUE DATE: 08/17/2022
м I	NORMALLY OPEN, NITROGEN DIOXIDE NOMINAL	1	RETURN FAN				REDUCER — ECCENTRIC		
	OUTSIDE AIR OUTSIDE AIR INTAKE	(RTU)	ROOF TOP UNIT			***************************************	SAFETY VALVE OR PRESSURE RELIEF	25. ALL ELECTRICAL WORK REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM SHALL BE PROVIDED BY THE MECHANICAL CONTRACTOR. ANY PERMITS OR LICENSED ELECTRICAL WORK THAT THE MECHANICAL CONTRACTOR IS NOT ABLE TO PERFORM OR PROVIDE SHALL BE SUB CONTRACTED TO A LICENSED ELECTRICAL	REVISIONS
D D	OPPOSED BLADE DAMPER OPEN-ENDED DUCT	$\left\langle \frac{\text{UH}}{1} \right\rangle$	UNIT HEATER				SOLENOID VALVE	CONTRACTOR/COMPANY.	
.	PUMP POUNDS PER CUBIC FOOT						SPRING CHECK VALVE		
·	PRESSURE DROP PRESSURE REDUCING VALVE	-	 	1					
G	POUNDS PER SQUARE INCH POUNDS PER SQUARE INCH GAUGE		AIR DISTRIBUTION DEVICE DESIGNATION				SWING CHECK VALVE		
	RETURN RETURN AIR	S-1	UPPER VALUE - DEVICE TYPE / TAG #				THERMOSTATIC TRAP		
	RELATIVE HUMIDITY, REHEAT REFRIGERANT LIQUID PIPING	CFM	X = EXISTING TO BE REUSED						
М	REVOLUTIONS PER MINUTE REFRIGERANT SUCTION PIPING		LOWER VALUE — AIR FLOW QUANTITY IN CFM			十 分	ELECTRIC OR ELECTRONIC		
'	ROOF TOP AIR CONDITIONING UNIT SUPPLY			4			TRIPLE—DUTY VALVE (COMBINATION CHECK, FLOW MEASURING, BALANCING VALVE, AND SHUT OFF)		SHEET TITLE:
	SUPPLY AIR SUPPLY FAN	L-1 CFM	LOUVER			 			COVER SHEET
. FT	SQUARE FEET STATIC PRESSURE (INCHES WATER GAUGE)	T-1 CFM	TRANSFER GRILLE OR REGISTER				ELECTRIC OR ELECTRONIC		
. IN.	SQUARE INCHES STAINLESS STEEL					——II——	UNION OR FLANGE		
P	TEMPERATURE SENSOR TOTAL STATIC PRESSURE (INCHES WATER GAUGE)	D-1 CFM	DISPLACEMENT DIFFUSER				FINNED TUBE RADIATION DESIGNATION]	
5	TYPICAL UNIT HEATER	S-1 CFM	SUPPLY DIFFUSER				UPPER VALUE — EQUIPMENT DESIGNATION & TAG #		
V	VARIABLE AIR VOLUME VOLUME DAMPER		4 WAY BLOW EXCEPT WHERE INDICATED OTHERWISE			FTR-XX	LOWER VALUE - MBH		RΛ
	VOLUME DAMPER VARIABLE FREQUENCY DRIVE WATTS	R-1 CFM	RETURN GRILLE OR REGISTER			X LF	VALUE BELOW — ACTIVE LENGTH OF FINNED TUBE ENCLOSURE. LENGTH SHALL BE AS SHOWN		171
	WATTS WET BULB TEMPERATURE, *F WATER COLUMN	F-1	FYHALIST CDILLE OR REGISTER				OR NOTED ON THE PLANS		_
	WATER COLUMN WATER GAUGE	CFM	EXHAUST GRILLE OR REGISTER				RETURN PIPING IN CABINET		

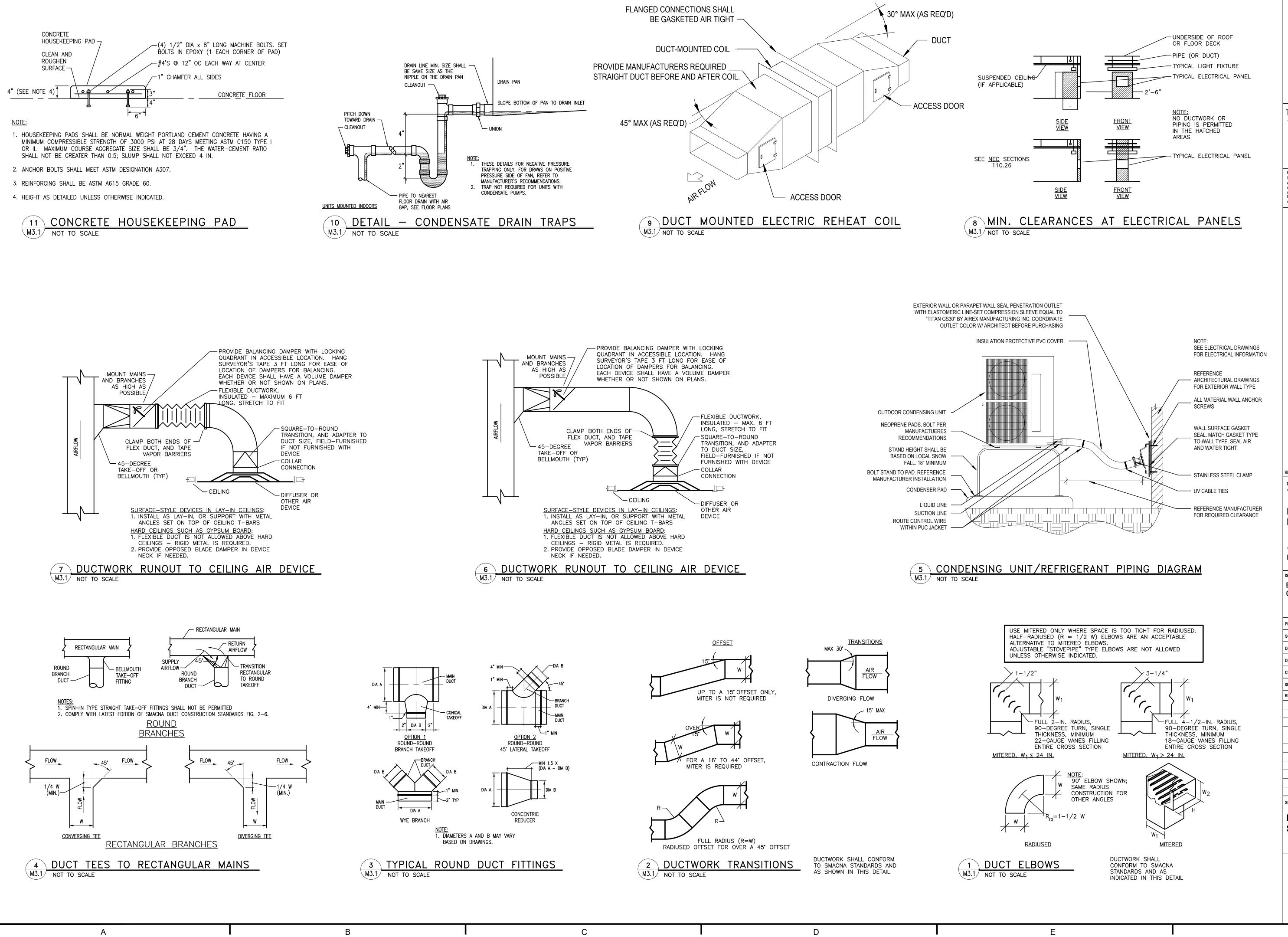
PROJ. NO.:	\$1386	STANRIUM OF MANAGEMENT OF THOMAS
SCALE:	AS NOTED	THOMAS THOMAS
DESN. BY:	TWB/JDP	
DRAWN BY:	JO	
CHKD BY:	TWB	ON YCENSE
ISSUE DATE:	08/17/2022	STOWAL ENDING
REVISIONS		08/17/2022











TURNER GROUP

26 Pinewood Ln.
Harrison, Maine 04040
t:207.583.4571

ENGINEERS • BUILDING SCIENTISTS

turnerbuildingscience.com

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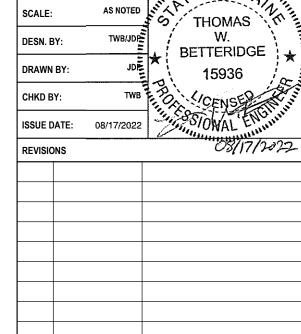
KEY PLAN:

PROJECT TITLE / ADDRESS:
TOWN OF POLAND, ME

POLAND TOWN OFFICE HVAC MODIFICATIONS

1231 Maine Street Poland, ME 04274

BID & CONSTRUCTION DOCUMENTS 08/17/2022



SHEET TITLE:

DETAILS SHEET 1 OF 2

M3.1

Turner Building Science & Design, LLC

26 Pinewood Ln. Harrison, Maine 04040 t:207.583.4571 turnerbuildingscience.com

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PROJECT TITLE / ADDRESS:

1231 Maine Street Poland, ME 04274

REVISIONS

SHEET TITLE:

TOWN OF POLAND, ME

POLAND TOWN OFFICE

HVAC MODIFICATIONS

BID & CONSTRUCTION DOCUMENTS 08/17/2022

This drawing is schematic in nature. Final routing of piping & wiring shall be determined by the installing contractor and/or designer of record Additional refrigerant charge is needed depending on the size and length of extended piping. Please refer the amount of pre—charge and the formula of calculation which is mentioned on the data book. CITY MULTI NTXMSH48A182AACU-N] NTXMSH42A152AÆCU-S] TB3 G DIP SWITCH 7-3 DFF TB3 G DIP SWITCH 7-3 OFF 208-230V FUSE 208-230V FUSE CR CR CR CR AC-2 AC-3 Diamond System Builder sw: 4.4.2.17 db: 4.4.2.5 7/29/2022 10:56 AM

200 2504) 0012 FUSE

NTXMSH42A152A4CU-W]

LILZ TB7

C56

TB3 G DIP SWITCH 7-3 DFF

(S)

P1

1006
185185 65

185185 67

1FET PROZEMIJENA

PET PROZEMIJENA

DELERALISE

CR

CR

AC-6 AC-7

DETAILS SHEET 2 OF 2

M3.2

	VRF INDOOR UNIT SCHEDULE																						
				COOI	LING (BTUH)			FAN			FILTI	RS			U	NIT ELECTRI	ICAL		DINATNICIONIC				
TAG	SERVES	SYSTEM	UNIT TYPE	TOTAL	SENSIBLE	HEATING (BTUH)	SUPPLY AIRFLOW (CFM)	OUTSIDE AIRFLOW (CFM)	ESP (IN. WG)	DRAIN (IN.)	MERV-A	THICK (IN.)	SOUND dB(A)	VOLTS	PH	HZ	MCA	MFS	- DIMENSIONS (W x D x H) (IN.)	WEIGHT (LBS)	MANUFACTURER	MODEL	NOTES
HP-1	LOBBY & BREAKROOM	CU-1	DUCTED	15,835	13,090	17,981	600	85	0.6	1-1/4	13	2	37	208/230	1	60	2.94	15	40x25.57x9.875	60	MITSUBISHI	TPEFYP018MA144A	1,2,3,4,5
HP-2	112 OFFICE & 113 OFFICE	CU-1	DUCTED	15,835	13,090	17,174	600	50	0.6	1-1/4	13	2	37	208/230	1	60	2.94	15	35.44x27.57x9.875	60	MITSUBISHI	TPEFYP018MA144A	1,2,3,4,5
HP-3	OPEN OFFICE	CU-1	DUCTED	21,113	18,345	23,185	870	75	0.6	1-1/4	13	2	39	208/230	1	60	2.88	15	46.312x27.57x9.875	70	MITSUBISHI	TPEFYP024MA144A	1,2,3,4,5
HP-4	104 OFFICE & 106 OFFICE	CU-2	DUCTED	13,196	10,845	15,284	490	50	0.6	1-1/4	13	2	34	208/230	1	60	2.88	15	35.44x27.57x9.875	60	MITSUBISHI	TPEFYP015MA144A	1,2,3,4,5
HP-5	111A & 111B OFFICE	CU-2	DUCTED	10,556	7,970	12,137	370	40	0.6	1-1/4	13	2	34	208/230	1	60	2.13	15	27.56x27.57x9.875	50	MITSUBISHI	TPEFYP012MA144A	1,2,3,4,5
HP-6	MEETING	CU-3	DUCTED	21,113	18,345	20,179	880	150	0.6	1-1/4	13	2	39	208/230	1	60	2.88	15	46.312x27.57x9.875	70	MITSUBISHI	TPEFYP024MA144A	1,2,3,4,5
HP-7	MEETING	CU-3	DUCTED	21,113	18,345	20,179	880	150	0.6	1-1/4	13	2	39	208/230	1	60	2.88	15	46.312x27.57x9.875	70	MITSUBISHI	TPEFYP024MA144A	1,2,3,4,5

NOTES:

1. RATED TEMPERATURES: COOLING EAT, 80 DB / 67 WB INDOORS, 95 DB OUTDOORS. HEATING, 70 DB INDOORS, 43 DB OUTDOORS.

2. CONDENSATE DRAIN: CEILING UNITS: PROVIDE CONDENSATE PUMP AS SPECIFIED, POWERED FROM UNIT POWER. DUCTED UNITS: INTERNAL RISER TO RAISED OUTLET FOR GRAVITY DRAIN. ALL UNITS: DRAIN HOSE AND CLAMPS TO RIGID PIPE.

3. MITSUBISHI SIMPLE MA REMOTE WALL CONTROLLER. SINGLE CONTROLLER PER UNIT. PROVIDE RELAY KIT FOR EXTERNAL HEATER ADAPTER FOR ELECTRIC DUCT COIL.

4. SEE OUTDOOR UNIT FOR ADDITIONAL NOTES.

5. PROVIDE WITH FILTER BOX WITH MERV 13 FILTERS.

									VRF	SYSTE	ЕМ О	UTDOOR UI	NIT SC	HEDULE											
			NIOR GINLAI	COOLING		RATED TEM	PS INDOORS	DESIGN OUTDOO	OR TEMPERATURE		EFFIC	CIENCIES	REI	RIGERANT	COLIND		UNI	T ELEC	TRICAL		CIZE				
TAG	SERVES	UNIT TYPE	NOMINAL CAPACITY (TONS)	COOLING CAPACITY (BTUH)	HEATING CAPACITY (BTUH)	COOLING (DEG. F DB)	HEATING (DEG. F DB)	COOLING (DEG. F DB)	HEATING (DEG. F WB)	EER	SEER	COP (47 DEG. F)	TYPE	FACTORY CHARGE (LB)	SOUND PRESSURE LEVEL dB(A)	VOLTS	РН	HZ	MCA	МОСР	SIZE (W x D x H) (IN.)	WEIGHT (LBS)	MANUFACTURER	MODEL	NOTES
CU-1	HP-1,2,3	HYPER HEAT	4	47,614	45,404	75	70	87	-6.5	12.2	19.75	3.65	410A	5.6	54	208/230	1	60	36	40	42x13x53	300	MITSUBISHI	NTXMSH48A182AA	1,2,3,4,5,6,7,8,9 ,10,11
CU-2	HP-4,5,6	HYPER HEAT	3.5	42,382	40,359	75	70	87	-6.5	12.2	20	3.75	410A	5.6	54	208/230	1	60	36	40	42x13x53	300	MITSUBISHI	NTXMSH42A152AA	1,2,3,4,5,6,7,8,9 ,10,11
CU-3	HP-6,7	HYPER HEAT	3.5	42,382	40,359	75	70	87	-6.5	12.2	20	3.75	410A	5.6	54	208/230	1	60	36	40	42x13x53	300	MITSUBISHI	NTXMSH42A152AA	1,2,3,4,5,6,7,8,9 ,10,11

GENERAL NOTES:

1. HEAT PUMP SYSTEM PROVIDES EITHER HEATING OR COOLING.

2. INTEGRATE ERV'S INTO SYSTEM FOR OCCUPIED UNOCCUPIED CONTROL.

3. EFFICIENCY VALUES ARE BASED ON AHRI 1230 TEST METHOD.

4. PROVIDE INTERCONNECTING POWER AND CONTROL WIRING IN CONDUIT TO INDOOR UNITS AND CONTROLS.

5. REFRIGERANT CHARGE SHALL BE FIELD-VERIFIED.

6. SEE MANUFACTURER'S WRITTEN REQUIREMENTS AND GUIDELINES FOR INSTALLATION REQUIREMENTS

7. PROVIDE GROUND MOUNTING STAND. HEIGHT AT LEAST 24 IN. ABOVE ADJACENT FINISHED GRADE, SHIMMED LEVEL.

8. BOLT UNITS TO RAILS WITH LARGEST-POSSIBLE DIAMETER HEX-HEAD FASTENER AT EACH FACTORY MOUNTING HOLE.

9. FACTORY REPRESENTATIVES SHALL STARTUP AND COMMISSION EQUIPMENT UPON COMPLETION OF EQUIPMENT INSTALLATIONS.

10. FACTORY REPRESENTATIVES SHALL PROVIDE END-USER TRAINING ON THE EQUIPMENT UPON COMPLETION OF THE INSTALLATION OF EQUIPMENT.

11. UNIT SHALL HAVE HYPER-HEATING PERFORMANCE PROVIDING 100% CAPACITY AT 5 DEG F. AND 75% HEATING CAPACITY AT -13 DEG. F.

									EN	NERGY REC	OVER VEN	TILAT	OR SCHE	DULE						
		TEMPERATURE EFFECTIVENESS,					FAN M	OTOR(S)	WINTE	R PERFORMANCE	SUMMER PERF	ORMANCE		ELECTRICAL						
TAG	SERVES	WINTER (SENSIBLE LOAD	SYSTEM	AIRFLOW (CFM)	ESP (IN. WG)	FAN SPEED	QTY.	кw	EAT	LAT	EAT	LAT	VOLTS /DU /UZ	NACA (ANADS)	MOCP (AMPS)	MANUFACTURER	MODEL	BASE DIMENSIONS LxWxH (IN)	WEIGHT (LBS)	NOTES
		REDUCTION)					QII.	KVV	DB	DB/WB	DB	DB	VOLI3/PH/HZ	IVICA (AIVIPS)	IVIOCP (AIVIPS)					
ED\/ 1	OFFICES	75.00%	SUPPLY	300	0.4	MED-HIGH	1	0.176	0	49	95	88.7	230/1/60	2.1	15	TRANE-MITSUBISHI	TLGHF0470RVX	39.5 x 45 x 16	110	122456
EKA-1	OFFICES	75.00%	EXHAUST	300	0.4	MED-HIGH	1	0.176	70	21	74	80.3	250/1/60	3.1	12	TRAINE-IVII I SUBISITI	ILGHF0470KVX	39.3 X 43 X 16	110	1,2,3,4,5,6
ERV-2	MEETING	75 00%	SUPPLY	300	0.4	MED-HIGH	1	0.176	0	49	95	88.7	230/1/60	2.1	15	TRANE-MITSUBISHI	TLGHF0470RVX	39.5 x 45 x 16	110	122456
ERV-Z	ROOM	75.00%	EXHAUST	300	0.4	MED-HIGH	1	0.176	70	21	74	80.3	250/1/60	5.1	12	TRAINE-IVII I SUBISHI	ILGHFU4/UKVX	25.5 X 45 X 10	110	1,2,3,4,5,6

1. PROVIDE WITH DISCONNECT SWITCH.

4. INSTALL WITH FLEXIBLE CONNECTION

PROVIDE WITH DISCONNECT SWITCH.

2. PROVIDE MERV-8 FILTERS FOR SUPPLY AND MERV-8 FILTERS FOR EXHAUST.

3. GALVANIZED STEEL CONSTRUCTION, WITH INSULATED CABINET
4. PROVIDE SPRING ISOLATORS WITH 1-INCH INITIAL DEFLECTION

5. PROVIDE WITH HIGH EFFICIENCY DC MOTORS

	RETURN, EXHAUST & TRANSFER GRILLE SCHEDULE													
TAG	NECK SIZE (IN.)	FRAME SIZE (IN.)	AIRFLOW (CFM)	SP (IN. WG)	SOUND (NC)	ТҮРЕ	FRAME	MANUFACTURER	MODEL	NOTES				
R-1	8x8	8x8	156	0.021	-	CEILING	LAY-IN	PRICE	80	1,2,3,4				
R-2	10x10	10x10	240	0.021	-	CEILING	LAY-IN	PRICE	80	1,2,3,4				
R-3	12x12	12x12	360	0.021	-	CEILING	LAY-IN	PRICE	80	1,2,3,4				
R-4	18x18	18x18	832	0.021	-	CEILING	LAY-IN	PRICE	80	1,2,3,4				
NOTES:					,	GENERAL NOTES:								
1. INSTALL AS LAY-	IN, OR SU	RFACE MOU	JNT WITH SU	JPPORT		1. PROVIDE WITH WHITE STANDARD FINISH								
2. FOR INSTALLATION	ON IN 24x	24 EXPOSE	D TEE CEILIN	G		2. SEE PLANS FOR	R MULTIPLE UNIT	LOCATIONS.						
3. CONTRACTOR SH	HALL PRO\	/IDE SQUAI	RE-TO-ROUN	ND TRANS	ITION	3. AIRFLOW SCHEDULED IS FOR RATED PERFORMANCE. BALANCING CFM IS INDICATED ON PLANS.								

TAG	NECK SIZE (IN.)	FRAME SIZE (IN.)	AIRFLOW (CFM)	THROW (FT)	SOUND (NC)	SP (IN. WG)	PATTERN	ТҮРЕ	FRAME	MANUFACTURER	MODEL	NOTES						
S-1	10	24"x24"	218	3	-	0.03	4-WAY	LAY-IN	CEILING	PRICE	SPD	1,2,3,4,5,6,7,8,9						
S-2	12	24"x24"	314	4	-	0.04	4-WAY	LAY-IN	CEILING	PRICE	SPD	1,2,3,4,5,6,7,8,9						
S-3	14	24"x24"	440	5	-	0.06	4-WAY	LAY-IN	CEILING	PRICE	SPD	1,2,3,4,5,6,7,8,9						
OTES						GENERAL NOTE	S:				<u> </u>							
. FOR	INSTALLATIO	N IN 24x24 EX	(POSED TEE	CEILING		1. PROVIDE WI	TH WHITE STAND	ARD FINISH										
. INST	ALL AS LAY-II	N, OR SURFAC	E MOUNT \	WITH SUPF	PORT	2. SEE PLANS FO	OR MULTIPLE UN	T LOCATIONS										
. INSTALL AS LAY-IN, OR SURFACE MOUNT WITH SUPPORT 2. SEE PLANS FOR MULTIPLE UNIT LOCATIONS . SQUARE-TO-ROUND ADAPTER TO AVAILABLE SIZE NEAREST 3. AIRFLOW SCHEDULED IS FOR RATED PERFORMANCE. BALANCING CFM IS INDICATED ON PLANS.																		
O DU	CT SIZE																	
. THR	OWS RATED A	AT 75 FPM TER	RMINALVEL	.OCITY		4. SQUARE-NEC	K CEILING DIFFU	SERS: 4-WAY PATT	ERN SCHEDULED; PR	OVIDE CORE PATTERN	S AS INDIC	ATED ON PLANS.						
	OWS RATED A	AT 200-100 FPI	M TERMINA	AL VELOCIT	Υ	4. CONTRACTO	R SHALL PROVID	ANY TRANSITIONS	S REQUIRED TO DUC	ΓSIZE								
5. THR		AT 100 FPM TE	RMINALVE	LOCITY		5. BALANCING	AGENT SHALL SE	T DISCHARGE VANE	S TO REQUIRED PAT	TERN FOR COMFORTA	BLE AIRFLO	W						
	DWS RATED A		. PLAQUE FACE. ADJUST THERMAL DIFFUSER SETPOINTS - 70°F 6. CONTRACTOR SHALL PROVIDE ANY TRANSITIONS REQUIRED TO DUCT SIZE															
. THR			AL DIFFUSE	K SETPOIN	113 /01		HEATING, 75°F COOLING.											
. THRO	QUE FACE. AI	DJUST THERM	AL DIFFUSE	K SETPOIN	113 701													
5. THRO 7. PLAO HEATIN	QUE FACE. AI	DJUST THERM		R SETPOIN	701													

6. PROVIDE WITH INTERLOCKS TO SIMPLE MA CONTROLLER FOR OCCUPIED UNOCCUPIED SCHEDULING.

7. PROVIDE SENSIBLE AND LATENT CROSS-FLOW ENERGY RECOVERY CORE.

DUCT HEATER SCHEDULE												
TAG	CFM	KW	MINIMUM VELOCITY (FPM)	MINIMUM STAGES	EAT (DEG. F.)	LAT (DEG. F.)	DIMENSIONS WxH (IN)	V/PH/HZ	AMPS	MANUFACTURER	MODEL	NOTES
DC-1	600	6.5	500	4	56	90	18 x 8	230/1/60	28.261	GREENHECK	IDHB	1
DC-2	600	6.5	500	4	56	90	18 x 8	230/1/60	28.261	GREENHECK	IDHB	1
DC-3	870	10	500	4	54	90	24 x 8	230/1/60	43.478	GREENHECK	IDHB	1
DC-4	490	5.5	500	4	55	90	14 x 8	230/1/60	23.913	GREENHECK	IDHB	1
DC-5	370	4.5	500	4	52	90	12 x 8	230/1/60	19.565	GREENHECK	IDHB	1
DC-6	880	12	600	4	47	90	24 x 8	230/1/60	52.174	GREENHECK	IDHB	1
DC-7	880	12	600	4	47	90	24 x 8	230/1/60	52.174	GREENHECK	IDHB	1
NOTES:	NOTES:											
1. PRO\	. PROVIDE WITH ADJUSTABLE AIRFLOW SWITCH, CONTROLS TRANSFORMER, DISCONNECT SWITCH AND FAN INTERLOCK.											



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EV DI AN:

PROJECT TITLE / ADDRESS:

TOWN OF POLAND, ME

POLAND TOWN OFFICE HVAC MODIFICATIONS

1231 Maine Street Poland, ME 04274

BID & CONSTRUCTION DOCUMENTS
08/17/2022

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ET TITLE:

SCHEDULES

M4_1

B C

4. CONTRACTOR SHALL PROVIDE ANY TRANSITIONS REQUIRED TO

PACKAGING IN PLACE UNTIL INSTALLATION.

COORDINATE AND MANAGE EACH TRADE'S EFFORT WHILE THEY PLACE THEIR

NFORMATION ON THE SAME DRAWINGS.

C. USE HANGERS AND SUPPORTS WITH GALVANIZED METALLIC COATINGS FOR PIPING AND EQUIPMENT THAT WILL NOT HAVE FIELD-APPLIED FINISH. C. GALVANIZED-STEEL-SHEET SLEEVES: 0.0239-INCH (0.6-MM) MINIMUM THICKNESS; ROUND TUBE CLOSED WITH WELDED LONGITUDINAL JOINT. D. USE THERMAL-HANGER SHIELD INSERTS FOR INSULATED PIPING AND TUBING. D. SLEEVE: PROVIDE SMOOTH, CORE-DRILLED HOLE IN CONCRETE CONSTRUCTION, OR E. HORIZONTAL-PIPING HANGERS AND SUPPORTS: UNLESS OTHERWISE INDICATED AND EXCEPT AS SPECIFIED IN PIPING SYSTEM SECTIONS, INSTALL THE FOLLOWING A METAL OR PLASTIC PIPE SLEEVE. METAL SLEEVES: GALVANIZED STEEL SCHEDULE 40 PIPE WHEN INSTALLED IN NORMALLY-DRY LOCATIONS. 1. ADJUSTABLE, STEEL CLEVIS HANGERS (MSS TYPE 1): FOR SUSPENSION OF NONINSULATED OR INSULATED, STATIONARY PIPES NPS 1/2 TO NPS 30. 2. PLASTIC PIPE SLEEVES: SCHEDULE 40 PVC, ABS, DR AQUATHERM POLYPROPYLENE PIPE. 2. YOKE-TYPE PIPE CLAMPS (MSS TYPE 2); FOR SUSPENSION OF UP TO 1050 DEG F, PIPES NPS 4 TO NPS 24, REQUIRING UP TO 4 INCHES OF INSULATION. A. MATERIAL: BRASS AT FLOORS AND IN POTENTIALLY DAMP OR WET LOCATIONS. END OF SECTION 230529 BRASS OR STEEL IN OTHER LOCATIONS. B. FINISH: EXCEPT AS INDICATED BELOW, POLISHED CHROME PLATED IN EXPOSED LOCATIONS, PRIME PAINTED STEEL OR ROUGH BRASS IN MECHANICAL ROOMS AND SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT C. DNE-PIECE, CAST-BRASS TYPE: WITH FINISH AND SETSCREW FASTENER. D. DNE-PIECE, DEEP-PATTERN TYPE: DEEP-DRAWN, BOX-SHAPED BRASS WITH CHROME-PLATED FINISH AND SPRING-CLIP FASTENERS. A. SECTION INCLUDES: E. DNE-PIECE, STAMPED-STEEL TYPE: WITH CHROME-PLATED FINISH AND SPRING-CLIP FASTENERS. EQUIPMENT LABEL F. SPLIT-CASTING BRASS TYPE: WITH CONCEALED HINGE AND SETSCREW 2. PIPE LABELS G. SPLIT-PLATE, STAMPED-STEEL TYPE: WITH CHROME-PLATED FINISH, HINGE, AND DUCT LABELS. SPRING-CLIP FASTENERS. 1.2 ACTION SUBMITTALS PART 3 - EXECUTION A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT. A. PROVIDE SLEEVES FOR PIPING PASSING THROUGH PENETRATIONS IN FLOORS, PARTITIONS, ROOFS, AND WALLS. PART 2 - PRODUCTS B. INSTALL SLEEVES IN CONCRETE FLOORS, CONCRETE ROOF SLABS, AND CONCRETE WALLS AS THE SLABS AND WALLS ARE CONSTRUCTED. 2.1 EQUIPMENT LABELS A. METAL LABELS FOR EQUIPMENT: C. SIZE SLEEVES TO ALLOW FIRESTOPPING, IF REQUIRED. 1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING: D. SIZE HOLES AND SLEEVES TO ALLOW THE REQUIRED CLEAR ANNULAR SPACE FOR INSULATION, AND A MINIMUM OF 1/4 IN. (6.4 MM) CLEAR OUTSIDE THE PIPE AND a. <u>CRAFTMARK PIPE MARKERS</u>, INSULATION FOR MOVEMENT DUE TO AND EXPANSION AND CONTRACTION. b. <u>SETON IDENTIFICATION PRODUCTS; A BRADY CORPORATION COMPANY.</u> E. CUT SLEEVES FLUSH WITH BOTH SURFACES, EXCEPT AT FLOORS. c. OR APPROVED EQUAL F. FASTEN SLEEVES PERMANENTLY IN PLACE 2. MATERIAL AND THICKNESS: BRASS, 0.032-INCH MINIMUM THICKNESS, AND HAVING G. USING GROUT, SEAL THE SPACE DUTSIDE OF SLEEVES IN CONCRETE SLABS AND WALLS WHICH DO NOT HAVE WATERTIGHT SLEEVE SYSTEM. PREDRILLED OR STAMPED HOLES FOR ATTACHMENT HARDWARE 3. LETTER COLOR: BLACK. H. PROVIDE ESCUTCHEONS FOR PIPING PENETRATIONS OF WALLS, CEILINGS, AND 4. BACKGROUND COLOR: WHITE. I. ESCUTCHEONS AND FLOOR PLATES ON BARE PIPING SHALL BE ONE-PIECE TYPE WHERE POSSIBLE. ESCUTCHEONS AND FLOOR PLATES ON INSULATED PIPING AND ON EXISTING PIPING SHALL BE SPLIT, HINGED TYPE. 5. MINIMUM LABEL SIZE: LENGTH AND WIDTH VARY FOR REQUIRED LABEL CONTENT, BUT NOT LESS THAN 2-1/2 BY 3/4 INCH. 6. MINIMUM LETTER SIZE: 1/4 INCH FOR NAME OF UNITS IF VIEWING DISTANCE IS J. SIZE ESCUTCHEONS AND FLOOR PLATES WITH ID TO CLOSELY FIT AROUND PIPE, TUBE, AND INSULATION OF PIPING AND WITH OD THAT COMPLETELY COVERS LESS THAN 24 INCHES, 1/2 INCH FOR VIEWING DISTANCES UP TO 72 INCHES, AND PROPORTIONATELY LARGER LETTERING FOR GREATER VIEWING DISTANCES. DPENING. INCLUDE SECONDARY LETTERING TWO-THIRDS TO THREE-QUARTERS THE SIZE OF PRINCIPAL LETTERING. END OF SECTION 230517 7. FASTENERS: STAINLESS-STEEL RIVETS OR SELF-TAPPING SCREWS. 8. ADHESIVE: CONTACT-TYPE PERMANENT ADHESIVE, COMPATIBLE WITH LABEL AND WITH SUBSTRATE. 2.2 PIPE LABELS A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING: SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT CRAFTMARK PIPE MARKERS, 2. <u>SETUN IDENTIFICATION PRODUCTS; A BRADY CORPORATION COMPANY</u>, PART 1 - GENERAL 3. OR APPROVED EQUAL 1.1 SUMMARY B. GENERAL REQUIREMENTS FOR MANUFACTURED PIPE LABELS: PREPRINTED, COLOR-CODED, WITH LETTERING INDICATING SERVICE, AND SHOWING FLOW DIRECTION ACCORDING TO ASME A13.1. A. SECTION INCLUDES: METAL PIPE HANGERS AND SUPPORTS C. PRETENSIONED PIPE LABELS: PRECOILED, SEMIRIGID PLASTIC FORMED TO COVER FULL CIRCUMFERENCE OF PIPE AND TO ATTACH TO PIPE WITHOUT FASTENERS OR 1.2 ACTION SUBMITTALS A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT. D. SELF-ADHESIVE PIPE LABELS: PRINTED PLASTIC WITH CONTACT-TYPE, PERMANENT-ADHESIVE BACKING. PART 2 - PRODUCTS E. PIPE LABEL CONTENTS: INCLUDE IDENTIFICATION OF PIPING SERVICE USING SAME DESIGNATIONS OR ABBREVIATIONS AS USED ON DRAWINGS; ALSO INCLUDE PIPE 2.1 METAL PIPE HANGERS AND SUPPORTS A. CARBON-STEEL PIPE HANGERS AND SUPPORTS: 1. FLOW-DIRECTION ARROWS: INTEGRAL WITH PIPING SYSTEM SERVICE LETTERING TO ACCOMMODATE BOTH DIRECTIONS OR AS SEPARATE UNIT ON EACH PIPE 1. DESCRIPTION: MSS SP-58, TYPES 1 THROUGH 58, FACTORY-FABRICATED LABEL TO INDICATE FLOW DIRECTION. 2. GALVANIZED METALLIC COATINGS: PRE-GALVANIZED, HOT-DIP GALVANIZED, OR ELECTRO-GALVANIZED. 2. LETTERING SIZE: SIZE LETTERS ACCORDING TO ASME A13.1 FOR PIPING 3. NONMETALLIC COATINGS: PLASTIC COATED, OR EPOXY POWDER COATED. 4. PADDED HANGERS: HANGER WITH FIBERGLASS OR OTHER PIPE INSULATION PAD A. <u>MANUFACTURERS:</u> SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING: OR CUSHION TO SUPPORT BEARING SURFACE OF PIPING. . HANGER RODS: CONTINUOUS-THREAD ROD, NUTS, AND WASHER MADE OF CARBON 2. SETUN IDENTIFICATION PRODUCTS; A BRADY CORPORATION COMPANY. 2.2 THERMAL-HANGER SHIELD INSERTS A. <u>MANUFACTURERS:</u> SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING: B. MATERIAL AND THICKNESS: MULTILAYER, MULTICOLOR, PLASTIC LABELS FOR MECHANICAL ENGRAVING, 1/8 INCH THICK, AND HAVING PREDRILLED HOLES FOR BUCKARDDS, INC. C. LETTER COLOR: BLACK. 2. CARPENTER & PATERSON, INC. D. BACKGROUND COLOR: WHITE. 3. <u>NATIONAL PIPE HANGER CORPORATION</u> E. MAXIMUM TEMPERATURE: ABLE TO WITHSTAND TEMPERATURES UP TO 160 DEG F. 4. PIPE SHIELDS INC. B. INSULATION-INSERT MATERIAL FOR COLD PIPING: ASTM C 552, TYPE II CELLULAR GLASS WITH 100-PSI OR ASTM C 591, TYPE VI, GRADE 1 POLYISOCYANURATE WITH 125-PSI MINIMUM COMPRESSIVE STRENGTH AND VAPOR BARRIER. F. MINIMUM LABEL SIZE: LENGTH AND WIDTH VARY FOR REQUIRED LABEL CONTENT, BUT NOT LESS THAN 2-1/2 BY 3/4 INCH. G. MINIMUM LETTER SIZE: 1/4 INCH FOR NAME OF UNITS IF VIEWING DISTANCE IS LESS THAN 24 INCHES, 1/2 INCH FOR VIEWING DISTANCES UP TO 72 INCHES, AND PROPORTIONATELY LARGER LETTERING FOR GREATER VIEWING DISTANCES. INCLUDE C. INSULATION-INSERT MATERIAL FOR HOT PIPING: WATER-REPELLENT-TREATED, ASTM C 533, TYPE I CALCIUM SILICATE WITH 100-PSI ASTM C 552, TYPE II CELLULAR GLASS WITH 100-PSI OR ASTM C 591, TYPE VI, GRADE 1 SECONDARY LETTERING TWO-THIRDS TO THREE-QUARTERS THE SIZE OF PRINCIPAL POLYISOCYANURATE WITH 125-PSI MINIMUM COMPRESSIVE STRENGTH H. FASTENERS: STAINLESS-STEEL RIVETS OR SELF-TAPPING SCREWS. D. FOR TRAPEZE OR CLAMPED SYSTEMS: INSERT AND SHIELD SHALL COVER ENTIRE CIRCUMFERENCE OF PIPE. I. ADHESIVE: CONTACT-TYPE PERMANENT ADHESIVE, COMPATIBLE WITH LABEL AND E. FOR CLEVIS OR BAND HANGERS: INSERT AND SHIELD SHALL COVER LOWER 180J. DUCT LABEL CONTENTS: INCLUDE IDENTIFICATION OF DUCT SERVICE USING SAME DESIGNATIONS OR ABBREVIATIONS AS USED ON DRAWINGS; ALSO INCLUDE DUCT DEGREES OF PIPE. F. INSERT LENGTH: EXTEND 2 INCHES BEYOND SHEET METAL SHIELD FOR PIPING OPERATING BELOW AMBIENT AIR TEMPERATURE. SIZE AND AN ARROW INDICATING FLOW DIRECTION. 1. FLOW-DIRECTION ARROWS: INTEGRAL WITH DUCT SYSTEM SERVICE LETTERING TO ACCOMMODATE BOTH DIRECTIONS OR AS SEPARATE UNIT ON EACH DUCT LABEL TO INDICATE FLOW DIRECTION. 2.3 MATERIALS A. ALUMINUM: ASTM B 221. PART 3 - EXECUTION B. CARBON STEEL: ASTM A 1011/A 1011M. C. STRUCTURAL STEEL: ASTM A 36/A 36M, CARBON-STEEL PLATES, SHAPES, AND A. CLEAN PIPING AND EQUIPMENT SURFACES OF SUBSTANCES THAT COULD IMPAIR BOND OF IDENTIFICATION DEVICES, INCLUDING DIRT, OIL, GREASE, RELEASE AGENTS, AND INCOMPATIBLE PRIMERS, PAINTS, AND ENCAPSULANTS. D. THREADED RODS: CONTINUOUSLY THREADED. ZINC-PLATED OR GALVANIZED STEEL FOR INDOOR APPLICATIONS AND STAINLESS STEEL FOR OUTDOOR APPLICATIONS. MATING NUTS AND WASHERS OF SIMILAR MATERIALS AS RODS. 3.2 EQUIPMENT LABEL INSTALLATION PART 3 - EXECUTION A. INSTALL OR PERMANENTLY FASTEN LABELS ON EACH MAJOR ITEM OF MECHANICAL EQUIPMENT. A. STRENGTH OF SUPPORT ASSEMBLIES: WHERE NOT INDICATED, SELECT SIZES OF COMPONENTS SO STRENGTH WILL BE ADEQUATE TO CARRY PRESENT AND FUTURE B. LOCATE EQUIPMENT LABELS WHERE ACCESSIBLE AND VISIBLE. STATIC LOADS WITHIN SPECIFIED LOADING LIMITS, MINIMUM STATIC DESIGN LOAD USED FOR STRENGTH DETERMINATION SHALL BE WEIGHT OF SUPPORTED 3.3 PIPE LABEL INSTALLATION A. PIPE LABEL LOCATIONS: LOCATE PIPE LABELS WHERE PIPING IS EXPOSED OR ABOVE ACCESSIBLE CEILINGS IN FINISHED SPACES; MACHINE ROOMS; ACCESSIBLE MAINTENANCE SPACES SUCH AS SHAFTS, TUNNELS, AND PLENUMS, AND EXTERIOR 3.2 HANGER AND SUPPORT INSTALLATION EXPOSED LOCATIONS AS FOLLOWS: A. METAL PIPE-HANGER INSTALLATION: COMPLY WITH MSS SP-58. INSTALL HANGERS, SUPPORTS, CLAMPS, AND ATTACHMENTS AS REQUIRED TO PROPERLY SUPPORT 1. NEAR EACH VALVE AND CONTROL DEVICE PIPING FROM THE BUILDING STRUCTURE. 2. NEAR EACH BRANCH CONNECTION, EXCLUDING SHORT TAKEOFFS FOR FIXTURES AND TERMINAL UNITS. WHERE FLOW PATTERN IS NOT OBVIOUS, MARK EACH PIPE B. THERMAL-HANGER SHIELD INSTALLATION: INSTALL IN PIPE HANGER OR SHIELD FOR INSULATED PIPING. 3. NEAR PENETRATIONS AND ON BOTH SIDES OF THROUGH WALLS, FLOORS, C. INSTALL HANGERS AND SUPPORTS COMPLETE WITH NECESSARY ATTACHMENTS, INSERTS, BOLTS, RODS, NUTS, WASHERS, AND OTHER ACCESSORIES. CEILINGS, AND INACCESSIBLE ENCLOSURES. 4. AT ACCESS DOORS, MANHOLES, AND SIMILAR ACCESS POINTS THAT PERMIT VIEW OF CONCEALED PIPING. D. INSTALL LATERAL BRACING WITH PIPE HANGERS AND SUPPORTS TO PREVENT 5. NEAR MAJOR EQUIPMENT ITEMS AND OTHER POINTS OF ORIGINATION AND E. LOAD DISTRIBUTION: INSTALL HANGERS AND SUPPORTS SO THAT PIPING LIVE AND DEAD LOADS AND STRESSES FROM MOVEMENT WILL NOT BE TRANSMITTED TO 6. SPACED AT MAXIMUM INTERVALS OF 50 FEET ALONG EACH RUN. REDUCE INTERVALS TO 25 FEET IN AREAS OF CONGESTED PIPING AND EQUIPMENT F. INSULATED PIPING: 7. DN PIPING ABOVE REMOVABLE ACOUSTICAL CEILINGS. DMIT INTERMEDIATELY SPACED LABELS. 1. ATTACH CLAMPS AND SPACERS TO PIPING. a. PIPING OPERATING ABOVE AMBIENT AIR TEMPERATURE: CLAMP MAY PROJECT B. DIRECTIONAL FLOW ARROWS: ARROWS SHALL BE USED TO INDICATE DIRECTION OF FLOW IN PIPES, INCLUDING PIPES WHERE FLOW IS ALLOWED IN BOTH DIRECTIONS. THROUGH INSULATION. b. PIPING OPERATING BELOW AMBIENT AIR TEMPERATURE: USE THERMAL-HANGER SHIELD INSERT WITH CLAMP SIZED TO MATCH OD OF INSERT. C. PIPE LABEL COLOR SCHEDULE 2. INSTALL MSS SP-58, TYPE 39, PROTECTION SADDLES IF INSULATION WITHOUT VAPOR BARRIER IS INDICATED. FILL INTERIOR VOIDS WITH INSULATION THAT 1. REFRIGERANT PIPING: BLACK LETTERS IN A SAFETY-DRANGE BACKGROUND. MATCHES ADJOINING INSULATION. 3.4 DUCT LABEL INSTALLATION A. INSTALL PLASTIC-LAMINATED OR SELF-ADHESIVE DUCT LABELS WITH PERMANENT ADHESIVE ON AIR DUCTS IN THE SPECIFIC LABEL COLORS, TEXT, AND DIRECTIONAL FLOWS FOR EACH COMPONENT PART ARE DESCRIBED IN A SINGLE a. OPTION: THERMAL-HANGER SHIELD INSERTS MAY BE USED. INCLUDE STEEL WEIGHT-DISTRIBUTION PLATE FOR PIPE NPS 4 AND LARGER IF PIPE IS

3.3 HANGER AND SUPPORT SCHEDULE

A. SPECIFIC HANGER AND SUPPORT REQUIREMENTS ARE IN SECTIONS SPECIFYING PIPING SYSTEMS AND EQUIPMENT.

B. COMPLY WITH MSS SP-58 FOR PIPE-HANGER SELECTIONS AND APPLICATIONS THAT ARE NOT SPECIFIED IN PIPING SYSTEM SECTIONS.

COMPREHENSIVE TABLE THAT IS CHAPTER 5, APPENDIX A, BUILDING SERVICES IDENTIFICATION LABELING. THIS LABELING SYSTEM MUST BE PART OF ANY CONSTRUCTION PROJECT, EVEN THOSE THAT ARE LIMITED TO A PORTION OF A

CONCEALED SPACES AND AT MAXIMUM INTERVALS OF 50 FEET IN EACH SPACE WHERE DUCTS ARE EXPOSED OR CONCEALED BY REMOVABLE CEILING SYSTEM.

B. LOCATE LABELS NEAR POINTS WHERE DUCTS ENTER INTO AND EXIT FROM

BUILDING OR A SINGLE UTILITY SYSTEM.

END OF SECTION 230553

PART 2 - PRODUCTS

WELDED STEEL COLLAR; ZINC COATED.

A. GALVANIZED-STEEL WALL PIPES: ASTM A53, SCHEDULE 40, WITH PLAIN ENDS AND

B. GALVANIZED-STEEL-PIPE SLEEVES: ASTM A53, TYPE E, GRADE B, SCHEDULE 40,

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KEY PLAN:

PROJECT TITLE / ADDRESS: TOWN OF POLAND, ME

POLAND TOWN OFFICE **HVAC MODIFICATIONS**

1231 Maine Street **Poland, ME 04274**

BID & CONSTRUCTION DOCUMENTS 08/17/2022

C OF AS NOTED **THOMAS** BETTERIDGE DRAWN BY: 15936 . 58570WAL . ISSUE DATE: REVISIONS

SPECIFICATIONS SHEET 1 OF 3

INSTALLED ON ROLLERS.

INSTALLED ON ROLLERS.

3. INSTALL MSS SP-58, TYPE 40, PROTECTIVE SHIELDS ON COLD PIPING WITH

a. OPTION: THERMAL-HANGER SHIELD INSERTS MAY BE USED. INCLUDE STEEL WEIGHT-DISTRIBUTION PLATE FOR PIPE NPS 4 AND LARGER IF PIPE IS

VAPOR BARRIER. SHIELDS SHALL SPAN AN ARC OF 180 DEGREES.

a. NPS 1/4 TO NPS 3-1/2: 12 INCHES LONG AND 0.048 INCH THICK.

5. THERMAL-HANGER SHIELDS: INSTALL WITH INSULATION SAME THICKNESS AS PIPING INSULATION.

4. SHIELD DIMENSIONS FOR PIPE: NOT LESS THAN THE FOLLOWING:

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC 7. RECORD FINAL FAN-PERFORMANCE DATA. PART 1 - GENERAL 3.6 PROCEDURES FOR CONDENSING UNITS A. VERIFY PROPER ROTATION OF FANS. B. MEASURE ENTERING- AND LEAVING-AIR TEMPERATURES. A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS, APPLY TO THIS C. RECORD FAN AND MOTOR OPERATING DATA. L2 SUMMARY A, SET HVAC SYSTEM'S AIRFLOW RATES AND WATER FLOW RATES WITHIN THE FOLLOWING TOLERANCES: A. SECTION INCLUDES 1. SUPPLY, RETURN, AND EXHAUST FANS AND EQUIPMENT WITH FANS: PLUS OR MINUS 10 BALANCING AIR SYSTEMS 2. TESTING, ADJUSTING, AND BALANCING EQUIPMENT: 2. AIR DUTLETS AND INLETS: PLUS DR MINUS 10 PERCENT. a. HEAT EXCHANGERS. B, MAINTAINING PRESSURE RELATIONSHIPS AS DESIGNED SHALL HAVE PRIDRITY OVER THE TOLERANCES SPECIFIED ABOVE. b. M□T□RS. c. CONDENSING UNITS. d. HEAT-TRANSFER COILS A. GENERAL: PREPARE A CERTIFIED WRITTEN REPORT; TABULATE AND DIVIDE THE REPORT INTO SEPARATE SECTIONS FOR TESTED SYSTEMS AND BALANCED SYSTEMS. 1.3 INFORMATIONAL SUBMITTALS 1. INCLUDE A CERTIFICATION SHEET AT THE FRONT OF THE REPORT'S BINDER, SIGNED AND A. QUALIFICATION DATA: WITHIN 30 DAYS OF CONTRACTOR'S NOTICE TO PROCEED, SUBMIT
DOCUMENTATION THAT THE TAB SPECIALIST AND THIS PROJECT'S TAB TEAM MEMBERS MEET SEALED BY THE CERTIFIED TESTING AND BALANCING ENGINEER. THE QUALIFICATIONS SPECIFIED IN "QUALITY ASSURANCE" ARTICLE. 2. INCLUDE A LIST OF INSTRUMENTS USED FOR PROCEDURES, ALONG WITH PROOF OF 3. CERTIFY VALIDITY AND ACCURACY OF FIELD DATA. A. TAB SPECIALISTS QUALIFICATIONS: CERTIFIED BY AABC OR NEBB. B. FINAL REPORT CONTENTS: IN ADDITION TO CERTIFIED FIELD-REPORT DATA, INCLUDE THE 1. TAB FIELD SUPERVISOR: EMPLOYEE OF THE TAB SPECIALIST AND CERTIFIED BY AABC OR FAN CURVES 2. TAB TECHNICIAN EMPLOYEE OF THE TAB SPECIALIST AND CERTIFIED BY AABC OR NEBB AS MANUFACTURERS' TEST DATA. 3. FIELD TEST REPORTS PREPARED BY SYSTEM AND EQUIPMENT INSTALLERS. 4. DTHER INFORMATION RELATIVE TO EQUIPMENT PERFORMANCE; DO NOT INCLUDE SHOP DRAWINGS AND PRODUCT DATA. PART 3 - EXECUTION C. GENERAL REPORT DATA: IN ADDITION TO FORM TITLES AND ENTRIES, INCLUDE THE FOLLOWING 3.1 EXAMINATIO A. EXAMINE THE CONTRACT DOCUMENTS TO BECOME FAMILIAR WITH PROJECT REQUIREMENTS AND TO DISCOVER CONDITIONS IN SYSTEMS DESIGNS THAT MAY PRECLUDE PROPER TAB OF TITLE PAGE. 2. NAME AND ADDRESS OF THE TAB SPECIALIST. B. EXAMINE INSTALLED SYSTEMS FOR BALANCING DEVICES, SUCH AS TEST PORTS, GAGE COCKS, THERMOMETER WELLS, FLOW-CONTROL DEVICES, BALANCING VALVES AND FITTINGS, AND MANUAL VOLUME DAMPERS. VERIFY THAT LOCATIONS OF THESE BALANCING DEVICES ARE 3. PROJECT NAME. 4. PROJECT LOCATION. APPLICABLE FOR INTENDED PURPOSE AND ARE ACCESSIBLE. 5. ENGINEER'S NAME AND ADDRESS. C. EXAMINE THE APPROVED SUBMITTALS FOR HVAC SYSTEMS AND EQUIPMENT. 6. CONTRACTOR'S NAME AND ADDRESS. D. EXAMINE DESIGN DATA INCLUDING HVAC SYSTEM DESCRIPTIONS, STATEMENTS OF DESIGN ASSUMPTIONS FOR ENVIRONMENTAL CONDITIONS AND SYSTEMS DUTPUT, AND STATEMENTS OF PHILOSOPHIES AND ASSUMPTIONS ABOUT HVAC SYSTEM AND EQUIPMENT CONTROLS. 7. REPORT DATE. 8. SIGNATURE OF TAB SUPERVISOR WHO CERTIFIES THE REPORT EXAMINE SYSTEM AND EQUIPMENT INSTALLATIONS AND VERIFY THAT FIELD QUALITY-CONTROL TESTING, CLEANING, AND ADJUSTING SPECIFIED IN INDIVIDUAL SECTIONS HAVE BEEN 9. TABLE OF CONTENTS WITH THE TOTAL NUMBER OF PAGES DEFINED FOR EACH SECTION OF THE REPORT. NUMBER EACH PAGE IN THE REPORT. 10. SUMMARY OF CONTENTS INCLUDING THE FOLLOWING: EXAMINE HEAT-TRANSFER COILS FOR CORRECT PIPING CONNECTIONS AND FOR CLEAN AND a. INDICATED VERSUS FINAL PERFORMANCE REPORT DEFICIENCIES DISCOVERED BEFORE AND DURING PERFORMANCE OF TAB PROCEDURES.

OBSERVE AND RECORD SYSTEM REACTIONS TO CHANGES IN CONDITIONS, RECORD DEFAULT SET b. NOTABLE CHARACTERISTICS OF SYSTEMS. c. DESCRIPTION OF SYSTEM OPERATION SEQUENCE IF IT VARIES FROM THE CONTRACT DOCUMENTS. POINTS IF DIFFERENT FROM INDICATED VALUES. 3.2 PREPARATION 11. NOMENCLATURE SHEETS FOR EACH ITEM OF EQUIPMENT. A. PREPARE A TAB PLAN THAT INCLUDES THE FOLLOWING: 12. DATA FOR TERMINAL UNITS, INCLUDING MANUFACTURER'S NAME, TYPE, SIZE, AND FITTINGS. EQUIPMENT AND SYSTEMS TO BE TESTED. 13.NOTES TO EXPLAIN WHY CERTAIN FINAL DATA IN THE BODY OF REPORTS VARY FROM 2. STRATEGIES AND STEP-BY-STEP PROCEDURES FOR BALANCING THE SYSTEMS 14. TEST CONDITIONS FOR FANS AND PUMP PERFORMANCE FORMS INCLUDING THE FOLLOWING: 3. INSTRUMENTATION TO BE USEI a. SETTINGS FOR OUTDOOR-, RETURN-, AND EXHAUST-AIR DAMPERS 4. SAMPLE FORMS WITH SPECIFIC IDENTIFICATION FOR ALL EQUIPMENT. b. CONDITIONS OF FILTERS B. PERFORM SYSTEM-READINESS CHECKS OF HVAC SYSTEMS AND EQUIPMENT TO VERIFY SYSTEM READINESS FOR TAB WORK. INCLUDE, AT A MINIMUM, THE FOLLOWING: c. COOLING COIL, WET- AND DRY-BULB CONDITIONS. d. FACE AND BYPASS DAMPER SETTINGS AT COILS. a. DUCT SYSTEMS ARE COMPLETE WITH TERMINALS INSTALLED. e, FAN DRIVE SETTINGS INCLUDING SETTINGS AND PERCENTAGE \Box F MAXIMUM PITCH DIAMETER. b. VOLUME, SMOKE, AND FIRE DAMPERS ARE OPEN AND FUNCTIONAL f. INLET VANE SETTINGS FOR VARIABLE-AIR-VOLUME SYSTEMS. g. SETTINGS FOR SUPPLY-AIR, STATIC-PRESSURE CONTROLLER d. FANS ARE OPERATING, FREE OF VIBRATION, AND ROTATING IN CORRECT DIRECTION. h. OTHER SYSTEM OPERATING CONDITIONS THAT AFFECT PERFORMANCE e. CEILINGS ARE INSTALLED D. SYSTEM DIAGRAMS: INCLUDE SCHEMATIC LAYOUTS OF AIR AND HYDRONIC DISTRIBUTION SYSTEMS. PRESENT EACH SYSTEM WITH SINGLE-LINE DIAGRAM AND INCLUDE THE FOLLOWING: f. WINDOWS AND DOORS ARE INSTALLED. g. SUITABLE ACCESS TO BALANCING DEVICES AND EQUIPMENT IS PROVIDED. 1. QUANTITIES OF OUTDOOR, SUPPLY, RETURN, AND EXHAUST AIRFLOWS. 2. WATER AND STEAM FLOW RATES. 3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING N PERFORM TESTING AND BALANCING PROCEDURES ON EACH SYSTEM ACCORDING TO THE PROCEDURES CONTAINED IN AABC'S "NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE" ASHRAE 111 NEBB'S "PROCEDURAL STANDARDS FOR TESTING, ADJUSTING, AND BALANCING OF 3. DUCT, DUTLET, AND INLET SIZES 4. PIPE AND VALVE SIZES AND LOCATIONS ENVIRONMENTAL SYSTEMS' SMACNA'S 'HVAC SYSTEMS - TESTING, ADJUSTING, AND BALANCING' 5. TERMINAL UNITS. 6. BALANCING STATIONS. CUT INSULATION, DUCTS, PIPES, AND EQUIPMENT CABINETS FOR INSTALLATION OF TEST PROBES TO THE MINIMUM EXTENT NECESSARY FOR TAB PROCEDURES. 7. POSITION OF BALANCING DEVICES E. FAN TEST REPORTS: FOR SUPPLY, RETURN, AND EXHAUST FANS, INCLUDE THE FOLLOWING: 1. AFTER TESTING AND BALANCING, PATCH PROBE HOLES IN DUCTS WITH SAME MATERIAL AND THICKNESS AS USED TO CONSTRUCT DUCTS. MARK EQUIPMENT AND BALANCING DEVICES, INCLUDING DAMPER-CONTROL POSITIONS, VALVE POSITION INDICATORS, FAN-SPEED-CONTROL LEVERS, AND SIMILAR CONTROLS AND DEVICES, WITH PAINT OR OTHER SUITABLE, PERMANENT IDENTIFICATION MATERIAL TO SHOW FINAL a. SYSTEM IDENTIFICATION b. LOCATION c. MAKE AND TYPE. D. TAKE AND REPORT TESTING AND BALANCING MEASUREMENTS IN INCH-POUND (IP) UNITS. d. MODEL NUMBER AND SIZE e. MANUFACTURER'S SERIAL NUMBER. A. PREPARE TEST REPORTS FOR BOTH FANS AND OUTLETS, OBTAIN MANUFACTURER'S OUTLET f. ARRANGEMENT AND CLASS FACTORS AND RECOMMENDED TESTING PROCEDURES, CROSS-CHECK THE SUMMATION OF g. SHEAVE MAKE, SIZE IN INCHES, AND BORE REQUIRED DUTLET VOLUMES WITH REQUIRED FAN VOLUMES. h. CENTER-TO-CENTER DIMENSIONS OF SHEAVE AND AMOUNT OF ADJUSTMENTS IN INCHES. B. LOCATE START-STOP AND DISCONNECT SWITCHES, ELECTRICAL INTERLOCKS, AND MOTOR 2. MOTOR DATA C. VERIFY THAT MOTOR STARTERS ARE EQUIPPED WITH PROPERLY SIZED THERMAL PROTECTION a. MOTOR MAKE, AND FRAME TYPE AND SIZE. D. CHECK DAMPERS FOR PROPER POSITION TO ACHIEVE DESIRED AIRFLOW PATH. b. HORSEPOWER AND RPM c. VOLTS, PHASE, AND HERTZ F. CHECK CONDENSATE DRAINS FOR PROPER CONNECTIONS AND FUNCTIONING. d. FULL-LOAD AMPERAGE AND SERVICE FACTOR e. SHEAVE MAKE, SIZE IN INCHES, AND BORE. G. CHECK FOR PROPER SEALING OF AIR-HANDLING-UNIT COMPONENTS. f. CENTER-TO-CENTER DIMENSIONS OF SHEAVE, AND AMOUNT OF ADJUSTMENTS IN INCHES. 3.5 PR□CEDURES F□R C□NSTANT-V□LUME AIR SYSTEMS g. NUMBER, MAKE, AND SIZE OF BELTS A. ADJUST FANS TO DELIVER TOTAL INDICATED AIRFLOWS WITHIN THE MAXIMUM ALLOWABLE FAN SPEED LISTED BY FAN MANUFACTURER. 3. TEST DATA (INDICATED AND ACTUAL VALUES) a. TOTAL AIRFLOW RATE IN CFM. a. SET DUTSIDE-AIR, RETURN-AIR, AND RELIEF-AIR DAMPERS FOR PROPER POSITION THAT b. TOTAL SYSTEM STATIC PRESSURE IN INCHES WG. SIMULATES MINIMUM DUTDOOR-AIR CONDITIONS. b. WHERE DUCT CONDITIONS ALLOW, MEASURE AIRFLOW BY PITOT-TUBE TRAVERSE. IF d. DISCHARGE STATIC PRESSURE IN INCHES WG. NECESSARY, PERFORM MULTIPLE PITOT-TUBE TRAVERSES TO OBTAIN TOTAL AIRFLOW. e. SUCTION STATIC PRESSURE IN INCHES WG. c. WHERE DUCT CONDITIONS ARE NOT SUITABLE FOR PITOT-TUBE TRAVERSE MEASUREMENTS, A COIL TRAVERSE MAY BE ACCEPTABLE. F. ROUND, FLAT-OVAL, AND RECTANGULAR DUCT TRAVERSE REPORTS: INCLUDE A DIAGRAM WITH A GRID REPRESENTING THE DUCT CROSS-SECTION AND RECORD THE FOLLOWING: d. IF A RELIABLE PITOT-TUBE TRAVERSE OR COIL TRAVERSE IS NOT POSSIBLE, MEASURE AIRFLOW AT TERMINALS AND CALCULATE THE TOTAL AIRFLOW. 1. REPORT DATA: 2. MEASURE FAN STATIC PRESSURES AS FOLLOWS: a. SYSTEM AND AIR-HANDLING-UNIT NUMBER. a. MEASURE STATIC PRESSURE DIRECTLY AT THE FAN DUTLET DR THROUGH THE FLEXIBLE b. LOCATION AND ZONE c. TRAVERSE AIR TEMPERATURE IN DEG F 6. MEASURE STATIC PRESSURE DIRECTLY AT THE FAN INLET OR THROUGH THE FLEXIBLE d. DUCT STATIC PRESSURE IN INCHES WG. e. DUCT SIZE IN INCHES c. MEASURE STATIC PRESSURE ACROSS EACH COMPONENT THAT MAKES UP THE AIR-HANDLING SYSTEM. f. DUCT AREA IN SQ. FT. d REPORT ARTIFICIAL LOADING OF FILTERS AT THE TIME STATIC PRESSURES ARE g. INDICATED AIRFLOW RATE IN CFM. h. INDICATED VELOCITY IN FPM. 3. REVIEW RECORD DOCUMENTS TO DETERMINE VARIATIONS IN DESIGN STATIC PRESSURES VERSUS ACTUAL STATIC PRESSURES, CALCULATE ACTUAL SYSTEM-EFFECT FACTORS. i. ACTUAL AIRFLOW RATE IN CFM. RECOMMEND ADJUSTMENTS TO ACCOMMODATE ACTUAL CONDITIONS. j. ACTUAL AVERAGE VELOCITY IN FPM. 4. DBTAIN APPROVAL FROM CONSTRUCTION MANAGER FOR ADJUSTMENT OF FAN SPEED HIGHER OR LOWER THAN INDICATED SPEED, COMPLY WITH REQUIREMENTS IN HVAC SECTIONS FOR AIR-HANDLING UNITS FOR ADJUSTMENT OF FANS, BELTS, AND PULLEY SIZES TO ACHIEVE k. BAROMETRIC PRESSURE IN PSIG. G. AIR-TERMINAL-DEVICE REPORTS: INDICATED AIR-HANDLING-UNIT PERFORMANCE. 1. UNIT DATA: 5. DO NOT MAKE FAN-SPEED ADJUSTMENTS THAT RESULT IN MOTOR OVERLOAD, CONSULT EQUIPMENT MANUFACTURERS ABOUT FAN-SPEED SAFETY FACTORS, MODULATE DAMPERS AND MEASURE FAN-MOTOR AMPERAGE TO ENSURE THAT NO OVERLOAD OCCURS, MEASURE a. SYSTEM AND AIR-HANDLING UNIT IDENTIFICATION. b. LOCATION AND ZONE AMPERAGE IN FULL-COOLING, FULL-HEATING, ECONOMIZER, AND ANY OTHER OPERATING MODE TO DETERMINE THE MAXIMUM REQUIRED BRAKE HORSEPOWER. c. APPARATUS USED FOR TEST B. ADJUST VOLUME DAMPERS FOR MAIN DUCT, SUBMAIN DUCTS, AND MAJOR BRANCH DUCTS TO INDICATED AIRFLOWS. d. AREA SERVED I. MEASURE AIRFLOW OF SUBMAIN AND BRANCH DUCTS. f. NUMBER FROM SYSTEM DIAGRAM 2. ADJUST SUBMAIN AND BRANCH DUCT VOLUME DAMPERS FOR SPECIFIED AIRFLOW. g. TYPE AND MODEL NUMBER 3. RE-MEASURE EACH SUBMAIN AND BRANCH DUCT AFTER ALL HAVE BEEN ADJUSTED. C. ADJUST AIR INLETS AND DUTLETS FOR EACH SPACE TO INDICATED AIRFLOWS. i. EFFECTIVE AREA IN SQ. FT.. 1. SET AIRFLOW PATTERNS OF ADJUSTABLE DUTLETS FOR PROPER DISTRIBUTION WITHOUT 2. TEST DATA (INDICATED AND ACTUAL VALUES): a. AIRFLOW RATE IN CFM 2. MEASURE INLETS AND DUTLETS AIRFLOW. b. AIR VELOCITY IN FPM 3. ADJUST EACH INLET AND DUTLET FOR SPECIFIED AIRFLOW. c. PRELIMINARY AIRFLOW RATE AS NEEDED IN CFM. 4. RE-MEASURE EACH INLET AND DUTLET AFTER THEY HAVE BEEN ADJUSTED. d. PRELIMINARY VELOCITY AS NEEDED IN FPM. D. VERIFY FINAL SYSTEM CONDITIONS. RE-MEASURE AND CONFIRM THAT MINIMUM DUTDOOR, RETURN, AND RELIEF AIRFLOWS ARE WITHIN DESIGN. READJUST TO DESIGN IF NECESSARY. e. FINAL AIRFLOW RATE IN CFN f. FINAL VELOCITY IN FPM. 2. RE-MEASURE AND CONFIRM THAT TOTAL AIRFLOW IS WITHIN DESIGN. g. SPACE TEMPERATURE IN DEG F 3. RE-MEASURE ALL FINAL FAN OPERATING DATA, RPMS, VOLTS, AMPS, AND STATIC PROFILE. H. INSTRUMENT CALIBRATION REPORTS 4. MARK ALL FINAL SETTINGS. 1. REPORT DATA: 5. TEST SYSTEM IN ECONOMIZER MODE. VERIFY PROPER OPERATION AND ADJUST IF NECESSARY. a. INSTRUMENT TYPE AND MAKE. b. SERIAL NUMBER. 6. MEASURE AND RECORD ALL OPERATING DATA. c. APPLICATION

1. CAPACITOR-DISCHARGE-WELD PINS: COPPER- OR ZINC-COATED STEEL PIN, FULLY ANNEALED FOR CAPACITOR-DISCHARGE WELDING, 0.106-INCH-DIAMETER SHANK, LENGTH TO SUIT DEPTH OF INSULATION INDICATED 2. CUPPED-HEAD, CAPACITOR-DISCHARGE-WELD PINS: COPPER- OR ZINC-COATED STEEL PIN, FULLY ANNEALED FOR CAPACITOR-DISCHARGE WELDING, 0.106-INCH-DIAMETER SHANK, LENGTH TO SUIT DEPTH OF INSULATION INDICATED WITH INTEGRAL 1-1/2-INCH

END OF SECTION 230593 PART 2 - PRODUCTS b. <u>ARMACELL LL</u> b. ARMACELL LLC d. <u>K-FLEX USA</u>, c. <u>FOSTER BRAND; H. B. FULLER CONSTRUCTION PRODUCTS.</u> d. MON-ECO INDUSTRIES, INC. D. FSK JACKET ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A FOR BONDING INSULATION JACKET LAP SEAMS AND JOINTS. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING: a. CHILDERS BRAND, H. B. FULLER CONSTRUCTION PRODUCTS. b. EAGLE BRIDGES - MARATHON INDUSTRIES c. FOSTER BRAND; H. B. FULLER CONSTRUCTION PRODUCTS. d. MON-ECO INDUSTRIES, INC. A. FSK AND METAL JACKET FLASHING SEALANTS: 1. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND 2. FIRE- AND WATER-RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT. 3. SERVICE TEMPERATURE RANGE: MINUS 40 TO PLUS 250 DEG F. 4. COLOR: ALUMINUM 2.4 FACTORY-APPLIED JACKETS A INSULATION SYSTEM SCHEDULES INDICATE FACTORY-APPLIED JACKETS ON VARIOUS APPLICATIONS. WHEN FACTORY-APPLIED JACKETS ARE INDICATED, COMPLY WITH THE 1. FSK JACKET: ALUMINUM-FOIL, FIBERGLASS-REINFORCED SCRIM WITH KRAFT-PAPER BACKING; COMPLYING WITH ASTM C 1136, TYPE II. A. FSK TAPE: FOIL-FACE, VAPOR-RETARDER TAPE MATCHING FACTORY-APPLIED JACKET WITH ACRYLIC ADHESIVE; COMPLYING WITH ASTM C 1136. 1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING: a. AVERY DENNISON CORPORATION, SPECIALTY TAPES DIVISION b. <u>IDEAL TAPE CO., INC., AN AMERICAN BILTRITE COMPANY</u>, c. <u>KNAUF INSULATION.</u> 2. WIDTH: 3 INCHES. 3. THICKNESS: 6.5 MILS 4. ADHESION: 90 DUNCES FORCE/INCH IN WIDTH. 5. ELONGATION: 2 PERCENT 6. TENSILE STRENGTH: 40 LBF/INCH IN WIDTH. 7. FSK TAPE DISKS AND SQUARES: PRECUT DISKS OR SQUARES OF FSK TAPE 1. STAINLESS STEEL: ASTM A 167 DR ASTM A 240/A 240M, TYPE 304; 0.015 INCH THICK, 1/2 INCH WIDE WITH WING SEAL OR CLOSED SEAL. 2. ALUMINUM: ASTM B 209, ALLOY 3003, 3005, 3105, OR 5005; TEMPER H-14, 0.020 INCH THICK, 1/2 INCH WIDE WITH WING SEAL OR CLOSED SEAL. B. INSULATION PINS AND HANGERS:

d. DATES OF USE. e. DATES OF CALIBRATION 3.9 VERIFICATION OF TAB REPORT A. THE TAB SPECIALIST'S TEST AND BALANCE ENGINEER SHALL CONDUCT THE INSPECTION IN THE PRESENCE OF OWNER OR ENGINEER. B. OWNER OR ENGINEER SHALL RANDOMLY SELECT MEASUREMENTS, DOCUMENTED IN THE FINAL REPORT, TO BE RECHECKED. RECHECKING SHALL BE LIMITED TO EITHER 10 PERCENT OF THE TOTAL MEASUREMENTS RECORDED. 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 D. IF THE NUMBER OF 'FAILED' MEASUREMENTS IS GREATER THAN 10 PERCENT OF THE TOTAL MEASUREMENTS CHECKED DURING THE FINAL INSPECTION, THE TESTING AND BALANCING SHALL BE CONSIDERED INCOMPLETE AND SHALL BE REJECTED. E. IF TAB WORK FAILS, 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. F. PREPARE TEST AND INSPECTION REPORTS. SECTION 230713 - DUCT INSULATION A. SECTION INCLUDES INSULATING THE FOLLOWING DUCT SERVICES: 1. INDOOR, CONCEALED SUPPLY, RETURN, EXHAUST, AND OUTDOOR AIR. A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED. INCLUDE THERMAL CONDUCTIVITY, WATER-VAPOR PERMEANCE THICKNESS, AND JACKETS (BOTH FACTORY- AND FIELD-APPLIED IF A. INSTALLER QUALIFICATIONS: SKILLED MECHANICS WHO HAVE SUCCESSFULLY COMPLETED AN APPRENTICESHIP PROGRAM OR ANOTHER CRAFT TRAINING PROGRAM CERTIFIED BY THE DEPARTMENT OF LABOR, BUREAU OF APPRENTICESHIP AND TRAINING. B. SURFACE-BURNING CHARACTERISTICS: FOR INSULATION AND RELATED MATERIALS, AS DETERMINED BY TESTING IDENTICAL PRODUCTS ACCORDING TO ASTM E 84, BY A TESTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION, FACTORY LABEL INSULATION AND JACKET MATERIALS AND ADHESIVE, MASTIC, TAPES, AND CEMENT MATERIAL CONTAINERS WITH APPROPRIATE MARKINGS OF APPLICABLE TESTING AGENCY. 1. INSULATION INSTALLED INDORS: FLAME-SPREAD INDEX OF 25 OR LESS, AN SMOKE-DEVELOPED INDEX OF 50 OR LESS. 2. INSULATION INSTALLED OUTDOORS: FLAME-SPREAD INDEX OF 75 OR LESS, AND SMOKE-DEVELOPED INDEX OF 150 OR LESS. 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 SHALL BE APPLIED. B. PRODUCTS SHALL NOT CONTAIN ASBESTOS, LEAD, MERCURY, OR MERCURY COMPOUNDS. C. FLEXIBLE ELASTOMERIC INSULATION: CLOSED-CELL, SPONGE- OR EXPANDED-RUBBER MATERIALS. COMPLY WITH ASTM C 534, TYPE II FOR SHEET MATERIALS. 1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING: a. <u>AEROFLEX USA</u>. D. MINERAL-FIBER BLANKET INSULATION: MINERAL OR GLASS FIBERS BONDED WITH A THERMOSETTING RESIN. COMPLY WITH ASTM C 553, TYPE II AND ASTM C 1290, TYPE I WITH FACTORY-APPLIED FSK JACKET, FACTORY-APPLIED JACKET REQUIREMENTS ARE SPECIFIED IN "FACTORY-APPLIED JACKETS" ARTICLE. 1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING: a. <u>JOHNS MANVILLE; A BERKSHIRE HATHAWAY COMPANY</u> b. <u>KNAUF INSULATION</u>, c. MANSON INSULATION INC. d. <u>DWENS CORNING</u> A. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES AND FOR BONDING INSULATION TO ITSELF AND TO SURFACES TO BE INSULATED UNLESS OTHERWISE INDICATED B. FLEXIBLE ELASTOMERIC AND POLYOLEFIN ADHESIVE: COMPLY WITH MIL-A-24179A, TYPE II, 1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING: a. <u>AEROFLEX USA.</u> c. FOSTER BRAND; H. B. FULLER CONSTRUCTION PRODUCTS, C. MINERAL-FIBER ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A. . <u>MANUFACTURERS:</u> SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING: a. CHILDERS BRAND; H. B. FULLER CONSTRUCTION PRODUCTS. b. <u>EAGLE BRIDGES - MARATHON INDUSTRIES</u>

PART 3 - EXECUTION PREPARATION A SURFACE PREPARATION: CLEAN AND DRY SURFACES TO RECEIVE INSULATION. REMOVE MATERIALS THAT WILL ADVERSELY AFFECT INSULATION APPLICATION. A. INSTALL INSULATION MATERIALS, ACCESSORIES, AND FINISHES WITH SMOOTH, STRAIGHT, AND EVEN SURFACES; FREE OF VOIDS THROUGHOUT THE LENGTH OF DUCTS AND FITTINGS. B. INSTALL INSULATION MATERIALS, VAPOR BARRIERS OR RETARDERS, JACKETS, AND THICKNESSES REQUIRED FOR EACH ITEM OF DUCT SYSTEM AS SPECIFIED IN INSULATION C. INSTALL ACCESSORIES COMPATIBLE WITH INSULATION MATERIALS AND SUITABLE FOR THE SERVICE. INSTALL ACCESSORIES THAT DO NOT CORRODE, SOFTEN, OR OTHERWISE ATTACK INSULATION OR JACKET IN EITHER WET OR DRY STATE. D. INSTALL INSULATION WITH LONGITUDINAL SEAMS AT TOP AND BOTTOM OF HORIZONTAL RUNS. E. INSTALL MULTIPLE LAYERS OF INSULATION WITH LONGITUDINAL AND END SEAMS STAGGERED. F. KEEP INSULATION MATERIALS DRY DURING APPLICATION AND FINISHING G. INSTALL INSULATION WITH TIGHT LONGITUDINAL SEAMS AND END JOINTS. BOND SEAMS AND JOINTS WITH ADHESIVE RECOMMENDED BY INSULATION MATERIAL MANUFACTURER. H. INSTALL INSULATION WITH LEAST NUMBER OF JOINTS PRACTICAL I. WHERE VAPOR BARRIER IS INDICATED, SEAL JOINTS, SEAMS, AND PENETRATIONS IN INSULATION AT HANGERS, SUPPORTS, ANCHORS, AND OTHER PROJECTIONS WITH 1. INSTALL INSULATION CONTINUOUSLY THROUGH HANGERS AND AROUND ANCHOR ATTACHMENTS. 2. FOR INSULATION APPLICATION WHERE VAPOR BARRIERS ARE INDICATED, EXTEND INSULATION ON ANCHOR LEGS FROM POINT OF ATTACHMENT TO SUPPORTED ITEM TO POINT OF ATTACHMENT TO STRUCTURE. TAPER AND SEAL ENDS AT ATTACHMENT TO STRUCTURE

3. INSTALL INSERT MATERIALS AND INSTALL INSULATION TO TIGHTLY JOIN THE INSERT. SEAL INSULATION TO INSULATION INSERTS WITH ADHESIVE OR SEALING COMPOUND RECOMMENDED BY INSULATION MATERIAL MANUFACTURER. J. APPLY ADHESIVES, MASTICS, AND SEALANTS AT MANUFACTURER'S RECOMMENDED COVERAGE RATE AND WET AND DRY FILM THICKNESSES. K. CUT INSULATION IN A MANNER TO AVOID COMPRESSING INSULATION MORE THAN 75 PERCENT OF ITS NOMINAL THICKNESS. L. REPAIR DAMAGED INSULATION FACINGS BY APPLYING SAME FACING MATERIAL OVER DAMAGED AREAS. EXTEND PATCHES AT LEAST 4 INCHES BEYOND DAMAGED AREAS. ADHERE, STAPLE, AND SEAL PATCHES SIMILAR TO BUTT JOINTS.

A. INSULATION INSTALLATION AT ROOF OR ATTIC PENETRATIONS: INSTALL INSULATION CONTINUOUSLY THROUGH ROOF PENETRATIONS. SEAL PENETRATIONS WITH FLASHING SEALANT.

B. INSULATION INSTALLATION AT INTERIOR WALL AND PARTITION PENETRATIONS (THAT ARE NOT FIRE RATED): INSTALL INSULATION CONTINUOUSLY THROUGH WALLS AND PARTITIONS. 3.4 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. SEAL LONGITUDINAL SEAMS AND END JOINTS WITH MANUFACTURER'S RECOMMENDED ADHESIVE TO ELIMINATE OPENINGS IN INSULATION THAT ALLOW PASSAGE OF AIR TO SURFACE BEING

3.5 INSTALLATION OF MINERAL-FIBER INSULATION A. BLANKET INSULATION INSTALLATION ON DUCTS AND PLENUMS: SECURE WITH ADHESIVE AND APPLY ADHESIVES ACCORDING TO MANUFACTURER'S RECOMMENDED COVERAGE RATES PER UNIT AREA, FOR 100 PERCENT COVERAGE OF DUCT AND PLENUM SURFACES.

2. APPLY ADHESIVE TO ENTIRE CIRCUMFERENCE OF DUCTS AND TO ALL SURFACES OF FITTINGS AND TRANSITIONS.

3. INSTALL EITHER CAPACITOR-DISCHARGE-WELD PINS AND SPEED WASHERS OR CUPPED-HEAD, CAPACITOR-DISCHARGE-WELD PINS ON SIDES AND BOTTOM OF HORIZONTAL DUCTS AND SIDES OF VERTICAL DUCTS AS FOLLOWS: a. ON DUCT SIDES WITH DIMENSIONS 18 INCHES AND SMALLER, PLACE PINS ALONG LONGITUDINAL CENTERLINE OF DUCT. SPACE 3 INCHES MAXIMUM FROM INSULATION END

JDINTS, AND 16 INCHES D.C. b. ON DUCT SIDES WITH DIMENSIONS LARGER THAN 18 INCHES, PLACE PINS 16 INCHES O.C. EACH WAY, AND 3 INCHES MAXIMUM FROM INSULATION JOINTS. INSTALL ADDITIONAL PINS TO HOLD INSULATION TIGHTLY AGAINST SURFACE AT CROSS BRACING.

c. PINS MAY BE DMITTED FROM TOP SURFACE OF HORIZONTAL, RECTANGULAR DUCTS AND

d. DO NOT OVERCOMPRESS INSULATION DURING INSTALLATION. e. IMPALE INSULATION OVER PINS AND ATTACH SPEED WASHERS

f. CUT EXCESS PORTION OF PINS EXTENDING BEYOND SPEED WASHERS OR BEND PARALLEL WITH INSULATION SURFACE. COVER EXPOSED PINS AND WASHERS WITH TAPE MATCHING 4. FOR DUCTS AND PLENUMS WITH SURFACE TEMPERATURES BELOW AMBIENT, INSTALL 4 CONTINUOUS UNBROKEN VAPOR BARRIER, CREATE A FACING LAP FOR LONGITUDINAL SEAMS AND FND ININTS WITH INSULATION BY REMOVING 2 INCHES FROM ONE EDGE AND ONE ENI DIF INSULATION SEGMENT. SECURE LAPS TO ADJACENT INSULATION SECTION WITH 1/2-INCH DUTWARD-CLINCHING STAPLES, 1 INCH D.C. INSTALL VAPOR BARRIER CONSISTING OF FACTORY- OR FIELD-APPLIED JACKET, ADHESIVE, VAPOR-BARRIER MASTIC, AND SEALANT AT JOINTS, SEAMS, AND PROTRUSIONS.

a. REPAIR PUNCTURES, TEARS, AND PENETRATIONS WITH TAPE OR MASTIC TO MAINTAIN VAPOR-BARRIER SEAL. 6. INSTALL VAPOR STOPS FOR DUCTWORK AND PLENUMS OPERATING BELOW 50 DEG F AT 18-FOOT INTERVALS. VAPOR STOPS SHALL CONSIST OF VAPOR-BARRIER MASTIC APPLIED IN A Z-SHAPED PATTERN OVER INSULATION FACE, ALONG BUTT END OF INSULATION, AND OVER THE SURFACE. COVER INSULATION FACE AND SURFACE TO BE

NSULATED A WIDTH EQUAL TO TWO TIMES THE INSULATION THICKNESS, BUT NOT LESS 5. OVERLAP UNFACED BLANKETS A MINIMUM OF 2 INCHES ON LONGITUDINAL SEAMS AND END JOINTS. AT END JOINTS, SECURE WITH STEEL BANDS SPACED A MAXIMUM OF 18 INCHES

6. INSTALL INSULATION ON RECTANGULAR DUCT ELBOWS AND TRANSITIONS WITH A FULL INSULATION SECTION FOR EACH SURFACE. INSTALL INSULATION ON ROUND AND FLAT-OVAL DUCT ELBOWS WITH INDIVIDUALLY MITERED GORES CUT TO FIT THE ELBOW.

7. INSULATE DUCT STIFFENERS, HANGERS, AND FLANGES THAT PROTRUDE BEYOND INSULATION SURFACE WITH 6-INCH-WIDE STRIPS OF SAME MATERIAL USED TO INSULATE DUCT. SECURE ON ALTERNATING SIDES OF STIFFENER, HANGER, AND FLANGE WITH PINS SPACED 6 INCHES

3.6 FIELD-APPLIED JACKET INSTALLATION A. WHERE FSK JACKETS ARE INDICATED, INSTALL AS FOLLOWS:

2. INSTALL LAP OR JOINT STRIPS WITH SAME MATERIAL AS JACKE 3. SECURE JACKET TO INSULATION WITH MANUFACTURER'S RECOMMENDED ADHESIVE.

4. INSTALL JACKET WITH 1-1/2-INCH LAPS AT LONGITUDINAL SEAMS AND 3-INCH-WIDE JOINT 5. SEAL OPENINGS, PUNCTURES, AND BREAKS IN VAPOR-RETARDER JACKETS AND EXPOSED INSULATION WITH VAPOR-BARRIER MASTIC.

A. CONCEALED OR EXPOSED BELOW THE ROOF (BELOW THE ROOF LINE IN THE ATTIC), RECTANGULAR, ROUND AND FLAT-OVAL, SUPPLY-AIR, RETURN AIR, EXHAUST AIR OR OUTSIDE AIR DUCT INSULATION SHALL BE ONE OF THE FOLLOWING 1. FLEXIBLE ELASTOMERIC: 2 INCH THICK. MINIMUM OF R-6 INSTALLED.

2. MINERAL-FIBER BLANKET WITH FSK JACKET: NOMINAL DENSITY. MINIMUM OF R-6 INSTALLED. 2 INCHES THICK AND 0.75-LB/CU, FT.

END OF SECTION 230713

SECTION 230719 - HVAC PIPING INSULATION

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. SECTION INCLUDES INSULATING THE FOLLOWING HVAC PIPING SYSTEMS CONDENSATE DRAIN PIPING, INDOORS. 2. REFRIGERANT SUCTION AND HOT-GAS PIPING, INDOORS AND OUTDOORS.

A. INSTALLER QUALIFICATIONS: SKILLED MECHANICS WHO HAVE SUCCESSFULLY COMPLETED AN APPRENTICESHIP PROGRAM OR ANOTHER CRAFT TRAINING PROGRAM CERTIFIED BY THE DEPARTMENT OF LABOR, BUREAU OF APPRENTICESHIP AND TRAINING. B. SURFACE-BURNING CHARACTERISTICS: FOR INSULATION AND RELATED MATERIALS, AS DETERMINED BY TESTING IDENTICAL PRODUCTS ACCORDING TO ASTM E 84, BY A TESTING AND

INSPECTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION, FACTORY LABEL INSULATION AND JACKET MATERIALS AND ADHESIVE, MASTIC, TAPES, AND CEMENT MATERIAL CONTAINERS, WITH APPROPRIATE MARKINGS OF APPLICABLE TESTING AGENCY. 1. INSULATION INSTALLED INDOORS: FLAME-SPREAD INDEX OF 25 OR LESS, AND SMOKE-DEVELOPED INDEX OF 50 OR LESS.

2. INSULATION INSTALLED OUTDOORS: FLAME-SPREAD INDEX OF 75 OR LESS, AND SMOKE-DEVELOPED INDEX OF 150 OR LESS.

2.1 INSULATION MATERIALS

2.2 ADHESIVES

1.2 QUALITY ASSURANCE

A. COMPLY WITH REQUIREMENTS IN "PIPING INSULATION SCHEDULE, GENERAL," 'INDOOR PIPING INSULATION SCHEDULE," "OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE," FOR WHERE INSULATING MATERIALS SHALL BE APPLIED.

B, PRODUCTS SHALL NOT CONTAIN ASBESTOS, LEAD, MERCURY, OR MERCURY COMPOUNDS C. FLEXIBLE ELASTOMERIC INSULATION: CLOSED-CELL, SPONGE- OR EXPANDED-RUBBER MATERIALS. COMPLY WITH ASTM C 534, TYPE I FOR TUBULAR MATERIALS. 1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:

α. <u>AEROFLEX USA</u> b. <u>ARMACELL LLC</u> c, <u>K-FLEX USA,</u>

A. FLEXIBLE ELASTOMERIC ADHESIVE: COMPLY WITH MIL-A-24179A, TYPE II, CLASS I. 2.3 SEALANTS A. ASJ FLASHING SEALANTS:

STAINLESS STEEL: ASTM A 167 DR ASTM A 240/A 240M, TYPE 304; 0.015 INCH THICK, 1/2 INCH WIDE WITH WING SEAL DR CLOSED SEAL.

2. ALUMINUM: ASTM B 209, ALLOY 3003, 3005, 3105, DR 5005, TEMPER H-14, 0.020 INCH

B. INSTALL INSULATION WITH LONGITUDINAL SEAMS AT TOP AND BOTTOM OF HORIZONTAL RUNS.

C. INSTALL MULTIPLE LAYERS OF INSULATION WITH LONGITUDINAL AND END SEAMS STAGGERED.

D. INSTALL INSULATION WITH TIGHT LONGITUDINAL SEAMS AND END JOINTS. BOND SEAMS AND JOINTS WITH ADHESIVE RECOMMENDED BY INSULATION MATERIAL MANUFACTURER.

E. APPLY ADHESIVES, MASTICS, AND SEALANTS AT MANUFACTURER'S RECOMMENDED COVERAGE

2. COVER CIRCUMFERENTIAL JOINTS WITH 3-INCH- WIDE STRIPS, OF SAME MATERIAL AS INSULATION JACKET. SECURE STRIPS WITH ADHESIVE AND OUTWARD CLINCHING STAPLES

3. OVERLAP JACKET LONGITUDINAL SEAMS AT LEAST 1-1/2 INCHES. INSTALL INSULATION WITH LONGITUDINAL SEAMS AT BOTTOM OF PIPE. CLEAN AND DRY SURFACE TO RECEIVE SELF-SEALING LAP. STAPLE LAPS WITH OUTWARD CLINCHING STAPLES ALONG EDGE AT 2

4. COVER JOINTS AND SEAMS WITH TAPE, ACCORDING TO INSULATION MATERIAL MANUFACTURER'S WRITTEN INSTRUCTIONS, TO MAINTAIN VAPOR SEAL.

5. WHERE VAPOR BARRIERS ARE INDICATED, APPLY VAPOR-BARRIER MASTIC ON SEAMS AND

A. INSULATION INSTALLATION AT ABOVEGROUND EXTERIOR WALL PENETRATIONS: INSTALL

2. FOR APPLICATIONS REQUIRING ONLY INDOOR INSULATION, TERMINATE INSULATION INSIDE

3. EXTEND JACKET OF OUTDOOR INSULATION OUTSIDE WALL FLASHING AND OVERLAP WALL

B. INSULATION INSTALLATION AT INTERIOR WALL AND PARTITION PENETRATIONS (THAT ARE NOT FIRE RATED): INSTALL INSULATION CONTINUOUSLY THROUGH WALLS AND PARTITIONS.

A. REQUIREMENTS IN THIS ARTICLE GENERALLY APPLY TO ALL INSULATION MATERIALS EXCEPT WHERE MORE SPECIFIC REQUIREMENTS ARE SPECIFIED IN VARIOUS PIPE INSULATION MATERIAL INSTALL ATTOM ARTICLES

1. INSTALL INSULATION OVER FITTINGS, VALVES, STRAINERS, FLANGES, UNIONS, AND OTHER SPECIALTIES WITH CONTINUOUS THERMAL AND VAPOR-RETARDER INTEGRITY UNLESS

2. INSULATE PIPE ELBOWS USING PREFORMED FITTING INSULATION OR MITERED FITTINGS MADE FROM SAME MATERIAL AND DENSITY AS ADJACENT PIPE INSULATION. EACH PIECE

3. INSULATE TEE FITTINGS WITH PREFORMED FITTING INSULATION OR SECTIONAL PIP! INSULATION OF SAME MATERIAL AND THICKNESS AS USED FOR ADJACENT PIPE. CU SECTIONAL PIPE INSULATION TO FIT. BUTT EACH SECTION CLOSELY TO THE NEXT AN

4. INSULATE VALVES USING PREFORMED FITTING INSULATION OR SECTIONAL PIPE INSULATION OF SAME MATERIAL, DENSITY, AND THICKNESS AS USED FOR ADJACENT PIPE. OVERLAP ADJOINING PIPE INSULATION BY NOT LESS THAN TWO TIMES THE THICKNESS OF PIPE INSULATION, OR ONE PIPE DIAMETER, WHICHEVER IS THICKER. FOR VALVES, INSULATE UP TO AND INCLUDING THE BONNETS, VALVE STIFFING-BOX STUDE, BOLTS, AND NOTS. FILL

5. COVER SEGMENTED INSULATED SURFACES WITH A LAYER OF FINISHING CEMENT AND COA

6. FOR SERVICES NOT SPECIFIED TO RECEIVE A FIELD-APPLIED JACKET EXCEPT FOR FLEXIBLE ELASTOMERIC AND POLYDLEFIN, INSTALL FITTED PVC COVER OVER ELBOWS, TEES, STRAINERS, VALVES, FLANGES, AND UNIONS. TERMINATE ENDS WITH PVC END CAPS. TAPE PVC COVERS TO ADJOINING INSULATION FACING USING PVC TAPE.

7. STENCIL OR LABEL THE OUTSIDE INSULATION JACKET OF EACH UNION WITH THE WORD

C. INSULATE INSTRUMENT CONNECTIONS FOR THERMOMETERS, PRESSURE GAGES, PRESSURE TEMPERATURE TAPS, TEST CONNECTIONS, FLOW METERS, SENSORS, SWITCHES, AND TRANSMITTERS ON INSULATED PIPES. SHAPE INSULATION AT THESE CONNECTIONS BY

TAPERING IT TO AND AROUND THE CONNECTION WITH INSULATING CEMENT AND FINISH WITH

A. SEAL LONGITUDINAL SEAMS AND END JOINTS WITH MANUFACTURER'S RECOMMENDED ADHESIVE TO ELIMINATE OPENINGS IN INSULATION THAT ALLOW PASSAGE OF AIR TO SURFACE BEING

FILL VOIDS BETWEEN INNER CIRCUMFERENCE OF FLANGE INSULATION AND CIRCUMFERENCE OF ADJACENT STRAIGHT PIPE SEGMENTS WITH CUT SECTIONS OF

4. SECURE INSULATION TO FLANGES AND SEAL SEAMS WITH MANUFACTURER'S RECOMMENDED

ADHESIVE TO ELIMINATE OPENINGS IN INSULATION THAT ALLOW PASSAGE OF AIR T SURFACE BEING INSULATED.

HOLD IN PLACE WITH TIE WIRE. BOND PIECES WITH ADHESIVE.

"UNION." MATCH SIZE AND COLOR OF PIPE LABELS.

FINISHING CEMENT, MASTIC, AND FLASHING SEALANT.

1. INSTALL PIPE INSULATION TO DUTER DIAMETER OF PIPE FLANGE

PLUS TWICE THE THICKNESS OF PIPE INSULATION.

INSULATION OF SAME THICKNESS AS PIPE INSULATION.

C. INSULATION INSTALLATION ON PIPE FITTINGS AND ELBOWS:

1. ALL PIPE SIZES: INSULATION SHALL BE THE FOLLOWING:

1. ALL PIPE SIZES: INSULATION SHALL BE THE FOLLOWING:

a. FLEXIBLE ELASTOMERIC: 1 INCH THICK.

3.6 DUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. REFRIGERANT SUCTION AND HOT-GAS PIPING OR TUBING:

a. FLEXIBLE ELASTOMERIC: 2 INCHES THICK.

3.7 DUTDOOR, FIELD-APPLIED JACKET SCHEDULE

1. INSTALL MITERED SECTIONS OF PIPE INSULATION.

3.5 INDOOR PIPING INSULATION SCHEDULE

3.4 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

B. INSULATION INSTALLATION ON PIPE FLANGES:

SHALL BE BUTTED TIGHTLY AGAINST ADJUINING PIECE AND BUNDED WITH ADHESIVE. FILL

JOINTS, SEAMS, VOIDS, AND IRREGULAR SURFACES WITH INSULATING CEMENT FINISHED TO A SMOOTH, HARD, AND UNIFORM CONTOUR THAT IS UNIFORM WITH ADJOINING PIPE

B. INSULATION INSTALLATION ON FITTINGS, ackslashALackslashS. STRAINERS, FLANGES, AND UNIONS:

WALL 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.

THICK, 1/2 INCH WIDE WITH WING SEAL OR CLOSED SEAL.

F. INSTALL INSULATION WITH FACTORY-APPLIED JACKETS AS FOLLOWS:

ALONG BOTH EDGES OF STRIP, SPACED 4 INCHES O.C.

INSULATION CONTINUOUSLY THROUGH WALL PENETRATIONS.

4. SEAL JACKET TO WALL FLASHING WITH FLASHING SEALAN

1. SEAL PENETRATIONS WITH FLASHING SEALANT

FLASHING AT LEAST 2 INCHES.

3.3 GENERAL PIPE INSULATION INSTALLATION

MATERIAL INSTALLATION ARTICLES.

SUBSTRATES.

4. COLOR: WHITE

3.1 GENERAL INSTALLATION REQUIREMENTS

RATE AND WET AND DRY FILM THICKNESSES.

1. DRAW JACKET TIGHT AND SMOOTH.

VALVES, AND SPECIALTIES.

2.4 SECUREMENTS

1. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, 2. FIRE- AND WATER-RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT. 3. SERVICE TEMPERATURE RANGE: MINUS 40 TO PLUS 250 DEG F.

Furner Building Science & Design, LL0 A. INSTALL INSULATION MATERIALS, ACCESSORIES, AND FINISHES WITH SMOOTH, STRAIGHT, AND EVEN SURFACES; FREE OF VOIDS THROUGHOUT THE LENGTH OF PIPING INCLUDING FITTINGS,

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WITH A MASTIC. INSTALL VAPOR-BARRIER MASTIC FOR BELOW-AMBIENT SERVICES AND A BREATHER MASTIC FOR ABOVE-AMBIENT SERVICES, REINFORCE THE MASTIC WITH FABRIC-REINFORCING MESH. TROWEL THE MASTIC TO A SMOOTH AND WELL-SHAPED KEYPLAN:

> PROJECT TITLE / ADDRESS TOWN OF POLAND, ME

POLAND TOWN OFFICE

HVAC MODIFICATIONS

Poland, ME 04274

PROJ. NO.:

2. MAKE WIDTH OF INSULATION SECTION SAME AS OVERALL WIDTH OF FLANGE AND BOLTS, BID & CONSTRUCTION DOCUMENTS

I INSTALL MITERED SECTIONS OF FIFE INSOCATION.	THOMAS YOUR
2. SECURE INSULATION MATERIALS AND SEAL SEAMS WITH MANUFACTURER'S RECOMMENDED ADHESIVE TO ELIMINATE OPENINGS IN INSULATION THAT ALLOW PASSAGE OF AIR TO SURFACE BEING INSULATED.	DESN. BY: TWB/JDE W. BETTERIDGE
INSULATION INSTALLATION ON VALVES AND PIPE SPECIALTIES:	DRAWN BY: JDE 15936 /
1. INSTALL PREFORMED VALVE COVERS MANUFACTURED OF SAME MATERIAL AS PIPE INSULATION WHEN AVAILABLE.	CHKD BY: TWB
2. WHEN PREFORMED VALVE COVERS ARE NOT AVAILABLE, INSTALL CUT SECTIONS OF PIPE AND SHEET INSULATION TO VALVE BODY. ARRANGE INSULATION TO PERMIT ACCESS TO PACKING AND TO ALLOW VALVE OPERATION WITHOUT DISTURBING INSULATION.	ISSUE DATE: 08/17/2022
3. INSTALL INSULATION TO FLANGES AS SPECIFIED FOR FLANGE INSULATION APPLICATION.	REVISIONS 03/17/2022
4. SECURE INSULATION TO VALVES AND SPECIALTIES AND SEAL SEAMS WITH MANUFACTURER'S RECOMMENDED ADHESIVE TO ELIMINATE OPENINGS IN INSULATION THAT ALLOW PASSAGE OF AIR TO SURFACE BEING INSULATED.	
INDOOR PIPING INSULATION SCHEDULE	
CONDENSATE AND EQUIPMENT DRAIN WATER BELOW 60 DEG F:	
1. ALL PIPE SIZES: INSULATION SHALL BE THE FOLLOWING:	
α. FLEXIBLE ELASTOMERIC: 3/4 INCH THICK.	
REFRIGERANT SUCTION AND HOT-GAS PIPING:	
1. ALL PIPE SIZES: INSULATION SHALL BE THE FOLLOWING:	
a, FLEXIBLE ELASTOMERIC: 1 INCH THICK,	
REFRIGERANT SUCTION AND HOT-GAS FLEXIBLE TUBING	

SHEET TITLE: **SPECIFICATIONS** SHEET 2 OF 3

GALVANIZED CARBON-STEEL WASHER.

A. INSTALL JACKET OVER INSULATION MATERIAL. FOR INSULATION WITH FACTORY-APPLIED JACKET, INSTALL THE FIELD-APPLIED JACKET OVER THE FACTORY-APPLIED JACKET.

END OF SECTION 230719

1. PVC: 20 MILS THICK.

SECTION 232300 - REFRIGERANT PIPING PART 1 - GENERAL A. SECTION INCLUDES: 1. REFRIGERANT PIPES AND FITTINGS. 2. REFRIGERANT PIPING VALVES AND SPECIALTIES. REFRIGERANTS 2 ACTION SUBMITTALS A. PRODUCT DATA: FOR EACH TYPE OF VALVE, REFRIGERANT PIPING, AND PIPING 3 PRODUCT STORAGE AND HANDLING A. STORE PIPING WITH END CAPS IN PLACE TO ENSURE THAT PIPING INTERIOR AND EXTERIOR ARE CLEAN WHEN INSTALLED. PART 2 - PRODUCTS 2.1 PERFORMANCE REQUIREMENTS A. LINE TEST PRESSURE FOR REFRIGERANT R-410A: 1. SUCTION LINES FOR AIR-CONDITIONING APPLICATIONS: 300 PSIG. 2. SUCTION LINES FOR HEAT-PUMP APPLICATIONS: 535 PSIG. 3. HDT-GAS AND LIQUID LINES: 535 PSIG. 2.2 COPPER TUBE AND FITTINGS A. COPPER TUBE: ASTM B 88, TYPE K OR L B. WROUGHT-COPPER FITTINGS: ASME B16.22 . WROUGHT-COPPER UNIONS: ASME B16.22. D. SOLDER FILLER METALS: ASTM B 32. USE 95-5 TIN ANTIMONY OR ALLOY HB SOLDER TO JOIN COPPER SOCKET FITTINGS ON COPPER PIPE. E. BRAZING FILLER METALS: AWS A5.8/A5.8M. F. FLEXIBLE CONNECTORS: 1. BDDY: TIN-BRONZE BELLOWS WITH TINNED-BRONZE-WIRE-REINFORCED PROTECTIVE JACKET. WITH W□VEN, FLEXIBLE, 2. END CONNECTIONS: SOCKET ENDS. 3. DFFSET PERFORMANCE: CAPABLE DF MINIMUM 3/4-INCH MISALIGNMENT IN MINIMUM 7-INCH- LONG ASSEMBLY. 4. WORKING PRESSURE RATING: FACTORY TEST AT MINIMUM 500 PSIG. 5. MAXIMUM OPERATING TEMPERATURE: 250 DEG F. 3 VALVES AND SPECIALTIES A. PACKED-ANGLE VALVES 1. BODY AND BONNET: FORGED BRASS OR CAST BRONZE. 2. PACKING: MOLDED STEM, BACK SEATING, AND REPLACEABLE UNDER PRESSURE. 3. OPERATOR: RISING STEM. 4. SEAT: NONROTATING, SELF-ALIGNING POLYTETRAFLUOROETHYLENE. 5. SEAL CAP: FORGED-BRASS OR VALOX HEX CAP. 6. END CONNECTIONS: SOCKET, UNION, THREADED, OR FLANGED. 7. WORKING PRESSURE RATING: 500 PSIG. 8. MAXIMUM OPERATING TEMPERATURE: 275 DEG F 1. BODY: DUCTILE IRON, FORGED BRASS, OR CAST BRONZE; GLOBE PATTERN. 2. BONNET: BOLTED DUCTILE IRON, FORGED BRASS, OR CAST BRONZE; OR BRASS 3. PISTON: REMOVABLE POLYTETRAFLUORDETHYLENE SEAT 4. CLOSING SPRING: STAINLESS STEEL. 5. END CONNECTIONS: SOCKET, UNION, THREADED, OR FLANGED. 6. MAXIMUM OPENING PRESSURE: 0.50 PSIG. 7. WORKING PRESSURE RATING: 500 PSIG 8. MAXIMUM OPERATING TEMPERATURE: 275 DEG F. C. SAFETY RELIEF VALVES: COMPLY WITH 2010 ASME BOILER AND PRESSURE VESSEL CODE; LISTED AND LABELED BY AN NRTL. 1. BODY AND BONNET: DUCTILE IRON AND STEEL, WITH NEOPRENE O-RING SEAL. 2. PISTON, CLOSING SPRING, AND SEAT INSERT: STAINLESS STEEL. 3. SEAT: POLYTETRAFLUOROETHYLENE 4. END CONNECTIONS: THREADED. 5. WORKING PRESSURE RATING: 400 PSIG. 6. MAXIMUM OPERATING TEMPERATURE: 240 DEG F. D. THERMOSTATIC EXPANSION VALVES: COMPLY WITH AHRI 750. 1. BODY, BONNET, AND SEAL CAP: FORGED BRASS OR STEEL. 2. DIAPHRAGM, PISTON, CLOSING SPRING, AND SEAT INSERT: STAINLESS STEEL. 3. PACKING AND GASKETS: NON-ASBESTOS. 4. CAPILLARY AND BULB: COPPER TUBING FILLED WITH REFRIGERANT CHARGE. 5. SUCTION TEMPERATURE: 40 DEG F. 6. SUPERHEAT: ADJUSTABLE 7. REVERSE-FLOW OPTION (FOR HEAT-PUMP APPLICATIONS). 8. END CONNECTIONS: SOCKET, FLARE, OR THREADED UNION. 9. WORKING PRESSURE RATING: 700 PSIG. . STRAIGHT-TYPE STRAINERS: 1. BODY: WELDED STEEL WITH CORROSION-RESISTANT COATING. 2. SCREEN: 100-MESH STAINLESS STEEL 3. END CONNECTIONS: SOCKET OR FLARE. 4. WORKING PRESSURE RATING: 500 PSIG 5. MAXIMUM OPERATING TEMPERATURE: 275 DEG F. ANGLE-TYPE STRAINERS: BODY: FORGED BRASS OR CAST BRONZE 2. DRAIN PLUG: BRASS HEX PLUG 3. SCREEN: 100-MESH MONEL 4. END CONNECTIONS: SOCKET OR FLARE. 5. WORKING PRESSURE RATING: 500 PSIG. 6. MAXIMUM OPERATING TEMPERATURE: 275 DEG F. i. MOISTURE/LIQUID INDICATORS: 1. BODY: FORGED BRASS. 2. WINDOW: REPLACEABLE, CLEAR, FUSED GLASS WINDOW WITH INDICATING ELEMENT PROTECTED BY FILTER SCREEN. 3. INDICATOR: COLOR CODED TO SHOW MOISTURE CONTENT IN PARTS PER MILLION 4. MINIMUM MOISTURE INDICATOR SENSITIVITY: INDICATE MOISTURE ABOVE 60 PPM 5. END CONNECTIONS: SOCKET OR FLARE. 6. WORKING PRESSURE RATING: 500 PSIG 7. MAXIMUM OPERATING TEMPERATURE: 240 DEG F REPLACEABLE-CORE FILTER DRYERS: COMPLY WITH AHRI 730. BDDY AND COVER: PAINTED-STEEL SHELL WITH DUCTILE-IRON COVER, STAINLESS-STEEL SCREWS, AND NEOPRENE GASKETS. 2. FILTER MEDIA: 10 MICRON, PLEATED WITH INTEGRAL END RINGS; STAINLESS-STEEL SUPPORT. 3. DESICCANT MEDIA: ACTIVATED ALUMINA 4. DESIGNED FOR REVERSE FLOW (FOR HEAT-PUMP APPLICATIONS). 5. END CONNECTIONS: SOCKET. 6. ACCESS PORTS: NPS 1/4 CONNECTIONS AT ENTERING AND LEAVING SIDES FOR PRESSURE DIFFERENTIAL MEASUREMENT. 7. MAXIMUM PRESSURE LOSS: 2 PSIG. 8. WORKING PRESSURE RATING: 500 PSIG 9. MAXIMUM OPERATING TEMPERATURE: 240 DEG F 4 REFRIGERANTS A. ASHRAE 34, R-410A: PENTAFLUORDETHANE/DIFLUOROMETHANE. PART 3 - EXECUTION 1 PIPING APPLICATIONS FOR REFRIGERANT R-410A A. HOT-GAS AND LIQUID LINES, AND SUCTION LINES FOR HEAT-PUMP APPLICATIONS COPPER, TYPE ACR TYPE K TYPE L, DRAWN-TEMPER TUBING AND WROUGHT-COPPER FITTINGS WITH ALLOY HB BRAZED JOINTS. B. SAFETY-RELIEF-VALVE DISCHARGE PIPING: COPPER, TYPE L, ANNEALED- OR DRAWN-TEMPER TUBING AND WROUGHT-COPPER FITTINGS WITH BRAZED JOINTS. .2 VALVE AND SPECIALTY APPLICATIONS A. INSTALL DIAPHRAGM PACKLESS VALVES IN SUCTION AND DISCHARGE LINES OF B. INSTALL SERVICE VALVES FOR GAGE TAPS AT INLET AND DUTLET OF HOT-GAS BYPASS VALVES AND STRAINERS IF THEY ARE NOT AN INTEGRAL PART OF C. INSTALL A CHECK VALVE AT THE COMPRESSOR DISCHARGE AND A LIQUID ACCUMULATOR AT THE COMPRESSOR SUCTION CONNECTION. D. EXCEPT AS OTHERWISE INDICATED, INSTALL DIAPHRAGM PACKLESS VALVES ON INLET AND DUTLET SIDE OF FILTER DRYERS. INSTALL SAFETY RELIEF VALVES WHERE REQUIRED BY 2010 ASME BOILER AND PRESSURE VESSEL CODE. PIPE SAFETY-RELIEF-VALVE DISCHARGE LINE TO F. INSTALL MOISTURE/LIQUID INDICATORS IN LIQUID LINE AT THE INLET OF THE THERMOSTATIC EXPANSION VALVE OR AT THE INLET OF THE EVAPORATOR COIL INSTALL STRAINERS UPSTREAM FROM AND ADJACENT TO THE FOLLOWING UNLESS THEY ARE FURNISHED AS AN INTEGRAL ASSEMBLY FOR THE DEVICE BEING PROTECTED: H. INSTALL FLEXIBLE CONNECTORS AT COMPRESSORS. .3 PIPING INSTALLATION A. DRAWING PLANS, SCHEMATICS, AND DIAGRAMS INDICATE GENERAL LOCATION AND ARRANGEMENT OF PIPING SYSTEMS; INDICATED LOCATIONS AND ARRANGEMENTS WERE USED TO SIZE PIPE AND CALCULATE FRICTION LOSS, EXPANSION, PUMP SIZING, AND OTHER DESIGN CONSIDERATIONS. INSTALL PIPING AS INDICATED UNLESS DEVIATIONS TO LAYOUT ARE APPROVED ON SHOP DRAWINGS. B. INSTALL REFRIGERANT PIPING ACCORDING TO ASHRAE 15. C. INSTALL PIPING IN CONCEALED LOCATIONS UNLESS OTHERWISE INDICATED AND EXCEPT IN EQUIPMENT ROOMS AND SERVICE AREAS.

D. INSTALL PIPING INDICATED TO BE EXPOSED AND PIPING IN EQUIPMENT ROOMS AND SERVICE AREAS AT RIGHT ANGLES OR PARALLEL TO BUILDING WALLS. DIAGONAL RUNS ARE PROHIBITED UNLESS SPECIFICALLY INDICATED OTHERWISE.

E. INSTALL PIPING ABOVE ACCESSIBLE CEILINGS TO ALLOW SUFFICIENT SPACE FOR

F. INSTALL PIPING ADJACENT TO MACHINES TO ALLOW SERVICE AND MAINTENANCE

2.4 HANGERS AND SUPPORTS I. SELECT SYSTEM COMPONENTS WITH PRESSURE RATING EQUAL TO DR GREATER THAN J. INSTALL PIPING AS SHORT AND DIRECT AS POSSIBLE, WITH A MINIMUM NUMBER OF K. ARRANGE PIPING TO ALLOW INSPECTION AND SERVICE OF REFRIGERATION EQUIPMENT. INSTALL VALVES AND SPECIALTIES IN ACCESSIBLE LOCATIONS TO ALLOW FOR SERVICE AND INSPECTION. INSTALL ACCESS DOORS OR PANELS AS SPECIFIED IN SECTION 083113 'ACCESS DOORS AND FRAMES' IF VALVES OR L. INSTALL REFRIGERANT PIPING IN RIGID OR FLEXIBLE CONDUIT IN LOCATIONS 1. INSTALL HORIZONTAL HOT-GAS DISCHARGE PIPING WITH A UNIFORM SLOPE 2. INSTALL HORIZONTAL SUCTION LINES WITH A UNIFORM SLOPE DOWNWARD TO N. WHEN BRAZING OR SOLDERING, REMOVE SOLENDID-VALVE COILS AND SIGHT GLASSES; ALSO REMOVE VALVE STEMS, SEATS, AND PACKING, AND ACCESSIBLE INTERNAL PARTS OF REFRIGERANT SPECIALTIES. DO NOT APPLY HEAT NEAR 1. ADJUSTABLE STEEL CLEVIS HANGERS FOR INDIVIDUAL HORIZONTAL RUNS LESS THAN 20 FEET LONG. 3. COPPER-CLAD HANGERS AND SUPPORTS FOR HANGERS AND SUPPORTS IN DIRECT CONTACT WITH COPPER PIPE. B. INSTALL HANGERS FOR COPPER TUBING WITH THE FOLLOWING MAXIMUM SPACING AND MINIMUM ROD DIAMETERS: 1. TEST REFRIGERANT PIPING, SPECIALTIES, AND RECEIVERS. ISOLATE COMPRESSOR, CONDENSER, EVAPORATOR, AND SAFETY DEVICES FROM TEST PRESSURE IF THEY ARE NOT RATED ABOVE THE TEST PRESSURE. 2. TEST HIGH- AND LOW-PRESSURE SIDE PIPING OF EACH SYSTEM SEPARATELY AT NOT LESS THAN THE PRESSURES INDICATED IN 'PERFORMANCE REQUIREMENTS' 6. SYSTEM SHALL MAINTAIN TEST PRESSURE AT THE MANIFOLD GAGE d. REMAKE LEAKING JOINTS USING NEW MATERIALS, AND RETEST UNTIL 2. EVACUATE ENTIRE REFRIGERANT SYSTEM WITH A VACUUM PUMP TO 500 MICROMETERS. IF VACUUM HOLDS FOR 12 HOURS, SYSTEM IS READY FOR 3. BREAK VACUUM WITH REFRIGERANT GAS, ALLOWING PRESSURE TO BUILD UP TO A. DELEGATED DUCT DESIGN: DUCT CONSTRUCTION, INCLUDING SHEET METAL THICKNESSES, SEAM AND JOINT CONSTRUCTION, REINFORCEMENTS, AND HANGERS AND SUPPORTS, SHALL COMPLY WITH SMACNA'S HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE' AND PERFORMANCE REQUIREMENTS AND DESIGN B. STRUCTURAL PERFORMANCE: DUCT HANGERS AND SUPPORTS SHALL WITHSTAND THE EFFECTS OF GRAVITY LOADS AND STRESSES WITHIN LIMITS AND UNDER CONDITIONS DESCRIBED IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS — C. AIRSTREAM SURFACES: SURFACES IN CONTACT WITH THE AIRSTREAM SHALL COMPLY 4. MATERIALS, FABRICATION, ASSEMBLY, AND SPACING OF HANGERS AND SUPPORTS.

G. INSTALL PIPING FREE OF SAGS AND BENDS.

WHERE EXPOSED TO MECHANICAL INJURY.

DOWNWARD AWAY FROM COMPRESSOR.

4. LIQUID LINES MAY BE INSTALLED LEVEL

A. INSTALL THE FOLLOWING PIPE ATTACHMENTS:

2. SPRING HANGERS TO SUPPORT VERTICAL RUNS.

A. PERFORM THE FOLLOWING TESTS AND INSPECTIONS:

THROUGHOUT DURATION OF TEST.

B. PREPARE TEST AND INSPECTION REPORTS.

SATISFACTORY RESULTS ARE ACHIEVED.

A. CHARGE SYSTEM USING THE FOLLOWING PROCEDURES:

1. SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

CRITERIA INDICATED IN "DUCT SCHEDULE" ARTICLI

. JOINT AND SEAM CONSTRUCTION AND SEALING.

STATIC-PRESSURE CLASS UNLESS OTHERWISE INDICATED.

3. REINFORCEMENT DETAILS AND SPACING.

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

STANDARDS - METAL AND FLEXIBLE."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

STANDARDS - METAL AND FLEXIBLE."

STANDARDS - METAL AND FLEXIBLE."

1. GALVANIZED COATING DESIGNATION: G90.

AND BARS: BLACK AND GALVANIZED.

INCHES OR LESS.

A. PRODUCT DATA: FOR EACH TYPE OF THE FOLLOWING PRODUCTS:

A. GENERAL FABRICATION REQUIREMENTS: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" BASED ON INDICATED

B. TRANSVERSE JOINTS: SELECT JOINT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 2-1, "RECTANGULAR DUCT/TRANSVERSE JOINTS," FOR STATIC-PRESSURE

CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT

INTERVALS, AND OTHER PROVISIONS IN SMACNA'S 'HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE.'

C. LONGITUDINAL SEAMS: SELECT SEAM TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 2-2, "RECTANGULAR DUCT/LONGITUDINAL SEAMS," FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS. METAL AND CLEXIBLE."

D. ELBOWS, TRANSITIONS, OFFSETS, BRANCH CONNECTIONS, AND OTHER DUCT CONSTRUCTION: SELECT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," CHAPTER 4, "FITTINGS

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

B. FLAT-OVAL DUCTS: INDICATED DIMENSIONS ARE THE DUCT WIDTH (MAJOR DIMENSION) AND DIAMETER OF THE ROUND SIDES CONNECTING THE FLAT PORTIONS

C. TRANSVERSE JOINTS: SELECT JOINT TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-1, "ROUND DUCT TRANSVERSE JOINTS," FOR STATIC-PRESSURE CLASS,

APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION

1. TRANSVERSE JOINTS IN DUCTS LARGER THAN 60 INCHES IN DIAMETER: FLANGED.

D. LONGITUDINAL SEAMS: SELECT SEAM TYPES AND FABRICATE ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-2, "ROUND DUCT LONGITUDINAL SEAMS," FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."

A. GENERAL MATERIAL REQUIREMENTS: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" FOR ACCEPTABLE MATERIALS, MATERIAL THICKNESSES, AND DUCT CONSTRUCTION METHODS UNLESS OTHERWISE INDICATED, SHEET METAL MATERIALS SHALL BE FREE OF PITTING, SEAM MARKS,

C. REINFORCEMENT SHAPES AND PLATES: ASTM A 36/A 36M, STEEL PLATES, SHAPES,

1. WHERE BLACK- AND GALVANIZED-STEEL SHAPES AND PLATES ARE USED TO REINFORCE ALUMINUM DUCTS, ISOLATE THE DIFFERENT METALS WITH BUTYL RUBBER, NEOPRENE, OR EPDM GASKET MATERIALS.

D. TIE RODS: GALVANIZED STEEL, 1/4-INCH MINIMUM DIAMETER FOR LENGTHS 36

ROLLER MARKS, STAINS, DISCOLORATIONS, AND OTHER IMPERFECTIONS.

2. FINISHES FOR SURFACES EXPOSED TO VIEW: MILL PHOSPHATIZED.

B. GALVANIZED SHEET STEEL: COMPLY WITH ASTM A 653/A 653M.

AND OTHER CONSTRUCTION," FOR STATIC-PRESSURE CLASS, APPLICABLE SEALING

REQUIREMENTS, MATERIALS INVOLVED, DUCT-SUPPORT INTERVALS, AND OTHER PROVISIONS IN SMACNA'S 'HVAC DUCT CONSTRUCTION STANDARDS - METAL AND

2. SINGLE-WALL ROUND DUCTS AND FITTINGS.

1. NPS 1/2: MAXIMUM SPAN, 60 INCHES; MINIMUM ROD, 1/4 INCH.

2. NPS 5/8: MAXIMUM SPAN, 60 INCHES; MINIMUM RDD, 1/4 INCH.

4. NPS 1-1/4: MAXIMUM SPAN, 96 INCHES: MINIMUM RDD, 3/8 INCH.

5. NPS 1-1/2: MAXIMUM SPAN, 96 INCHES; MINIMUM ROD, 3/8 INCH.

a. FILL SYSTEM WITH NITROGEN TO THE REQUIRED TEST PRESSURE

4. CHARGE SYSTEM WITH A NEW FILTER-DRYER CORE IN CHARGING LINE

C. TEST JOINTS AND FITTINGS WITH ELECTRONIC LEAK DETECTOR OR B BRUSHING A SMALL AMOUNT OF SOAP AND GLYCERIN SOLUTION OVER JOINTS.

INSTALL CORE IN FILTER DRYERS AFTER LEAK TEST BUT BEFORE EVACUATION.

3. NPS 1: MAXIMUM SPAN, 72 INCHES: MINIMUM RDD, 1/4 INCH.

6. NPS 2: MAXIMUM SPAN, 96 INCHES; MINIMUM ROD, 3/8 INCH.

EXPANSION-VALVE BULB.

3.4 HANGERS AND SUPPORTS

3.5 FIELD QUALITY CONTROL

3.6 SYSTEM CHARGING

CHARGING.

END OF SECTION 232300

PART 1 - GENERAI

A. SECTION INCLUDES

SECTION 233113 - METAL DUCTS

3. SHEET METAL MATERIALS.

4. SEALANTS AND GASKETS

5. HANGERS AND SUPPORTS.

1.2 PERFORMANCE REQUIREMENTS

METAL AND FLEXIBLE'

LINERS AND ADHESIVES.

2. SEALANTS AND GASKETS

B. DELEGATED-DESIGN SUBMITTAL:

1. SHEET METAL THICKNESSES.

1.3 ACTION SUBMITTALS

PART 2 - PRODUCTS

WITH REQUIREMENTS IN ASHRAE 62.1.

M. SLOPE REFRIGERANT PIPING AS FOLLOWS:

SYSTEM OPERATING PRESSURE.

JOINTS, ELBOWS, AND FITTINGS.

H. INSTALL FITTINGS FOR CHANGES IN DIRECTION AND BRANCH CONNECTIONS.

EQUIPMENT REQUIRING MAINTENANCE IS CONCEALED BEHIND FINISHED SURFACES.

3. INSTALL TRAPS AND DOUBLE RISERS TO ENTRAIN OIL IN VERTICAL RUNS.

A. HANGER RODS FOR NONCORROSIVE ENVIRONMENTS: CADMIUM-PLATED STEEL RODS B. HANGER RODS FOR CORROSIVE ENVIRONMENTS: ELECTROGALVANIZED, ALL-THREAD RODS OR GALVANIZED RODS WITH THREADS PAINTED WITH ZINC-CHROMATE PRIMER AFTER INSTALLATION. C. STRAP AND ROD SIZES: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS — METAL AND FLEXIBLE," TABLE 5-1, "RECTANGULAR DUCT HANGERS MINIMUM SIZE," AND TABLE 5-2, "MINIMUM HANGER SIZES FOR ROUND DUCT." D. STEEL CABLES FOR GALVANIZED-STEEL DUCTS: GALVANIZED STEEL COMPLYING WITH ASTM A 603. E. STEEL CABLE END CONNECTIONS: CADMIUM-PLATED STEEL ASSEMBLIES WITH BRACKETS, SWIVEL, AND BOLTS DESIGNED FOR DUCT HANGER SERVICE; WITH AN AUTOMATIC-LOCKING AND CLAMPING DEVICE. F. DUCT ATTACHMENTS: SHEET METAL SCREWS, BLIND RIVETS, DR SELF-TAPPING METAL SCREWS; COMPATIBLE WITH DUCT MATERIALS. G. TRAPEZE AND RISER SUPPORTS: 1. SUPPORTS FOR GALVANIZED-STEEL DUCTS: GALVANIZED-STEEL SHAPES AND 2. SUPPORTS FOR ALUMINUM DUCTS: ALUMINUM OR GALVANIZED STEEL COATED WITH ZINC CHROMATE PART 3 - EXECUTION 3.1 DUCT INSTALLATION A. INSTALL DUCTS ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE" UNLESS OTHERWISE INDICATED. B. INSTALL FACTORY- OR SHOP-FABRICATED FITTINGS FOR CHANGES IN DIRECTION, SIZE, AND SHAPE AND FOR BRANCH CONNECTIONS. C. WHERE DUCTS PASS THROUGH NON-FIRE-RATED INTERIOR PARTITIONS AND EXTERIOR WALLS AND ARE EXPOSED TO VIEW, COVER THE OPENING BETWEEN THE PARTITION AND DUCT OR DUCT INSULATION WITH SHEET METAL FLANGES OF SAME METAL THICKNESS AS THE DUCT. DVERLAP DPENINGS ON FOUR SIDES BY AT LEAST D. PROTECT DUCT INTERIORS FROM MOISTURE, CONSTRUCTION DEBRIS AND DUST, AND OTHER FOREIGN MATERIALS. 3.2 HANGER AND SUPPORT INSTALLATION A. COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," CHAPTER 5, "HANGERS AND SUPPORTS." B. HANGER SPACING: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," TABLE 5-1, "RECTANGULAR DUCT HANGERS MINIMUM SIZE," AND TABLE 5-2, "MINIMUM HANGER SIZES FOR ROUND DUCT," FOR MAXIMUM HANGER SPACING; INSTALL HANGERS AND SUPPORTS WITHIN 24 INCHES OF EACH ELBOW AND WITHIN 48 INCHES OF EACH BRANCH INTERSECTION. C. SUPPORT VERTICAL DUCTS WITH STEEL ANGLES OR CHANNEL SECURED TO THE SIDES OF THE DUCT WITH WELDS, BOLTS, SHEET METAL SCREWS, OR BLIND RIVETS, SUPPORT AT EACH FLOOR AND AT A MAXIMUM INTERVALS OF 16 FEET. D. INSTALL UPPER ATTACHMENTS TO STRUCTURES. SELECT AND SIZE UPPER ATTACHMENTS WITH PULL-DUT, TENSION, AND SHEAR CAPACITIES APPROPRIATE FOR SUPPORTED LOADS AND BUILDING MATERIALS WHERE USED. A. MAKE CONNECTIONS TO EQUIPMENT WITH FLEXIBLE CONNECTORS COMPLYING WITH SECTION 233300 'AIR DUCT ACCESSORIES." B. COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" FOR BRANCH, OUTLET AND INLET, AND TERMINAL UNIT CONNECTIONS. A. PAINT INTERIOR OF METAL DUCTS THAT ARE VISIBLE THROUGH REGISTERS AND GRILLES AND THAT DO NOT HAVE DUCT LINER. APPLY ONE COAT OF FLAT, BLACK, LATEX PAINT OVER A COMPATIBLE GALVANIZED-STEEL PRIMER. DUCT SCHEDULE B. SUPPLY DUCTS: 1. DUCTS CONNECTED TO FAN COIL UNITS, ERV-1 AND 2: a. PRESSURE CLASS: POSITIVE 2-INCH WG. b. MINIMUM SMACNA SEAL CLASS: A. c. SMACNA LEAKAGE CLASS FOR RECTANGULAR: 12. d. SMACNA LEAKAGE CLASS FOR ROUND AND FLAT OVAL: 12. C. RETURN DUCTS: 1. DUCTS CONNECTED TO FAN COIL UNITS, ERV-1 AND 2: a. PRESSURE CLASS: NEGATIVE 2-INCH WG. b. MINIMUM SMACNA SEAL CLASS: A. c. SMACNA LEAKAGE CLASS FOR RECTANGULAR: 12. d. SMACNA LEAKAGE CLASS FOR ROUND AND FLAT OVAL: 12. D. EXHAUST DUCTS: 1. DUCTS CONNECTED TO AIR-HANDLING UNITS ERV-1 AND 2 a. PRESSURE CLASS: POSITIVE OR NEGATIVE 2-INCH WG. POSITIVE PRESSURE. c. SMACNA LEAKAGE CLASS FOR RECTANGULAR: 6. d. SMACNA LEAKAGE CLASS FOR ROUND AND FLAT DVAL: E. DUTDOOR-AIR (NOT FILTERED, HEATED, OR COOLED) DUCTS: 1. DUCTS CONNECTED TO AIR-HANDLING UNITS ERV-1 AND 2: a. PRESSURE CLASS: POSITIVE OR NEGATIVE 2-INCH WG. b. MINIMUM SMACNA SEAL CLASS: A c. SMACNA LEAKAGE CLASS FOR RECTANGULAR: 6. d. SMACNA LEAKAGE CLASS FOR ROUND AND FLAT OVAL: 3. END OF SECTION 233113 SECTION 233300 - AIR DUCT ACCESSORIES PART 1 - GENERAL A. SECTION INCLUDES: MANUAL VOLUME DAMPERS. 2. FLANGE CONNECTORS. 3. DUCT-MOUNTED ACCESS DOORS. 4. FLEXIBLE CONNECTORS. 5. DUCT ACCESSORY HARDWARE. 1.2 ACTION SUBMITTALS A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT.

1. ON BOTH SIDES OF DUCT COILS. 2. TWD-HAND ACCESS: 12 BY 6 INCHES. 3. HEAD AND HAND ACCESS: 18 BY 10 INCHES. DUCT CLAMPED OR STRAPPED IN PLACE. 3.2 FIELD QUALITY CONTROL A. TESTS AND INSPECTIONS 1. OPERATE DAMPERS TO VERIFY FULL RANGE OF MOVEMENT. DOOR CAN BE PERFORMED. END OF SECTION 233300 SECTION 233346 - FLEXIBLE DUCTS PART 1 - GENERAL b. MINIMUM SMACNA SEAL CLASS: A IF NEGATIVE PRESSURE, AND A IF 1.1 SUMMARY A. SECTION INCLUDES: INSULATED FLEXIBLE DUCTS. 1.2 ACTION SUBMITTALS A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT PART 2 - PRODUCTS DISCOLORATIONS, AND OTHER IMPERFECTIONS. 2.2 INSULATED FLEXIBLE DUCTS 1. FLEXMASTER U.S.A., INC. 2. <u>MCGILL AIRFLOW LLC</u> 3. THERMAFLEX; A FLEX-TEK GROUP COMPANY, ALUMINIZED VAPOR-BARRIER FILM. A. GALVANIZED SHEET STEEL: COMPLY WITH ASTM A 653/A 653M. 2. MAXIMUM AIR VELOCITY: 4000 FPM. 1. GALVANIZED COATING DESIGNATION: G90. 3. TEMPERATURE RANGE: MINUS 10 TO PLUS 160 DEG F 2. EXPOSED-SURFACE FINISH: MILL PHOSPHATIZED 4. INSULATION R-VALUE: R6. B. REINFORCEMENT SHAPES AND PLATES: GALVANIZED-STEEL REINFORCEMENT WHERE INSTALLED ON GALVANIZED SHEET METAL DUCTS; COMPATIBLE MATERIALS FOR 2.3 FLEXIBLE DUCT CONNECTORS ALUMINUM AND STAINLESS-STEEL DUCTS. 2.2 MANUAL VOLUME DAMPERS A. STANDARD, STEEL, MANUAL VOLUME DAMPERS: 1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING: 3.1 INSTALLATION a. <u>GREENHECK FAN CORPORATION.</u> b. NAILOR INDUSTRIES INC. B. CONNECT DIFFUSERS OR LIGHT TROFFER BOOTS TO DUCTS WITH MAXIMUM 60-INCH LENGTHS OF FLEXIBLE DUCT CLAMPED OR STRAPPED IN PLACE. c. <u>POTTORFF</u> 2. STANDARD LEAKAGE RATING, WITH LINKAGE DUTSIDE AIRSTREAM. 3. SUITABLE FOR HORIZONTAL OR VERTICAL APPLICATIONS. D. INSTALLATION: a. FRAME: HAT-SHAPED, 0.094-INCH-THICK, GALVANIZED SHEET STEEL. 1. INSTALL DUCTS FULLY EXTENDED. 2. DO NOT BEND DUCTS ACROSS SHARP CORNERS. b. MITERED AND WELDED CORNERS c. FLANGES FOR ATTACHING TO WALLS AND FLANGELESS FRAMES FOR INSTALLING IN DUCTS. 5. BLADES: a. MULTIPLE OR SINGLE BLADE. E. SUPPORTING FLEXIBLE DUCTS: b. PARALLEL- OR OPPOSED-BLADE DESIGNA c. STIFFEN DAMPER BLADES FOR STABILITY d. GALVANIZED-STEEL, 0.064 INCH THICK. 6. BLADE AXLES: GALVANIZED STEEL. DIAMETER FROM CENTER LINE OF THE BEND. 7. BEARINGS: WRITTEN INSTALLATION INSTRUCTIONS. b. DAMPERS IN DUCTS WITH PRESSURE CLASSES OF 3-INCH WG OR LESS SHAIL 4. VERTICALLY INSTALLED DUCTS SHALL BE STABILIZED BY SUPPORT STRAPS AT A MAXIMUM OF 72 INCHES O.C. HAVE AXLES FULL LENGTH OF DAMPER BLADES AND BEARINGS AT BOTH ENDS OF OPERATING SHAFT. 8. TIE BARS AND BRACKETS: GALVANIZED STEEL END OF SECTION 233346 2.3 FLANGE CONNECTORS A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING: 1. <u>DUCTMATE INDUSTRIES, INC.</u> 2. WARD INDUSTRIES; A BRAND OF HART & COOLEY, INC. B. DESCRIPTION: ADD-ON OR ROLL-FORMED, FACTORY-FABRICATED, SLIDE-ON TRANSVERSE FLANGE CONNECTORS, GASKETS, AND COMPONENTS. C. MATERIAL: GALVANIZED STEEL.

A. DUCT-MOUNTED ACCESS DOORS: FABRICATE ACCESS PANELS ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE"; FIGURES 7-2, "DUCT ACCESS DOORS AND PANELS," AND 7-3, "ACCESS DOORS -ROUND DUCT. 1. DOOR: a. DOUBLE WALL, RECTANGULAR. b. GALVANIZED SHEET METAL WITH INSULATION FILL AND THICKNESS AS INDICATED FOR DUCT PRESSURE CLASS. d. HINGES AND LATCHES: 1-BY-1-INCHBUTT OR PIANO HINGE AND CAM LATCHES. e. FABRICATE DOORS AIRTIGHT AND SUITABLE FOR DUCT PRESSURE CLASS. 2. FRAME: GALVANIZED SHEET STEEL, WITH BEND-OVER TABS AND FOAM GASKETS. 3. NUMBER OF HINGES AND LOCKS: a. ACCESS DOORS LESS THAN 12 INCHES SQUARE: NO HINGES AND TWO SASH b. ACCESS DOORS UP TO 18 INCHES SQUARE: CONTINUOUS AND TWO SASH C. ACCESS DOORS UP TO 24 BY 48 INCHES! CONTINUOUS AND TWO COMPRESSION

2.5 FLEXIBLE CONNECTORS A. MATERIALS: FLAME-RETARDANT OR NONCOMBUSTIBLE FABRICS B. COATINGS AND ADHESIVES: COMPLY WITH UL 181, CLASS C. METAL-EDGED CONNECTORS: FACTORY FABRICATED WITH A FABRIC STRIP 3-1/6 INCHES WIDE ATTACHED TO TWO STRIPS OF 2-3/4-INCH-WIDE, 0.028-INCH-THICK, GALVANIZED SHEET STEEL OR 0.032-INCH-THICK ALUMINUM SHEETS. PROVIDE METAL COMPATIBLE WITH CONNECTED DUCTS. D. INDOOR SYSTEM, FLEXIBLE CONNECTOR FABRIC GLASS FABRIC DOUBLE COATED

MINIMUM WEIGHT: 26 DZ./SQ. YD.. 2. TENSILE STRENGTH: 480 LBF/INCH IN THE WARP AND 360 LBF/INCH IN THE 3. SERVICE TEMPERATURE: MINUS 40 TO PLUS 200 DEG F

PART 3 - EXECUTION 3.1 INSTALLATION

A. INSTALL DUCT ACCESSORIES ACCORDING TO APPLICABLE DETAILS IN SMACNA "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" FOR METAL

B. INSTALL DUCT ACCESSORIES OF MATERIALS SUITED TO DUCT MATERIALS; USE GALVANIZED-STEEL ACCESSORIES IN GALVANIZED-STEEL AND FIBROUS-GLASS DUCTS, STAINLESS-STEEL ACCESSORIES IN STAINLESS-STEEL DUCTS, AND ALUMINUM ACCESSORIES IN ALUMINUM DUCTS

C. INSTALL VOLUME DAMPERS AT POINTS ON SUPPLY, RETURN, AND EXHAUST SYSTEMS WHERE BRANCHES EXTEND FROM LARGER DUCTS. WHERE DAMPERS ARE INSTALLED IN DUCTS HAVING DUCT LINER, INSTALL DAMPERS WITH HAT CHANNELS OF SAME DEPTH AS LINER, AND TERMINATE LINER WITH NOSING AT HAT CHANNEL 1. INSTALL STEEL VOLUME DAMPERS IN STEEL DUCTS.

D. SET DAMPERS TO FULLY OPEN POSITION BEFORE TESTING, ADJUSTING, AND E. INSTALL TEST HOLES AT FAN INLETS AND OUTLETS AND ELSEWHERE AS

F. INSTALL DUCT ACCESS DOORS ON SIDES OF DUCTS TO ALLOW FOR INSPECTING, ADJUSTING, AND MAINTAINING ACCESSORIES AND EQUIPMENT AT THE FOLLOWING LOCATIONS:

G. INSTALL ACCESS DOORS WITH SWING AGAINST DUCT STATIC PRESSURE

1. DNE-HAND DR INSPECTION ACCESS: 8 BY 5 INCHES.

I. INSTALL FLEXIBLE CONNECTORS TO CONNECT DUCTS TO EQUIPMENT

J. CONNECT DIFFUSERS TO DUCTS WITH MAXIMUM 60-INCH LENGTHS OF FLEXIBLE K. CONNECT FLEXIBLE DUCTS TO METAL DUCTS WITH DRAW BANDS

L. INSTALL DUCT TEST HOLES WHERE REQUIRED FOR TESTING AND BALANCING PURPOSES.

2. INSPECT LOCATIONS OF ACCESS DOORS AND VERIFY THAT PURPOSE OF ACCESS

A. COMPLY WITH NFPA 90A, "INSTALLATION OF AIR CONDITIONING AND VENTILATING SYSTEMS," AND WITH NFPA 90B, "INSTALLATION OF WARM AIR HEATING AND AIR

B. COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AN FLEXIBLE" FOR ACCEPTABLE MATERIALS, MATERIAL THICKNESSES, AND DUC CONSTRUCTION METHODS UNLESS OTHERWISE INDICATED. SHEET METAL MATERIALS SHALL BE FREE OF PITTING, SEAM MARKS, ROLLER MARKS, STAINS,

C. COMPLY WITH THE AIR DIFFUSION COUNCIL'S 'ADC FLEXIBLE AIR DUCT TEST CODE

D. COMPLY WITH ASTM E 96/E 96M, "TEST METHODS FOR WATER VAPOR TRANSMISSION OF MATERIALS."

A. <u>MANUFACTURERS:</u> SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:

B. INSULATED, FLEXIBLE DUCT: UL 181, CLASS 1, TWO-PLY VINYL FILM SUPPORTED BY HELICALLY WOUND, SPRING-STEEL WIRE; FIBROUS-GLASS INSULATION;

1. PRESSURE RATING: 8-INCH WG POSITIVE AND 1.0-INCH WG NEGATIVE.

A. CLAMPS: NYLON STRAP IN SIZES 3 THROUGH 18 INCHES, TO SUIT DUCT SIZE.

A. INSTALL FLEXIBLE DUCTS ACCORDING TO APPLICABLE DETAILS IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE' FOR METAL DUCTS AND IN NAIMA AH116, 'FIBROUS GLASS DUCT CONSTRUCTION STANDARDS,' FOR

C. INSTALL DUCT TEST HOLES WHERE REQUIRED FOR TESTING AND BALANCING

3. BENDS OF FLEXIBLE DUCTING SHALL NOT EXCEED A MINIMUM OF ONE DUCT 4. AVOID CONTACT WITH METAL FIXTURES, WATER LINES, PIPES, OR CONDUITS. 5. INSTALL FLEXIBLE DUCTS IN A DIRECT LINE, WITHOUT SAGS, TWISTS, OR

1. SUSPEND FLEXIBLE DUCTS WITH BANDS 1-1/2 INCHES WIDE OR WIDER AND SPACED A MAXIMUM OF 48 INCHES APART. MAXIMUM CENTERLINE SAG BETWEEN SUPPORTS SHALL NOT EXCEED 1/2 INCH PER 12 INCHES. 2. INSTALL EXTRA SUPPORTS AT BENDS PLACED APPROXIMATELY ONE DUCT

3. DUCTS MAY REST ON CEILING JOISTS OR TRUSS SUPPORTS. SPACING BETWEEN SUPPORTS SHALL NOT EXCEED THE MAXIMUM SPACING PER MANUFACTURER'S

SECTION 238130 - VARIABLE-REFRIGERANT-FLOW AIR CONDITIONING SYSTEMS

1.1 DESCRIPTION A. VARIABLE CAPACITY, VARIABLE REFRIGERANT FLOW HEAT PUMP AND AIR CONDITIONING SPLIT SYSTEMS.

A. MANUFACTURER'S QUALIFICATIONS: COMPANY SPECIALIZING IN MANUFACTURING THE PRODUCTS SPECIFIED IN THIS SECTION WITH MINIMUM 3 YEARS' EXPERIENCE.

B. INSTALLER QUALIFICATIONS: COMPANY SPECIALIZING IN PERFORMING THE WORK OF THIS SECTION WITH MINIMUM 3 YEARS' EXPERIENCE. C. THE UNITS SHALL BE LISTED BY ELECTRICAL LABORATORIES (ETL) AND BEAR THE

D. THE DUTDOOR UNIT WILL BE FACTORY CHARGED WITH R410A. 1.3 VARRANT

A. MANUFACTURER'S WARRANTY FOR A PERIOD OF 1 YEAR FROM DATE OF INSTALLATION. LIMITED LABOR WARRANTY FOR A PERIOD OF 1 YEAR FROM DATE OF INSTALLATION. COMPRESSOR WARRANTY: 6 YEARS FROM DATE OF INSTALLATION. DURING THE STATED PERIOD, SHOULD ANY PART FAIL DUE TO DEFECTS IN MATERIAL AND WORKMANSHIP, IT SHALL BE REPAIRED OR REPLACED AT THE DISCRETION OF THE MANUFACTURER.

1.4 INSTALLATION REQUIREMENTS

A. THE SYSTEM MUST BE INSTALLED BY A FACTORY-TRAINED CONTRACTOR/DEALER. 1.5 DELIVERY, STORAGE AND HANDLING

A. UNIT SHALL BE STORED AND HANDLED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS. PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION A. MANUFACTURERS

 TRANE - MITSUBISH 2. DAIKIN, DISTRIBUTED BY DXS NEW ENGLAND. 3. OR APPROVED EQUAL.

FROM LEFT, RIGHT, REAR OR BOTTOM.

B. GENERAL: THE DUTDOOR UNIT IS DESIGNED SPECIFICALLY FOR USE WITH VRF SERIES COMPONENTS. 1. THE DUTDOOR UNIT SHALL BE FACTORY ASSEMBLED AND PRE-WIRED WITH

NECESSARY ELECTRONIC AND REFRIGERANT CONTROLS. THE REFRIGERATION CIRCUIT OF THE CONDENSING UNIT SHALL CONSIST OF SCROLL COMPRESSOR, MOTORS, FANS, CONDENSER COIL, ELECTRONIC EXPANSION VALVE, SOLENOID VALVES, DISTRIBUTION HEADERS, CAPILLARIES, FILTERS, SHUT OFF VALVES, OIL SEPARATORS, SERVICE PORTS, LIQUID RECEIVERS, AND ACCUMULATORS. 2. BOTH LIQUID AND SUCTION LINES MUST BE INDIVIDUALLY INSULATED BETWEEN THE DUTDOOR AND INDOOR UNITS. 3. THE DUTDOOR UNIT CAN BE WIRED AND PIPED WITH DUTDOOR UNIT ACCESS

4. THE SOUND PRESSURE DB(A) AT RATED CONDITIONS SHALL BE A VALUE OF 58 DECIBELS AT 3 FEET FROM THE FRONT OF THE UNIT. THE OUTDOOR UNIT SHALL BE CAPABLE OF OPERATING AT FURTHER REDUCED NOISE DURING NIGHTTIME. 5. THE SYSTEM WILL AUTOMATICALLY RESTART OPERATION AFTER A POWER FAILURE AND WILL NOT CAUSE ANY SETTINGS TO BE LOST, THUS ELIMINATING THE NEED FOR RE-PROGRAMMING.

1. THE DUTDOOR UNIT SHALL BE COMPLETELY WEATHERPROOF AND CORROSION RESISTANT. THE UNIT SHALL BE CONSTRUCTED FROM RUST-PROOFED MILD STEEL PANELS COATED WITH A BAKED ENAMEL FINISH.

1. THE CONDENSING UNIT SHALL CONSIST OF ONE PROPELLER TYPE, DIRECT-DRIVE FAN MOTORS THAT HAVE MULTIPLE SPEED OPERATION VIA A DC INVERTER. 2. THE CONDENSING UNIT FAN MOTOR SHALL HAVE MULTIPLE SPEED OPERATION OF THE DC INVERTER TYPE, AND BE OF HIGH EXTERNAL STATIC PRESSURE AND SHALL BE FACTORY SET AS STANDARD. 3. THE FAN MOTOR SHALL HAVE INHERENT PROTECTION AND PERMANENTLY LUBRICATED BEARINGS AND BE MOUNTED.

4. THE FAN MOTOR SHALL BE PROVIDED WITH A FAN GUARD TO PREVENT CONTACT WITH MOVING PARTS. E. CONDENSER COIL: 1. THE CONDENSER COIL SHALL BE MANUFACTURED FROM COPPER TUBES EXPANDED INTO ALUMINUM FINS TO FORM A MECHANICAL BOND. 2. THE COIL SHALL BE OF A WAFFLE LOUVER FIN AND HIGH HEAT EXCHANGER,

RIFLED BORE TUBE DESIGN TO ENSURE HIGHLY EFFICIENT PERFORMANCE. 1. THE SCROLL COMPRESSOR SHALL BE VARIABLE SPEED CONTROLLED WHICH IS CAPABLE OF CHANGING THE SPEED TO FOLLOW THE VARIATIONS IN TOTAL COOLING LOAD AS DETERMINED BY THE SUCTION GAS PRESSURE AS MEASURED

IN THE CONDENSING UNIT. 2. THE COMPRESSOR IN EACH CONDENSING UNIT SHALL BE OF HIGHLY EFFICIENT RELUCTANCE DC, HERMETICALLY SEALED SCROLL TYPE. 3. EACH COMPRESSOR SHALL BE EQUIPPED WITH A CRANKCASE HEATER, HIGH PRESSURE SAFETY SWITCH, AND INTERNAL THERMAL OVERLOAD PROTECTOR. 4. DIL SEPARATORS SHALL BE STANDARD WITH THE EQUIPMENT TOGETHER WITH AN

TIL BALANCING CIRCUIT 5. THE COMPRESSOR SHALL BE MOUNTED TO AVOID THE TRANSMISSION OF VIBRATION.

G. ELECTRICAL: 1. THE POWER SUPPLY TO THE OUTDOOR UNIT SHALL BE AS SCHEDULED.

2. THE CONTROL VOLTAGE BETWEEN THE INDOOR AND OUTDOOR UNIT SHALL BE 16VDC NON-SHIELDED 2 CONDUCTOR CABLE 3. THE CONTROL WIRING SHALL BE A TWO-WIRE MULTIPLEX TRANSMISSION SYSTEM, MAKING IT POSSIBLE TO CONNECT MULTIPLE INDOOR UNITS TO ONE OUTDOOR UNIT WITH DNE 2-CABLE WIRE, THUS SIMPLIFYING THE WIRING DPERATION.

4. THE CONTROL WIRING LENGTHS SHALL CONFORM WITH THE MANUFACTURER'S

2.2 INDOOR UNIT - CONCEALED CEILING DUCTED UNIT

A. PERFORMANCE: AS SPECIFIED ON DRAWINGS 1. INDOOR UNIT SHALL BE A BUILT-IN CEILING CONCEALED FAN COIL UNIT WITH VARIABLE SPEED DIRECT DRIVE DC TYPE FAN AND AUTO CFM ADJUSTMENT AT COMMISSIONING. CASING SHALL BE CONSTRUCTED OF GALVANIZED STEEL. CONFIGURATION SHALL BE HORIZONTAL DISCHARGE AIR WITH HORIZONTAL RETURN AIR, WITH A MAXIMUM HEIGHT OF 12" AND BE DESIGNED TO FIT IN TIGHT CEILING PLENIMS

TIGHT CEILING PLENUMS. 2. THE INDOOR UNIT'S SOUND PRESSURE SHALL RANGE FROM 28 DB(A) TO 36 DB(A) AT LOW SPEED MEASURED 5 FEET BELOW THE DUCTED UNIT. 3. THE INDOOR UNITS SHALL BE EQUIPPED WITH A CONDENSATE PAN AND CONDENSATE PUMP. THE CONDENSATE PUMP SHALL PROVIDE MINIMUM OF 25" OF LIFT FROM THE CENTER OF THE DRAIN OUTLET AND HAVE A BUILT-IN SAFETY

SHUTOFF AND ALARM. 4. THE FAN SHALL HAVE A VARIABLE SPEED DIRECT DRIVE DC MOTOR WITH STATICALLY AND DYNAMICALLY BALANCED IMPELLER WITH 3 USER-SELECTABLE FAN SPEEDS. THE AUTOMATIC FAN SPEED MODE SHALL ALLOW THE FAN TO VARY BETWEEN 5 SPEEDS BASED ON SPACE LOAD. THE UNIT SHALL HAVE LOGIC FOR AUTOMATICALLY ADJUSTING EXTERNAL STATIC PRESSURE SETTINGS OF THE FAN MOTOR (SELECTABLE DURING COMMISSIONING).

5. THE UNIT SHALL SHIP FROM THE FACTORY IN A REAR RETURN CONFIGURATION AND SHALL BE FIELD CONVERTIBLE TO A BOTTOM RETURN CONFIGURATION. 6. FIELD INSTALLED MERV-13 FILTERS AND FILTER KITS WITH 2" FILTER DEPTHS. 7. PROVIDE WITH CONTROLLER AS SCHEDULED. INTERLOCK OPERATION OF INDOOR UNIT WITH AN OCCUPIED UNDCCUPIED SCHEDULE THAT MATCHES THE ASSOCIATED ERV UNIT.

PART 3 - EXACUTION

3.1 EXAMINATI□N A. VERIFY THAT SYSTEM IS LOCATED PER DRAWINGS. B. VERIFY THAT PROPER POWER SUPPLY IS AVAILABLE.

3.2 INSTALLATION

A. INSTALL UNITS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

B. MOUNT GROUND-MOUNTED AIR-COOLED CONDENSING UNITS 24 IN. (0.61 M) ABOVE GRADE ON MANUFACTURER'S RECOMMENDED STAND. . INSTALL CONDENSING UNITS ON A FLAT SURFACE LEVEL WITHIN 1/8 INCH, AND ELEVATED A MINIMUM OF 18" FROM GROUND OR ROOF SURFACE. PROVIDE INTERMEDIATE SUPPORTS AS RECOMMENDED BY THE EQUIPMENT MANUFACTURER.

D. PROVIDE ALL NECESSARY CONTROL WIRING AS RECOMMENDED BY THE MANUFACTURER.

E. HIGH/LOW PRESSURE GAS LINE, LIQUID, AND SUCTION LINES MUST BE INDIVIDUALLY INSULATED BETWEEN THE OUTDOOR AND INDOOR UNITS.

F. PRIOR TO INSTALLATION CONTACT THE LOCAL MANUFACTURER'S REPRESENTATIVE TO REVIEW AND CONFIRM PIPING LAYOUT AND LENGTHS. G. USE REFRIGERATION BEST PRACTICE TO ALLOW PIPES TO EXPAND AND CONTRACT FREELY. REVIEW MANUFACTURER INSTALLATION INSTRUCTIONS TO ENSURE

EXPANSION JOINTS ARE PROPERLY DESIGNED. H. PRESSURE TEST ALL SYSTEMS TO 550 PSI AFTER SYSTEM WAS VACUUMED AND

HELD TO BELOW 500 MICRONS FOR AT LEAST ONE HOUR. REVIEW MANUFACTURER INSTALLATION INSTRUCTIONS FOR PROPER PRESSURE TEST PROCEDURES. END OF SECTION 238130

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KEY PLAN:

PROJECT TITLE / ADDRESS: TOWN OF POLAND, ME

POLAND TOWN OFFICE

HVAC MODIFICATIONS

1231 Maine Street Poland, ME 04274

BID & CONSTRUCTION DOCUMENTS

PROJ. NO.:	\$1386	STANRILL OF MANN
SCALE:	AS NOTED	STANFINE OF MANAGEMENT AT THOMAS
DESN. BY:	TWB/JDP	W. BETTERIDGE
DRAWN BY:	JOE	45026
CHKD BY:	тwв	ON CENSED TO STATE OF THE PARTY
ISSUE DATE:	08/17/2022	STOWAL ENGINEER
REVISIONS		08/17/2022

SHEET TITLE: **SPECIFICATIONS**

SHEET 3 OF 3

D. GAGE AND SHAPE: MATCH CONNECTING DUCTWORK.

2.4 DUCT-MOUNTED ACCESS DOORS