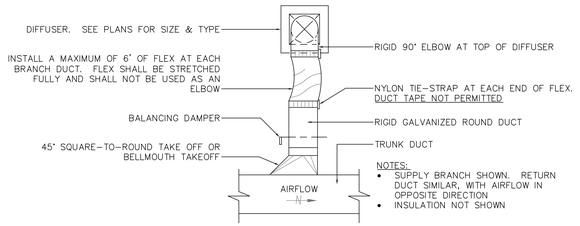
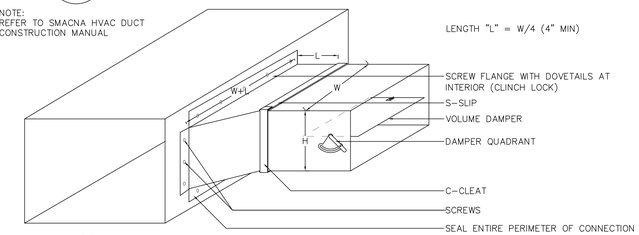


3 M-1 *TYPICAL ROUND BRANCH DUCT & DIFFUSER*

NOT TO SCALE

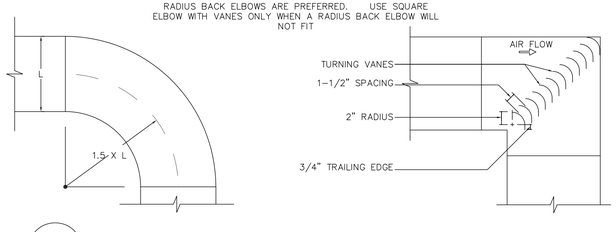


4 M-1 *TYPICAL RECTANGULAR BRANCH TAKEOFF*

NOT TO SCALE

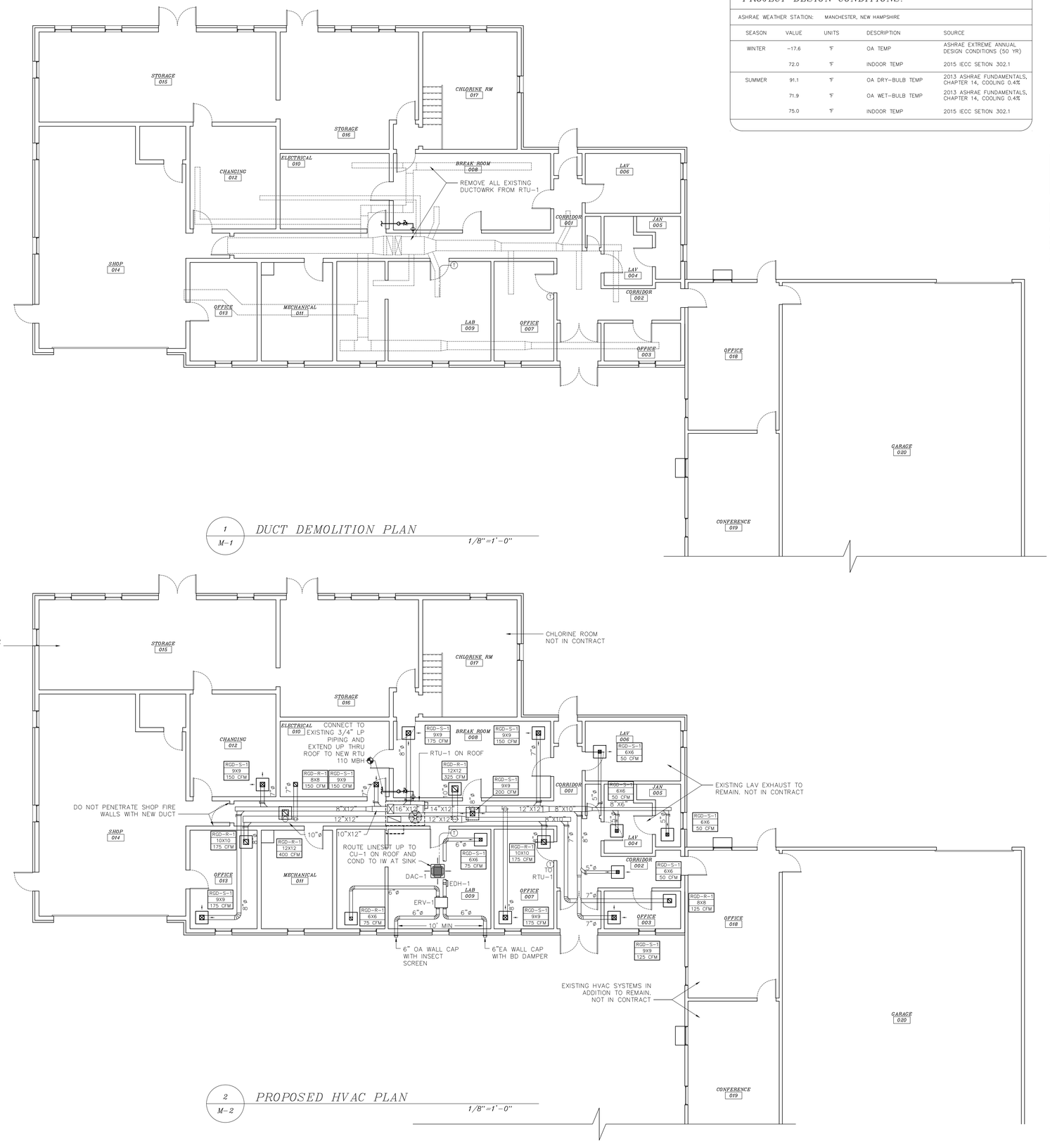
5 M-1 *TYPICAL DUCT TRANSITION*

NOT TO SCALE



6 M-1 *TYPICAL RECTANGULAR ELBOW*

NOT TO SCALE



1 M-1 *DUCT DEMOLITION PLAN*

1/8"=1'-0"

2 M-2 *PROPOSED HVAC PLAN*

1/8"=1'-0"

PROJECT DESIGN CONDITIONS:

ASHRAE WEATHER STATION: MANCHESTER, NEW HAMPSHIRE

SEASON	VALUE	UNITS	DESCRIPTION	SOURCE
WINTER	-17.6	°F	OA TEMP	ASHRAE EXTREME ANNUAL DESIGN CONDITIONS (50 YR)
	72.0	°F	INDOOR TEMP	2015 IECC SETION 302.1
SUMMER	91.1	°F	OA DRY-BULB TEMP	2013 ASHRAE FUNDAMENTALS, CHAPTER 14, COOLING 0.4%
	71.9	°F	OA WET-BULB TEMP	2013 ASHRAE FUNDAMENTALS, CHAPTER 14, COOLING 0.4%
	75.0	°F	INDOOR TEMP	2015 IECC SETION 302.1

DESIGN DAY Mechanicals Inc

THE PROJECT MANAGER FOR THIS PROJECT IS NOTED BELOW. PLEASE REFER ALL QUESTIONS, SUBMITTALS AND CORRESPONDENCE TO THE PROJECT MANAGER.

HVAC PROJECT MANAGER:

DAVID C. MAGNUSON
EMAIL: DAVEM@DESIGNDAYMECH.COM
PHONE: (603) 463-1086
ADDRESS: 65 OLD CENTER RD, DEERFIELD, NH 03037

STATE OF NEW HAMPSHIRE — ANDREW W. ARSENAULT No.7099 — LICENSED PROFESSIONAL ENGINEER

Digitally signed by Andrew W Arsenault
Date: 2021.09.16 13:10:47 -04'00'

PROJECT:

DERRY WASTE WATER TREATMENT FACILITY
TRANSFER LANE
DERRY, NH

FOR:

TOWN OF DERRY
NEW HAMPSHIRE

EXISTING AND PROPOSED DUCT PLANS

REVISIONS:

DESIGNED BY:	DCM
DRAWN BY:	DCM
CHECKED BY:	AWA
DDM JOB #:	2117
SCALE:	AS NOTED

DATE: 09/15/2021

M-1

SHEET 1 OF 3

Derry Wasterwater Facility

2015 IMC Ventilation Calculations & Airflows

ROOM #	ROOM NAME	OCCUPANCY CLASSIFICATION	OUTSIDE AIR REQUIREMENTS: OCCUPANT DENSITY	# OF OCCUPANTS (Pz)	PEOPLE OA AIRFLOW RATE (Rp)	PEOPLE OA AIRFLOW (Rp*Pz)	AREA OA AIRFLOW RATE (Ra)	ZONE FLOOR AREA (Az)	AREA OA AIRFLOW (Ra*Az)	BREATHING ZONE OA AIRFLOW (Vbz)	AIR DISTRIBUTION EFFECTIVENESS (Ez)	ZONE OA AIRFLOW REQUIRED (Voz)	SUPPLY Vpz	ZP	ACTUAL OA	EXHAUST REQUIREMENTS: AREA EA AIRFLOW RATE	FIXTURE EA AIRFLOW RATE	QTY FIXTURES	CFM REQUIRED	ACTUAL EA	ACTUAL RA	Notes
			[#/1000 Ft2]	[People]	[CFM/Person]	[CFM]	[CFM/Ft2]	[Ft2]	[CFM]	[CFM]	[#]	[CFM]	[CFM]		[CFM]	[CFM/ft2]	[CFM/Fixture]	[#]	[CFM]	[CFM]	[CFM]	
001	CORRIDOR	CORRIDORS					0.06	333	20	20	0.8	25	200	0.12	19						**400**	
002	CORRIDOR	CORRIDORS					0.06	65	4	4	0.8	5	50	0.10	5							
003	OFFICE	OFFICE SPACES	5	1	5.0	5	0.06	73	4	9	0.8	12	125	0.09	12						**125**	
004	LAV	TOILET ROOMS — PUBLIC (CONSTANT)						76			0.8		50		5		50	1	50	**50**		EXISTING EXHAUST FAN TO REMAIN
005	JANITOR	JANITOR CLOSETS, TRASH ROOM, RECYCLING						48			0.8					1.0			48	**50**		EXISTING EXHAUST FAN TO REMAIN
006	LAV	TOILET ROOMS — PUBLIC (CONSTANT)						145			0.8		50		5		50	1	50	**50**		EXISTING EXHAUST FAN TO REMAIN
007	OFFICE	OFFICE SPACES	5	1	5.0	5	0.06	151	9	14	0.8	18	175	0.10	17						**175**	
008	BREAK ROOM	OFFICE SPACES	5	4	5.0	20	`	305		20	0.8	25	325	0.08	31						**325**	
010	ELECTRICAL	STORAGE ROOMS					0.12	208	25	25	0.8	31	250	0.12							**250**	
012	CHANGING	LOCKER/DRESSING ROOMS		2				224			0.8		150		15	0.3			56	**75**		
013	OFFICE	OFFICE SPACES	5	1	5.0	5	0.06	168	10	15	0.8	19	175	0.11	17						**175**	
		RTU -1 Totals		**9**		**35**		**1,796**	**72**		**0.8**	**134**	**1550**	**0.12**	**126**							
		Actual Total People At Any One Time		**9**																**225**	**1,450**	
										IMC Requirements					**Min OA**	**Max OA**						
										EV	**D**	**Vou**	**Vot**									
										1	**1.0**	**107**	**107**		**150**	**150**						
009	LAB	OFFICE SPACES	1	1	5.0	5	0.06	387	23	28	0.8	35		N/A	75					**75**		
		ERV-1 Totals		**1**		**5**		**387**	**23**		**0.8**	**35**										
		Actual Total People At Any One Time																				

ENERGY RECOVERY UNIT SCHEDULE (ERV)

MARK	MAKE	MODEL	AIRFLOW: SUPPLY (CFM)	SUPPLY ESP (IN WC)	EXHAUST (CFM)	EXHAUST ESP (IN WC)	HEAT EXCHANGER: WINTER OA DB	WINTER OA RH	WINTER RA DB	WINTER RA RH	WINTER SA DB	SUMMER OA DB	SUMMER OA WB	SUMMER RA DB	SUMMER RA RH	SUMMER SA DB/WB	ELECTRICAL: SA MHP	EA MHP	VOLT/PH	FLA	MOCP	FILTER	NOTES
ERV-1	RENEWAIRE	EV90	75	0.25	75	0.25	-17.6	70%	70	35%	52	91.9	71.9	75	50%	78.4 / 69.2	0.03	0.03	120/1	0.35	15	1" MERV-8	1

NOTES:

1. TIME CLOCK. FACTORY MODEL RH-D 1 KW ELECTRIC DUCT HEATER (EDH-1)

GAS/ELECTRIC ROOF TOP UNIT SCHEDULE (RTU)

MARK	MAKE	MODEL	NOM TONS	SUPPLY (CFM)	ESP (IN. WC)	MIN OA (CFM)	COOLING (BASED ON MAX OCC OA): TOTAL (MBH)	SENSIBLE (MBH)	EFFICIENCY	EDB	EWB	LDB	LWB	HEATING (BASED ON MAX OCC OA): INPUT (MBH)	OUTPUT (MBH)	EFFICIENCY	FUEL	EAT	LAT	ELECTRICAL: BHP	VOLT/PH	MCA	MOCP	NOTES
RTU-1	CARRIER	48GCEM05	4	1,600	0.75	150	48.0	37.6	16 SEER	76.5	63.4	54.8	53.1	110	88	80.0	LP	61.8	112.7	0.81	208/3	27.0	30	1,2

NOTES:

1. CURB ADAPTER, 7 DAY PROGRAMMABLE THERMOSTAT, NON-FUSED DISCONNECT, UNPOWERED CONVENIENCE OUTLET
2. TWO POSITION OA DAMPER

CONDENSING UNIT SCHEDULE (CU)

MARK	SERVES	MAKE	MODEL	NOMINAL TONS	COOLING EFFICIENCY	HEATING EFFICIENCY	LIQUID LINE	SUCTION LINE	REFRIG	VOLT/PH	MCA	MOCP	NOTES
CU-1	DAC-1	TOSHIBA	RAV-SP180AT2UL	1.50	20.5 SEER	11.5 HSPF	1/4	1/2	410A	208-230/1	17.0	30	1,2

NOTES:

1. SUITABLE FOR HEATING OPERATION TO -4F
2. INDOOR UNIT IS POWERED BY THE CONDENSING UNIT

DUCTLESS AIR CONDITIONER SCHEDULE (DAC)

MARK	SERVES	MAKE	MODEL	COOLING (MBH)	HEATING (MBH)	AIRFLOW (CFM)	MOUNTING	CONDENSATE PUMP	NOTES
DAC-1	LAB	TOSHIBA	RAV-SP180UT-UL	19.0	18.8	600	WALL	YES	1,2

NOTES:

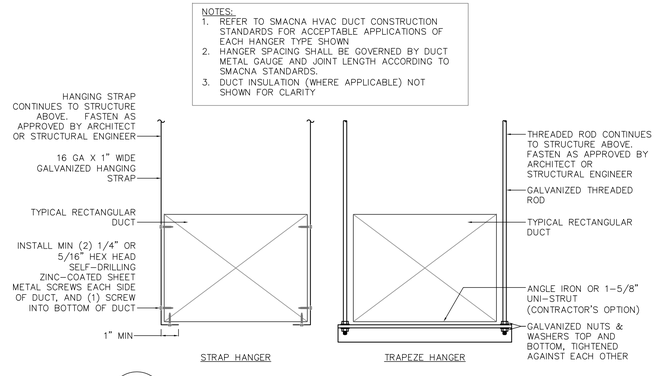
1. POWERED FROM OUTDOOR UNIT
2. WIRED CONTROLLER

REGISTER GRILLE DIFFUSER SCHEDULE (RGD)

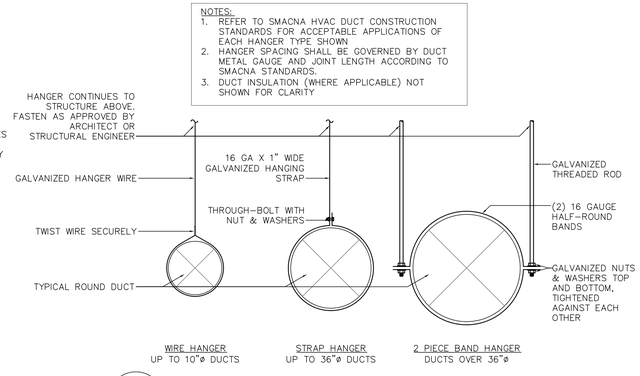
MARK	MAKE	MODEL	DAMPER	PATTERN	NECK SIZE	FRAME STYLE	MATERIAL	DESCRIPTION	NOTES
RGD-S-1	PRICE	SMD	YES	SEE DWGS	SEE DWGS	AS NEEDED	STEEL	SUPPLY	1
RGD-R-1	PRICE	530	YES	45° FIXED	SEE DWGS	AS NEEDED	STEEL	RETURN	1

NOTES:

1. RGD MOUNTED DAMPERS ARE TO BE USED FOR TRIM ONLY. PRIMARY VOLUME DAMPERS ARE TO BE INSTALLED IN THE DUCTS.



1 / M-2 *TYPICAL HANGERS – RECTANGULAR DUCT*
NOT TO SCALE



2 / M-2 *TYPICAL HANGERS – ROUND DUCT*
NOT TO SCALE

DESIGN DAY Mechanicals Inc

THE PROJECT MANAGER FOR THIS PROJECT IS NOTED BELOW. PLEASE REFER ALL QUESTIONS, SUBMITTALS AND CORRESPONDENCE TO THE PROJECT MANAGER.

HVAC PROJECT MANAGER:

DAVID C. MAGNUSON
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ADDRESS: 65 OLD CENTER RD, DEERFIELD, NH 03037

STATE OF NEW HAMPSHIRE – ANDREW W. ARSENAULT No.7099 – LICENSED PROFESSIONAL ENGINEER

Digitally signed by Andrew W Arsenault
Date: 2021.09.16 13:11:09 -04'00'

PROJECT:

DERRY
WASTE WATER
TREATMENT FACILITY
TRANSFER LANE
DERRY, NH

FOR:

TOWN OF DERRY
NEW HAMPSHIRE

VENTILATION CALCULATIONS AND EQUIPMENT SCHEDULES

REVISIONS:

DESIGNED BY: DCM
DRAWN BY: DCM
CHECKED BY: AWA

DDM JOB #: 2117
SCALE: AS NOTED

DATE: 09/15/2021

M-2

DIVISION 23 – HVAC SPECIFICATIONS

I) GENERAL

A) WORK INCLUDED:

1)THESE SPECIFICATIONS INCLUDE GENERAL REQUIREMENTS FOR ALL WORK REPRESENTED ON THESE DRAWINGS. NOT ALL SYSTEMS OR SYSTEM COMPONENTS DESCRIBED IN THESE SPECIFICATIONS ARE NECESSARILY INCLUDED AS A PART OF THIS PROJECT.

2) THE HEATING, VENTILATING, AND AIR CONDITIONING (HVAC) CONTRACTOR SHALL HEREAFTER BE DESCRIBED AS "THE CONTRACTOR" IN THIS HVAC SPECIFICATION. THE CONTRACTOR SHALL PROVIDE, INSTALL, PIPE, DUCT, AND WIRE, AS REQUIRED, HVAC SYSTEMS AS DESCRIBED BELOW, AND SHOWN OR DESCRIBED ON THESE PLANS AND SPECIFICATIONS.

B) QUALITY ASSURANCE:

1)THE INTERNATIONAL MECHANICAL CODE (IMC) 2015, AND THE INTERNATIONAL ENERGY CONSERVATION CODE (IEEC) 2015 ARE THE GOVERNING CODES FOR ALL HVAC WORK. THE CODES AND STANDARDS REFERENCED IN THE MECHANICAL CODE SHALL BE CONSIDERED A PART OF THE REQUIREMENTS OF CODE TO THE PRESCRIBED EXTENT OF EACH SUCH REFERENCE. WHERE DIFFERENCES OCCUR BETWEEN PROVISIONS OF THE CODE AND THE REFERENCED STANDARDS, THE PROVISIONS OF THE CODE SHALL APPLY. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO BE FAMILIAR WITH THE REQUIREMENTS OF ALL CODES AS THEY HAVE BEEN ADOPTED BY THE STATE AND LOCAL JURISDICTIONS.

2) EXCEPT AS SPECIFICALLY DESCRIBED OTHERWISE IN THESE SPECIFICATIONS, ALL COMPONENTS ALLOWED WITHIN THE ABOVE REFERENCED CODES SHALL BE ALLOWED AS A PART OF THE WORK.

3) THE WORKMANSHIP AND MATERIALS COVERED BY THESE SPECIFICATIONS SHALL CONFORM TO ALL ORDINANCES AND REGULATIONS OF ALL AUTHORITIES HAVING JURISDICTION, INCLUDING BUT NOT LIMITED TO, ALL APPLICABLE REGULATIONS OF THE CITY, COUNTY, AND STATE.

4) THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING AND PAYING FOR HVAC PERMITS, TAXES, CONNECTION AND INSPECTION FEES AS REQUIRED FOR THE COMPLETE INSTALLATION OF THE HVAC SYSTEM. THE CONTRACTOR SHALL PROVIDE TO THE OWNER ALL CERTIFICATES OF INSPECTION ISSUED BY THE JURISDICTION.

5) THE CONTRACTOR SHALL VISIT THE SITE AND EXAMINE ALL CONDITIONS AFFECTING THE PROPER EXECUTION OF THE CONTRACT, VERIFY ALL EXISTING CONDITIONS IN THE FIELD AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES BEFORE PROCEEDING WITH WORK.

6) DURING THE PROGRESS OF THE WORK, THE CONTRACTOR SHALL MAINTAIN AN ACCURATE RECORD OF ALL CHANGES MADE IN THE HVAC INSTALLATION FROM THE LAYOUT AND MATERIALS CONTAINED IN THE APPROVED DRAWINGS AND SPECIFICATIONS.

7) DRAWINGS AND CATALOG CUTS, SHOWING ALL HVAC EQUIPMENT AND SYSTEM COMPONENTS, SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL. FIELD MEASURE AND COORDINATE WITH ARCHITECTURAL AND STRUCTURAL DRAWINGS AND ALL OTHER TRADES THE PROPOSED LOCATIONS FOR NEW EQUIPMENT AND COMPONENTS BEFORE PRODUCING SUBMITTALS. NO ITEMS SHALL BE PURCHASED OR ORDERED BEFORE APPROVAL IS GIVEN BY THE ENGINEER IN WRITING.

8) THE CONTRACTOR SHALL COORDINATE HIS WORK WITH ALL OTHER TRADES.

C) RELATED DOCUMENTS:

1)THE GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTAL GENERAL CONDITIONS OF THE CONTRACT AND DIVISION 1 SPECIFICATION SECTIONS PROVIDED BY THE ARCHITECT, AND ALL OTHER DRAWINGS AND SPECIFICATIONS PROVIDED AS A PART OF THIS PROJECT, APPLY TO THIS DIVISION 23 AND TO ALL CONTRACTORS, SUBCONTRACTORS, OR OTHER PERSONS SUPPLYING MATERIALS AND/OR LABOR, ENTERING INTO THE PROJECT SITE AND/OR PREMISES, DIRECTLY OR INDIRECTLY.

2) THE SPECIFICATIONS AND DRAWINGS ARE INTENDED TO BE COMPLEMENTARY. A PARTICULAR SECTION, PARAGRAPH OR HEADING IN A DIVISION MAY NOT DESCRIBE EACH AND EVERY DETAIL CONCERNING WORK TO BE DONE AND MATERIALS TO BE FURNISHED. THE DRAWINGS ARE DIAGRAMMATIC AND MAY NOT SHOW ALL OF THE WORK REQUIRED OR ALL CONSTRUCTION DETAILS. DIMENSIONS ARE SHOWN FOR CRITICAL AREAS ONLY AS AN AID TO THE CONTRACTOR; ALL DIMENSIONS AND ACTUAL PLACEMENTS ARE TO BE VERIFIED IN THE FIELD. IT IS TO BE UNDERSTOOD THAT THE BEST TRADE PRACTICES OF THE DIVISION WILL PREVAIL.

3) ALL TRADE SUBCONTRACTORS ARE TO NOTE THAT THE ORGANIZATION OF SPECIFICATIONS INTO DIVISIONS, AND LIKEWISE THE ARRANGEMENT OF THE DRAWINGS, IS SET UP FOR THE CONVENIENCE OF UNDERSTANDING THE SCOPE OF THE WORK ONLY. THIS STRUCTURING SHALL NOT CONTROL THE GENERAL CONTRACTOR IN DIVIDING THE WORK AMONG TRADE SUBCONTRACTORS OR IN ESTABLISHING THE EXTENT OF THE WORK TO BE PERFORMED BY ANY TRADE. REFER TO GENERAL CONDITIONS.

II)PRODUCTS

A) GENERAL MECHANICAL MATERIALS:

1)ESCUTCHEONS: AT ALL FINISHED WALL PENETRATIONS, PROVIDE CHROME-PLATED SPLIT-RING ESCUTCHEON. INSIDE DIAMETER SHALL CLOSELY FIT PIPE OUTSIDE DIAMETER OR OUTSIDE OF PIPE INSULATION WHERE PIPE IS INSULATED. OUTSIDE DIAMETER SHALL COMPLETELY COVER THE OPENING IN FLOORS, WALLS, OR CEILINGS.

2) UNIONS: MALLEABLE-IRON, CLASS 150 FOR LOW PRESSURE SERVICE AND CLASS 250 FOR HIGH PRESSURE SERVICE; HEXAGONAL STOCK, WITH BALL-AND-SOCKET JOINTS, METAL-TO- METAL BRONZE SEATING SURFACES; FEMALE THREADED ENDS.

3) DIELECTRIC UNIONS: PROVIDE DIELECTRIC UNIONS WITH APPROPRIATE END CONNECTIONS FOR THE PIPE MATERIALS IN WHICH INSTALLED (SCREWED, SOLDERED, OR FLANGED), WHICH EFFECTIVELY ISOLATE DISSIMILAR METALS, TO PREVENT GALVANIC ACTION, AND STOP CORROSION.

4) SLEEVES: GALVANIZED SHEET METAL, SCHEDULE 40 STEEL PIPE, OR PVC AS APPROPRIATE FOR THE WALL CONSTRUCTION.

5) SLEEVE SEALS: MODULAR TYPE, CONSISTING OF INTERLOCKING SYNTHETIC RUBBER LINKS SHAPED TO CONTINUOUSLY FILL ANNULAR SPACE BETWEEN PIPE AND SLEEVE, CONNECTED WITH BOLTS AND PRESSURE PLATES WHICH CAUSE RUBBER SEALING ELEMENTS TO EXPAND WHEN TIGHTENED, PROVIDING WATERTIGHT SEAL AND ELECTRICAL INSULATION.

6) DRIP PANS: WHERE REQUIRED, PROVIDE DRIP PANS FABRICATED FROM CORROSION-RESISTANT SHEET METAL WITH WATERTIGHT JOINTS, AND WITH EDGES TURNED UP A MINIMUM OF 2-1/2". REINFORCE TOP, EITHER BY STRUCTURAL ANGLES OR BY ROLLING TOP OVER 1/4" STEEL ROD. PROVIDE HOLE, GASKET, AND FLANGE AT LOW POINT FOR WATERTIGHT JOINT AND 1" DRAIN LINE CONNECTION.

7) FIRESTOPPING/FIRE-RESISTANT SEALANT: WHERE REQUIRED, PROVIDE A FIRESTOP SYSTEM APPROPRIATE FOR THE ASSEMBLY PENETRATED AND THE PENETRATING ELEMENT. USE ONLY FIRESTOP PRODUCTS THAT HAVE BEEN UL 1479 OR ASTM E 814 TESTED FOR SPECIFIC FIRE-RATED CONDITIONS CONFORMING TO CONSTRUCTION ASSEMBLY TYPE, PENETRATING ITEM TYPE, ANNULAR SPACE REQUIREMENT AND FIRE-RATING INVOLVED FOR EACH SEPARATE INSTANCE. SUBMIT MANUFACTUER'S SPECIFIC DETAIL FOR EACH TYPE OF PENETRATION.

8) ACCESS DOORS: WHERE REQUIRED FOR PROPER SERVICE AND MAINTENANCE OF ALL MECHANICAL COMPONENTS, PROVIDE STEEL ACCESS DOORS AND FRAMES, FACTORY-FABRICATED AND ASSEMBLED UNITS, COMPLETE WITH ATTACHMENT DEVICES AND FASTENERS SUITABLE FOR THE SERVICE.

9) VALVES – PRESSURE AND TEMPERATURE RATED AS REQUIRED TO SUIT SYSTEM PRESSURES AND TEMPERATURES. UNLESS OTHERWISE INDICATED, PROVIDE VALVES OF SAME SIZE AS UPSTREAM PIPE SIZE.

10) SUPPORTS AND ANCHORS: HANGERS FOR PIPE UP TO AND INCLUDING 4" SHALL BE SWIVEL RING, SPLIT RING, WROUGHT PIPE CLAMP, BAND, ADJUSTABLE WROUGHT CLEVIS TYPE OR TRAPEZE. HANGERS FOR PIPES ABOVE 4" SHALL BE STANDARD CLEVIS, ROLLER OR TRAPEZE.

11) SADDLES AND SHIELDS: PROVIDE SADDLES AND SHIELDS UNDER PIPING HANGERS AND SUPPORTS, FACTORY-FABRICATED, FOR ALL INSULATED PIPING. SIZE SADDLES AND SHIELDS FOR EXACT FIT TO MATE WITH PIPE INSULATION.

12) ROOF PENETRATIONS SHALL BE THROUGH 12"(MIN.) HIGH CURBS OR TALL CONE FLASHINGS.

B) ELECTRICAL REQUIREMENTS OF MECHANICAL WORK:

1)BASIC ELECTRICAL COMPONENTS INCLUDE, BUT ARE NOT LIMITED TO ALL REQUIRED STARTERS, DISCONNECT SWITCHES, CONTROL DEVICES, AND MOTORS. IT INCLUDES MOTORS THAT ARE FACTORY-INSTALLED AS PART OF EQUIPMENT AND APPLIANCES AS WELL AS FIELD-INSTALLED MOTORS.

2) STARTERS AND DISCONNECTS: WHERE AVAILABLE, PROVIDE FACTORY MOUNTED DISCONNECTS AND STARTERS, OR, WHEN FACTORY MOUNTED STARTERS AND DISCONNECTS ARE NOT AVAILABLE PROVIDE COMBINATION STARTERS AND DISCONNECT SWITCHES, OR, WHERE COMBINATION STARTERS AND DISCONNECT SWITCHES ARE NOT SUITABLE OR AVAILABLE, PROVIDE SEPARATE STARTERS AND DISCONNECTS FOR ALL HVAC EQUIPMENT, AS REQUIRED FOR PROPER INSTALLATION AND OPERATION OF EQUIPMENT.

C) MECHANICAL IDENTIFICATION:

1)PROVIDE PIPE MARKERS AND EQUIPMENT MARKERS COMPLYING WITH ANSI A13.1 FOR LETTERING SIZE, LENGTH OF COLOR FIELD, COLORS, AND INSTALLED VIEWING ANGLES OF IDENTIFICATION DEVICES.

2) PIPE MARKERS

(a) SNAP-ON TYPE: PROVIDE MANUFACTURER'S STANDARD PRE-PRINTED, SEMI-RIGID, SNAP- ON, COLOR-CODED, PIPE MARKERS.

(b) PRESSURE-SENSITIVE TYPE: PROVIDE MANUFACTURER'S STANDARD PRE-PRINTED, PERMANENT ADHESIVE, COLOR-CODED, PRESSURE-SENSITIVE VINYL PIPE MARKERS.

3) INSTALL EVERY 40 FEET AND AT EACH CHANGE IN DIRECTION.

4) PLASTIC EQUIPMENT MARKERS: PROVIDE MANUFACTURER'S STANDARD LAMINATED PLASTIC, COLOR CODED EQUIPMENT MARKERS.

5) LETTERING AND GRAPHICS: COORDINATE NAMES, ABBREVIATIONS AND OTHER DESIGNATIONS USED IN MECHANICAL IDENTIFICATION WORK, WITH CORRESPONDING DESIGNATIONS SHOWN, SPECIFIED OR SCHEDULED. PROVIDE NUMBERS, LETTERING AND WORDING AS INDICATED OR, IF NOT OTHERWISE INDICATED, AS RECOMMENDED BY MANUFACTURERS OR AS REQUIRED FOR PROPER IDENTIFICATION AND OPERATION/MAINTENANCE OF MECHANICAL SYSTEMS AND EQUIPMENT.

D) VIBRATION CONTROL AND SEISMIC RESTRAINTS:

1)FIBERGLASS PADS AND SHAPES, NEOPRENE PADS, VIBRATION ISOLATION SPRINGS, PAD-TYPE ISOLATORS, PLATE-TYPE ISOLATORS, DOUBLE-PLATE-TYPE ISOLATORS, THREADED DOUBLE- PLATE-TYPE ISOLATORS, ALL-DIRECTIONAL ANCHORS, NEOPRENE MOUNTINGS, FREE STANDING SPRING ISOLATORS, HOUSED SPRING ISOLATORS, VERTICALLY-RESTRAINED SPRING ISOLATORS, EARTHQUAKE-RESISTANT SPRING ISOLATORS, SEISMIC SNUBBERS, THRUST RESTRAINTS, EQUIPMENT RAILS, FABRICATED EQUIPMENT BASES, INERTIA BASE FRAMES, ROOF-CURB ISOLATORS, ISOLATION HANGERS, RISER ISOLATORS, FLEXIBLE PIPE CONNECTORS SHALL BE PROVIDED AS REQUIRED AND AS SUITABLE FOR USE AND SERVICE.

2) WHERE SEISMIC RESTRAINTS ARE REQUIRED, THE CONTRACTOR SHALL PROVIDE CALCULATIONS, DETAILS AND LOCATIONS THAT ARE STAMPED BY A PROFESSIONAL ENGINEER.

E) DUCTWORK:

1)UNLESS OTHERWISE SPECIFIED, ALL RIGID DUCTWORK SHALL BE SHEET METAL MATERIALS AS SPECIFIED IN ASTM A700, WITH GALVANIZED SHEET STEEL: LOCK-FORMING QUALITY, ASTM A527, COATING DESIGNATION G60; MILL PHOSPHATIZED FINISH.

(a) ALL DUCTWORK ASSOCIATED WITH POOLS, SHOWERS, DISHWASHERS OR ANY OTHER MOISTURE SOURCES SHALL BE ALUMINUM OR STAINLESS STEEL. WHERE CONDENSATION CAN FORM INSIDE THE DUCT, JOINTS MUST BE SEALED OR WELDED WATERTIGHT.

(b) ALL DUCTWORK WHICH WILL BE PAINTED SHALL BE GALVANEALED.

2) PRESSURE CLASS AND SEAL CLASS (PER SMACNA): 2"PRESSURE CLASS, SEAL CLASS A (ALL TRANSVERSE JOINTS, LONGITUDINAL SEAMS AND DUCT WALL PENETRATIONS).

3) RECTANGULAR DUCT FABRICATION: FABRICATE RECTANGULAR DUCTS WITH GALVANIZED SHEET STEEL, IN ACCORDANCE WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS", TABLES 1-3 THROUGH 1-19, INCLUDING THEIR ASSOCIATED DETAILS. CONFORM TO THE REQUIREMENTS IN THE REFERENCED STANDARD FOR METAL THICKNESS, REINFORCING TYPES AND INTERVALS, TIE ROD APPLICATIONS, AND JOINT TYPES AND INTERVALS.

4) WHERE DUCT SUPPORTS ARE REQUIRED BETWEEN THE BUILDING STRUCTURAL FRAMING, SUITABLE INTERMEDIATE STEEL FRAMING SHALL BE PROVIDED BY THE CONTRACTOR.

5) WATER BASED LIQUID RUBBER DUCT SEALANT OR FLANGED JOINT MASTICS SHALL BE ONE-PART, ACID- CURING, SILICONE ELASTOMERIC JOINT SEALANTS, COMPLYING WITH ASTM C920, TYPE S, GRADE NS, CLASS 25, USE O.

6) FLEXIBLE DUCT CONNECTORS SHALL BE INSTALLED AT POINTS AS CLOSE AS POSSIBLE TO AIR HANDLERS AND FANS. THE CONNECTOR SHALL BE AT LEAST FOUR (4") INCHES WIDE AND FABRICATED SPECIFICALLY FOR USE AS A FLEXIBLE CONNECTOR. ALL CONNECTIONS SHALL BE AIR TIGHT AND MADE SO THE CONNECTOR IS UNDAMAGED WHEN THE JOINT IS REMOVED.

7) FLEXIBLE DUCTS: LIMITED TO 6 FEET MAXIMUM STRAIGHT AND FULLY STRETCHED. DO NOT USE FLEX AS AN ELBOW.

(a) INTERNAL FABRIC SHALL BE ACOUSTICALLY RATED BLACK RESILIENT CALENDERED FILM WITH COATED STEEL WIRE HELIX, 2"FIBERGLASS BLANKET (R-6.0), AND FIBERGLASS SCRIM REINFORCED ALUMINIZED POLYESTER FILM VAPOR BARRIER AS EXTERIOR FACING. LISTED AND LABELED AS A CLASS 1 AIR DUCT PER UL STD 181. RATED FOR PRESSURE CLASS LISTED ABOVE. EQUIVALENT TO THERMAFLEX M-KE.

8) BELLMOUTH OR 45 DEGREE TAKEOFFS SHALL BE USED FOR DUCT TAKEOFFS TO MINIMIZE PRESSURE DROP.

9) MANUAL VOLUME DAMPERS SHALL BE INSTALLED AT ALL DUCT TAKEOFFS AND AS NEEDED ELSEWHERE TO PROPERLY BALANCE THE SYSTEMS.

10) DUCT LINER

(a) ACOUSTICAL DUCT LINER SHALL BE FIBER GLASS WITH REINFORCED COATING SIMILAR TO JOHNS MANVILLE LINACOUSTIC RC.

(1) LINED DUCT DIMENSIONS SHOWN ARE NET. INCREASE SHEETMETAL DUCT DIMENSIONS AS NEEDED.

(b) SUPPLY AIR DUCTS SHALL BE LINED WITH 1-1/2"THICK LINER (R-6.3):

(1) FOR THE FIRST FIFTEEN (15) FEET FROM THE RTU.

(c) RETURN AIR DUCTS SHALL BE LINED WITH 1"THICK LINER:

(1) FOR THE FIRST FIFTEEN (15) FEET FROM THE RTU.

(d) TRANSFER DUCTS SHALL BE LINED WITH 1"THICK LINER.

(e) ADDITIONAL LINER REQUIREMENTS MAY BE SHOWN ON THE DRAWINGS.

11) FIRE, SMOKE, COMBINATION FIRE/SMOKE DAMPERS AND CEILING RADIATION DAMPERS

(a) FIRE DAMPERS: UL 555 LISTED TYPE "B" (OUT OF AIRSTREAM) 1-1/2 HOUR RATED FOR LESS THAN 3-HOUR FIRE-RESISTANCE RATED ASSEMBLIES AND 3 HOUR RATED FOR 3-HOUR OR GREATER FIRE-RESISTANCE RATED ASSEMBLIES

(1) DYNAMIC FIRE DAMPERS SHALL BE USED IN SYSTEMS DESIGNED TO OPERATE WITH FANS ON DURING A FIRE.

(2) STATIC FIRE DAMPERS MAY BE USED IN SYSTEMS NOT OPERATIONAL DURING A FIRE.

(b) SMOKE DAMPERS: UL 555S LISTED.

(1) VOLTAGE DETERMINED BY FIRE ALARM CONTRACTOR.

(c) COMBINATION FIRE/SMOKE DAMPERS: UL 555 AND UL 555S LISTED.

(1) VOLTAGE DETERMINED BY FIRE ALARM CONTRACTOR.

(d) CEILING RADIATION DAMPERS: UL 555C LISTED.

(e) REFER TO BOTH MECHANICAL AND ARCHITECTURAL DRAWINGS FOR THE LOCATION OF RATED ASSEMBLIES.

12) SMOKE DETECTORS IN AIR SYSTEMS GREATER THAN 2000 CFM SHALL BE FURNISHED AND INSTALLED BY THIS CONTRACTOR IN BOTH THE SUPPLY AND RETURN AIR DUCTWORK AS PER IMC AND NFPA 90A.

(a) IF THERE IS A FIRE ALARM SYSTEM IN THE BUILDING, THIS CONTRACTOR SHALL NOTIFY THE FIRE ALARM CONTRACTOR TO PROVIDE DUCT SMOKE DETECTORS WHERE REQUIRED.

F) AIR CONDITIONING CONDENSATE PIPING:

1)AIR CONDITIONING CONDENSATE PIPING SHALL BE SCHEDULE 40 PVC.

(a) ROOF TOP UNITS SHALL DRAIN CONDENSATE ONTO ROOF.

(b) INDOOR UNITS SHALL DRAIN CONDENSATE TO SANITARY OR STORM VIA INDIRECT CONNECTION.

2) PROVIDE AND INSTALL ISOLATION VALVES, UNIONS/FLANGES, MANUAL AIR VENTS, AND DRAIN VALVES AT ALL PIECES OF EQUIPMENT.

3) PITCH WATER PIPING UP IN THE DIRECTION OF FLOW, 1 INCH PER 40 FEET MINIMUM. PROVIDE AN AIR VENT AT ALL HIGH POINTS AND A DRAIN VALVE AT ALL LOW POINTS.

4) CUT ALL HOLES OF SUFFICIENT SIZE AND HANG ALL PIPE SO THAT THERE WILL BE NO COPPER OR STEEL TO METAL CONTACT AND RESULTANT NOISE DURING PIPE EXPANSION AND CONTRACTION. PROVIDE EXPANSION LOOPS WITH ROLLERS, GUIDES AND ANCHORS WHERE STRAIGHT RUNS OF PIPE EXCEED 100 FEET.

G) REFRIGERATION PIPING SYSTEMS:

1)COPPER TUBE AND FITTINGS:

(a) DRAWN-TEMPER OR ANNEALED COPPER TUBE: ASTM B280, TYPE ACR.

(b) WROUGHT-COPPER FITTINGS: ASME B16.22.

(c) BRAZING FILLER METALS: AWS A5.8, CLASSIFICATION BAG-1 (SILVER)

2) PREINSULATED COPPER ROLLS, SIMILAR TO PDM GELCOPPER ARE ACCEPTABLE.

3) PROVIDE AND INSTALL ALL REFRIGERANT PIPING SPECIALTIES REQUIRED AND RECOMMENDED BY THE REFRIGERATION EQUIPMENT MANUFACTURER.

H) INSULATION:

1)ALL INSULATION SHALL BE UL APPROVED FOR A FLAME SPREAD RATING OF NOT OVER 25 AND A SMOKE DEVELOPED RATING OF NOT OVER 50.

2) ALL INSULATION SHALL CONFORM TO THE REQUIREMENTS OF IECC 2015

3) REFRIGERANT PIPING INSULATION SHALL BE FLEXIBLE ELASTOMERIC THERMAL INSULATION: CLOSED-CELL, SPONGE- OR EXPANDED-RUBBER MATERIALS. COMPLY WITH ASTM C 534, TYPE I FOR TUBULAR MATERIALS AND TYPE II FOR SHEET MATERIALS.

(a) ADHESIVE: AS RECOMMENDED BY INSULATION MATERIAL MANUFACTURER.

(b) PROVIDE UV PROTECTIVE COATING ON ELASTOMERIC INSULATION THAT IS EXPOSED TO SUNLIGHT.

(c) REFRIGERANT PIPE INSULATION THICKNESS (40-60F OPERATING TEMPERATURE)

(1) ½"THICK INSULATION FOR 1-1/4"& SMALLER PIPE SIZES.

(2) 1"THICK INSULATION FOR 1-1/2"& LARGER PIPE SIZES.

4) DUCTWORK:

(a) INSIDE THE BUILDING THERMAL ENVELOPE – SUPPLY AND OUTDOOR AIR DUCTS AND PLENUMS (INCLUDING THOSE INSTALLED IN RETURN AIR PLENUMS) SHALL BE INSULATED WITH FORMALDEHYDE-FREE FIBERGLASS WITH FSK JACKET WITH AN INSTALLED MINIMUM R-6 VALUE, SIMILAR TO JOHNS MANVILLE MICROLITE FSK TYPE 75, 2-1/5"THICK. INTERNALLY LINED SUPPLY AIR DUCT WITH AN R-6 VALUE DOES NOT REQUIRE EXTERNAL INSULATION.

(1) RETURN AIR DUCTS ARE NOT INSULATED.

(2) EXHAUST AIR DUCTS AND PLENUMS SHALL BE INSULATED WITH R-6 TO TEN (10) FEET BACK FROM BUILDING EXTERIOR.

(3) EXHAUST AIR DUCTS BEYOND TEN (10) FEET FROM BUILDING EXTERIOR ARE NOT INSULATED.

(b) OUTSIDE THE BUILDING THERMAL ENVELOPE – SUPPLY, OUTSIDE, RETURN AND EXHAUST AIR DUCTS AND PLENUMS SHALL BE INSULATED WITH FORMALDEHYDE-FREE FIBERGLASS WITH FSK JACKET WITH AN INSTALLED MINIMUM R-12 VALUE, SIMILAR TO JOHNS MANVILLE MICROLITE FSK TYPE 75,4-2/5"THICK.

(c) ROOF MOUNTED SUPPLY, RETURN AND EXHAUST AIR DUCTS SHALL BE INSULATED WITH AN INSTALLED MINIMUM R-12 INSULATION, SIMILAR TO 2.5"THICK HUNTER H-SHIELD POLYISO OR JOHNS MANVILLE 814, 3"THICK, 3.0 PCF FIBERGLASS INSULATION BOARD WITH FSK JACKET.

(1) SLOPE TOP TO SHED WATER.

(2) COVER WITH VENTURECLAD 1577CW-E EMBOSSED ALUMINUM INSULATON JACKETING TAPE OR SIMILAR.

(d) ADDITIONAL DUCTWORK INSULATION REQUIREMENTS MAY BE SHOWN ON THE DRAWINGS.

III) EXECUTION

A) THE CONTRACTOR SHALL PROVIDE ALL SUPERVISION, LABOR, EQUIPMENT, MATERIAL, MACHINERY, PLANS, RIGGING, AND ANY AND ALL OTHER ITEMS NECESSARY TO COMPLETE THE MECHANICAL SYSTEM. SMALL DETAILS NOT USUALLY INDICATED ON THE DRAWINGS OR SPECIFIED, BUT WHICH ARE NECESSARY FOR THE PROPER INSTALLATION AND OPERATION OF THE MECHANICAL SYSTEM SHALL BE INCLUDED IN THE WORK AND IN THE CONTRACTOR'S ESTIMATE THE SAME AS IF HEREIN SPECIFIED OR SHOWN ON THE DRAWINGS.

B) THE CONTRACTOR SHALL INSTALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. THIS INCLUDES CHECKING THE MANUFACTURER'S INSTRUCTIONS TO DETERMINE WHAT TYPE OF GLYCOL SYSTEM MAY BE USED WITHI EQUIPMENT SO AS NOT TO VOID THE WARRANTY OR IMPAIR THE OPERATION OF THE EQUIPMENT. WHERE THE DRAWINGS AND SPECIFICATIONS CONFLICT WITH THE MANUFACTURER'S RECOMMENDATIONS, IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO BRING THIS TO THE ATTENTION OF THE ENGINEER.

C) THE HVAC EQUIPMENT MAY NOT BE USED FOR TEMPORARY HEAT DURING CONSTRUCTION. THE HVAC EQUIPMENT SHALL NOT BE STARTED AND TESTED UNTIL ALL CONSTRUCTION ACTIVITY THAT HAS THE POTENTIAL OF CREATING AIR BORNE PARTICULATES THAT COULD BE DRAWN INTO THE HVAC EQUIPMENT AND DUCTWORK SYSTEMS HAS BEEN COMPLETED. IN ADDITION, ALL DUCTWORK OPENINGS SHALL BE SEALED UNTIL THE TIME WHEN THE HVAC EQUIPMENT IS TO BE STARTED AND TESTED.

D) DUCTWORK AND FITTINGS SHALL HAVE ENDS COVERED WITH PLASTIC AT ALL TIMES.

E) UPON COMPLETION OF WORK, THE CONTRACTOR SHALL CLEAN, OIL AND GREASE (UNLESS FACTORY LUBRICATED) ALL FANS, PUMPS, MOTORS, ALL OTHER RUNNING EQUIPMENT AND APPARATUS AND MAKE CERTAIN THAT ALL SUCH APPARATUS AND MECHANISMS ARE IN PROPER WORKING ORDER AND MADE READY FOR TESTING.

F) REPLACE ALL FILTERS USED DURING CONSTRUCTION.

G) EQUIPMENT SHALL BE STARTED, TESTED, ADJUSTED AND PLACED IN SATISFACTORY OPERATING CONDITION BY THE CONTRACTOR.

H) THE CONTRACTOR SHALL INSTRUCT OWNER IN THE PROPER OPERATION OF EQUIPMENT, EXPLAIN THE PROPER OPERATING AND MAINTENANCE PROCEDURES AND SHALL FURNISH THE OWNER WITH ALL INSTRUCTION PAMPHLETS, BOOKS AND OTHER MATERIAL FURNISHED BY THE VARIOUS MANUFACTURERS

I) ALL VIBRATING EQUIPMENT NOT MOUNTED ON THE GROUND FLOOR SHALL BE MOUNTED ON OR SUSPENDED FROM VIBRATION ISOLATORS.

J)EQUIPMENT SHALL BE INSTALLED WITH CLEARANCE FOR PROPER MAINTENANCE. FILTERS, COILS, DRIVES, VALVES, AND CONTROLS SHALL BE ACCESSIBLE FOR SERVICING AND/OR REPLACEMENT.

K) EQUIPMENT SHALL BE COVERED FOR ONE YEAR FROM THE REVIEWING ENGINEER'S DATE OF ACCEPTANCE AND/OR THE DURATION OF THE MANUFACTURER'S GUARANTEE OR WARRANTY, WHICH EVER IS LONGER. THE CONTRACTOR SHALL FURNISH THE OWNER WITH ALL MANUFACTURER'S GUARANTEES OR WARRANTIES.

L)THE WATER AND AIR SYSTEMS SHALL BE BALANCED FROM -10% TO + 10% OF THE GPM AND CFM VALUES SHOWN ON THE APPROVED HVAC PLANS. BALANCING SHALL BE DONE IN ACCORDANCE WITH STANDARDS ESTABLISHED BY THE AABC OR NEBB USING REPORT SHEETS DEVELOPED BY THE AABC OR NEBB. SUBMIT REPORTS TO THE ENGINEER.

END OF DIVISION 23

DIVISION 25 – HVAC CONTROLS AND SEQUENCES OF OPERATION

I) GENERAL

A) REFER TO SPECIFICATION DIVISION 23 – HVAC SPECIFICATIONS, ESPECIALLY GENERAL FOR WORK INCLUDED, QUALITY ASSURANCE AND RELATED DOCUMENTS.

B) PROVIDE A COMPLETE ELECTRIC/ELECTRONIC CONTROL SYSTEM TO ACCOMPLISH ALL CONTROL SEQUENCES AS DESCRIBED BELOW.

C) ALL LINE AND LOW VOLTAGE CONTROL WIRING, TRANSFORMERS, DISCONNECTS, ETC REQUIRED FOR THE CONTROL SYSTEMS THAT IS NOT SHOWN ON THE ELECTRICAL DRAWINGS SHALL BE PROVIDED BY THE CONTROLS CONTRACTOR (HENCEFORTH CALLED "THE CONTRACTOR").

1)LINE VOLTAGE POWER FROM CIRCUIT BREAKERS IN ELECTRICAL PANELS TO CONTROL TRANSFORMERS OR CONTROL DEVICES SHALL BE INSTALLED BY THE CONTRACTOR.

2) COMPLY WITH DIVISION 26 REQUIREMENTS.

3) CONNECT VARIABLE FREQUENCY DRIVES (VFD) AND DUCT & AREA SMOKE DETECTORS (FURNISHED BY OTHERS) INTO CONTROL CIRCUITS TO ACCOMPLISH THE SEQUENCES OF OPERATION.

II)PRODUCTS

A) PROVIDE CONTROL PRODUCTS (IF NOT FACTORY PROVIDED BY HVAC EQUIPMENT MANUFACTURER) INCLUDING, BUT NOT LIMITED TO, CONTROL DAMPERS & VALVES, THERMOSTATS, TIMECLOCKS, SENSORS, RELAYS, CONTROLLERS, AND OTHER COMPONENTS AS REQUIRED FOR A COMPLETE INSTALLATION.

B) CONTROL DAMPERS SHALL BE LOW LEAKAGE DAMPERS WITH BLADE AND EDGE SEALS. CLASS 1 WITH LEAKAGE OF LESS THAN 4 CFM/SQFT AT 1.0"W.G. AND 8 CFM/SQFT AT 4.0"W.G.

C) CONTROL VALVES SHALL BE SELECTED FOR FLUID TYPE, TEMPERATURE AND PRESSURE CLASS WHICH MATCH PIPING MATERIALS AND END CONNECTIONS. CONTROL VALVES MUST CLOSE OFF AGAINST MAXIMUM SYSTEM PRESSURE.

D) DAMPER AND VALVE ACTUATORS SHALL BE ELECTRIC, SIZED TO SMOOTHLY OPERATE DAMPER OR VALVE WITH ADEQUATE TORQUE FOR TIGHT SHUTOFF AGAINST MAXIMUM SYSTEM PRESSURE.

1)ACTUATION REQUIREMENTS SHALL BE PER THE SEQUENCES OF OPERATION.

E) ROOM THERMOSTATS SHALL BE 7 DAY PROGRAMMABLE WITH A 5°F DEADBAND BETWEEN HEATING & COOLING AND SETBACK CAPABILITY (55°F HEATING & 85°F COOLING).

1)USER ADJUSTABLE SETPOINTS SHALL BE PROVIDED UNLESS NOTED OTHERWISE ON THE DRAWINGS.

III) EXECUTION

A) INSTALL SYSTEMS AND MATERIALS IN ACCORDANCE WITH MANUFACTURER INSTRUCITONS AND ROUGHING-IN DRAWINGS AND DETAILS ON THE DRAWINGS. INSTALL ELECTRICAL COMPONENTS AND USE ELECTRICAL PRODUCTS COMPLYING WITH REQUIREMENTS OF APPLICABLE DIVISION 26 SECTIONS. COORDINATE THE INSTALLATION IN ACCORDANCE WITH FINAL SHOP DRAWINGS, FIELD MEASUREMENTS, MANUFACTURER'S DATA AND AS SPECIFIED HEREIN.

B) MOUNT CONTROLLERS AT CONVENIENT LOCATIONS AND HEIGHTS. COORDINATE WITH ARCHITECT AND OTHER TRADES.

C) PROVIDE REMOTE CONTROL OF MANUAL RESET CONTROLLERS AS REQUIRED FOR USER ACCESSIBILITY. COORDINATE WITH OWNER.

D) THE TERM "CONTROL WIRING" IS DEFINED TO INCLUDE PROVIDING OF WIRE, CONDUIT AND MISCELLANEOUS MATERIALS AS REQUIRED FOR MOUNTING AND CONNECTING ELECTRIC CONTROL DEVICES.

E) INSTALL COMPLETE CONTROL WIRING SYSTEM FOR CONTROL SYSTEMS. CONCEAL WIRING, EXCEPT IN MECHANICAL ROOMS AND AREAS WHERE OTHER CONDUIT AND PIPING ARE EXPOSED. PROVIDE MULTI-CONDUCTOR INSTRUMENT HARNESS (BUNDLE) IN PLACE OF SINGLE CONDUCTORS WHERE A NUMBER OF CONDUCTORS CAN BE RUN ALONG A COMMON PATH. FASTEN FLEXIBLE CONDUCTORS BRIDGING CABINETS AND DOORS NEATLY ALONG HINGE SIDE AND PROTECT AGAINST ABRASION. TIE AND SUPPORT CONDUCTORS NEATLY.

F) INSTALL CIRCUITS OVER 25-VOLT WITH COLOR-CODED THWN/THHN WIRE IN EMT OR MC CABLE AS WHIPS TO EQUIPMENT CONNECTIONS. USE LIQUID-TITE CONDUIT IN EXTERIOR OR HAZARDOUS LOCATIONS.

G) INSTALL CIRCUITS UNDER 25-VOLT WITH COLOR-CODED NO. 18 WIRE WITH INSULATION ON EACH CONDUCTOR AND PLASTIC SHEATH OVER ALL. PROVIDE PLENUM RATED CABLE IN PLENUM CEILINGS.

H) INSTALL LOW VOLTAGE CIRCUITS WHICH ARE LOCATED IN CONCRETE SLABS OR IN MASONRY WALLS IN CONDUIT.

I) WHERE CONTROL WIRING MUST BE SURFACE MOUNTED IN OCCUPIED ROOMS AND IT IS NOT POSSIBLE TO CONCEAL WIRING, RUN WIRING IN WIREMOLD RACEWAY (COLOR BY ARCHITECT).

J)NUMBER-CODE OR COLOR-CODE CONDUCTORS APPROPRIATELY FOR IDENTIFICATION AND SERVICING OF THE CONTROL SYSTEM.

K) DEMONSTRATE CONTROL SYSTEM TO AND TRAIN OWNER'S PERSONNEL IN OPERATION AND MAINTENANCE OF CONTROL SYSTEM.

IV) SEQUENCES OF OPERATION

A) ROOF TOP UNITS (RTU) – SINGLE ZONE

1)THE RTU FAN SHALL OPERATE CONTINUOUSLY DURING OCCUPIED TIMES.

(a) DURING UNOCCUPIED TIMES, THE FAN SHALL ONLY RUN ON A CALL FOR HEATING OR COOLING.

2) DURING OCCUPIED TIMES, THE OA DAMPER SHALL OPEN TO ROOM PORTION MIN OA POSITION WHEN THE RTU FAN IS OPERATING.

(a) FOR RTUS WITH CO2 CONTROL, AS THE CO2 LEVEL RISES FROM 500 TO 1,000 PPM, THE OA DAMPER SHALL MODULATE OPEN FROM ROOM PORTION MIN OA TO MAX OCCUPANCY MIN OA.

3) THE ASSOCIATED 7-DAY PROGRAMMABLE THERMOSTAT SHALL INCLUDE OCCUPIED AND UNOCCUPIED HEATING AND COOLING SETPOINTS WITH A DEADBAND OF 5°F.

(a) OCCUPIED SETPOINTS SHALL BE 70°F HEATING AND 75°F COOLING.

(b) UNOCCUPIED SETPOINTS SHALL BE 55°F HEATING AND 85°F COOLING.

4) RTUS EXCEEDING 54 MBH COOLING SHALL INCLUDE AN INTEGRATED DIFFERENTIAL ENTHALPY ECONOMIZER. WHEN OA ENTHALPY IS LESS THAN RA ENTHALPY AND COOLING IS CALLED FOR, MODULATE THE OA DAMPER OPEN AND THE RA DAMPER CLOSED TO SATISFY THE CALL FOR COOLING BEFORE MECHANICAL COOLING IS ENGAGED.

5) IF THE UL 508 WATER-LEVEL DETECTION DEVICE IS TRIGGERRED, MECHANICAL COOLING SHALL BE DEACTIVATED.

B) ENERGY RECOVERY VENTILATORS (ERV)

1)THE ERV SHALL RUN CONTINOUSLY DURING OCCUPIED HOURS

C) DUCTLESS SPLIT SYSTEMS (DAC & CU)

1)COOLING OR HEATING SHALL OPERATE AS NEEDED TO MAINTAIN ROOM TEMPERATURE OF 70°F HEATING AND 75°F COOLING.

2) IF THE UL 508 WATER-LEVEL DETECTION DEVICE IN THE DRAIN PAN IS TRIGGERRED, MECHANICAL COOLING SHALL BE DEACTIVATED.

D) ELECTRIC DUCT HEATER (EDH)

1)HEATING SHALL BE MODULATED TO MAINTAIN DISCHARGE TEMPERATURE OF 60°F (ADJUSTABLE)

END OF DIVISION 25

LEGEND OF PIPING SYMBOLS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	PIPE ELBOW UP		BALL VALVE
	PIPE ELBOW DOWN		BUTTERFLY VALVE
	PIPE TEE UP		GATE VALVE
	PIPE TEE DOWN		OS&Y GATE VALVE
	PIPE CROSS OVER		CHECK VALVE
	UNION	BFP	BACK FLOW PREVENTER
	FLEXIBLE PIPE CONNECTOR		TRIPLE-DUTY VALVE
	END CAP		TRIPLE-DUTY VALVE WITH MEASUREMENT PORTS
	PETE'S PLUG	M	2-WAY MOTORIZED VALVE
	HOSE THREAD DRAIN VALVE WITH CAP AND CHAIN	M	3-WAY MOTORIZED VALVE
	CIRCUIT SETTER	T	TEMPERING VALVE
	STRAINER		PRESSURE REDUCING VALVE
	STRAINER WITH BLOWDOWN		TEMPERATURE & PRESSURE RELIEF VALVE
	CIRCULATOR PUMP	ΔP	DIFFERENTIAL PRESSURE BYPASS VALVE
MV	MANUAL AIR VENT		SOLENOID VALVE
AV	AUTOMATIC AIR VENT		GAS COCK
AS	AIR SCOOP		DIRECTION OF FLOW
AS	AIR SCOOP WITH VENT		DIRECTION OF PITCH
			CONNECT TO EXISTING
AS	AIR SEPARATOR WITH VENT		PIPE CONTINUES
			THERMOMETER
MARK FEET	FIN TUBE IDENTIFICATION TAG		PRESSURE GAUGE WITH SHUTOFF & PIGTAIL
			VACUUM BREAKER
	FIN TUBE RADIATION WITH COVER		ELECTRIC HEAT TRACING

LEGEND OF DUCT SYMBOLS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MANUAL BALANCING DAMPER		RECTANGULAR RETURN OR EXHAUST DUCT UP
FD	FIRE DAMPER		ROUND RETURN OR EXHAUST DUCT UP
SD	SMOKE DAMPER		RECTANGULAR RETURN OR EXHAUST DUCT DOWN
SFD	SMOKE & FIRE DAMPER		ROUND RETURN OR EXHAUST DUCT DOWN
	CABLE OPERATED DAMPER		RECTANGULAR SUPPLY DUCT UP
	BACK DRAFT DAMPER		ROUND SUPPLY DUCT UP
M	MOTORIZED DAMPER		RECTANGULAR SUPPLY DUCT DOWN
	SUPPLY AIRFLOW		ROUND SUPPLY DUCT DOWN
	RETURN / EXHAUST AIRFLOW	MARK SIZE CFM	REGISTER, GRILLE AND DIFFUSER IDENTIFICATION TAG
	CONNECT TO EXISTING		

LEGEND OF CONTROL SYMBOLS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
T	THERMOSTAT	H	HUMIDISTAT
TS	TEMPERATURE SENSOR	P	PRESSURE SENSOR
CO	CARBON MONOXIDE SENSOR	SD	SMOKE DETECTOR
CO_2	CARBON DIOXIDE SENSOR	L	INDICATOR LAMP

MECHANICAL ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR	EAT	ENTERING AIR TEMPERATURE	HRV	HEAT RECOVERY VENTILATOR	MPT	MALE PIPE THREAD
AMP	AMPACITY	EC	ELECTRICAL CONTRACTOR	HW	HOT WATER	NA	NOT APPLICABLE
APD	AIR PRESSURE DROP	EER	ENERGY EFFICIENCY RATIO	HWUH	HOT WATER UNIT HEATER	NC	NORMALLY CLOSED
ATC	AUTOMATIC TEMP. CONTROL	EFT	ENTERING FLUID TEMPERATURE	HWCUH	HOT WATER CABINET HEATER	NO	NORMALLY OPEN
BTU/H	BRITISH THERMAL UNITS/HOUR	ERV	ENERGY RECOVERY VENTILATOR	HWR	HOT WATER RETURN	OA	OUTSIDE AIR
CAP	CAPACITY	ESP	EXTERNAL STATIC PRESSURE	HWS	HOT WATER SUPPLY	OD	OUTSIDE DIAMETER
CH	CHILLED	ET	EXPANSION TANK	HX	HEAT EXCHANGER	PD	PRESSURE DROP
CHW	CHILLED WATER	EWT	ENTERING WATER TEMPERATURE	ID	INSIDE DIAMETER	PG	PROPYLENE GLYCOL
C/HWR	CHILLED & HOT WATER RETURN	F	FAHRENHEIT	IN	INCHES	PSI	POUNDS PER SQUARE INCH
C/HWS	CHILLED & HOT WATER SUPPLY	FA	FRESH AIR	KW	KILOWATTS	PH/ø	PHASE
CHWR	CHILLED WATER RETURN	FPD	FLUID PRESSURE DROP	LAT	LEAVING AIR TEMPERATURE	R	RETURN
CHWS	CHILLED WATER SUPPLY	FPM	FEET PER MINUTE	LB/#	POUNDS	RA	RETURN AIR
COND	CONDENSATE	FPT	FEMALE PIPE THREAD	LFT	LEAVING FLUID TEMPERATURE	RTU	ROOFTOP UNIT
CONN	CONNECT OR CONNECTION	FT HD	FEET HEAD	LPS	LOW PRESSURE STEAM	SF	SQUARE FEET
CONV	CONVECTOR	FTR	FIN TUBE RADIATION	LWT	LEAVING WATER TEMPERATURE	SQ IN	SQUARE INCHES
CP	CIRCULATOR PUMP	FW	FRESH WATER	M	MINUTES	S	SUPPLY
CW	COLD WATER	GC	GENERAL CONTRACTOR	MAX	MAXIMUM	SA	SUPPLY AIR
CWR	CONDENSER WATER RETURN	GHWS	GLYCOL & WATER SUPPLY	MBH	THOUSANDS OF BTU/H	TEMP	TEMPERATURE
CWS	CONDENSER WATER SUPPLY	GHWR	GLYCOL & WATER RETURN	MC	MECHANICAL CONTRACTOR	V	VOLTS
DB	DRY BULB	GPM	GALLONS PER MINUTE	MCA	MINIMUM CIRCUIT AMPACITY	W	WATTS
DN	DOWN	HP	HORSEPOWER	MIN	MINUTE OR MINIMUM	WPD	WATER PRESSURE DROP
DX	DIRECT EXPANSION	HPS	HIGH PRESSURE STEAM	MOCP	MAX OVERCURRENT PROTECTION	WB	WET BULB
EA	EXHAUST AIR	HR	HOUR	MPS	MEDIUM PRESSURE STEAM	WC	WATER COLUMN

DDMI DESIGN DAY Mechanicals Inc

THE PROJECT MANAGER FOR THIS PROJECT IS NOTED BELOW: PLEASE REFER ALL QUESTIONS, SUBMITTALS AND CORRESPONDENCE TO THE PROJECT MANAGER.

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STATE OF NEW HAMPSHIRE – ANDREW W. ARSENAULT No.7099 – LICENSED PROFESSIONAL ENGINEER
Digitally signed by Andrew W Arsenault
Date: 2021.09.16 13:11:29 -04'00'

PROJECT:
DERRY
WASTE WATER
TREATMENT FACILITY
TRANSFER LANE
DERRY, NH

FOR:
TOWN OF DERRY
NEW HAMPSHIRE

SPECIFICATIONS, LEGENDS AND SEQUENCES OF OPERATION

REVISIONS:

DESIGNED BY: DCM
DRAWN BY: DCM
CHECKED BY: AWA

DDM JOB #: 21117
SCALE: AS NOTED

DATE: 09/15/2021

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