GENERAL

15101 CODES AND PERMITS

1. THE FOLLOWING CODES WILL BE COMPLIED WITH WHEN DESIGNING AND INSTALLING COMPONENTS AND SYSTEMS UNDER DIVISION 15 - MECHANICAL: OHSA, BOCA, IMC ASHRAE, SMACNA, NFPA, STATE AND LOCAL ENERGY CODES.
2. STATE AND LOCAL MECHANICAL PERMITS WILL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR
3. VENTILATION RATES ARE IN COMPLIANCE WITH ASHRAE 62.1 2007.

15102 DESIGN CONDITIONS

1. CLIMATIC DESIGN CONDITIONS WILL BE BASED ON PORTLAND, MAINE AND THE SURROUNDING AND ARE AS FOLLOWS:

WINTER: -10° F

SUMMER: 87° F DB AND 71° F WB

INTERIOR CONDITIONS: 70 DEG F +/-2

15110 BASIC MECHANICAL REQUIREMENTS

1. THESE DRAWINGS ARE DIAGRAMMATIC; IT IS THE INSTALLER'S RESPONSIBILITY TO VERIFY ALL CONDITIONS IN THE FIELD TO INSURE THE SYSTEMS CAN BE INSTALLED AS SHOWN. ANY CONFLICTS WITH STRUCTURE OF OTHER BUILDING SYSTEMS MUST BE RESOLVED PRIOR TO COMENCING WORK.
2. IT IS THE INTENTION OF THESE DRAWINGS TO SHOW A COMPLETE HVAC SYSTEM INSTALLED IN ACCORDANCE WITH ALL APPLICABLE CODES AND REGULATIONS. ANY DISCREPANCIES SHOULD BE BROUGHT TO THE ENGINEERING DEPARTMENTS' ATTENTION.
3. ALL EQUIPMENT MUST BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS. ANY DISCREPANCIES SHOULD BE BROUGHT TO THE ENGINEERING DEPARTMENTS' ATTENTION
4. ALL MOTORS FURNISHED SHALL MEET NEMA REQUIREMENTS AND SHALL HAVE AN OPERATING TEMPERATURE OF NOT TO EXCEED 40° C ABOVE AMBIENT TEMPERATURE AND BE SO MARKED. EXCEPT AS NOTED ALL MOTORS SHALL BE OF THE OPEN DRIP-PROOF TYPE. MOTORS MAY BE FURNISHED OF THE FULLY ENCLOSED TYPE IF IT IS THE STANDARD EQUIPMENT.
5. NAMEPLATES BEARING MANUFACTURER'S NAME OR IDENTIFIABLE TRADEMARK SHALL BE SECURELY AFFIXED IN A CONSPICUOUS PLACE ON EQUIPMENT, OR OTHERWISE PERMANENTLY MARKED.
6. FLEXIBLE METAL CONDUIT SHALL BE USED FOR ALL CONNECTIONS TO MOTORS AND VIBRATING EQUIPMENT.
7. CIRCULATION PUMPS TO BE SIZED WITH A MINIMUM OF A 10% SAFETY FACTOR IN FLOW RATES.
8. AIR SIDE HVAC SYSTEMS TO BE DESIGN AT A NC LEVEL OF 30 TO 35.

SECTION 15810
DUCTWORK

PART 1 - GENERAL

1.01SUMMARY

A. SECTION INCLUDES: THIS SPECIFICATION, IN CONJUNCTION WITH THE CONTRACT DOCUMENTS AND DESIGN DRAWINGS, PROVIDES THE MINIMUM REQUIREMENTS FOR MATERIALS AND OPERATIONS USED IN THE FABRICATION AND INSTALLATION OF DUCTWORK. SYSTEMS COVERED BY THIS DOCUMENT INCLUDE HEATING, VENTILATING, AIR CONDITIONING AND EXHAUST.

1.02 REFERENCES

A. THE LATEST EDITION OF THE FOLLOWING CODES AND STANDARDS SHALL BE USED. WHERE DIFFERENCES BETWEEN STANDARDS AND THIS SPECIFICATION EXIST, THIS SPECIFICATION SHALL TAKE PRECEDENCE.
B. SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)
C. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
D. AMERICAN SOCIETY OF HEATING, REFRIGERATION, AND AIR CONDITIONING ENGINEERS (ASHRAE)

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

RIGID DUCTS, CASINGS AND FITTINGS: SHALL BE MADE FROM GALVANIZED STEEL SHEETS OF LOCK FORM QUALITY PER ASTM A653 WITH A G90 ZINC COATING (0.90 OZ/FT2 BOTH SIDES), UNLESS OTHERWISE SHOWN ON THE CONTRACT DOCUMENTS. SHEETS SHALL BE FREE OF PITS, BLISTERS, SLIVERS, AND UNGALVANIZED SPOTS.

A. SUPPORTS: ANGLE IRON, CHANNELS, RODS AND RELATED SUPPORTING MATERIALS SHALL BE GALVANIZED OR RED OXIDE COATED.
B. FASTENERS: USE GALVANIZED RIVETS, SCREWS AND BOLTS THROUGHOUT, EXCEPT ON STAINLESS STEEL DUCTWORK, USE SS FASTENERS.
C. REINFORCEMENT: PROVIDE GALVANIZED STEEL OR STAINLESS STEEL REINFORCEMENT SHAPES AND PLATES WHERE REQUIRED.
D. TIE RODS: USE GALVANIZED STEEL, 1/4 INCH MINIMUM DIAMETER FASTENERS FOR DUCTWORK 36 INCH OR LESS IN LENGTH; USE 3/8 INCH MINIMUM DIAMETER FOR LENGTHS LONGER THAN 36 IN.
E. FLEXIBLE DUCT - SUPPLY & RETURN AIR (INSULATED, LOW PRESSURE): DUCT TO BE A FACTORY FABRICATED ASSEMBLY WITH A LAMINATED INNER LINER OF ALUMINUM FOIL, FIBERGLASS AND POLYESTER, A GALVANIZED STEEL HELIX COIL FORMED TO THE INNER LINER, A FIBERGLASS INSULATION BLANKET, AND A POLYETHYLENE OUTER JACKET. FLEXIBLE DUCT SHALL BE RATED FOR 2.0" W.G. POSITIVE PRESSURE.
F. MECHANICAL LINER AND FASTENERS:
 1. LINERS: INTERNAL DUCT LINERS SHALL BE 1 INCH THICK FIBERGLASS TYPE I OR II PER ASTM 1071 AND HAVE A THERMAL CONDUCTIVITY (K-VALUE) OF 0.26 AT 75 DEG. F. LINERS SHALL COMPLY WITH NFPA 90A AND 90B AND WITH NAIMA AH124 AND HAVE A MAXIMUM FLAME-SPREAD INDEX OF 25 AND SMOKE-DEVELOPED INDEX OF 50 WHEN TESTED ACCORDING TO ASTM E84. LINERS SHALL BE TREATED WITH AN EPA APPROVED BIOCIDE TO RESIST BACTERIAL AND FUNGAL GROWTH. ALL SURFACES EXPOSED TO THE AIR STREAM SHALL BE COATED TO PREVENT EROSION OF GLASS FIBERS.
 2. MECHANICAL FASTENERS: GALVANIZED STEEL, SUITABLE FOR ADHESIVE, MECHANICAL OR WELDING ATTACHMENT (SELF-STICK ADHESIVE FASTENERS ARE NOT PERMITTED). PROVIDE FASTENERS THAT WILL NOT DAMAGE THE LINER WHEN APPLIED AS RECOMMENDED BY THE MANUFACTURER, THAT DO NOT CAUSE LEAKAGE WITHIN THE DUCT AND THAT WILL SUSTAIN A 50-POUND TENSILE DEAD LOAD PERPENDICULAR TO DUCT WALL.
 3. LINER ADHESIVE: NON-OXIDIZING, VINYL ACRYLIC, WATER-BASED ADHESIVE USED TO BOND INSULATION TO SHEET METAL SURFACES. OPERATIONAL TEMPERATURE RANGE -20 TO +160°F; CURING TIME 24 HOURS. MANUFACTURED BY UNITED MCGILL, TYPE UNI-TACK. COMPLY WITH NFPA 90A AND 90B AND WITH ASTM C916

2.02 DESIGN AND CONSTRUCTION

A. GENERAL:
 1. CONSTRUCT ALL DUCTS, CASINGS AND FITTINGS OF RIGID, GALVANIZED STEEL, UNLESS OTHERWISE SHOWN IN THE CONTRACT DOCUMENTS.
 2. CONTRACTOR IS RESPONSIBLE FOR COORDINATION BETWEEN THE DUCTWORK TRADE AND THE OTHER MECHANICAL, ELECTRICAL AND ARCHITECTURAL TRADES.
 3. INSULATION SHALL BE AS SPECIFIED IN SECTION 15081, "DUCT INSULATION."
 4. INSTALL INTERNAL DUCT LINERS ON DUCTS INDICATED TO HAVE LINERS ON THE CONSTRUCTION DRAWINGS. INSTALL LINERS PER NAIMA DUCT LINER GUIDELINES.

B. DUCTWORK PRESSURE CLASSIFICATION

UNLESS OTHERWISE INDICATED ON THE CONSTRUCTION DRAWINGS, DUCTWORK SHALL BE CONSTRUCTED TO MEET THE APPROPRIATE PRESSURE CLASS DEFINED BELOW.
 1. DUCTWORK FROM THE SUPPLY AIR FAN TO THE TERMINAL VELOCITY REDUCTION DEVICE (VAV BOX) OR ZONE-TEMPERING COIL SHALL BE FABRICATED TO MEET MINIMUM 2" W.G. INTERNAL PRESSURE.
 2. RETURN AIR DUCTWORK SHALL BE FABRICATED TO MEET MINIMUM 2" W.G. INTERNAL PRESSURE.

C. RECTANGULAR DUCTWORK:
 1. SHALL CONFORM TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS, METAL AND FLEXIBLE OR SMACNA RECTANGULAR INDUSTRIAL DUCT CONSTRUCTION STANDARDS. MITERED ELBOWS TO HAVE SINGLE WALL TURNING VANES.

D. ROUND DUCTWORK:
 1. SPIRAL LOCKSEAM OR LONGITUDINAL WELDED SEAM AS MANUFACTURED BY UNITED MCGILL SHEET METAL COMPANY OR EQUAL. MODELS UNISEAL, UNICOAT, OR LONGITUDINAL SEAM.
 2. MINIMUM GALVANIZED STEEL OR STAINLESS STEEL GAUGES, HANGER SPACING, AND REINFORCEMENT SHALL BE PER SMACNA HVAC DUCT CONSTRUCTION STANDARDS
 3. FITTINGS: FITTINGS SHALL HAVE A WALL THICKNESS NOT LESS THAN THAT REQUIRED FOR LONGITUDINAL-SEAM STRAIGHT DUCT.
 4. ELBOWS:
  A. ELBOWS FOR ROUND DUCTS SHALL HAVE A MINIMUM CENTERLINE RADIUS OF 1-1/2 TIMES THE DIAMETER OF THE DUCT AND SHALL BE CONSTRUCTED WITHOUT SPLITTERS.

2.03 DAMPERS

A. OUTSIDE AIR DAMPERS: DAMPERS SHALL BE LOW-LEAKAGE TYPE; GREENHECK MODEL VCD-23 OR EQUAL.
B. MANUAL BALANCING DAMPERS (SUPPLY AIR AND GENERAL EXHAUST SYSTEMS): DAMPERS MAY BE FACTORY OR CONTRACTOR FABRICATED PER SMACNA DUCT CONSTRUCTION STANDARDS.

2.04 HANGERS AND SUPPORTS

A. GENERAL: REFER TO SMACNA DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE, RECTANGULAR INDUSTRIAL DUCT CONSTRUCTION STANDARDS, AND ROUND INDUSTRIAL DUCT CONSTRUCTION STANDARDS RESPECTIVELY FOR RECTANGULAR AND ROUND DUCTWORK FOR INSTALLATION OF HANGERS AND SPACING.
 1. STRAPS AND ANGLES SHALL BE MANUFACTURED FROM GALVANIZED STEEL; RODS SHALL BE MANUFACTURED FROM UNCOATED OR GALVANIZED STEEL.
 2. PERFORATED IRON BAND FOR DUCT SUPPORT IS PROHIBITED.
 3. WIRE FOR DUCT SUPPORT IS PROHIBITED.

2.05 SEALANTS

A. DUCT SEALER SHALL BE WATER BASED SEALER FOR INDOOR / OUTDOOR USE. U.L. CLASSIFIED AND PAINTABLE AS MANUFACTURED BY DURODYNE MODEL SAS OR EQUAL.
B. SELF-ADHERING VINYL COATED FABRIC DUCT TAPE IS NOT PERMITTED, EXCEPT TO TEMPORARILY SEAL THE DUCT OPENINGS FOR CONTAMINATION PREVENTION.

PART 3 - EXECUTION

3.01 INSTALLATION

A. FLEXIBLE DUCTS:
 1. PROVIDE FLEXIBLE DUCT IN FULLY EXTENDED CONDITION, FREE FROM KINKS.
 2. USE ONLY THE MINIMUM LENGTH REQUIRED TO MAKE THE CONNECTION.
 3. DO NOT EXCEED 8'-0" IN LENGTH, FULLY EXTENDED.
 4. WHERE HORIZONTAL SUPPORT IS REQUIRED, HANGER OR SADDLE MATERIAL SHALL BE WIDE ENOUGH SO THAT IT DOES NOT REDUCE THE INTERNAL DIAMETER OF THE DUCT AND SHALL BE A MINIMUM 1" WIDE BANDING MATERIAL HANGERS AT NOT MORE THAN 2'-6" CENTERS. MAXIMUM ALLOWABLE SAG ½" PER FOOT OF SUPPORT SPACING. FLEXIBLE DUCT SHALL EXTEND STRAIGHT FOR SEVERAL INCHES FROM A CONNECTION BEFORE BENDING.
 5. MAKE JOINTS AND CONNECTIONS WITH 1/2" WIDE POSITIVE LOCKING STEEL, NYLON OR PLENUM RATED STRAPS. CONNECTIONS SHALL BE PER SMACNA DUCT CONSTRUCTION STANDARDS.
 6. USE INSULATED FLEX WHERE INSULATED DUCT IS REQUIRED.

B. METAL DUCTWORK:
 1. INSTALL WITH A MINIMUM OF 4" SEPARATION FROM EARTH TO THE DUCT OR INSULATION FINISH.
 2. SECURELY FASTEN AT EACH CHANGE IN DIRECTION.
 3. INSTALL BRANCH CONNECTIONS AND COUPLINGS TIGHT TO THE DUCT WALL SURFACE WITH A MINIMUM OF PROJECTION INTO DUCT. SECURE WITH SHEET METAL SCREWS AT INTERVALS OF 12 INCHES WITH A MINIMUM OF 3 SCREWS IN EACH CONNECTION.

C. INSULATION: SHALL BE INSTALLED AS DETAILED IN SECTION 15081, "DUCT INSULATION." THE INSULATION, FACINGS, TAPES AND ADHESIVES APPLIED TO THE EXTERIOR SURFACES OF DUCTS LOCATED WITHIN THE BUILDINGS SHALL HAVE A COMPOSITE FLAME SPREAD OF 25 OR LESS AND A SMOKE DEVELOPED RATING OF 50 OR LESS.

D. SEALING DUCTWORK:
 1. 0"-2" W.G. CLASSIFICATION: TRANSVERSE JOINTS SHALL BE SEALED AS PER SMACNA GUIDELINES FOR SEAL CLASS A USING PRODUCTS LISTED IN SECTION 2.

3.02 GAS FIRED EQUIPMENT

A. COMBUSTION AIR AND VENTING OF GAS-FIRED EQUIPMENT SHALL CONFORM TO THE REQUIREMENTS OF THE INTERNATIONAL MECHANICAL CODE.

3.03 DUCT LINERS

A. INSTALL DUCT LINERS AT LOCATIONS AS SHOWN ON THE DRAWINGS AND IN ACCORDANCE WITH NAIMA FIBROUS GLASS DUCT LINER STANDARD. APPLY WITH A SINGLE LAYER OF INDICATED THICKNESS.

3.04 HANGERS AND SUPPORTS

A. HANGERS SHALL BE INSTALLED PLUMB AND SHALL PRESENT A NEAT APPEARANCE.
B. STRAP HANGERS SHALL EXTEND THE FULL DEPTH OF THE DUCT, BEND AND EXTEND 1 INCH UNDER AND AGAINST THE BOTTOM OF THE DUCT.
C. ATTACH HANGERS TO THE DUCTS USING RIVETS OR SCREWS OF APPROPRIATE SIZES 6 INCHES ON CENTER (MINIMUM OF 2 EACH SIDE) AND ON THE BOTTOM RETURN.
D. ALL DUCTS SHALL BE RIGIDLY SUPPORTED.
 1. WHERE VERTICAL DUCTS PASS THROUGH FLOORS OR ROOFS, SUPPORTING ANGLES SHALL BE ATTACHED TO DUCTS AND TO THE STRUCTURE.
 2. PLACE SUPPORTING ANGLES ON AT LEAST TWO SIDES OF THE DUCT.

3.05 CONNECTORS

A. PROVIDE FLEXIBLE CONNECTIONS, NOT LESS THAN 4 INCHES WIDE, CONSTRUCTED OF APPROVED FIREPROOF, WATERPROOF, NON-ASBESTOS, AND GLASS FABRIC, AT THE INLET AND OUTLET CONNECTION OF EACH FAN UNIT, SECURELY FASTENED TO THE UNIT AND TO THE DUCTWORK BY A GALVANIZED IRON BAND PROVIDED WITH TIGHTENING SCREWS. THERE SHALL BE NO METAL-TO-METAL CONTACT AT FLEXIBLE CONNECTIONS. THERE SHALL BE NO STRETCHING OF THE FLEXIBLE MATERIAL AT FLEXIBLE CONNECTIONS. THIS CONNECTION SHALL BE UL LISTED, TO MEET NFPA 90 REQUIREMENTS AND THE FOLLOWING APPLICATIONS:
 1. INDOOR SUPPLY/RETURN AIR: NEOPRENE COATED GLASS FABRIC, MINIMUM 30 OZ./SQ.YD., VENTFABRICS - "VENTGLAS" OR DURODYNE - "NEOPRENE".
 2. OUTDOOR SUPPLY/RETURN AIR: U.V. RESISTANT HYPALON COATED GLASS FABRIC, MINIMUM 24 OZ./SQ.YD. VENTFABRICS - "VENTLON" OR DURODYNE - "DUROLON".

3.08 DAMPERS

A. BALANCING DAMPERS: SHALL BE INSTALLED WHERE SHOWN ON DRAWINGS AND AS MAY BE REQUIRED TO BALANCE SYSTEM.

SECTION 15855
DIFFUSERS, REGISTERS AND GRILLES

1. PROVIDE SUPPLY DIFFUSERS, RETURN GRILLES AND EXHAUST OUTLETS OF SIZE, TYPE AND DESIGN AS SHOWN ON DRAWINGS. ACCEPTABLE MANUFACTURERS SHALL BE:PRICE,TITUS, ANEMOSTAT, KRUEGER, METALAIRE OR OTHER MANUFACTURER PRE-APPROVED BY THE ENGINERING DEPARTMENT.
2. EQUIPMENT SHALL BE TESTED AND RATED PER ASHRAE 91-70.
3. EQUIPMENT SHALL HANDLE AIR QUANTITIES AT OPERATING VELOCITIES.
 A. WITH MAXIMUM DIFFUSION WITHIN SPACE SUPPLIED OR EXHAUSTED.
 B. WITHOUT OBJECTIONABLE AIR MOVEMENT AS DETERMINED BY ENGINEER.
 C. WITH SOUND PRESSURE LEVEL NOT TO EXCEED NC 30
4. DIFFUSERS WITHIN SAME ROOM OR AREA SHALL BE OF SAME TYPE AND STYLE TO PROVIDE ARCHITECTURAL UNIFORMITY.
5. FINISH SHALL BE AS DIRECTED BY ARCHITECT.
6. COORDINATE DIFFUSERS, REGISTERS AND GRILLES WITH CEILING AND WALL CONSTRUCTION. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LENGTHS AND FOR FRAMING AND MITERING ARRANGEMENTS THAT MAY DIFFER FROM THOSE SHOWN ON HVAC DRAWINGS.

SECTION 15081
DUCT INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. SECTION INCLUDES SEMI RIGID AND FLEXIBLE INSULATION FOR DUCTS, PLENUMS, AND BREECHINGS; INSULATING CEMENTS; FIELD-APPLIED JACKETS, ACCESSORIES; AND SEALING COMPOUNDS.

1.02 REFERENCES

A. AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

A. MINERAL-FIBER BOARD THERMAL INSULATION: GLASS FIBERS BONDED WITH A THERMOSETTING RESIN. COMPLY WITH ASTM C 612, TYPE IB, FOR USE TO 450 DEG. F, WITH A FACTORY-APPLIED JACKET MANUFACTURED FROM FOIL, REINFORCING SCRIM, AND KRAFT PAPER (FSK). MINIMUM DENSITY OF 3 LB./CU.FT., MAXIMUM CONDUCTIVITY OF 0.40 (BTU-IN./HR.-SQ.FT.-DEG. F) AT 300 DEG. F.

B.MINERAL-FIBER BLANKET THERMAL INSULATION: GLASS FIBERS BONDED WITH A THERMOSETTING RESIN. COMPLY WITH ASTM C 553, TYPE II, FOR USE TO 450 DEG. F, WITH A FACTORY-APPLIED JACKET MANUFACTURED FROM FOIL, REINFORCING SCRIM, AND KRAFT PAPER (FSK). MINIMUM DENSITY OF 3/4 LB./CU.FT., MAXIMUM CONDUCTIVITY OF 0.43 (BTU-IN./HR.-SQ.FT.-DEG. F) AT 200 DEG. F.

C. FIBERGLASS "PIPE & TANK" INSULATION: SEMI-RIGID FIBERGLASS BOARD IN ROLL FORM. COMPLY WITH ASTM C 795, TYPE II, FOR USE TO 850 DEG. F WITH A FACTORY-APPLIED JACKET MANUFACTURED FROM FOIL, REINFORCING SCRIM, AND KRAFT PAPER (FSK). MAXIMUM CONDUCTIVITY OF 0.45 (BTU-IN./HR.-SQ.FT.-DEG. F) AT 300 DEG. F.

D. CALCIUM SILICATE INSULATION: FLAT, CURVED, AND GROOVED-BLOCK SECTIONS OF NONCOMBUSTIBLE, INORGANIC HYDROUS CALCIUM SILICATE WITH A NON ASBESTOS FIBROUS REINFORCEMENT. COMPLY WITH ASTM C 533, TYPE I.

E.VAPOR-RETARDER MASTICS: FIRE- AND WATER-RESISTANT, VAPOR-RETARDER MASTIC FOR INDOOR APPLICATIONS. COMPLY WITH MIL-C-19565C, TYPE II.

F. GREASE RATED DUCT INSULATION: ZERO CLEARANCE WRAP RATED FOR COMMERCIAL GREASE DUCT. THERMAL CERAMICS FIREMASTER FASTWRAP+ OR APPROVED EQUIVILENT

DUCT DATA			
DUCTWORK DESCRIPTION	PRESS CLASS	LINER	INSULATION
SUPPLY	2" WG	1" FIRST 6' OF DUCTWORK	1.5" FOIL FACED INSULATION FOR NON-EXPOSED DUCTWORK
RETURN	2" WG	1" FIRST 6' OF DUCTWORK	NONE
HOOD SUPPLY	2" WG	1" FIRST 6' OF DUCTWORK	1.5" FOIL FACED INSULATION FOR NON-EXPOSED DUCTWORK
HOOD EXHAUST	16 GA. WELDED B.I.	NONE	3" OF GREASE RATED ZERO CLEARANCE WRAP
BATHROOM EXHAUST	2" WG	NONE	NONE
EXPOSED SUPPLY	2" WG GALV/NEAL/SPIRAL	NONE	NONE
OUTDOOR EXTERIOR	2" WG	1" FIRST 6' OF DUCTWORK	2" FSK BOARD WITH VENTURE CLAD JACKET OR EQUIVILENT

SECTION 15301
HYDRONIC PIPING SYSTEM

1. HOT WATER HEATING PIPING: TYPE L HARD COPPER TUBING AND CAST BRONZE OR WROUGHT COPPER SOLDER FITTINGS OR SCHEDULE 40 CARBON STEEL PIPE WITH THREADED JOINTS AND MALLEABLE IRON FITTINGS.

SUMMARY:
- HOT WATER SUPPLY AND RETURN TO BE : SCH 40 WITH THREADED, OR WELDED CONNECTIONS, OR TYPE L HARD COPPER

2. ADJUSTABLE SWIVEL HANGERS: PIPE SIZES 2" AND LESS: CARPENTER AND PATERSON FIG. 800 CONFORMING TO MSS-SP-58, OVERSIZE FOR INSULATED PIPING SYSTEMS. PIPE SIZES LARGER THAN 2": CARPENTER ANDS PATERSON FIG. 100, OVERSIZE FOR INSULATED PIPING SYSTEMS.
3. BALL VALVES: APOLLO 70-100 SERIES OR EQUAL, BRONZE BODY, FED. SPEC. WW-V-35, TYPE 11, CLASS (BRONZE), STYLE 3, BLOW-OUT PROOF STEM, 600 POUND W.O.G., SCREWED CONNECTION FOR STEEL PIPE, SWEAT CONNECTION FOR COPPER TUBE. PROVIDE STEM EXTENSION TO ALLOW OPERATION WITHOUT INTERFERING WITH PIPE INSULATION.
4. GATE VALVES: NIBCO MODEL S-113 OR T-113, OR EQUAL, BRONZE BODY FED. SPEC. WW-V- 54, WEDGE DISC, RISING STEM, SCREWED CONNECTION FOR STEEL PIPE, SWEAT CONNECTION FOR COPPER TUBE, 150-POUND CLASS.
5. OUTSIDE SCREW AND YOKE (OS&Y) GATE VALVES: NIBCO MODEL F-617-0, IRON BODY, FED. SPEC. WW-V-58 WITH BRONZE TRIM, 125 POUND CLASS OR EQUAL..
6. CHECK VALVES: TACO MPV, FLOWCHECKS, OR EQUAL ACCORDING TO PIPE SIZES.
7. THERMOMETERS: TRERICE MODEL V80445 OR ASHCROFT SERIES 600A-04, DIAL TYPE, MIL SPEC MIL-T-9955, 4-1/2" DIAMETER FACE.
8. PRESSURE GAUGES: TRERICE SERIES 800 OR ASHCROFT TYPE 1005, GRADE B, ANSI B40.1, 3-1/2" DIAMETER FACE INSTALLED WITH SHUTOFF PETCOCK AND RESTRICTOR. PRESSURE RANGE: 0-60 PSIG WITH 5 PSI GRADUATIONS, 0-100 PSIG WITH 10 PSI GRADUATIONS FOR CONDENSER WATER PUMPS.
9. MANUAL AIR VENTS: BRASS BODY, FIBER DISCS, 125 PSI WORKING PRESSURE, AND 240 DEGREE F MAXIMUM TEMPERATURE, ADJUSTABLE FOR QUICK VENTING AT SYSTEM START-UP.
10. AIR SEPERATOR TO TACO, AS SCHEDULED (WHEN APPICABLE).

SECTION 15302
PIPING AND ACCESSORIES

A. HANGER AND SUPPORT INSTALLATION
 1. VERTICAL PIPING: MSS TYPE 8 OR TYP3 42, CLAMPS.
 2. INDIVIDUAL, STRAIGHT, HORIZONTAL PIPING RUNS: ACCORDING TO THE FOLLOWING:
  A. 100 FEET OR LESS: MSS TYPE 1, ADJUSTABLE, STEEL CLEVIS HANGERS.
  B. LONGER THAN 100 FEET: MSS TYPE 43, ADJUSTABLE ROLLER HANGERS.
 3. INDIVIDUAL, STRAIGHT, HORIZONTAL PIPING RUNS: ACCORDING TO THE FOLLOWING:

 4. ROD DIAMETER MAY BE REDUCED 1 SIZE FOR DOUBLE-ROD HANGERS, WITH 3/8" MINIMUM. RODS.

 5. INSTALL HANGERS FOR COPPER PIPING WITH THE FOLLOWING MAXIMUM HORIZONTAL SPACING AND MUNUMUM ROD DIAMETERS:
  A. NPS 1-1/2 AND NPS 2: 60 INCHES WITH 3/8" ROD.
  B. NPS 3: 60 INCHES WITH ½" ROD.
  C. NPS 4 AND NPS 5: 60 INCHES WITH 5/8" ROD
  D. NPS 6: 60 INCHES WITH ¾" ROD.
  E. NPS 8 TO NPS 12: 60 INCEHS WITH 7/8" ROD
  F. SPACING FOR 10 FOOT LENGTHS MAY BE INCREASED TO 10 FEET. SPACING FOR FITTINGS IS LIMITED TO 60 INCHES.
 6. INSTALL SUPPORTS FOR VERTICAL COPPER PIPING EVERY 15 FEET.
 7.SUPPORT PIPING AND TUBING NOT LISTED ABOVE ACCORDING TO MSS SP-69 AND MANUFACTURER'S WRITTEN INSTRUCTIONS.

B. PIPING SUPPORTS
 1. HORIZONTAL PIPING SHALL BE SUPPORTED BY FORGED STEEL ADJUSTABLE CLEVIS TYPE "CARPERNTER & PATTERSON" FIG#100 OR 100SH OR APPROVED EQUAL.
 2. HANGER RODS AND MAXIMUM SPACING SHALL BE AS FOLLOWS:

PIPE SIZE	ROD DIAMETER	MAXIMUM SPACING
1 ¼" & BELOW	3/8"	6'- 0"
1 ½" & 2"	3/8"	8'- 0"
2 ½" & 3"	½"	8 - 0"

 3. PROVIDE ADDITIONAL SUPPORTS AT CHANGE OF DIRECTION, RUNOUTS, AND CONCENTRATED LOADS DUE TO VALVES, ETC.
 4. VERTICAL PIPING SHALL BE SUPPORTED WITH BEARING PLATE ON STRUCTURAL SUPPORT. PROVIDE GUIDES AT EVERY SECOND FLOOR (SPACING NOT TO EXCEDD 25 FT.). SUPPORT AT TOP SHALL BE PROVIDED WITH SPRING HANGER HAVING A PROVISION FOR EXPANSION.

SECTION15303
PIPING INSULATION

A. GENERAL
 1. ALL INSULATION MATERIALS INCLUDING JACKETS, FACING, ADHESIVE, COATING AND ACCESSORIES SHALL BE FIRE AND SMOKE HAZARD RATED AND LISTED BY UNDERWRITER'S LABORATORIES, INC. AND COMPLY WITH UL 723 (ASTM E-84). THE FUEL CONTRIBUTED AND SMOKE DEVELOPED SHALL NOT EXCEED 50 AND FLAME SPREAD SHALL NOT EXCEED 25.

B. PIPING INSULATION
 1. INSULATION FOR PIPING SHALL BE MOLDED FIBERGLASS, MAXIMUM 0.23 K-FACTOR AT 75°F MEAN TEMPERATURE, ¾ LB. DENSITY WITH ALL PURPOSE JACKET (FIRE RETARDANT LAMINATE OF WHITE KRAFT FACING, GLASS SCRIM REINFORCING AND ALUMINUM FOIL.)

PIPING INSULATION DATA					
SERVICE	INSULATION MATERIAL	VAPOR BARRRIER REQUIRED	INSULATION WALL THICKNESS AT THE GIVEN PIPE DIAMETERS		
			<1"	1" to <1.5"	1.5" to 4"
Hydronic Heating Systems (Hot Water Supply and Return)					
Fluid Design Operating Temperature Range: 141° F to 200° F	Glass Fiber	Yes	1.0"	1.0"	1.0"
Air Conditioning Condensate Drain Line Located Inside	Elastomeric Foam	N/A	0.5"	0.5"	1.0"
	Glass Fiber	Yes	0.5"	0.5"	1.0"
Cooling Systems (Chilled Water)					
Fluid Design Operating Temperature Range: 40° F to 60° F	Elastomeric Foam	N/A	0.5"	0.5"	1.0"
	Glass Fiber	Yes	0.5"	0.5"	1.0"

SECTION 15304
GAS PIPING

1. GAS PIPING TO BE SCH. 40 STEEL WITH MALLEABLE FITTINGS AND / OR CORRUGATED STAINLESS STEEL TUBING (CSST)
2. INSTALL PIPING IN ACCORDANCE WITH NFPA 54 AND / OR AUTHORITY HAVING JURISDICTION
3. SOUTHERN MAINE PLUMBING AND HEATING TO INSTALL GAS PIPE FROM BUILDING REGULATOR / METER PROVIDED BY GAS COMPANY TO ALL GAS FIRED EQUIPMENT EXCEPT RTU-1 AND RTU-2. W.H. DEMMONS TO CONNECT GAS PIPING TO RTU-1 AND RTU-2 ON ROOF.
4. EXTERIOR PIPE SHALL BE PAINTED AND ALL PIPING SHALL BE LABELED "GAS" IN CONSPICUOUS LOCATIONS PER CODE
5. GAS PIPING SERVING SEPARATE AREAS OF THE BUILDING SHALL BE IDENTIFIED IN AN APPROVED MANNER AND IN ACCORDANCE WITH NFPA CODE REQUIREMENTS
6. ALL PIPING SHALL BE TESTED AN ACCORDANCE WITH NFPA 54 REQUIREMENTS. TESTS SHALL BE COMPLETED USING AIR AT A MINIMUM OF 5 PSIG USING A PRESSURE GAUGE RATED FOR 10 PSI FOR A MINIMUM PERIOD OF 24 HOURS. DURING THIS TEST ALL JOINTS SHALL BE EXAMINED.

SECTION 15401: HVAC EQUIPMENT

RTU 1 & RTU 2 AND MUA UNIT

1. ROOF TOP HVAC EQUIPMENT TO BE AS SCHEDULED. THE UNITS SHALL BE INSTALLED IN ACCORDANCE WITH THIS SPECIFICATION AND PERFORM AT THE SPECIFIED CONDITIONS.
2. STANDARD ECONOMIZER CONTROLS WILL BE INCLUDED AS PART OF THE ROOF TOP UNIT CONTROL SEQUENCE TO MAXIMIZE ENERGY CONSERVATION THROUGH "FREE COOLING" WHENEVER OA CONDITIONS ALLOW.
3. ROOF CURBS SHALL BE AS REQUIRED FOR DOWNFLOW DISCHARGE

EXHAUST FANS (EF-1, EF-2 AND EF-3)

1. ALL EXHAUST FANS TO BE ROOF MOUNTED FANS AS SCHEDULED

GREASE HOOD AND DISHWASHER HOOD

1. GREASE HOOD AND DISHWASHER HOOD TO BE CAPTIVEAIRE HOODS AS SCHEDULED

UNIT HEATER (UH-1)

1. ELECTRIC UNIT HEATER SHALL BE DAYTON MODEL 2YU68 AS SCHEDULED OR EQUIVILENT

DUCT HUMIDIFIER

1. DUCT HUMIDIFIER TO BE DRI-STEEM MODEL VM-16 AS SCHEDULED

SECTION 15501: START UP OF SYSTEM

STARTUP, TESTING AND BALANCING

A. GENERAL
 1. PROVIDE QUALIFIED PERSONNEL, EQUIPMENT, APPARATUS AND SERVICES FOR START UP, TESTING AND BALANCING OF MECHANICAL SYSTEMS, TO PERFORMANCE SHOWN ON SCHEDULES, AS SPECIFIED, AS REQUIRED BY CODES, STANDARDS, REGULATIONS AND AUTHORITIES HAVING JURISDICTION INCLUDING CITY, TOWN OR COUNTY INSPECTORS, OWNERS AND ARCHITECT. NOTE THAT SOME ATC START-UP PROCEDURES REQUIRE THE COOPERATION OF THE BALANCING CONTRACTOR, THE EQUIPMENT MANUFACTURER'S REPRESENTATIVE AND THE ATC CONTRACTOR.

SECTION 6: CONTROLS

15601 CONTROLS AND SEQUENCE OF OPERATION

1) ROOF TOP UNITS RTU-1 AND RTU-2 SHALL CONTROLLED BY A PROGRAMABLE HEAT/COOL THERMOSTAT LOCATED IN THE CONDITIONED SPACE AS SHOWN ON THE DRAWINGS. SMOKE DETECTION SHALL BE A DUCT MOUNTED TYPE.
2) GREASE HOOD EXHAUST SYSTEM SHALL BE CONTROLLED WITH FACTORY SUPPLIED CONTROL SYSTEM SUPPLIED WITH HOODS.
3) DISHWASHER HOOD EXHAUST FAN (EF-3) SHALL BE MANUALLY CONTROLLED WITH A LOCALLY MOUNTED ON/OFF CONTROL SWITCH.
4) GREASE HOOD MAKE-UP AIR UNIT (MUA-1) SHALL BE TIED INTO FACTORY SUPPLIED HOOD CONTROL SYSTEM PROVIDED BY HOOD SUPPLIER.
5) ROOF MOUNTED BATHROOM EXHAUST FAN (EF-1) SHALL BE TIED INTO BATHROOM LIGHT SWITCHES LOCATED IN THE BATHROOMS SERVICED BY THE FAN
6) DUCT MOUNTED HUMIDIFIER (H-1) SHALL BE CONTROLLED BY FACTORY SUPPLIED CONTROL SYSTEM PROVIDED BY HUMIDIFIER SUPPLIER
7) ELECTRIC UNIT HEATER (UH-1) SHALL BE LOCALLY CONTROLLED BY A DEDICATED THERMOSTAT LOCATED IN THE AREA IT IS SERVING

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W.H.DEMMONS INC.
Maine Air Conditioning
Portland Sheet Metal
Demmons Roofing

FOR CONSTRUCTION

BAYSIDE BOWLING
PORTLAND, ME

SPECIFICATIONS

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