# SECTION 23 02 10

# BASIC MATERIALS AND METHODS – HVAC

## PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other conditions, if any) and Division 1 as appropriate, apply to the work specified in this section.

B. Refer to Section 230200 for HVAC General Provisions.

C. Refer to other sections in Division 23 for materials and methods not specified herein.

1.2 DESCRIPTION OF WORK

A. Included in this Section are the following:

1. Copper Tubing & Fittings
2. Unions
3. Motors

1.3 REFERENCE STANDARDS

A. Refer to Section 230200 for a general description of requirements applying to this section.

B. Install work to meet the requirements of the following:

1. New Castle County Dept. of License and Inspections
2. International Mechanical Code
3. Gas Utility Company
4. NFPA
5. OSHA
6. ASHRAE
7. Manufacturer's Standardization Society (MSS) of the valve and Fittings Industry, Inc.:

   SP-58 Pipe Hangers and Supports Materials, Design and Manufacture.
   SP-69 Pipe Hangers and Supports Selection and Application

C. Appliances and materials governed by UL requirements shall meet such requirements and bear the label.

1.4 QUALITY ASSURANCE

A. Provide adequate supervision of labor force to assure that all aspects of the specifications are being fulfilled.

B. Verify that all work and equipment is installed in accordance with manufacturer's warranty requirements.

**PART 2 – PRODUCTS**

2.1 COPPER TUBING & FITTINGS

A. Refrigeration Piping:

1. Copper tubing: Type ACR, hard drawn temper.
2. Fitting: Wrought-copper, solder joints, ASME B16.22 or ASME B16.26.
3. Joints: Brazed, American Welding Society (AWS) Class BCUP-5 for brazing filler metal.

B. Condensate Drain Piping:

1. Pipe: Copper tubing Type DWV.
2. Fittings: Wrought copper solder type drainage fittings, ASME B16.23 or B16.29.

2.2 UNIONS

A. Up to and including 2 inch pipe size: Screwed pattern, bronze-to- bronze seat.

B. Above 2 inch pipe size: Flanged pattern, A.S.A. forged steel, with gaskets, bolts and nuts.

C. Copper tubing unions shall have sweated type ends. Flanged unions on copper tubing may be soldered connections.

D. Materials and pressure ratings shall be the same as specified for the respective pipe and fitting system unless otherwise specified.

2.3 MOTORS

A. All single phase and polyphase motors shall be manufactured to incorporate the latest NEMA standards.

B. All single phase and polyphase motors shall have steel frames with ball bearings and copper windings. All motors to have a Class "F" insulation system with a service factor of 1.15.

C. All motors shall be 1725 RPM, 4 pole design, unless otherwise noted on the drawings, or in the equipment specifications.

D. Motors installed indoors and not exposed to moisture shall be open, drip proof, Class B temperature rise based on 40°C maximum ambient temperature.

E. Motors installed outdoors and exposed to moisture shall be totally enclosed, fan cooled, Class B temperature rise based on 40 deg. C maximum ambient temperature.

F. Based on NEMA Standards, motors shall comply with the following minimum nominal efficiencies at full load.

| Nominal Efficiencies for "NEMA Premium ™" Induction Motors Rated 600 Volts or Less (Random Wound) | | | | | | |
|---|---|---|---|---|---|---|
| | Open Drip-Proof | | | Totally Enclosed Fan-Cooled | | |
| HP | 3500 RPM | 1800 RPM | 1200 RPM | 3500 RPM | 1800 RPM | 1200 RPM |
| 1 | 82.5 | 85.5 | 77.0 | 82.5 | 85.5 | 77.0 |
| 1.5 | 86.5 | 86.5 | 84.0 | 87.5 | 86.5 | 84.0 |
| 2 | 87.5 | 86.5 | 85.5 | 88.5 | 86.5 | 85.5 |
| 3 | 88.5 | 89.5 | 85.5 | 89.5 | 89.5 | 86.5 |
| 5 | 89.5 | 89.5 | 86.5 | 89.5 | 89.5 | 88.5 |
| 7.5 | 90.2 | 91.0 | 88.5 | 91.0 | 91.7 | 89.5 |
| 10 | 91.7 | 91.7 | 89.5 | 91.0 | 91.7 | 90.2 |

G. Motor Characteristics: Refer to Equipment Schedules for specific data.

120/208 Volt System: Motors 1/2HP & Larger - 208V, 3 Phase, 3 Wire
Motors Less than 1/2HP- 120V, 1 Phase, 2 Wire

277/480 Volt System: Motors 1/2HP & Larger - 480V, 3 Phase, 3 Wire

H. All motors rated less than 1/2HP shall have thermal protection of the auto-reset type as an integral part of the motor.

I. All motors rated 1/2HP and larger shall have thermal protection provided by an external device.

J. Whenever a variable frequency PWM drive is installed to control an AC motor, a maintenance-free, circumferential, conductive micro fiber shaft grounding ring shall be installed on the AC motor drive end to discharge shaft currents to ground. Recommended part: AEGIS SGR™ Bearing Protection Ring, as made by Electro Static Technology. Install in accordance with the manufacturer's written instructions.

## PART 3 – EXECUTION

### 3.1 PIPING SYSTEMS

A. All piping to drain to low points. Low points shall be provided with drain valves with hose thread.

B. Do not install trapped lines where water cannot be drained or air can accumulate without being vented.

C. Piping shall run square with building lines.

D. Piping shall not be insulated or covered until tested.

F. Necessary drains, off-sets, vents and drips shall be provided for coordination of the work as part of the contract.

G. Running or close nipples are not permitted.

H. Piping shall not be installed over electrical transformers, panels, switchgear, substations, and control panels.

I. Allow clearance for expansion and contraction.

J. Install eccentric piping fittings where change in sizes occurs in piping systems. Tops of pipes to remain level.

K. Install isolating fittings between sections of ferrous and non-ferrous pipe or connected equipment.

L. Do not support piping from other piping, conduits or equipment.

M. Unions shall be provided adjacent to all valves, at equipment connections, and where necessary to facilitate dismantling of the piping system.

N. Material Requirements for Systems:

1. Condensate Drain (including pumped condensate):

a. Type DWV copper.
b. Schedule 40 PVC.

2. Refrigerant Piping: Type ACR hard copper.

3.2 TAGS, CHARTS AND IDENTIFICATION

A. See Paragraph "Labeling" in GENERAL PROVISIONS for equipment labeling.

B. Identify each valve in all systems with black, numbered and stamped 1- 1/2" brass or aluminum tags fastened to valve by brass chain and S-hook.

C. Provide 1/8" scale diagrams showing location, number and service or function of each tagged item.

1. Frame diagrams in approved metal frames with clear acrylic front, hinges, and locks.

2. Secure to wall in Mechanical Room.

3. Provide two additional separate copies permanently covered and bound.

a. Include one (1) copy in the Operation and Maintenance Manuals.

D. Piping Identification: Identify piping with Seton "Setmark" or Brimar, semi-rigid plastic, wraparound pipe markers with flow arrows and conforming to ANSI A13.1. Locate marker at

each valve, changes in direction, where pipes pass thru barriers and every 25' of horizontal runs. Lettering on background shall be in accordance with the following colors:

| Legend | | Background | Lettering |
|---|---|---|---|
| 1. | Refrigerant Liquid | - Yellow | - Black |
| 2. | Refrigerant Gas | - Yellow | - Black |

3.3 SOLDERING/BRAZING

A. Connections between copper tubing and copper fittings shall be made with the appropriate filler metal. Flux shall be non-corrosive type as recommended by the manufacturer of the filler metal, and conforming to AWS A5.8.

B. Tubing shall be cut square and then reamed and deburred. End of tubing and inside of fitting cup shall be cleaned with steel wool and the flux shall be applied to the clean surface before joining. After joining, the excess filler metal shall be wiped off while still plastic.

C. Silver brazing alloy shall be equal to Easy-Flo by Handy and Harmon or Sta-Brite silver solder and shall be used for joints in:

1. Air conditioning drain piping

D. Where the silver brazing is performed in a confined non-ventilated space, a non-toxic, cadmium-free brazing alloy such as braze 560 by Handy & Harman shall be used.

E. Refrigerant piping shall be silver brazed using Harris Sil-Fos 15 or equivalent, with nitrogen purge.

F. Bring joint to solder temperature or brazing temperature in as short a time as possible.

G. Form continuous solder bead or brazing filler bead around entire circumference of joint.

H. Wipe excess solder from joint area while solder is still plastic.

**END OF SECTION 23 02 10**