SECTION 15100 – BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 ITEMS INCLUDED:

Basic components for complete mechanical systems including safety devices, pipe and pipe fittings, unions, hangers and supports, valves and strainers, motors, motor controllers, thermometers, gauges and alarms.

1.02 RELATED WORK:

A. Insulation.

B. Access panels and/or doors.

C. All headings listed in Division 15 and 16 - Mechanical and Electrical.

1.03 SUBMITTALS:

A. See Section 01300 and Section 15010 - General Provisions - Mechanical.

PART 2 - PRODUCTS

2.01 General:

A. Materials shall be best intended for and meet with approval of Owner. Owner will reserve the right to reject any materials not in accordance with those required or not meeting with Owner's approval, either before or after installation.

2.02 SAFETY DEVICES:

A. Provide suitable guards on all equipment to enclose belts, pulleys, motor shafts, electrical contacts, etc. Removable guards shall be cast iron, sheet metal or wire mesh, rigidly secured.

B. Pressure and temperature relief devices shall be provided on each item of equipment where normally required.

2.03 PIPE AND PIPE FITTINGS:

A. All pipe and fittings shall be uniform in size, free from defects, and of sufficient strength to suite particular system.

B. PVC soil pipe shall conform to ASTM D-3034.

C. Copper pipe shall be hard-drawn type "L" or "K" weight copper water tubing conforming to ASTM B-88 for solder joints. All buried copper pipe shall be soft type "K" copper. Refrigerant pipe shall be ACR, Type L. Fittings shall be wrought copper conforming to ASA 816.22 and meeting ASTM B-75, except that drainage piping shall be DWV solder joint fittings.

D. Iron pipe size brass pipe shall conform to ASTM B-43, provided with 125 psi fittings.

E. Solder fittings for use with copper tubing shall be wrought or cast brass fittings, drainage pattern or standard design as required.

F. Joints for copper tubing shall be made with 95-5 (tin and antimony) solder.

G. Plain steel pipe shall conform to ASTM A120, schedule 40 or 80 weight as required. Fitting for ferrous piping shall be for minimum 125 psi swp of weight and material consistent with pipe weight and material, black or galvanized to conform to pipe used. All weld fitting shall conform to ASA B16.9 with beveled edges. Weldolet type fittings conforming to ASA B31.1 and B16.9 will be acceptable where branch is at least two sizes smaller than main. Threaded pipe shall have cast iron 125 psi swp ASA B16.4 or malleable iron 150 psi swp ASA B16.3 fittings. Fittings for non-pressure steel piping systems shall be black cast iron drainage fittings, ASA B16.12.

2.04 UNIONS:

A. Unions for copper pipe 2" (5.08 cm) and under shall be 125 psi swp brass ground-joint type welder ends.

B. Patented type dielectric fittings or couplings shall be provided in pipe systems wherever dissimilar metals are joined.

2.05 HANGERS AND SUPPORTS:

A. All materials required for proper support of equipment and piping shall be provided. Each hanger shall be suitable for structural conditions, vibration, temperature, pipe materials, and expansion conditions encountered.

B. Pipe hangers for horizontal piping shall be standard malleable iron supports with adjustable split-ring or clevis type hangers for all general piping. Hangers for copper pipe shall be copper-coated, adjustable, pipe-ring type.

C. Where piping runs of three or more pipes are grouped together, pipe racks consisting of "unistrut", or approved equal shall be utilized.

D. Clamps, inserts, bolts, channel and angle iron, racks, rollers, etc., shall be provided for duct, piping and equipment supports as required. All hanger and support components shall be adequate for loads involved. Strict compliance with manufacturer's recommendations shall be maintained in applying all devices.

2.06 VALVES AND STRAINERS:

A. Valves shall be approved standard weight valves suitable for working pressure of 125 psi swp minimum, and adequate for service intended. Gate, globe and ball valves shall be repackable when open and under pressure. Valves shall be fitted and constructed of materials recommended by valve manufacturer for particular services.

B. Ball valves shall have stainless steel ball and stem, teflon or EPT seat, watts B-6000-SS, or approved equal. Bronze body shall be used for 3" and smaller sizes.

C. Lubricated-plug type valves shall be flanged for 2-1/2" and larger, screwed for smaller sizes. Valves shall be Rockwell 142 for small sizes and 143 for larger sizes, or approved equal.

2.07 MOTORS:

A. See drawings for voltage and phase of equipment.

B. Motor shall be selected by manufacturers of driven equipment and provided with voltage ratings required. Contractors shall verify voltage requirements with Division 16, Electrical, prior to ordering equipment.

C. Refer to Division Electrical, for additional motor requirements.

D. Motors shall be suitable for operation at +/- 10% rated voltage. Equipment manufacturer shall provide "boost" transformer if required to meet this specification.

2.08 MOTOR CONTROLLERS:

A. Single phase motors shall have manual type starters and pilot lights. Single phase motors with built-in overload protection will not require starters.

B. Starters for three (3) phase motors shall be magnetic across- the-line type with three (3) overloads. Provide combination disconnect switches, pilot lights, auxiliary contacts, and hand-off- auto switches as necessary and where stipulated on Drawings. Starters shall be Square D, Allen-Bradley, General Electric, or approved equal.

C. Refer to Division 16 Electrical, for additional motor requirements.

2.09 THERMOMETERS:

A. Adequate instrumentation shall be provided for operation, evaluation, adjustment, and malfunction indications of systems.

B. Thermometers shall be installed with separable sockets, bronze in nonferrous systems and stainless steel in ferrous systems. Thermometers shall be mercury type with 4-1/4" dial, adjustable angle face, and white face with black figures and pointer.

PART 3 - EXECUTION

3.01 GENERAL:

A. Contractor shall inspect project conditions thoroughly at commencement of work and plan execution of work around conditions prevailing.

B. Equipment shall be placed and arranged so that all items requiring periodic service are accessible. This shall include all motors, oil reservoirs, filters, valves, temperature controls, electrical devices, damper handles and such related items.

C. Work shall be installed by competent workmen in their respective fields. Installations shall at all times be under direct supervision of a supervisor who is thoroughly familiar with all portions of installation.

3.02 PIPING SYSTEMS:

A. Piping systems shall be erected and true without undue strains and parallel with building lines, and in accordance with quality standards for trades involved.

B. Piping systems shall consist of the following:

1. All soil, waste, sewer, vent, mains, risers, and branch lines shall be P.V.C. as approved for drain, waste and vent piping in accordance with ASTM D-3034. Jointing shall be solvent weld.

2. Domestic water piping within building, above slab, shall be hard-drawn type “L” or “K” weight copper water tubing Buried copper conforming to ASTM B-88 for solder joints, underground water piping shall be type "K" soft copper with solder brazed joints, coated with asphaltum having glass fabric imbedded in

second coat.
3. Iron-pipe-size brass pipe shall be used for domestic water and waste connections. Exposed connections shall be chrome plated. All underground water piping shall be coated with heavy asphaltum after final testing.

4. Condensate drain piping for air conditioning equipment shall be Type “M” copper, with drainage fittings.

3.03 PIPE JOINTS:

A. P.V.C. piping shall be jointed by solvent weld complying with ASTM D-2241. If P.V.C. piping is used in party walls (fire rated walls), all penetrations of the drywall shall be made with metallic pipe. P.V.C. piping shall not be used where code prohibits use of same.

B. Copper pipe ends and fittings shall be thoroughly cleaned before applying solder brazing alloy. Brazed joints in copper piping shall have 1300 F melting point silver-phosphorous brazing alloy using petroleum base flux. Soldered joints in copper piping shall have 95-5 tin-antimony solder applied using petroleum base flux.

C. All copper piping expansion loops shall be brazed using long radius fittings and shall be "cold sprung".

D. Couplings or adapters for joining dissimilar piping materials shall be dielectric type installed as recommended by manufacturer of couplings.

E. Joints between threaded pipe and bells of soil pipe shall be made with caulking ferrules.

F. Joints between copper tubing and cast iron soil pipe shall be made with cast bronze or brass adapters for leading-in to bells of solid pipe.

G. Flanged joints shall be made using steel threaded or welded flanges in steel piping and brazed or bronze flanges in copper tube piping. Bolts shall be galvanized steel for iron or steel flanges, bronze for brass or bronze flanges.

H. Screwed joints in steel piping shall have standard, cleanout tapered threads, with pipe ends reamed. Teflon tape shall be used as joint-seal or screwed joints. At least three threads shall be exposed after pulling joints up tight.

I. Welded joints in steel piping shall be electric or gas welded using appropriate type welding rods. Gas fuel pipe shall be welded, except at connections where threaded malleable fittings shall be used.

J. Piping shall be installed with anchors, loops, offsets and expansion control devices, as required, to prevent excess strains on piping.

3.04 HANGERS AND SUPPORTS:

A. Contractor shall provide proper supports for all equipment and piping furnished and /or installed. Strap hangers will not be allowed.

B. Each hanger or support shall be suitable for purposes and conditions encountered. All piping shall be substantially supported in neat (and workmanlike) manner and shall be free from sagging, with loops, etc., as required for expansion and contraction. All exposed hangers in finished spaces shall have cast escutcheons with set screw or steel ceiling plates.

C. Where piping runs of three or more pipes are grouped together, pipe racks shall be provided. Piping runs shall be coordinated with other trades.
D. For cold insulated piping, adequately-sized sheet metal shields, shall be provided with heavy density (7 pounds or heavier) insulation or cork bearing points so that hangers will not crush or wrinkle insulation. Hangers for such piping shall be sized to contain insulation.

E. Horizontal suspended piping shall have minimum number of hangers required or outlined herein:

1. PVC soil pipe shall have one hanger or suport for each pipe length located close to joints.

2. Copper tubing shall have hanger spaced 8'-0" maximum for 1-1/4" and larger tubing and 6'-0" maximum for smaller tubing.

F. Vertical piping shall be supported with friction riser clamps or other satisfactory methods as dictated by particular situations as recommended by hanger manufacturer.

G. Clamps, inserts, bolts, channel and angle iron, racks, etc., shall be furnished for duct, piping and equipment supports as required. All hanger and support components shall be adequate for loads involved. Strict compliance with manufacturer's recommendations shall be maintained in applying all devices.

H. Equipment shall be adequately supported with all bracing, foundations, angles, channels, hangers, etc., furnished.

I. Approved floor stands, wall brackets, etc., may be used to support lines running near floor or walls, which can be safely supported by floors or walls. Pipe lines near walls may be supported by hangers from approved wall brackets.

J. No piping may be hung from other piping unless specifically so detailed on Drawings and approved by owner.

3.05 UNIONS:

A. Unions shall be installed at each pipe system connection to a piece of equipment and as required.

B. Unions shall be installed at equipment side of all shut-off valves, fixtures, and traps.

3.06 VALVES:

A. Gate or ball valves shall be used at all connections to equipment. Ball valves shall be provided with plastic insulated lever handles color-coded for each service and used on domestic water through 3" (7.62 cm) size.

B. Lubricated-plug type valves shall be used at all gas connections to equipment.

C. Valves, strainers, and components shall be installed in accordance with manufacturer's recommendation.

3.07 THERMOMETERS:

A. Provide thermometers at all lines leaving water heater and at other required locations.

B. Gauge cocks and capped thermometer wells shall be provided where required.

3.08 EQUIPMENT INSTALLATIONS:

A. Equipment shall be installed in accordance with manufacturer's recommendation.

B. All equipment components such as motors, lubrication points, disconnects, etc., shall be readily accessible for servicing and replacement.

C. Motors and motor control devices shall be installed having suitable electrical characteristics to operate at required voltages.

3.09 SLEEVES AND ESCUTCHEONS:

A. Sleeves shall be installed where piping passes through structures. All structural openings shall be approved by the structural engineer. Sleeves shall be ample sizes for pipe movement and shall not be used for pipe support. Sleeve openings shall be packed with approved fireproof material. Insulation for ductwork and cold piping shall be continuous through each sleeve.

B. Sleeves through structural concrete members shall be of different materials. Sleeves through other than structural components of building shall be 20 gauge galvanized sheet metal or approved plastic with lock seam joints. Sleeves shall be sufficient sizes to pass pipe insulation through where pipe is insulated.

C. Sleeves shall be set flush with walls and ceilings. Floor sleeves shall exetend 1" above floors in finished areas and 2" in all other areas. Where piping passes through below-grade walls or on-grade floors, spaces between sleeves and pipes shall be caulked with oakum and lead or other suitable waterproofing. Spaces between pipes and floor sleeves shall be filled with glass fiber and non-hardening caulking.

D. In finished areas, chromium plated escutcheon plates shall be installed where exposed piping passes through walls, ceilings and floors of projects. Plates shall be properly sized to conceal sleeves and fastened to pipe or insulation. Exposed hanger rods in finished spaces shall have cast iron escutcheons with set screws.

3.10 EXCAVATION AND BACKFILLING:

A. Contractor shall provide proper sheathing and bracing, where necessary for work involved. Bell holes for all bell and spigot pipe shall be provided.

B. All excavations shall be maintained free of standing water.

C. Any pipe bed not on undisturbed, well compacted earth shall have a clean and compact sand pipe bed.

D. After underground work has been completely installed and thoroughly tested, trenches and other excavations shall be backfilled as covered elsewhere in these specifications. All backfilling materials shall be free from cinders and harmful or corrosive materials.

E. After all backfilling has been completed, all spoilage shall be removed from project site.

3.11 PIPE SYSTEM CLEANING:

A. After installations are completed and before testing, all piping systems shall be thoroughly cleaned (blown-out, flushed-out, swabbed out/or chemically treated until clean).

B. Potable (cold and hot) water systems shall be cleaned and sterilized as required by governing codes and result certified by an Owner-approved testing laboratory.

3.12 TESTING AND ADJUSTMENTS:

A. All piping shall be tested and proven tight before covering is applied or piping concealed. All tests shall be witnessed by Owner.

B. All piping except sanitary and storm drainage systems shall be tested by hydrostatic or pneumatic pressure at least 1-1/2 times maximum operating pressure but not less than 100 psi for sufficient time to detect leaks and defects.

C. Each test set-up shall provide for changes in ambient temperatures from causing false pressure readings during tests.

D. Sanitary systems shall be thoroughly tested by hydrostatic or pneumatic pressure suitable to local plumbing code; however, of not less than 10 feet of water column to detect all leaks and defects.

E. Each pipe system shall be tested and balanced so that design conditions are achieved at each piece of equipment.

F. Each pipe system shall be completely balanced and tested including the following:

1. All valves shall be opened to full open position.

2. Water in systems shall be examined to see if water has been treated and cleaned.

3. Remove and clean all strainers.

4. All temperature controls shall be set for proper operating conditions.

5. Operation of all automatic valves shall be checked.

6. Proper pump rotation shall be verified.

3.13 OPERATION AND MAINTENANCE:

A. Contractor shall turn over to Owner all systems completely clean, safe, meeting all governing codes, regulations, and requirements and operating properly in every respect.

B. Owner's representative(s) shall be instructed in proper operation and maintenance of every system and piece of equipment. Review Operating and Maintenance Manuals with Owner's representatives.

Two hours of instruction shall be provided for the maintenance and operation of air conditioning equipment and thermostats.

C. See Section 01705 - Contract Closeout, for further discussions on this subject.

END OF SECTION 15100