SECTION 22 05 00 - PLUMBING

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Section 23 05 00 “Common Work Results for Mechanical” applies to the work of this Section.

B. The work listed or required by this section of the specifications is not intended to limit or establish the extent of the Plumbing work. The General Contractor shall be responsible for determining the extent of the Plumbing work to be done under a subcontract.

1.2. DESCRIPTION

A. Work Included: The work includes the furnishing of labor, materials, appliances and tools necessary for the installation, in complete working order, of plumbing systems as herein specified and as indicated on the drawings. The item of work shall include, but not be limited to, the following principal items:

1. Fixtures and equipment included in plumbing schedule or as indicated on the drawings.
2. Soil, waste and vent piping systems
3. Natural gas piping systems
4. Storm and overflow drainage piping systems
5. Potable hot, cold, hot water return and tempered water piping systems
6. Non potable hot and cold water piping systems
7. Acid Waste and Vent piping systems
8. Laboratory and Instrument Compressed Air and Vacuum piping systems
9. Gas Seismic Valve and Regulators
10. Sleeves, hangers and seismic bracing for piping systems
11. Insulation of piping
12. Testing
13. Excavation and backfill
14. Rough-in and final gas, water and utility connections to mechanical equipment

B. Other work herein specified and shown on the accompanying drawings including addenda, change order and approved shop drawings.
C. The Contractor shall furnish other tradesmen with drawings and directions necessary to enable them to properly construct their work so that the systems shall be properly interconnected.

D. The Contractor shall be responsible for the correctness of his drawings and instructions and make, at his expense, necessary changes in the completed work of other trades made necessary by errors in his drawings or instructions.

1.3. RELATED WORK SPECIFIED ELSEWHERE

A. Work designated on drawings to be installed or performed by other sections of the specifications.

B. Finish painting of equipment, piping and ductwork shall be under Division 9 Painting Section, except as noted otherwise.

C. Equipment foundations, curbs, or equipment pads as provided under the Concrete Section or Structural Steel Section. Coordinate exact foundation sizes and elevations, and anchor bolt sizes and locations.

1.4. EQUIPMENT RESTRICTIONS

A. Refer to Section 23 05 00

1.5. SUBMITTALS

A. In addition to the requirements of Section 23 05 00, submittal brochures shall include the following items:

1. Piping Materials: Waste and Vent, Potable Hot, Cold and Tempered Water, Acid Waste and Vent, Non-potable Hot & Cold Water, Natural Gas, Storm Drain, Compressed Air and Vacuum

2. Piping Accessories: Hangers, Dielectric Couplers, Hanger Supports, Insulation, and Hanger Brackets

3. Valves: Gate Valves, Check Valves, Ball Valves, and Gas Seismic Valves & Regulators

4. Access Panels


B. Contractor shall coordinate and provide shop drawings of the following:

1. Dimension drawings for concrete pad, curb and equipment foundations (1/4” scale minimum) including bolt sizes and locations.
2. Steel fabrication drawings for equipment and pipe supports attachments (1/8” scale).

3. Control Wiring Diagrams.

**PART 2 - PRODUCTS**

2.1. GENERAL

Plumbing fixtures, fittings or valves intended to dispense water for human consumption which contain more than 0.25% LEAD are not permitted to be sold or installed anywhere within the State of California. These devices shall be 3rd party listed to ANNEX G of NSF/ANSI 61-2008 or other approved testing standard. Evidence of compliance shall be presented to the Building Inspector prior to final inspection California Health & Safety Code 116875 (AB1963).

2.2. PIPING SYSTEMS

A. Sewer, Waste and Vent Piping, Storm Drain and Overflow Piping: Hubless cast iron pipe and fitting with stainless steel compression couplings as manufactured by Tyler Pipe Company, conforming to the standards contained in the Cast Iron Soil Pipe Institute Standard 301-78 and acceptable to IAPMO.

B. Potable and non-potable Cold, Tempered Water and Hot Water Piping above grade or slab and indirect or condensate drain piping: ASTM B88, Type “L” seamless hard drawn copper tubing with ASTM B16.22 wrot copper fittings. Joints shall be soldered with lead-free, tin-zinc alloy solder such as Harris Stay-Safe 50. Flanges, bronze solder joint, ANSI 150 lb.


D. Natural Gas Piping, above Grade:

   1. Pipe:
      a. 1” and under: ASTM A-53, Schedule 40, black steel, butt welded.
      b. 2” to 6” ASTM A-53, Schedule 40, black steel, seamless.
      c. 8” to 12”: ASTM A-53, Schedule 20, black steel, seamless.

   2. Fittings:
      a. 2” and under: Screwed: malleable iron, black, 150 lb. unions: Malleable iron, black, ground joint, 250 lb., Grinnel No. 554.
      b. 2-1/2” and over: Welded only, 3 pass, butt welded fittings.

E. Natural gas piping, exterior (below grade): Same as “gas piping above grade” except polyethylene coated or wrapped to a point 12” above grade.
F. Acid resistant drain and vent piping: Shall be of flame retardant polyphylene. Pipe and fittings shall be Schedule 40 wall thickness and shall be joined by mechanical joint for above ground piping and socket weld fusion jointing for under slab piping. Installation and testing shall be in accordance with contract drawings. The manufacturer’s recommendations and the local plumbing code.

G. Compressed air and vacuum piping: Compressed Air and Vacuum Piping above grade or slab and indirect or condensate drain piping: ASTM B88, Type “L” seamless hard drawn copper tubing with ASTM B16.22 wrot copper fittings. Joints shall be soldered with lead-free, tin-zinc alloy solder such as Harris Stay-Safe 50. Flanges, bronze solder joint, ANSI 150 lb.

H. Gas Seismic Valves and Regulators:
    1. Type: Balancing diaphragm type with internal relief valve, strainer, vent and automatic shut off.
    2. Capacities: As indicated on the drawings.
    3. Manufacturers: Pacific Seismic Earthquake Valve or equal. Equimeter, Fisher, Reliance, or Rockwell Regulators

I. Hangers, Supports, Brackets and Plates:
    1. Horizontal pipe lines shall be carried by hangers or supports spaced according to the following schedule or supported as required by the Uniform Plumbing Code:

    | Schedule 40 Steel Pipe | Copper Water Pipes |
    |------------------------|--------------------|
    | Size                   | Max. Spacing       | Tube O.D.       | Max. Spacing       |
    | ¾” – 1”                | 7’-0”              | 1” and less     | 6’-0”              |
    | 1-1/4” – 1-1/2”        | 8’-0”              | 1-1/2” and up   | 8’-0”              |
    | 2”                     | 10’-0”             |                   |                    |
    | 2-1/2”                 | 11’-0”             |                   |                    |
    | 3”                     | 12’-0”             |                   |                    |
    | 4”                     | 14’-0”             |                   |                    |
    | 5”                     | 15’-0”             |                   |                    |
    | 6”                     | 17’-0”             |                   |                    |

    2. Where two or more lines are run at the same elevation, trapeze hangers constructed of “Unistrut” and rods as herein specified may be used. Provide separate hangers for each branch take-off three feet in length or more. Hangers shall be set so as to allow the pipe to adjust itself to changes produced by expansion and contraction.

    3. Hangers for non-insulated pipelines shall be clevis type “Grinnell” Figure 260 or approved equal. Hangers for insulated pipelines shall be a “Grinnell” Figure 300 or approved equal. Hangers shall be supported on threaded rod hangers of the following sizes:

    | Pipe Size       | Rod Size   |
    |-----------------|------------|
    | 2” and under    | 3/8” rods  |
    | 2-1/2” and 3”   | 1/2” rods  |
4” 5/8” rods
5” and 6” 3/4” rods

4. Hanger Isolation: Copper piping lines shall have “Semco” Trisolators between the hanger or bracket and the pipe.

5. Supports: Supports for vertical piping shall be “Grinnel” Figure 261 or approved equal split clamps bolted around the pipe and resting on the floor slab.

6. Brackets: Standoff brackets for vertical line of piping and valve assemblies shall be “Secure Strut & Hanger Co.” Figure 7 or approved equal offset pipe clamps.

7. Plates: Where exposed pipes pass through walls, floor and ceilings, they shall be fitted with “Beaton and Caldwell Manufacturing Company” No. 3 – A factory finish split wall plates fastened to the pipe with a set screw. Plates shall be large enough to cover the openings around the pipe.

8. Seismic Bracing: Where hanger rods on horizontal runs of pipe are 24 inches in length or longer, there shall be one 3/16” x 1” steel stay bolted to each pipe hanger clamp and anchored to the wall or ceiling. Stays to ceiling shall rise at a 45 degree angle and be anchored with 5/16” bolts in chinch lead anchors for concrete construction; for steel construction clamp with beam clamps to beams. Alternate stays shall be installed on opposite sides.

J. Identification of Piping: Identify and paint exposed piping, with appropriate color-coding as specified in Section 23 05 00.

2.3. VALVES

A. Provide and install valves required for draining and full control of piping and equipment. Valves shall be one of the following makes for the various conditions and positions required: “NIBCO,” “Stockham” or “Crane”. Valves of one type shall be of one manufacturer.

B. Unless otherwise indicated, valves of types installed in connection with mechanical piping shall comply with the following:

1. Pack stems in conformance to ASTM B16.34.

2. Valves 4” and larger mounted in excess of 7’-0” above the floor in mechanical rooms shall be equipped with chain operators and guides. Extend chains to within 6’-6” of floor.

3. Mark each valve at the factory with the following minimum information, engraved, stamped or cast on each valve or metal tag permanently attached to the valve.

   a. Manufacturer’s name.
   b. Catalog or figure number.
   c. Size and pressure class.
d. Arrows to indicate direction of flow on check, globe, angle, nonreturn and eccentric plug valves.

e. Underwriter’s Laboratories (UL) approved valves shall bear the UL label.

4. Each valve shall be the same size as the pipe in which it is installed.

5. Provide extended valve stem with tee handle on valves installed in insulated piping.

C. Bronze Gate Valves: Provide wedge disc pattern with nonrising stem, repackable under full operating pressure when wide open.

1. Provide valves designed for 125 psig stem and 200 psig non-shock water, oil or gas working pressures.

2. Size 2” and smaller:

3. Manufacturer:
   a. NIBCO: Model S-113, solder cup ends; Model T-113, NPT threaded ends
   b. STOCKHAM: Figure No. B-104, solder cup ends; Figure No. B-103, NPT threaded ends.
   c. CRANE: Catalog No. 1701 S. Solder cup ends; Catalog No. 1701, NPT threaded ends.

D. Ball Valve, two-piece or one top entry bronze body conventional port with 316 stainless steel ball, Teflon seats and stuffing box ring, blowout-proof stem with lever handle.

1. Provide valves designed for 125 psig stem and 400 psig non-shock water, oil or gas.

2. Size 3” and smaller
   a. NIBCO: Model S-580-66, solder cup ends; Model T-580-66, NPT threaded ends
   b. STOCKHAM: Figure No. S-214 BR-T-S, solder cup ends; Figure No. S-214 BR-T-T, NPT threaded ends
   c. CRANE: Catalog No. 2192H, solder cup ends; Catalog No. 2190H, NPT threaded ends

E. Swing Check Valve, bronze body, horizontal swing, Y-pattern with 45º seat regrindable type, with renewable seat and disc.

1. Provide valves designed for 125 psig steam and 200 psig non-shock water, oil or gas.

2. Size 3” and smaller

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a. NIBCO: Model S-413, solder cup ends; Model T-413, NPT threaded ends

b. STOCKMAN: Figure No. S-321 solder cup ends; Figure No. B-321, NPT threaded ends

c. CRANE: Catalog No. 1342, solder cup ends; Catalog No. 37, NPT threaded ends

F. Pressure Reducing Valves: Bronze Body and Bell Housing, nylon reinforced Buna-N diaphragm and renewable stainless steel seat. Wilkins 500 YSBR series, WATTS No. 233S or equal.

G. Backflow Prevention Devices:
   1. Manufacturer shall be Wilkins, Cla-Val or equal.
   2. Reduced Pressure Principle Type: Cast Iron Body with spring loaded, diaphragm assisted main check valve, a spring loaded second check valve and a spring loaded diaphragm actuated differential pressure relief valve, body rated for 175 psi working pressure complete with two full port resilient wedge gate valves and four resilient seated ball valve test cocks. Stainless steel and bronze corrosion resistant internal parts and replaceable seats.
   3. Arrange for and pay fees for testing and certification of backflow prevention devices by a firm or agency approved by the Owner’s Representative.

H. Relief Valves:
   1. Potable Water Temperature and Pressure: On hot water storage tanks provide an American Society of Mechanical Engineers (ASME) rated McDonald Miller, Watts Regulator Co., or equal, thermostatic, self-closing temperature and pressure relief valve, located in the relief valve openings of tanks. Valve shall have a minimum thermal discharge capacity equal to the input capacity of the heater, standard pressure setting of 125 psig and standard temperature setting of 210°F. Route discharge pipe to service sink.

2.4. WATER HAMMER ARRESTORS

A. Stainless steel housing and bellows designed specifically to cushion surges in water supply piping due to sudden on-off operation of valves. Sizes are recommended by Plumbing and Drainage Institute Standard PDI WH-201. Manufacturer: “J.R. Smith” Hydrotol, “Greer” Surge Kushon, or “Wade” shockstops.

B. Provide access door for arrestors located in the plumbing chases.

2.5. INSULATION:

A. General: Pipe thickness shall conform to Title 24 as a minimum. Use thickness specified, if greater than Title 24 requirements.
B. Pipe Insulation

1. Manufacturers: Johns Manville Corporation or approved equal.

2. Glass Fiber: Johns Manville Micro-Lok meeting ASTM C547; rigid molded, non-combustible.
   a. ‘K’ (ksi) Value: 0.23 at 75°F.
   b. Maximum service temperature: 850°F.
   c. Vapor Retarder Jacket: AP-T Plus white kraft paper reinforced with glass fiber yarn and bonded to aluminum foil, secure with self sealing longitudinal laps and butt strips or AP jacket with outward cinch expanding staples or vapor barrier mastic as needed.

   a. ‘K’ (ksi) Value: 0.28 at 75°F.
   b. Maximum Service Temperature: 220°F.
   d. Maximum Smoke Developed: 50 (for 3/4” thick and below); 100 (for above 3/4” thick).
   e. Connection: Water vapor retarder adhesive as needed; Rubatex R-373 adhesive.
   f. UV-Protection: Outdoor protective coating; Rubatex 374 coating.

4. Field Applied Jackets:
   b. Connections: Tacks; Pressure sensitive color matching vinyl tape.
   c. Canvas Jacket: UL listed fabric, 6 oz./ sq. yd., plain weave cotton treated with dilute fire retardant lagging adhesive.
   d. Aluminum Jacket: 0.016 inch thick sheet, embossed finish with longitudinal slip joints and 2 inch laps, die shaped fitting covers with factory attached protective liner.
   e. Stainless Steel Jacket: Type 304 stainless steel, 0.010 inch, corrugated finish.

C. Equipment Insulation:

1. Manufacturers: Johns Manville Corporation or approved equal.
2. Flexible Fiber Glass Blanket: Manville 812 Spin-Glass meeting ASTM C612; flexible.
   a. ‘K’ (ksi) Value: 0.24 at 75°F.
   b. Maximum Service Temperature: 450°F.
   c. Density: 1.5 lb./cu. ft. density.
   d. Vapor Retarder Jacket: Aluminum foil reinforced with fiber glass yarn and laminated to fire-resistant kraft, secured with UL listed pressure sensitive tape and/or outward clinch expanding staples and vapor barrier mastic as needed.

3. Rigid Fiberglas Board: Manville 814 Spin-Glas meeting ASTM C612; rigid, noncombustible.
   a. ‘K’ (ksi) Value: 0.23 at 75°F.
   b. Maximum Service Temperature: 850°F.
   c. Density: 3.0 lb./cu. ft.
   d. Vapor Retarder Jacket: Aluminum foil reinforced with fiber glass yarn and laminated to fire-resistant kraft, secured with UL listed pressure sensitive tape and/or outward clinch expanding staples and vapor barrier mastic as needed.
   e. Facing: 1 inch galvanized hexagonal wire mesh stitched on one face of insulation.

4. Rigid Fiber Glass Board: Manville 1000 Spin-Glas meeting ASTM C612; rigid, noncombustible.
   a. ‘K’ (ksi) Value: 0.23 at 75°F.
   b. Maximum Service Temperature: 850°F.
   c. Density: 3.0 lb/cu ft
   d. Facing: 1 inch galvanized hexagonal wire mesh stitched on one face of insulation.

5. Cellular Glass: ASTM C552; ‘K’ Value of 0.35 at 75°F; 8.0 lb./cu. ft. density.

   a. ‘K’ (ksi) Value: 0.28 at 75°F.
   b. Maximum Service Temperature: 220°F.
   d. Maximum Smoke Developed: 50 (for 3/4” thick and below); 100 (for above 3/4” thick).
e. Connection: Water vapor retarder adhesive as needed; Rubatex R-373 adhesive.

f. UV-Protection: Outdoor protective coating; Rubatex 374 coating.

D. Equipment Insulation:

1. Apply insulation as close as possible to equipment by grooving, scoring and beveling insulation, if necessary. As required, secure insulation to equipment with studs, pins, clips, adhesive, wires or bands.

2. Fill joints, cracks, seams and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retardant cement.

3. Provide insulated dual temperature equipment or cold equipment containing fluids below ambient temperature with vapor retardant jackets.

4. For insulated equipment contained fluids above ambient temperature, provide jacket with or without vapor barrier.

5. Cover insulation with metal mesh and finish with heavy coat of insulating cement, mastic or aluminum jacket as indicated in the drawings.

6. For equipment in mechanical equipment rooms or in finished spaces, finish with Manville Zeston 2000 jacketing and fitting covers or aluminum jacketing.

7. Do not insulate over nameplate or ASME stamps. Bevel and seal insulation around such.

8. When equipment with insulation requires periodic opening for maintenance, repair or cleaning, install insulation in such a manner that it can be easily removed and replaced without damage.

E. Piping Insulation Schedule:

1. Insulate waste lines receiving cold condensate same as roof drainage to first branch receiving waste.

<table>
<thead>
<tr>
<th>Description</th>
<th>Pipe Size Inch</th>
<th>Thickness Inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible Fiber Glass Insulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic Hot 70ºF to 200ºF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cold Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roof Drain Bodies</td>
<td></td>
<td></td>
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<tr>
<td>Roof Drainage within 10 ft (3 meters) of the exterior</td>
<td></td>
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<tr>
<td>Plumbing Vents within 10 ft all sizes (3 meters) of the exterior</td>
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<table>
<thead>
<tr>
<th>Description</th>
<th>Pipe Size</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Elastomeric Foam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic Hot 70°F to 200°F</td>
<td>up to 2  inch</td>
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</tr>
</tbody>
</table>

**F. Equipment Insulation Schedule:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Rigid Fiber Glass Board</td>
<td></td>
</tr>
<tr>
<td>Domestic Hot Water Storage Tanks</td>
<td>2</td>
</tr>
</tbody>
</table>

### 2.6. HEAT TRACE

**A.** Install on all piping located within 5 feet of exterior walls including but not limited to all pipe drops in or at exterior walls as well as all exposed piping outside the building.

**B.** Furnish and install a complete UL Listed, CSA Certified, or FM Approved system of heating cables, components, and controls to prevent pipes from freezing.

**C.** The self-regulating heating cable shall consist of two (2) 16 AWG nickel-copper bus wires embedded in parallel in a self-regulating polymer core that varies its power output to respond to temperature all along its length, allowing the heating cable to be cut to length in the field. The heating cable shall be covered by a radiation-crosslinked, modified polyolefin dielectric jacket. To provide a ground path and to enhance the heating cable’s ruggedness, the heating cable shall have a braid of tinned copper and an outer jacket of modified polyolefin.

**D.** In order to conserve energy and to prevent overheating, the heating cable shall have a self-regulating factor of at least 90 percent. The self-regulating factor is defined as the percentage reduction, without thermostatic control, of the heating cable output going from 40°F pipe temperature operation to 150°F pipe temperature operation.

**E.** Heating cable shall operate on line voltages of (select: 120) volts without the use of transformers.

**F.** Heating cable for metal-pipe freeze protection shall be sized according to the table below. The required heating cable output rating is in watts per foot at 50°F. (Heating cable selection based on 2” fiberglass insulation on metal piping).

**G.** Heating cable shall be 8 x L1-CR (2/20 amps circuit at 120 volts) as manufactured by Raychem Corporation or approved equal.

**H.** Power connection, end seal, splice and tee kit components shall be applied in the field.

**I.** Heating-cable circuit shall be protected by a ground-fault device for equipment protection. This requirement is in accordance with Section 427-22 of the NEC-1996.

**J.** Thermostatic Control Ambient Sensing System shall be controlled by an ambient sensing thermostat AMC-1A set at 40°F either directly or through an appropriate contractor.
K. System must be installed per manufacturer’s recommendations.

L. Apply the heating cable linearly on the pipe after piping has been successfully pressure-tested. Secure the heating cable to piping with cable ties or fiberglass tape.

M. Apply “Electric Traced” labels on the outside of the thermal insulation.

N. After installation and before and after installing the thermal insulation, subject heating cable to testing using a 2500-Vdc Megger. Minimum insulation resistance shall be 20 megohms or greater.

2.7. FIXTURES

A. Plumbing fixtures shall be provided by the manufacturers listed below. Make, Type and Model Number for fixtures are shown on drawing schedules.

1. For water closets, urinals, lavatories, and service sinks – Kohler, American Standard or Chicago.
   a. Water closet flush valves – Zurn, Sloan or Delany.
   b. Lavatory faucets – Kohler, American Standard or Chicago.
   c. Service sink faucet – Kohler, American Standard or Chicago.
   d. Toilet seats – Olsonite or approved equal.

2. Stainless Steel Sinks – Elkay or Just
   a. Sink Faucet – Elkay or Just

3. Epoxy Resin Laboratory Sink:
   a. Manufacturer based upon Thermo Scientific “Hamilton” or Durcon Inc. may be submitted for approval.


5. Floor Drain, Floor Sinks, Roof Drains, Overflow Drains, Roof Receptor and Air Gap Fittings – J.R. Smith, Josam or Zurn.

6. Hose Bibbs – Acorn, Woodford.

7. Trap primers – Precision Plumbing Products or approved equal.

B. Water Heater:

1. Metal jacketed storage type, electric glass lining, polyurethane foam insulation, adjustable thermostat with automatic overheat safety control, magnesium anode, temperature and pressure relief valve, 300 psi tested tank, characteristics as noted on
C. Expansion Tank:

1. Shall be pre-pressurized diaphragm tube for portable hot water systems, Therm-X-Trol, as manufactured by “Amtrol” or approved equal.

2.8. HOT WATER CIRCULATING PUMPS

A. General:

1. Pump shall be of the in-line type. Pump and motor shall be selected to have non-overloading characteristics. Any motor horsepowers shown are estimated minimum requirements and larger motors must be furnished, if necessary to meet non-overloading requirements. Pumps shall be selected so that the design head (at design flow) is not more than 80% of the maximum head. The minimum clearance between the casing shearwater and the impeller shall be 20% of the impeller diameter. Pumps shall be "Bell and Gossett”, "Paco”, "Peerless”, or “Aurora.”

2. Provide flanged connections on pumps.

3. Do not connect pumps to piping before piping is thoroughly cleaned and flushed of dirt and grit. After piping connections have been made, fill system before starting pumps. Do not run pumps dry under any circumstances.

4. Support piping from building structure so as to prevent any strain on pump casings. Make final check for perfect alignment of piping connections after pump has been secured in place.

5. Pipe-supported circulator pumps shall be furnished with bronze bodies, bronze impeller, mechanical seal, and flexible couplings.

6. Install each unit for domestic hot water service with a surface or immersion aqua stat with adjustable differential to start and stop the pump.

2.9. LABORATORY FITTINGS

A. Gas Turret (Single): “Chicago” #980-VR-909-957-3K-CGASCP or approved equal.

B. Gas Turret (Double): “Chicago” #982-VR-909-957-3K-CGASCP or approved equal.

C. Compressed Air Turret (Single): “Chicago” #980-909-957-3K-AGVCP or approved equal.

D. Compressed Air Turret (Double): “Chicago” #981-909-957-3KAGVCP or approved equal.

E. Vacuum Turret (Single): “Chicago” #980-WS909-957-3K-AGVCP or approved equal.

F. Vacuum Turret (Double): “Chicago” #981-WS909-957-3K-AGVCP or approved equal.
2.10. MEDICAL GAS OUTLET STATIONS

1. The style of outlets shall verify with the Users.

2. Medical gas outlet stations shall be modular, quick-disconnect recessed type, or DISS screw thread recessed type equal to BeaconMedaes Series B. Threaded DISS connector shall be per CGA standards and U.S. color code.

3. Outlets shall be field assembled with sequences and services indicated. Centerline spacing of multiple outlets shall be 5-inch minimum.

4. Outlet stations shall have a die cast light gray epoxy powder coated trim plate. Furnish indexed rough in and gas specific latch valve with non-interchangeable safety keying and with color coded gas service identification. The safety keying index pins shall be permanently captured in the latch assembly and non-removable without destroying the outlet. Designs with index pins molded in plastic are not acceptable.

5. The latch mechanisms shall be designed for one handed, single thrust mounting and one handed fingertip release of secondary equipment.

6. The complete outlet shall be made, cleaned and packaged to NFPA 99 Standards, UL Listed and CSA certified. Medical gas outlets shall be cleaned for oxygen service in accordance with CGA Pamphlet G-4.1. The assembly shall be capped and the finish assembly poly bagged for shipment.

7. The rough in assembly shall be of modular design and include a gas specific 16 gauge steel mounting plate designed to permit on-site ganging of multiple outlets, on 5 inch center line spacing. A machined brass outlet block shall be permanently attached to the mounting bracket to permit the 1/2" OD, type-K copper inlet to swivel 360 degrees for attachment to the piping system. The rough in assembly shall contain a double seal to prevent gas leakage between the rough in and latch-valve assemblies after the wall is finished. A single o-ring seal shall not be acceptable.

8. The latch-valve assembly shall telescope up to 3/4-inch to allow for variation in finished wall thickness from 1/2 to 1-1/4-inch.

9. DISS Outlets shall be used for all ceiling mount applications. The style of outlets shall match the existing Hospital. Contractor shall filed verify with the Hospital prior to ordering the devices.

10. Furnish hose assemblies for ceiling outlets for the finished ceiling height as indicated on drawings. Provide each hose with a heavy-duty chain type dual retractor for pressure gases and dual for vacuum. Retractors made of stainless cable are not acceptable. Allow an extra 18” of hose length for retractors.

11. Patient Headwall Unit: Outlet shall be provided as integral with headwall units. Outlet quantity and type (i.e. oxygen, medical vacuum, medical air, etc.) is shown on the drawings. Contractor shall rough-in for and make required field connections to the unit, including piping required for interconnection of multiple headwall unit manifolds. Rough-in shall comply with headwall unit shop drawing requirements.
12. Outlets shall be UL listed.

13. Grounding: The Contractor shall be responsible for connection of outlets to an established common ground.

2.11. NEUTRALIZATION TANK AND SAMPLING TANK & CONTROL PANEL

1. The tanks shall have having inlet and outlet and vent connections with seamless construction.

2. The tanks shall be manufactured from high density polyethylene. Top is complete with gasketed, bolt down cover.

3. The tanks shall be furnished with stainless steel hardware and neoprene gasket material.

4. Manufacturer by Zurn or equal.

2.12. LABORATORY AND INSTRUMENT AIR COMPRESSOR SYSTEM

A. Provide a complete lab and instrument air source, supplying compressed air continuously for the life of the equipment.

B. All components shall be valved to permit service to any component.

C. Furnish a complete plant consisting of compressors, receiver, air treatment system and controls capable of providing scheduled capacity with one compressor out of service.

D. System is completely factory assembled. Systems requiring site assembly are not acceptable (remounting of components removed for shipping is permitted).

E. The control system is NEMA 12 and UL labeled. Provide in the control system:

1. Automatic lead/lag sequencing and alternation.

2. A separate circuit breaker disconnect for each compressor internal to the main control cabinet and protected by the safety interlock of that cabinet.

3. Full voltage motor starters with overload protection.

4. Redundant 120 Volt control circuit transformers.

5. HOA lighted selector switches.

6. Panel mounted pressure gauge.

7. Runtime hour-meters for each compressor.

8. When HOA switches are in Hand mode, system will operate on pressure switch and compressors will not run if lead switch is satisfied.
9. Provide visual and audible alarm indication for high discharge air temperature shutdown with isolated contacts for remote alarm.

10. A temperature sensor at the outlet of each compressor cylinder or air-end to provide hi-temp alarm and shutdown that compressor. Systems employing a single switch for multiple cylinders are not acceptable.

11. Dryer is controlled from main control panel with selector switches mounted on control panel.

F. All moving parts (fans, pulleys and belts) shall be fully protected by an OSHA approved enclosure.

G. All support structures shall be a minimum of 10 Gauge Steel.

H. The compressor module and motors shall be fully isolated from the main compressor base by means of a four point; heavy-duty seismic restrained Cal. OSHPD approved isolation system for a minimum of 95% isolation efficiency. Engineering data shall be provided supporting isolation efficacy and equal weight distribution between supports. Pumps not having this feature shall have an inertia base sized for that system installed at this contractors expense.

I. Provide an air treatment system including desiccant dryer, filters, and regulator sized for peak calculated demand. Include dew point monitoring. Lab air treatment shall include:

1. Desiccant dryer producing a 10°F (-12°C) pressure dew point. Refrigerant dryers are not acceptable.

2. Dryer purge flow control through an integral dew point based purge control system. Purge controllers using desiccant temperature are not acceptable.

3. 441 transfer valve utilizing two ceramic slide plates. Units utilizing multiple solenoids or diaphragm type switching are not acceptable. Valve shall require no periodic service and be covered by a 5 year factory warranty.

4. System piping shall be brazed except where unions are required for service. Vibration flexes shall be all metal and of sufficient length to achieve full isolation. Systems using rubber tubing flex connectors with hose clamps are not acceptable. Systems with short flex connections providing only nominal isolation are not acceptable.

J. Provide corrosion resistant, ASME Coded, National Board Certified receiver rated for a minimum 150 PSIG design pressure. Include a liquid level glass, safety relief valve, manual drain valve, and a screened automatic solenoid valve. During normal operation the flow of air will travel through the tank to allow water vapor to condense in tank.

K. The complete air package shall be pre-wired, pre-piped and assembled on one common base with single point connections for electrical, intake air, discharge air, and condensate drains. All elements shall be factory installed including final isolation valve.

L. The compressors shall be a continuous duty rated scroll type with sealed bearings. The design shall be single stage, air-cooled, consisting of one fixed and one orbiting scroll sealed with
PTFE tip seals between the scroll halves and rated for 828 kPa (120 PSIG) discharge pressure. Orbiting bearings shall be grease filled and permanently sealed type requiring no lubrication at any time. Units requiring re-lubrication are not acceptable. Noise level shall not exceed 75 dB(A) for duplex system, 78 dB(A) for triplex system, and 80 dB(A) for quad system with pumps running at peak demand. Belt tensioning shall be achieved with a pivoting motor mounting base adjustable with one tensioning screw. Each compressor shall be equipped with an integral air-cooled after cooler designed for a maximum approach temperature of 7°C (15°F) at 37.8°C (100°F) ambient and complete with electronic drain valve. The discharge of piping of each compressor shall incorporate an integral valve to prevent more than 1/4 revolution of reverse rotation of the scroll at shutdown. The MGEM shall include in their price all labor and parts required for normal maintenance of the actual scroll compressor(s) (i.e. not including service for the package and accessories) for the life of the compressor.

M. The complete lab air system and all electrical components shall be factory pretested prior to shipment by the manufacturer.

N. Manufacture shall provide 5 years warranty for material and labor.

O. The design is based on BeaconMedaes or approved equal.

2.13. LABORATORY AND INSTRUMENT VACUUM SYSTEM

A. Provide a complete lab and instrument air source, supplying vacuum air continuously for the life of the equipment.

B. All components shall be at least simplexed and valved to permit service to vacuum pump. Each pump exhaust shall be isolated by a union fitting permitting capping for service removal.

C. Furnish complete plant consisting of pump, receiver and controls capable of providing the scheduled capacity with one pump. All capacities will be indicated in SCFM at 22 inches HG.

D. System shall be completely factory assembled, requiring only interconnection between modules on site. Systems requiring on site assembly other than interconnection are not acceptable (replacement of components removed for shipping is permitted).

E. Each pump will be direct or close coupled to a NEMA rated High Efficiency TEFC motor with a service factor of 1.15.

F. The pump will include inlet and outlet flex connectors supplied by the system manufacturer.

G. Programmable Logic Controllers (PLC) will be used to implement operating logic. PLC has integral memory and EPROM backup. PLC shall control the automatic alternation of the vacuum pumps with provisions for simultaneous operation if required, and automatic activation of reserve unit if required. A lag alarm on control cabinet and contacts for the master alarm will be provided.

H. The complete control system and all electrical components shall be NEMA 12 and UL labeled. The control system shall provide:

1. Automatic pump starts based on demand.
2. Circuit breaker disconnect for the vacuum.

3. The control system shall include an automatic minimum run time adjustment to automatically adjust run time based on demand.

4. Full voltage motor starter with overload protection.

5. 120 volt control circuit transformers.

6. Control cabinet shall have lighted HOA selector switch.

7. Panel mounted vacuum gauge.

8. Runtime hour-meter for each pump.

I. Provide oil lubricated rotary vane pump, dynamically balanced multi vane design with heavy duty aluminum alloy vanes for maximum heat dissipation. Minimum vane life is 50,000 operation hours. Oil recirculation is differential pressure with full recirculation and multistage exhaust oil separation rated at not less than 99.998% efficiency. Each pump is provided with an oil non-return valve, filter change indicator for exhaust oil separation filters, and high discharge temperature switch. Service to the oil lubrication system filters does not require disconnection of the exhaust piping. The oil lubrication system shall all be enclosed in one module to minimize oil leaks. Systems with external piping for oil lubrication are not acceptable. Systems requiring separate additional external electric motors for oil cooling are not acceptable. Rubber hose flex connectors and hose clamps are not acceptable for assembling package.

J. Manufacture shall provide 3 years warranty for material and labor.

K. The design is based on Dekker Vacuum Technologies or approved equal.

END OF SECTION 22 05 00