5. Remove and clean strainer screens. Close drain valves and replace drain plugs.

6. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.12 CLEANING

A. Clean and disinfect potable and non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Submit water samples for testing in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

3.13 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Under-building-slab, domestic water, building-service entrance piping, NPS 8 and smaller, shall be the following:

1. Mechanical-joint, ductile-iron pipe; standard-pattern mechanical-joint fittings; and mechanical joints.

D. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be the following:

1. Soft copper tube, ASTM B 88, Type k; No joints below grade.

E. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L ASTM B 88; cast- or wrought- copper solder-joint fittings; and soldered joints.

2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal fittings; and pressure-seal joints.

F. Aboveground domestic water piping, NPS 2 1/2 and larger, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L ASTM B 88; cast- or wrought- copper solder-joint fittings; and soldered or brazed joints.

2. Hard copper tube, ASTM B 88, Type L ASTM B 88; cast- or wrought- copper solder-joint fittings; and brazed joints for 4" and larger.

3. Hard copper tube, ASTM B 88, Type L; copper pressure-seal fittings; and pressure-seal joints.

4. Hard copper tube, ASTM B 88, Type L; grooved-joint copper-tube appurtenances; and grooved joints.

G. Non-Potable-Water Piping: Use same materials as domestic water piping

3.14 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly valves with flanged or grooved ends for piping NPS 2-1/2 and larger.

2. Throttling Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly valves with flanged or grooved ends for piping NPS 2-1/2 and larger.

3. Hot-Water Circulation Piping, Balancing Duty: Automatic balancing valves.

4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION

a. Husky

b. Cascade Waterworks Mfg. Co.

c. Mission Rubber Co.

2.9 DRIP PANS

A. Of not less than 14-gauge galvanized steel with raised sides and galvanized steel pipe nipple drains welded in place at low points.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. PVC piping shall not be used within occupied spaces or plenums of occupied spaces.

C. Aboveground, soil and waste piping shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

2. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.

3. Copper DWV tube, copper drainage fittings, and soldered joints.

D. Aboveground, vent piping shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

2. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.

3. Copper DWV tube, copper drainage fittings, and soldered joints.

E. Underground, soil, waste, and vent piping shall be any of the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.

2. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

F. Underground, grease waste, and vent piping shall be any of the following:

1. Service class, epoxy coated cast-iron soil piping; gaskets; and gasketed joints.

3.2 PIPING INSTALLATION

A. Sanitary sewer piping outside the building is specified in Division 22 Section "Facility Sanitary Sewers."

e. JCM Industries, Inc.

f. Romac Industries, Inc.

g. Smith-Blair, Inc.

h. Viking Johnson.

2. Center-Sleeve Material: Manufacturer's standard.

3. Gasket Material: Natural or synthetic rubber.

4. Metal Component Finish: Corrosion-resistant coating or material.

D. Expansion Joints: Two or three-piece, ductile-iron assembly consisting of telescoping sleeve(s) with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

1. Available Manufacturers:

a. EBAA Iron Sales, Inc.

b. Romac Industries, Inc.

c. Star Pipe Products; Star Fittings Div.

2.6 DRIP PANS

A. Of not less than 14-gauge galvanized steel with raised sides and galvanized steel pipe nipple drains welded in place at low points.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. PVC piping shall not be used within occupied spaces or plenums of occupied spaces.

B. Aboveground storm drainage piping shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

2. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings; and coupled joints.

3. Dissimilar Pipe-Material Couplings: Flexible, Shielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

C. Underground storm drainage piping shall be any of the following:

1. Extra-heavy class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

3. Dissimilar Pipe-Material Couplings: Flexible, Shielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

3.2 PIPING INSTALLATION

A. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers. Cleanouts are specified in Division 22 Section "Storm Drainage Piping Specialties."

B. Install wall-penetration fitting system at each service pipe penetration through foundation wall. Make installation watertight.

C. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

D. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

E. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

F. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:

1. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.

2. Horizontal Storm-Drainage Piping: 1 percent downward in direction of flow.

G. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

H. Install underground PVC storm drainage piping according to ASTM D 2321.

I. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

J. Hubless cast-iron piping 6" and larger shall be restrained at any direction change using blocks, rods, bracing or other suitable methods.

K. Provide drip pans under waste lines concealed above operating, cysto and delivery rooms, cath labs, nurseries, food preparation centers, food serving facilities, food storage areas, central services, electronic data processing areas, electric and telecommunication closets, and other

supplier or separate agency acceptable to authorities having jurisdiction perform the following procedures:

1. Clean medical gas tube and fittings, valves, gages, and other components of oil, grease, and other readily oxidizable materials as required for oxygen service according to CGA G-4.1, "Cleaning Equipment for Oxygen Service."

2. Wash medical gas tubing and components in hot, alkaline-cleaner-water solution of sodium carbonate or trisodium phosphate in proportion of 1 lb of chemical to 3 gal. of water.

    a. Scrub to ensure complete cleaning.

    b. Rinse with clean, hot water to remove cleaning solution.

3.2 PIPING APPLICATIONS

A. Connect new tubing to existing tubing with memory-metal or axially swaged couplings.

B. Medical Air Piping: Use Type L, copper medical gas tube; wrought-copper fittings; and brazed joints or axially swaged couplings.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Comply with ASSE Standard #6010 for installation of compressed-air piping.

C. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and coordinate with other services occupying that space.

F. Install piping adjacent to equipment and specialties to allow service and maintenance.

G. Install nipples, special fittings and valves with pressure ratings same as or higher than system pressure rating used in applications below unless otherwise indicated.

H. Install piping to permit valve servicing.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

2.7 NITROGEN

A. Description: Comply with USP 28 - NF 23 for oil-free dry nitrogen, for blow down and testing.

PART 3 - EXECUTION

3.1 PREPARATION

A. Cleaning of Medical Gas Tubing: If manufacturer-cleaned and -capped fittings or tubing are not available or if precleaned fittings or tubing must be recleaned because of exposure, have supplier or separate agency acceptable to authorities having jurisdiction perform the following procedures:

1. Clean medical gas tube and fittings, valves, gages, and other components of oil, grease, and other readily oxidizable materials as required for oxygen service according to CGA G-4.1, "Cleaning Equipment for Oxygen Service."

2. Wash medical gas tubing and components in hot, alkaline-cleaner-water solution of sodium carbonate or trisodium phosphate in proportion of 1 lb of chemical to 3 gal. of water.

a. Scrub to ensure complete cleaning.

b. Rinse with clean, hot water to remove cleaning solution.

3.2 PIPING APPLICATIONS

A. Connect new copper tubing to existing tubing with memory-metal or axially swaged couplings.

B. Medical Vacuum Piping: Use the following piping materials for each size range:

1. NPS 8 and Smaller: Type L, copper medical gas tube; wrought-copper fittings; and brazed joints or axially swaged couplings.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of vacuum piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Comply with ASSE Standard #6010 for installation of vacuum piping.

C. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

PART 3 - EXECUTION

3.1 PREPARATION

A. Cleaning of Medical Gas Tubing: If manufacturer-cleaned and -capped fittings or tubing are not available or if precleaned fittings or tubing must be recleaned because of exposure, have supplier or separate agency acceptable to authorities having jurisdiction, perform the following procedures:

1. Clean medical gas tube and fittings, valves, gages, and other components of oil, grease, and other readily oxidizable materials as required for oxygen service according to CGA G-4.1, "Cleaning Equipment for Oxygen Service."

2. Wash medical gas tubing and components in hot, alkaline-cleaner-water solution of sodium carbonate or trisodium phosphate in proportion of 1 lb of chemical to 3 gal. of water.

a. Scrub to ensure complete cleaning.

b. Rinse with clean, hot water to remove cleaning solution.

3.2 PIPING APPLICATIONS

A. Medical Gas Piping Except Nitrogen: Use Type L, copper medical gas tube; wrought-copper fittings; and brazed joints or axially swaged couplings.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of gas piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, equipment sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Comply with ASSE Standard #6010 for installation of medical gas piping.

C. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and coordinate with other services occupying that space.

F. Install piping adjacent to equipment and specialties to allow service and maintenance.

G. Install nipples, and special fittings, and valves with pressure ratings same as or higher than system pressure rating used in applications below unless otherwise indicated.

H. Install piping to permit valve servicing.

3.10 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below unless otherwise indicated.

B. Aboveground Chemical-Waste Piping: Use any of the following piping materials:

1. PP drainage piping and electrofusion or mechanical joints.

2. PVDF drainage piping and electrofusion or mechanical joints.

3. CPVC drainage pipe and fittings and solvent cement joints

C. Under Slab-on-Grade, Indoor, Chemical-Waste Piping: Use any of the following piping materials:

1. PP drainage piping and electrofusion joints.

2. PVDF drainage piping and electrofusion joints.

3. CPVC drainage pipe and fittings and solvent cement joints.

END OF SECTION

1. Manufacturers:

   a. Grinnell Mechanical Products.

   b. Perfection Corporation; a subsidiary of American Meter Company.

   c. Precision Plumbing Products, Inc.

   d. Sioux Chief Manufacturing Company, Inc.

   e. Victaulic Company of America.

2. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or brazed joints.

2. Standard weight, Type S, Grade B steel pipe, fully welded, with Class 150 wrought cast or forged steel flanges at equipment and valve connections only.

B. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:

1. Standard weight, Type S, Grade B steel pipe, fully welded, with Class 150 wrought cast or forged steel flanges at equipment and valve connections only.

C. Chilled-water piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

2. Standard weight, Type S, Grade B steel pipe, fully welded, with Class 150 wrought cast or forged steel flanges at equipment and valve connections only.

D. Chilled-water piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:

1. Standard weight, Type S, Grade B steel pipe, fully welded, with Class 150 wrought cast or forged steel flanges at equipment and valve connections only.

E. Condenser-water piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

2. Standard weight, Type S, Grade B steel pipe, fully welded, with Class 150 wrought cast or forged steel flanges at equipment and valve connections only.

F. Condenser-water piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:

1. Standard weight, Type S, Grade B steel pipe, fully welded, with Class 150 wrought cast or forged steel flanges at equipment and valve connections only.

G. Makeup-water piping installed aboveground shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

H. Makeup-Water Piping Installed Belowground: Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.

I. Condensate-Drain Piping: Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

J. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.

K. Air-Vent Piping:

1. Inlet: Same as service where installed according to the piping manufacturer's written instructions.

2. Outlet: Type L, annealed-temper copper tubing with soldered or flared joints.

L. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed according to the piping manufacturer's written instructions.

M. Cryogen Vent Piping: Schedule 10 stainless steel or Type L (B) copper pipe for connecting to equipment connection for discharging to the outside 7 feet above the roof.

3.2 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Cut pipe to measurements established at site and work into place with forcing or springing.

C. Piping shall be installed by skilled mechanics using designated basic materials plus any required supplementary materials.

D. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.