Exhibit D

SECTION 11 40 00 – KITCHEN EQUIPMENT

Part 1: General

1.01 Summary
1.02 Related Sections
1.03 Definitions
1.04 Submittals Required
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Part 2: Products

2.01 Manufacturers
2.02 Products
   A. **All Equipment is to be approved by the PSD Plumbing Department**. **This section lists typical equipment used recently as a basis for design.**
   B. MATERIALS
      1. Stainless Steel: Stainless steel shall be of U.S. Standard gauges, but not less than 20 gauge, Type 304 with No. 4 finish.
      2. Galvanized Steel: Galvanized Steel shall be of 14 gauge and shall be hot dipped galvanized. Galvanized steel may be used in all non-exposed areas, areas with no contact with food or serving items and in framework. When used in framework, galvanized steel shall be of welded construction (welding is to be done before galvanizing). Use of galvanized steel will be subject to final approval during submittal check.
      3. Insulation Materials: For normal temperature applications, such as custom fabricated under-counter refrigerators, use extruded polystyrene material 2 in. (50 mm) thick, bonded at all joints.
      4. For heated-type application, such as plate warmers, use block-type rock wool, minimum 1 in. (25 mm) thick.
      5. For low temperature applications, such as ice bins, cold pans, or custom fabricated under counter freezers, use urethane, rigid foam board or foamed-in-place, not less than 2 in. (50 mm) thick, except that vertical surfaces of cold pans and ice bins may be 1 in. (25 mm) thick. Bond insulation at joints to prevent condensation on exterior.
      6. At counter tops subject to heat from cooking equipment and/or refrigeration compressors, use 1 in. (25 mm) thick Manville Martinite 36, or equal, to insulate underside of top. Also add Martinite material between freezer or refrigerator and 14 gauge (1.98 mm) stainless steel top.
      7. Fiberglass insulation materials shall not be used. Insulation shall be bonded to all surfaces.

C. METAL TOP CONSTRUCTION

1. Metal tops to be one-piece 14 gauge stainless steel welded construction including field joints. Tops to be secured to a full perimeter galvanized steel channel frames except at wood top tables, drainboards and dishtable where channel frames shall be stainless steel and cross braced not farther than 30 in. (760 mm) on center. Fasten top with stud bolts or tack welds. Coat underside of tops with a minimum 1/16 in. (1.6 mm) thick approved hard-drying, sound-deadening, mastic material. Apply all coatings by spreading after top has been secured to frame, such that top and frame are covered and sealed. Table tops must not deflect or distort when fully loaded.

D. ENCLOSED CABINET BASES

1. Fabricate bases from not less than 18 gauge (1.27 mm) steel reinforced by forming metal ends and shelves. Partitions to be constructed of stainless steel. The ends and vertical partitions can be of single wall construction, with a 2 in. (50 mm) face partitions and sides shall be welded at intersections and be flush with the bottom edge of the bottom shelf.
2. Unexposed backs and structural members may be constructed of galvanized steel.
3. Intermediate shelves to be removable. Bottom shelves shall be non-removable.
4. All cabinet doors to be hinged left or right unless otherwise specified.

E. LEGS AND CROSS RAILS

1. Legs and cross rails to be of 1 5/8 in. diameter (941 mm), 16 gauge (1.59 mm) seamless stainless steel tubing. All crossrails to be continuously welded, ground and polished. Tack welds or other methods of connection are not acceptable. Bottoms of legs to be wedged inward and fitted with a stainless steel bullet-type foot with not less than 2 in. adjustment. Freestanding legs are to be pegged to floor with 1/4 in. (6 mm) diameter stainless steel rods.
2. Stainless steel gussets shall not be less than 3 in. (76 mm) diameter and 3/4 in. (95 mm) long. Outer shell to be 16 gauge (1.59 mm) stainless steel reinforced with 12 gauge (2.78 mm) mild steel insert welded to interior of shell. Gusset to be large enough to accommodate a 1-5/8 in. (41 mm) tube and shall have an Allen screw fastener.
3. Low counter legs shall be constructed of stainless steel exterior and shall be 5 3/4 in. (146 mm) minimum height or 7 in. (178 mm) maximum height with 3 1/2 in. (89 mm) square plate with four countersunk holes, welded to the top for fastening.
4. Adjustable feet to be constructed of stainless steel 1/2 in. (38 mm) diameter tapered at the bottom to 1 in. (25 mm) diameter, fitted with a 3/4 in. (19 mm) cold-rolled rod threaded for minimum of 1/2 in. (38 mm) for fitting into a threaded plug welded to leg. A push-in foot is not acceptable. Tables with utilities will have flanged feet and will be securely bolted to the floor with stainless steel fasteners as required by local code.
5. When legs are fastened to equipment, the following methods must be used:
    i. Sinks: Gussets shall be welded to triangular stainless steel plates, which in turn shall be welded to the underside of sink.
    ii. Metal Top Table or Dishtable: Gussetts shall be welded to 14 gauge or heavier channel reinforcing.
    iii. Wood Top: Gusset shall be welded to a stainless steel channel of not less than 14 gauge stainless steel (1.98 mm), secured to the top with screws through slotted holes.

F. SHELVES

1. When shelves are part of the fixture, the following must take place:
    i. Open base type shelf shall be notched around the leg and continuously welded to the leg.
    ii. Cabinet base type shelf shall be turned-up 2" on the back side with a minimum of 1/4 in. (6 mm) radius to insure a tight fit to enclosure panels.

G. WALL MOUNTED SHELVING, RACKS, AND CABINETS

1. Wall backing of sufficient size and strength to support the intended fixture when fully loaded or at full capacity.

H. SINKS, STEAM TABLES AND BAIN MARIES

1. When multiple compartments are part of the design, they shall be continuous on the exterior without applied facing strips or panels. Bottoms of each compartment to be creased to ensure complete drainage to waste opening.
2. Partitions between compartments to be double thickness, continuous and welded.
3. Where sink bowls are exposed, the exterior shall be polished to a number 4 finish.
4. Furnish following drains, wastes and faucets manufactured by Chicago Faucets with lever type handles, shipped loose for installation.
5. Basket strainer drains shall be Fisher Model 6555 with 3 1/2 in. (89 mm) basket.
6. Rotary drains shall Fisher Model 6100 rotary type waste with connected overflow. Valve to be 2 in. (50 mm) chrome plated.
7. Water stand bain maries shall be fitted with 2 1/2 in. (50 mm) waste with basket strainer with connected overflow and adapter to connect to 1/2 in. (38 mm) drain line. Use Standard Keil box pattern basket, drain number 4161-Cp with 458-X overflow head.
8. Furnish faucets for all sinks, bain maries, water stations and other fixtures per 'D' above. If not otherwise specified, all faucets will be backsplash mounted.
9. Provide vacuum breakers on equipment.
10. Floor sinks are to be made of cast iron with porcelain enamel coating to withstand 250 deg. Temperatures, and have secure grates to prevent falls. Floor sinks are to be level with the floor to prevent a trip hazard and to allow water to flow into them. They should be positioned out of the walkway portions of the kitchen; i.e.: under the steam table serving counter or dish machine. These must be under open counter areas or positioned so that they are accessible for cleaning. A trench drain or large square drain (24in.x24in) should be used in front of the steam kettle. A stainless steel anti-splash box should be provided for draining kettles.

I. CUSTOM FABRICATED WORKMANSHIP

1. Items of specially custom fabricated equipment must be custom fabricated by an acceptable manufacturer, who is N.S.F. approved and custom fabricated in an approved manner.
2. Welding and Soldering: Materials 18 gauge (1.27 mm) or heavier, shall be welded.
3. Seams and joints shall be shop-welded or soldered as the nature of the material will require.
4. Welds shall be ground smooth and polished to match original finish.
5. Where galvanizing has been burned off, the weld shall be cleaned and touched up with high-grade aluminum paint.
6. Fasteners and Joints: The following will not be accepted:

i. Exposed screw or bolt heads. Rivets. Butt joints made by rivetting straps under seams and then filled with solder. All fasteners exposed to moisture will be stainless steel.
ii. Rolled Edges: Rolled edges with corners bullnosed, ground and polished.

7. Coved Corners: All stainless steel food service equipment shall have 1/2 in. (13 mm) or larger radius coves in all horizontal and vertical corners and intersections per N.S.F. standards.
8. Closures: Where ends of fixtures, backsplashes, shelves, etc. are open, fill by forming the metal, or weld sections, if necessary, to close entire opening flush to walls or adjoining fixtures.
9. Fabricated equipment having a specified manufacturer, if fabricated by another manufacturer; It shall be specifically understood that all standard accessories, construction details, and features, whether stated or not, will be met, and/or, provided by the current manufacturer.
10. All shelf, counter, or other penetrations will have properly sized grommets installed and secured to prevent accidental removal.

J. OPERATION REQUIREMENTS

1. Insure quiet operation of food service and related equipment. Provide sound deadening on all tables, counters, undershelves, sinks and drainboards.
2. Insure bumper gaskets, stops, and any other protection is installed on all custom fabricated equipment as needed.

K. CONNECTION TERMINALS

1. All custom fabricated equipment shall be provided with standard connection terminals to make final connections on job site.

L. EXHAUST HOODS, WALK-IN COOLERS AND DISHMACHINES

1. Provide all stainless steel duct connections and collars.
2. 22 Gauge Stainless Steel Wall Flashing is required from the lowest point of the Exhaust Hood to the top of the cove base, and full width of the hood. All seams and edges will be fully finished. Overlap seams or raw edges are not acceptable.
3. Fire dampers may be required per project.
4. Dish-machines should be Hobart model: AM-14 T (Tall) for elementary schools and Hobart C -line (C-44 or C-64) (all with 6 inch height extension) for Jr. High and High schools. These are to be hot water sanitizing, with Hatco gas fired booster heater for energy efficiency. Gas boosters are to be vented into draft hood above dishwasher using stainless steel vent pipe. A water connection (3/4 x 1/2TEE) is to be installed on the rinse piping to dishwasher (above dish-counter) with a ½ x ¼" compression stop for soap/rinse control connection.

M. INSERT PANS

1. All cut-outs, openings, drawers, and equipment to hold stainless steel insert pans shall be provided with a full complement of pans as follows:
2. One (1) stainless steel, 20 gauge (.95 mm) minimum, solid insert pan for each space, sized per plans, details, and specifications.
3. Provide one full-size pan to securely fit each opening.
4. Provide a maximum depth pan to suit each application and space allocated for same.
5. Provide 18 gauge (1.27 mm) removable stainless steel adapter bars where applicable.

N. TRAY SLIDES

1. Configuration of all corners, turns, and shape of tray slides for proper support and safe guidance of trays.
2. Size and shape of tray to be used in operation.

O. ENCLOSURES

1. Provide and install enclosure panels secured or removable as specified for any item which houses equipment with movable parts, i.e. compressors, pumps, etc. Also, cover and provide protection for any exposed steam line or condensate line, which may be within reach of operating personnel.

P. DISPENSER (SELF-LEVELING)

1. Verify make of ware, their dimensions, and weight and submit to the dispenser manufacturer at earliest possible date so that springs may be properly calibrated.

Q. WATER FILTER-PURIFIER

1. Furnish in-line water filter-purifiers to remove contaminants, minerals, taste, or odors from beverage system, coffee urns, and icemakers, and steamers, manufactured by Everpure or equal. Provide proper size filter - purifier for equipment being supplied. Locate to insure easy access for cartridge replacement.

R. CONVENIENCE AND POWER OUTLETS

1. Make cut-outs and install appropriate boxes or outlets in custom fabricated fixtures complete with wiring conduit, outlet and cover plate.
2. All outlets and plugs shall conform to NEMA standards. Convenience (and all 120V outlets) will be NEMA 520R, horizontally mounted.
3. All electrical outlets and devices shall be first quality "Specification Grade."

S. PLUGS AND CORDS

1. Where cords and plugs are used, they must comply with National Electrical Manufacturer's Association (NEMA.) requirements.

T. HEATING EQUIPMENT

1. Electric and heating equipment to be installed so as shall be readily cleanable or easily removable for cleaning.
2. Steam-heated custom fabricated equipment shall be of self-contained assembly complete with control valves located in an accessible position.
3. Convection Steamers are to be “Cleveland” brand. (Please verify size/model with owner prior to spec. so as to size to individual school’s needs)
4. Steam Kettles are to be “Cleveland” brand. (Self-contained, natural gas). A pre-rinse faucet combined with a fill faucet should be installed with the kettle, and have a backflow device.
5. Hot holding cabinets/proofers should be “CresCor” brand.
6. Stovetops/Ranges should be Garland brand. These need to electronic/spark ignition. (No open pilots)
7. Convection ovens should be Blodgett: Model: DFG-100 with solid-state manual controls (not digital), casters, flexible gas hose with quick disconnect and restraining tether. Gas manifold to be installed with individual gas cocks for each oven (top and bottom).

U. STARTERS, SWITCHES AND CONTROLS

1. Furnish all starters, motor controls, remote controls and transformers as required.
2. Locate all switches out of heat zone.

3. All starters, switches and controls shall have white on black phenolic plastic identification plates with stainless steel screws conspicuously located on adjacent surfaces.

V. REFRIGERATION

1. Walk-In Coolers/Freezers are to utilize BOHN (brand) condensing units and Copeland components. Compressor Racks are to be on the roof in appropriate outdoor cabinets. All walk-ins should have a digital temperature display/alarm; it should be wired and connected to an alarm notification system to call maintenance in the event of high temperature conditions. Door latches should accommodate owner's padlock. Walk-in thresholds are to be a smooth or ramped surface to accommodate carts rolling in/out. Condensate drains are to be insulated and encased with plastic (washable surface). Drain shall not impede in walkway outside walk-ins.
2. Refrigeration systems shall include start-up and thirteen-month parts and labor guarantee as stated herein before plus an additional four-year guarantee on all condensing units and compressors. This includes refrigerators, ice cream cabinets, icemakers, freezers, dispensers, and all other refrigerated items. Service maintenance contracts are at the discretion of the Owner.
3. All refrigeration condensing units shall include pre-wiring, pre-piping, crankcase regulator, head pressure regulator, factory-installed suction line accumulator, phased loss protection, five year warranty, main fuse disconnect, structural steel frame and weatherproof carbon steel body panel with epoxy paint finish, and refrigerant detective alarm.
4. Compressors and related components must be fully accessible for service and maintenance.
5. Reach in Refrigerators: "True" is the recommended brand.

W. COLD PANS

1. Ice pans, refrigerated pans and cabinets to be provided with breaker strips where adjoining top or cabinet face materials, to prevent transfer of cold.

X. VENTILATION OF REFRIGERATED EQUIPMENT

1. Adequate air supply and exhaust shall be provided for all self-contained or remote refrigeration condensing units, both custom fabricated and standard, as required for proper operation.
2. If additional ventilation is required to ensure correct operating temperatures, so state in a letter for evaluation and decision before purchase/fabrication.

Y. COMPONENTS

1. Coils: Coils for standard and custom fabricated refrigerators to have vinyl plastic coatings, stainless steel housings and shall be installed in such a manner as to be replaceable.
2. Expansion Valves: Standard reach-in refrigerators and freezers, for remote refrigeration systems, shall be complete with thermostatic expansion valves at the evaporator.
3. Thermometers: Refrigerated compartments, custom fabricated and standard shall be fitted with flush digital type thermometers with chrome-plated bezels. Thermometers to be adjustable and shall be calibrated after installation. Thermometers shall have an accuracy of + 2oF. (1oC). Walk-in boxes will have digital alarms as noted in itemized specifications.

4. Hardware: Refrigerator hardware for standard and custom fabricated refrigerator compartments shall be solid, heavy-duty components. Hinges must be self-closing. Latches shall be magnetic edge mount-type.
5. Locks: Doors and drawers for reach-in refrigerated compartments, both custom fabricated and standard, to be fitted with cylinder locking type latches, and provided with master keys.

Z. MISCELLANEOUS METALS

1. Provide and install 22 gauge stainless steel wall flashing from the top of floor cove base to under the lowest point of the exhaust hood(s). Flashing will extend the full width of the exhaust hood. 22ga stainless steel wall flashing will be installed from the top of the backsplash to the base of wall shelves at all sinks and work tables with sinks unless otherwise stated. Corner Guards (14ga Stainless Steel, 48' high, 4" x 4", broke at 90°, with a 5° return brake) will be installed at all outside corners of the foodservice areas. 90° brake angle will be adjusted to match the actual angle of the walls. Base of the corner guards will be at the top of the floor cove base. Provide and install all necessary trim panels and closures, including cosmetic coverings. Equipment closures will match the individual equipment finishes.

AA. MISCELLANEOUS EQUIPMENT

1. Can openers should be Edlund model: S-11
2. Garbage Disposals are to be In-Sink-erator brand with legs to the floor and should have splashguards installed. P-traps are to be chrome -plated cast-brass.
3. Ice Machines should be cubed ice (not crushed). Manitowoc Brand is recommended. A floor sink is needed under edge of machine to accommodate drain lines.
4. Island sinks are to have covered/protected water lines. Floor supplied water lines are not acceptable. Water supply to come from ceiling with stainless steel chase for piping. Accessible isolation valves for each sink are required.
5. Hand sinks should have no towel or soap dispensers incorporated in design of sink. These can be provided separately to accommodate district-wide standardization of paper towels, etc.
6. Mixers/slicers should be "Hobart" brand.
7. Kitchen should have a custodial closet with a mop sink (with a backflow device on faucet).
8. Casters must be installed on all gas appliances and have flexible gas hoses with quick disconnect and restraining tether. (front casters shall lock)
9. Grease trap is to be a one- piece design with two cast manholes level to grade and have cleanouts for inlet and outlet. Please check with health dept for sizing guidelines.
10. Exterior Kitchen doors shall be at least 48 inches wide to accommodate removal/installation of equipment.
11. Isle ways in kitchen shall be wide enough for removal/ installation of equipment and should be wide enough near ovens to allow room for cooks to safely remove pans from oven and pass by with oven doors open while carrying hot pans to a nearby counter that will accommodate hot pans.

Part 3: Execution

3.01 Preparation

3.02 Installation

A. TRIMMING AND SEALING OF EQUIPMENT

1. Any space between units to walls, ceilings, floors and adjoining non-portable units shall be completely sealed against entrance of food particles or vermin by means of trim strips, welding, soldering, or commercial joint material suitable to the nature of the equipment.
2. Sealer, when not exposed to extreme heat, shall be single part neutral curing silicone sealant.
3. Ends of hollow sections shall be closed.

B. CUTTING AND FITTING

1. Do all cutting and fitting required on the equipment during installation and hook up.
2. No cutting, notching, drilling, or altering of any kind will be done to the without first obtaining permission from the Owner.

C. QUALIFICATIONS

1. All work associated with kitchen equipment (moving, installing, unhook/hook up, gas/power/water, etc.) to be done by a kitchen equipment vendor/expert/specialized company. Work not to be done by the general contractor, electrician, plumber, etc.
    i. PSD may be contacted as the first option but is not obligated to do work for construction projects.

3.03 Cleaning and Protection

END OF SECTION 11 40 00

SECTION 11 40 50 - ITEMIZED SPECIFICATIONS

- All fasteners will be stainless steel, and fastener heads will be burr free.
- Each of the following items is to be complete with all factory accessories and options included in the specified model as well as options, modifications, or accessories as listed.
- Equipment that attaches to walls, and has legs, will be attached to the wall under the backsplash with 'Z' clips every 32" or closer, and the legs pinned to the floor with stainless steel pins. All wall mounted equipment must have wall backing at the mounting points. Tables with utilities will have flanged feet bolted to the floor. Suitable wall backing required.
- Wall bumpers wherever impact damage from mobile equipment is possible. Wall bumpers will be by Boston Bumper.
- Gas connections will be 3/4" rear entry.
- Shelving will be assembled first shelf ten inches (10") off floor, or as required by local code, with the balance of shelves equally spaced to top of post.
- In every case the valves will be electrically tripped, and manually reset. Electric or automatic reset valves are not permitted.
- Coordinate NEMA configuration. • Provide shop drawings for approval prior to fabrication.

CASHIER COUNTER - mobile

1. Four (4) polyurethane, non-marking casters, two (2) with brakes.

2. Stainless steel top with knock out for the Cash Register cord.
3. 15" x 20" x 3" Keyed cash drawer.
4. Drop leaf tray slide on both sides.

MILK DISPENSER

1. True Model No.: TMC-49-SS Pertinent Data: ---Utilities Required: 120V/1PH; 8.2A
2. Forced Air, 12 Crates, S/S Drop Font/Hold-Open Flip-Up Lids, Lock
3. S/S Interior & Floor, 3 Heavy Duty Floor Racks
4. Digital Thermometer, 4" Castor, 1/3 HP, 115/60/1

MOBILE SALAD BAR

Manufacturer: Cambro Model No.: 5FBRSL 1.
Tray rails FBR5R on both sides of unit.

TRAY LOWERATOR DISPENSER

Manufacturer: Lakesideodel No.: 818 1.
Swivel casters, two (2) with brakes.

SERVING COUNTER

Manufacturer: Custom Fabricated Model No.: Stainless Steel

1. Adjustable stainless steel legs with flanged feet on front legs only.
2. Open shelving.
3. Chicago #349CP fill faucet.

VERTICAL SNEEZE GUARD

Manufacturer: Brass Smith Model No.: Z9500 Pertinent Data: Fixed, Adjustable Utilities

1. 1/4" tempered front adjustable glass.
2. 1" radius on all corners.
3. All supports and base shall be 1” diameter. Brushed aluminum finish.

CONDIMENT CART

Manufacturer: Lakeside Model No.: BC330

1. Swivel casters, two (2) with brakes.
2. Enclosed sides to conceal contents of cart.

HOT FOOD WELL

Manufacturer: Atlas Set-N-Serve Model No.: WIHL-2: 208V/1PH; 8.2A; 1/2” HW, 1" IW

1. Factory-installed manifold drain and valve.
2. Apron mounted remote controls.
3. Heavy duty cord and plug.
4. If skirting is used, skirting panels shall be removable for servicing equipment.

MOBILE PASS-THRU REFRIGERATOR

Manufacturer: True Model No.: TR1RPT-1S-1S: 120V/1PH, 8.3A

1. Stainless steel shelves.
2. Heavy duty cord and plug.
3. Heavy duty 6" high casters, two (2) with brakes.
4. Five year compressor warranty and 1 year Service/Labor warranty.

MOBILE HEATED TRANSPORT CABINET

Manufacturer: Cres Cor Model No.: H-137-PSUA-12C: 120V/1PH, 16.0A

1. Formed and welded .100 aluminum top, .190 aluminum base.
2. 11 sets extruded universal angles for multiple pan sizes.
3. Field reversible brushed .063 aluminum door.
4. Controls which are accessible without opening door.
5. Heavy duty 5" swivel casters, two (2) with brakes.
6. Corner bumpers.
7. Digital thermometer.
8. Heavy duty cord and plug.

WORK TABLE WITH DRAWER

Manufacturer: Custom Fabricated Model No.: Stainless Steel

1. Flanged feet on all legs.
2. 16 gauge stainless steel undershelf.
3. One (1) 20" x 20" self-closing drawer with 250-pound extension slides.

ICE MAKER WITH BIN

Manufacturer: Manitowoc Model No.: QR-0212A: 208V/1PH13.2A; 3/8" CW (from water filter); 3/4" IW

1. All stainless steel construction.
2. Produce cubes 7/8" x 7/8" x 7/8" thick.
3. Heavy duty cord and plug. 4. Install water filtration system

WATER FILTRATION SYSTEM

Manufacturer: Everpure Model No.: 9324-01: 3/8 " CW

1. Coordinate installation with Ice Maker With Bin.

WORK TABLE WITH DRAWERS

Manufacturer: Custom Fabricated Model No.: Stainless Steel

1. Flanged feet on all legs.
2. 16 gauge stainless steel undershelf.
3. Two (2) 20" x 20" self-closing drawer with 250-pound extension slide.

UTILITY RACK

Manufacturer: Cres Cor Model No.: 207-UA-13: Universal Angle Slides

1. Heavy duty extruded aluminum construction.
2. Verify tray size with owner.
3. Pan stop.
4. Perimeter bumper.
5. Four (4) 5" diameter, swivel, polyurethane tires.

FROST TOP

Manufacturer: Delfield Model No.: N8245 Pertinent: 120V/1PH; 7.0A

1. One piece 18 gauge stainless steel.
2. Drain trough and 2" overhang around perimeter.
3. Suspended condensing unit.
4. Heavy duty cord and plug.
5. If skirting is used, skirting panels shall be removable for servicing equipment.

EXHAUST HOOD

Manufacturer: Molitron Model No.: BFC/87-54: UL Listed, Modular Extractor: 120V/1PH; 15.0A; 2175 CFM Exhaust

1. Assembly to consist of two (2) section 87" long x 54" wide x 30" high wall mount. Construction to be 18-gauge, Type 304 stainless steel with No. 4 finish with an additional 12" on the right hand side, to mount Fire Suppression System.
2. UL-listed, NSF-approved grease extractor in compliance with NFPA 96, latest edition.
3. Modular high slot grease extractor to be easily removable with high-velocity, low-volume, sixturn design to extract grease with 95% efficiency. Exhaust slot opening to be located within 51/2" of top of hood for faster smoke capture, lower turbulence, and maximum grease extraction. Lower slot location is not acceptable.
4. Concealed grease trough with collection drawers at each end, to be accessible from top and full length for easy cleaning.
5. UL-listed incandescent light fixtures and bulbs pre-wired to one single connection point on each hood section.
6. Fire suppression system shall be wet chemical and shall be built onto the hood. All pre-piping for
   fire suppression system to be done in hood manufacturer’s shop.
7. Fan, light, and gas reset station controls to be supplied in integral switch. Fan controls to automatically turn exhaust fan ON upon activation of the fire suppression system.
8. Hood manufacturer shall provide 12" x 54" x 30" high enclosure cabinet for Fire Suppression System.
9. Stainless steel matching closure panels from top of hood to finished ceiling, if required.
10. Unistrut hanger bars 3" on center from end of each section.
11. All exposed welds to be ground and polished.
12. Stainless steel wall flashing and window mullion trim below hood.
13. Exhaust and supply fans to be furnished in compliance with local and national codes, and sized for CFM and static pressure requirements.

FIRE PROTECTION SYSTEM

Manufacturer: Ansul Model No.: Piranha-7 Pertinent Data: Wet Chemical-Dual Agent: 120V/1PH; 20.0A

1. Surface appliance nozzles, hood and duct protection nozzles for Item #22, Exhaust Hood, as required by NFPA 96, latest edition and all governing codes.
2. Remote manual pull station and microswitches with two (2) sets of normally open, and two (2) sets of normally closed contact points.
3. Piping to be installed in hood manufacturer's shop. All exposed piping to be chrome-plated or stainless steel.
4. All components and labor necessary for a completely functional and installed system, per NFPA 96, latest edition, and all governing codes.
5. Automatic mechanical shut-off valves for gas equipment below exhaust hood (*not electric solenoid valves*).
6. Shunt trip breakers or disconnects at main electrical panel interconnected with micro-switches at fire system control panel for all equipment under exhaust hood.
7. Six month and twelve month inspections, servicing, and replacement of components per NFPA 96, latest edition, and governing codes.
8. Factory authorized certificate of fire system required upon completion of installation, connection, and testing.

TWO BURNER RANGE WITH CABINET BASE

Manufacturer: Garland Model No.: M4S: Cabinet Base: 3/4" Gas @ 70 MBTUs

1. 3/4" rear gas connection. Verify altitude and type of gas.
2. Quick-disconnect hose with 48" long restraint cable.
3. End caps and cover.
4. Flame failure on all burners.
5. Stainless steel on both sides.
6. Four (4) polyurethane, nonmarking, swivel casters, front two (2) with brakes.

DOUBLE CONVECTION OVEN

Manufacturer: Blodgett Model No.: DFG-100 Double: 120V/1PH, 6.0A (fans each); 3/4" Gas @ 110 MBTU or Cleveland model: 24CGA10.2ESnatural gas convection steamer. PSD Plumbing Department to verify model needed.

1. Solid state manual controls.
2. Four (4) 4" casters, two (2) swivel and two (2) with brakes.
3. Stainless steel exterior front and two (2) sides.
4. Gas manifold with individual gas cocks for each oven.
5. Stainless steel oven liner.
6. Extra oven racks.
7. Stainless steel draft diverter.
8. 48" gas quick connect and restraining cable.
9. Solid doors.
10. Heavy duty cord and plug.

DOUBLE CONVECTION STEAMER

Manufacturer: Cleveland Model No.: 24-CGP-10: 120V/1PH, 0.15 KW; 3/8" CW, 1/2" IW; 3/4" Gas @ 240 MBTU

1. Electronic timer with compensating load feature.
2. Stainless steel cabinet base and frame.
3. ON/OFF steam switch for compartment controls.
4. Compartment door steam shut off switch.
5. Dissolve liquid descaling kit.
6. Boiler descaling pump kit.

HAND SINK

Manufacturer: Advance Model No.: 7-PS-60: 1/2" HW, 1/2" CW; 1-1/2" DW

1. With Chicago Faucet #521.
2. Basket Drain.

UTENSIL POST

Manufacturer: Custom Fabricated Stainless Steel 1.

Coordinate installation next to 60 Quart Mixer.

60 QUART MIXER (OFCI)

208V 3PH accessories for 60 qt. mixer with 60 qt bowl:

1. Hobart Model M-24635.
2. Hobart Model M-73856.
3. Hobart Model P-10072.
4. Hobart Model M-78032-1.

PRE-RINSE UNIT

Manufacturer: Chicago Model No.: 510-GCLCP: Splash Mount Utilities Required: 1/2" HW; 3/4" CW (1/2" CW to disposer)

1. Mount on wall at 54" above finished floor.
2. Wall bracket.

FLOOR TROUGH AND GRATE

40-GALLON TILTING KETTLE

Manufacturer: Cleveland model: KGT-12T tabletop tilting kettle with Cleveland ST-28 equipment stand (preferred) or Cleveland Model No.: KGL-40-T: 120V/1PH, 10.0A (controls); 1/2" HW, 1/2" CW; 3/4" Gas @ 140 MBTU. PSD Plumbing department to verify selection per project.

1. Type 316 stainless steel kettle liner.
2. Pan carrier.
3. Kettle accessory kit.
4. 2" diameter tangent draw-off valve with drain strainer.

5. Hot and cold water faucet and pre-rinse faucet with swing spout and mounting bracket.
6. Spring assisted, hinged, rotatable, domed stainless steel cover.
7. Measuring strip.

WALL SHELF

Manufacturer: Custom Fabricated Stainless Steel

1. Mount over Prep Table with Sink.

PREP TABLE WITH SINKS

Manufacturer: Custom Fabricated Stainless Steel: 120V/1PH, 20.0A (Convenience Outlet); 3/4" HW, 3/4" CW; 2" IW

1. Flanged feet on front legs only.
2. Two (2) 20" x 20" x 18" deep sink with removable poly cutting board inserts and connected overflow and rotary waste assembly.
3. Chicago faucet #540LD14.
4. 16 gauge stainless steel undershelf with 2" turn-up at the rear.
5. Guides for Cutting Board.
6. Cutout for Disposer Cone.
7. One (1) 20" x 20" self-closing drawer with 250-pound extension slides.
8. Space for Trash Receptacle.
9. Bracket for control switch for Disposer.
10. Scrap trough between disposer cone and sinks, to comply with local health code.

DISPOSER

Manufacturer: In-Sink-Erator Model No.: SS-200-18-CC-101: 208V/3PH, 2 HP; 1/2" CW; 3" DW

1. Coordinate installation with Prep Table with Sinks.
2. Type C 18" Cone fully welded into Prep Table with Sinks.
3. Solenoid valve, syphon breaker, and time delay relay.
4. Model CC-101 control center.
5. Adjustable support legs.
6. Chrome plated cast-brass p-trap.

PRE-RINSE UNIT

Manufacturer: Chicago Model No.: 510-GCLCP: Splash Mount: 1/2" HW; 3/4" CW (1/2" CW to disposer)

1. Wall bracket. 2. Interconnect water line from pre-rinse unit to Disposer.

CUTTING BOARD

Manufacturer: Read Model No.: CB-141824: Woodfiber Laminate

CAN OPENER

Manufacturer: Edlund Model No.: S-11: Table Mounted

1. Stainless steel.

OVERSHELF
Manufacturer: Custom Fabricated Stainless Steel

WORK TABLE WITH DRAWER
Manufacturer: Custom Fabricated Stainless Steel: 120V/1PH, 20.0A (Convenience Outlet)

1. Flanged feet on front legs only.
2. 16 gauge stainless steel undershelf with 2" turn-up at the rear.
3. Space for Digital Scale.
4. Two (2) electrical outlets in splash.
5. One (1) 20" x 20" self-closing drawer with 250-pound extension slides.

OVERSHELF
Manufacturer: Custom Fabricated Stainless Steel

WORK TABLE
Manufacturer: Custom Fabricated Stainless Steel: 120V/1PH, 20.0A (Convenience Outlet)

1. Flanged feet on front legs only.
2. 16 gauge stainless steel undershelf with 2" turn-up at the rear.
3. Three tier unit with 20" x 20" self-closing drawers with 250-pound extension slides.
4. Two (2) electrical outlets in splash and one (1) 208V-1PH outlet for Microwave Oven.

MICROWAVE OVEN
Manufacturer: Amana Model No.: RC17S: 208V/1PH, 20.0A

1. Heavy duty cord and plug.

HAND SINK
Manufacturer: Advance Model No.: 7-PS-60: 1/2" HW, 1/2" CW; 1-1/2" DW

1. Chicago faucet #521.

SOILED DISHTABLE
Manufacturer: Custom Fabricated Stainless Steel

1. Flanged feet on front legs only.
2. One (1) 21" x 18" x 8" deep sink and weld in sink adaptor for Disposer.
3. Stainless steel switch bracket for Disposer controls.
4. Fully enclosed corner and 3/4" turndown at Dishwasher.
5. 22-gauge stainless steel wall flashing.

PRE-RINSE UNIT
Manufacturer: Chicago Model No.: 510-GCLCP: Splash Mount: 1/2" HW; 3/4" CW (1/2" CW to disposer)

1. Wall bracket.
2. Interconnect water line from pre-rinse unit to Disposer.

DISPOSER

Manufacturer: In-Sink-Erator Model No.: SS-200-7-CC-101: 208V/3PH, 2 HP; 1/2" CW; 3" DW

1. #7 Collar adaptor fully welded into Soiled Dishtable.
2. Solenoid valve, syphon breaker, and time delay relay.
3. Model CC-101 control center.
4. Adjustable support legs.
5. Chrome plated cast-brass p-trap.

CONDENSATE HOOD

Manufacturer: Custom Fabricated Stainless Steel: 1000 CFM Exhaust, 1" IW

1. 18 gauge stainless steel construction.
2. Gutter corner.
3. Fully welded vertical body, corners and top spot welded and sealed.
4. Hanger bracket is to be pre-punched at the factory.
5. Heavy duty lock nuts, one above and one below the hanger bracket.

DISHWASHER

Manufacturer: Hobart Model No.: AM-15T: 208V/3PH; 24.6A; 3/4" HW; 2" IW (Elementary Schools). Use Hobart Model: CL44E conveyor dishwasher with integral booster heater (Secondary schools)

1. Peg rack, combination rack, and sheet pan rack.
2. All Dishwashers to have a built in hot water booster.
3. Mounted circuit breakers for single-point electrical connection.
4. 3/4" pressure regulator valve.
5. Machine shall be all stainless steel construction, including legs and front panel.
6. Hot water sanitizing, and automatically timed tank fill.
7. Water hammer arrester.

BOOSTER HEATER (to be integral to dishwasher, no stand-alone booster heaters)

~~Manufacturer: Hatco Model No.: PMG-60: Floor Model: 120V-1PH; 2.0A; 1/2" Gas; 58 MTU; 3/4" HW; 3/4" IW~~

1. ~~Inter-plumb booster heater with Dishmachine.~~
2. ~~PMGH-60 Exhaust Hood, and high altitude orifice kit, vent to exterior.~~

POT SINK / CLEAN DISHTABLE

Manufacturer: Custom Fabricated Stainless Steel

Utilities Required: 3/4" HW, 3/4” CW; 2" IW

1. Standard fabrication SF-1B, SF-3C, SF-5A, SF-5C, SF-6A, SF-9, SF-12, SF-13, and SF-20.
2. Provide flanged feet on front legs only.
3. Provide three (3) 30" x 24" x 18" deep sinks with rotary waste and connected rear overflow.
4. Provide two (2) Chicago faucets #540LD14. Mount to splash behind sink compartments.
5. Provide 22-gauge stainless steel wall flashing from top of back splash to bottom of Pot Shelf.

6. Provide 3/4" turn-down at Dishwasher and a fully enclosed corner.
7. Provide 16 gauge stainless steel undershelf with 2" turn-up at rear and right side.
8. Provide shop drawings for approval prior to fabrication.

POT SHELF

Manufacturer: Custom Fabricated: Stainless Steel

EVAPORATOR COIL

Manufacturer: Bohn Model No.: LET140: Electric Defrost: 208V/1PH, 11.7A; 1" IW

1. Indirect waste to be terminated with a “P” trap.
2. Heater tape for walk-in freezer drain lines at 6 watts per foot.
3. Connect wires from the coil to the time clock on Compressor Rack for defrost cycle. 4. Drain lines to be insulated and encased with PVC.

DUNNAGE RACK

Manufacturer: Metro Model No.: HP31GX2: Open Grid Shelf

FREEZER SHELVING

Manufacturer: Metro Model No.: (20)1836GX (4)1842GX (8)1848GX (32)63PX: Metro Max

1. Verify room dimensions.

WALK-IN COOLER/FREEZER

Manufacturer: RMI Model No.: Custom Utilities Required: 120V/1PH, 20.0 A (for lights)

1. Wall panels to consist of 4" foamed in place Urethane foam insulated panels with less than 25 flame spread and less than 450 smoke density. All exposed finishes to be 18-gauge, Type 304 stainless steel with No. 4 finish. All unexposed panels to be 20-gauge galvanized steel.
2. Each refrigerated compartment shall be monitored by a Datalarm Monitoring Systems manufactured by Modularm Corporation. Single compartments (cooler-freezer combos or two compartments adjacent to each other), shall by monitored by a Datalarm 2, two point monitor. All Datalarms are to be connected to a Datahub, as manufactured by Modularm. Interconnecting wire from Datalarms to the Datahub will be CAT5E. The Datahub will connect to an on-premise network. System must be configured to be able to connect to the security system alarm network supplied by the school district.
3. All panels to have tongue and groove construction and be rigidly coupled with steel cam locks, foamed in place on 4'-0" centers, minimum of three (3) per joint for walls and two (2) for ceilings. Section lock ports to be furnished with PVC snap-in buttons. Panel joints to be sealed with continuous PVC gasket at interior and exterior panel edges, foamed onto panels at the factory.
4. Ceiling panels to have a maximum deflection of 1/240 of the clear span under uniform loading of 20 pounds per square foot. Exposed ceiling finish to be .040 aluminum with white acrylic. Ceiling support system shall use hanger network attached to hanger brackets, designed to engage with female lock pins and imbedded within foam core of ceiling panels.

5. Installation of panels to be: Floor Depression: non-insulated, level-smooth, clean, depressed floor and apply asphalt emulsion, vapor barrier of foil-coated kraft waterproof paper as determined by ASTM E96-80, and floor insulation of two (2) or more layers, joint staggered, of rigid foamboard with R-value equal to wall insulation and perm rating of 20 psi Vapor permeable separation of organic 15 pound felt protective slip sheet for applying over insulation with joints lapped 6" (min) and flashed up height of base.
6. Freezer and Cooler door to be 36” wide x 6'-6-1/4" high, hinged. Door to be flush fitting with 3" insulation and finish to be same type as wall panels. Door jambs to be 20-gauge stainless steel, all corners heliarc welded, ground and polished. Gaskets to be PVC with vulcanized and continuous magnetic core at sides and head of door jamb. Sill wiper to be adjustable neoprene, removable and held in place with stainless steel retainer strip and fasteners. Doors to accommodate PSD padlocks.
7. Each door to have three (3) hinges consisting of nylon cam, stainless steel pin, zinc die cast, polished chrome finish. Door pull to be high pressure die-cast zinc, highly polished chrome plated. Each exterior door to have mortise deadbolt, including inside release, with stainless steel components, chrome-plated exposed surfaces, and cylinders keyed alike.
8. Heated door gasket and 36" x 22" vision panel; 24" high kickplate of 1/8" aluminum tread plate on both sides of door, full width of door; and heated, removable threshold of 1/8" thick stainless steel plate.
9. Interior cart bumper of 1/4" x 2" aluminum bar at 2'-0" AFF. (Cooler)
10. Hydraulic rack and pinion door closer with automatic hold open. Three coat aluminum finish with lacquer final coat.
11. Hardware to be mounted with reinforced steel tapping plates and stainless steel machine screws.
12. Provide PVC, low-temperature strip curtains, transparent, 8" wide by 0.080" thick, at door openings.
13. Adequate fluorescent light fixtures installed in ceiling to accomplish 20 foot candle power at 6" above finished floor, fully enclosed and gasketed vapor tight with shatterproof diffuser sized for two (2) T-8 fluorescent tubes.
14. Switch covers: weatherproof neoprene with unbreakable red plastic lens for constant burning interior light and indicating exterior light. Rigid 3/4" conduit and wiring to be concealed in insulated panels, and terminated in vapor-tight splice box mounted on inside wall of compartment near ceiling, with 1-1/4" diameter hold in ceiling panel.
15. All electrical penetrations to the ambient of the walk-in require “EY” seal offs.
16. Unheated pressure relief port.
17. Matching closure panel and two (2) trim strips.
18. Coil supports or 2" diameter nylon threaded rods, plated steel nuts and washers to adequately support specified evaporator coils.
19. Escutcheon plates of 5" diameter stainless steel, to dress off utility penetrations, including drain lines.

EVAPORATOR COIL

Manufacturer: Bohn Model No.: ADT120: 120V/1PH, 3.6A; 1" IW Set in place per manufacturer’s standard specifications and the following:

1. Evaporator shall be located and interconnected to Compressor Rack.
2. Indirect waste to be terminated with a “P” trap.
3. Drain lines to be insulated and encased with PVC.

COMPRESSOR RACK

Manufacturer: Kairak Model No.: KMR-1FN: 208V/3PH, 29.7A

1. Rack dimensions are 48" long x 42" wide x 36 " high, and weighs 625 pounds.
2. All core holes to be provided and fireproofed.
3. 4" housekeeping pad for the compressor
4. All copper tubing to be refrigerant grade Type “L”. Hard copper joints to be sweat type fittings; mechanical bends are not acceptable.
5. All suction lines with vertical rise of 15 feet or more are to be trapped for proper oil return.
6. For steel to copper connections, use silver solder; for copper to copper connections, use sil-fos. Do not use soft solders on refrigerant lines.
7. All piping to be pressure tested with nitrogen at 300 psi.
8. All completed refrigeration systems must be evacuated to 300 microns or less with vacuum pump.
9. Furnish and install heater tape for walk-in freezer drain lines at 6 watts per foot.
10. UL-listed package with main fused disconnect, prepiped and pre-wired for single point connection.
11. Insulate suction lines back to all compressors.
12. Plastic isolation bushings for copper to metal contact to prevent leakage.
13. Copeland Compressors to be semi-hermetic with suction and discharge valves.
14. Copeland compressor with shut-off valves, electronic oil failure control, breakers, and wiring for each.
15. Head pressure relief valve on chilled water inlet lines.
16. Replaceable liquid line drier with valves, pressure controls fitted with “super hoses,” sight glass, and oil separator.
17. Five-year compressor warranty and one-year parts and labor.
18. Certified, licensed Refrigeration Mechanic possessing a certification 40 CFR Part 82 sub-part F, as mandated by the E.P.A.

DUNNAGE RACK

Manufacturer: Metro Model No.: HP35GX2

COOLER SHELVING

Manufacturer: Metro Model No.: (16)1836GX (8)1842GX (8)1848GX (32)63PX: Metro Max

STORAGE SHELVING

Manufacturer: Metro Model No.: (8)1836BR (4)1842BR (44)1848BR (56) 74P: Super Erecta

CAN RACK

Manufacturer: New Age Model No.: 1250: Front Loading

DUNNAGE RACK
Manufacturer: Metro Model No.: HP35GX2

BREAD RACKS
Manufacturer: Contractor shall verify current model being used by Child Nutrition Department

END OF SECTION 11 40 50

DIVISION 21
Fire Suppression

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SECTION 21 05 00 – COMMON WORK RESULTS OF FIRE PROTECTION

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2.02 Products: See Plumbing Sections

Part 3: Execution

3.01 Preparation
3.02 Installation
- A. EXCAVATING, TRENCHING, AND BACKFILLING
- B. PIPING INSTALLATION 1. General:
  - i. Arrange pipe in group runs where feasible. Coordinate locations with all trades. Avoid traps in piping.
- C. ELECTRICAL: See Electrical Sections

3.03 Cleaning and Protection

END OF SECTION 21 05 00

SECTION 21 11 00 – FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING

Part 1: General

1.01 Summary
- A. Work involved with remodeling existing systems shall be done in accordance with NFPA-13. Provide new sprinkler heads in all locations where existing head layout is altered. Verify existing piping arrangement, conditions, and locations at site before beginning fabrication.

1.02 Related Sections
1.03 Definitions
1.04 Submittals Required
1.05 Quality Assurance
1.06 Scheduling

A. All drawings and sprinkler calculations are subject to Insurance Services Offices and/or Poudre Fire Authority review and approval as well as the Architect/Engineer's before installation.

1.07 Delivery, Storage, and Handling

1.08 Regulatory Requirements

Part 2: Products

2.01 Manufacturers

2.02 Products

A. SIAMESE FIRE DEPARTMENT CONNECTIONS

1. Siamese connections shall be Croker Fire Equipment No. 6010, or equal, with clapper valve, FM approval, brass finish. Threads shall be identical to those used in the city in which system is being installed and shall meet requirements of local fire department. 2-1/2" x 2-1/2" x 4" with cast brass plugs and chains. Siamese connection for sprinkler system shall have a 4" underwriter's swing check valve with ball drip; extend drain from ball drip to a predetermined PSD location. Brand "Auto Sprinkler."

B. FLOW ALARMS AND SUPERVISORY VALVE SWITCH

1. Flow alarms shall be Autocall Type WF, Potter Model VSR, Grinnell E-1, or approved equal, DPST flow alarms with suitable adjustable retards. Flow alarms shall be suitable for 120-volt operation. Factory Mutual (FM) approved and UL listed.
2. Provide a UL-approved switch for main sprinkler valve(s) where indicated. Switch shall give alarm indication when main valve is closed. Switch shall be suitable for 120-volt operation.

C. SPRINKLER SYSTEM

1. Automatic sprinkler system shall be designed by the Contractor for hazard indicated. Entire system shall be in accordance with NFPA and as specified herein and/or indicated. Contractor is herein given the option of sizing sprinkler system per pipe sizing tables in NFPA-13 or by the hydraulic method.
    i. Contractor is responsible for obtaining all necessary flow tests at site required for hydraulic calculations.
    ii. No sprinkler heads shall be installed in air locks due to potential for freezing.
2. Hydraulic design methods shall conform to the methods outlined in NFPA No. 13 and shall provide for pipe sizes such that not more than a 10% variation will occur in sprinkler discharge. Hazen and Williams formula with C=120 shall be used in hydraulic calculations, and additional requirements specified herein. Design conditions shall be based on the most remote 1,500 square feet for each zone. Design shall be light hazard with a design density of 0.10 GPM per square foot, or as determined by the authority having jurisdiction.
3. Prior to starting fabrication or installation of sprinkler system, Contractor shall submit detailed 1/8-inch scale (minimum) shop drawings, stamped "Reviewed" by agency having jurisdiction, to Architect/Engineer for review and approval. At time of completion of work, obtain certificate of inspection and approval from same agency.
4. Approved Manufacturers:
    i. Viking Sprinkler Corporation.
    ii. Grinnell Company, Inc.
    iii. The Automatic Sprinkler Corporation of America.
    iv. Grimes Company.

v. Approved equal selected from "List of Inspected Fire Protection Equipment and Materials" published annually by Factory Mutual Engineering and UL and shall bear ULapproved stamp or label.

5. In rooms and/or spaces where sprinkler head locations are not indicated, locate sprinkler heads to avoid conflicts with other pieces of equipment such as lights, speakers, diffusers, etc., located in ceiling. Consult Architectural, Mechanical, or Electrical plans carefully to avoid conflicts.
6. System shall be provided complete with water supply connection, sprinklers, all piping, fittings, valves, seals, test connections, hangers, supports, sleeves, escutcheons, drain valves, test connections, signs, diagrams, etc., all as required for a complete and operating system.

All drain and test valves must be ball valves. Provide drain valves at all low points.

7. Fire Sprinklers:

i. All sprinklers shall be automatic closed spray type sprinkler heads of ordinary degree temperature rating except where excess temperatures are anticipated; heads shall be of higher rating. ii. Sprinkler heads installed in areas which do not have suspended ceilings shall be of brass upright type. Sprinklers shall be installed with consideration being given to all ductwork, piping, etc., and heads shall be located above and/or below ductwork as required by NFPA Standards.

iii. Sprinkler heads installed in areas which have suspended ceilings shall be of the concealed sprinkler type with flat white cover plate.

a. Braided stainless steel flex heads may be used
b. Corrugated flex heads are not allowed

iv. Side wall sprinkler heads indicated shall be sidewall chrome plated with chrome plated flat type escutcheon plate.

v. Provide sprinkler head protective cage to exposed heads in gyms, shop areas, mechanical rooms, storage rooms or other spaces where equipment movement or activities may damage unprotected heads.

vi. Provide stock of spare heads, of each type installed, packed in a suitable cabinet. Number of each type of spare heads to be provided shall be as indicated in NFPA-13. The cabinet shall contain at least two sprinkler head wrenches. vi. Upright sprinklers located as to be subject to mechanical injury shall be protected with approved guards.

D. BACKFLOW PREVENTER

1. Shall be double check type.
2. Two independent "Y" type spring-loaded ductile check valves, two OS&Y shut-off valves, and four test clocks.
3. With stainless steel center-guided checks with soft elastomer discs for drip-tight closure against backflow.
4. UL-listed for fire line service.
5. Backflow preventer to be full line size.
6. Provide floor drain at all backflow preventor locations.
7. Febco Model 850 C. All other types of backflow preventors must be approved *by PSD Plumbing Department.*

Part 3: Execution

3.01 Preparation

3.02 Installation

3.03 Cleaning and Protection

END OF SECTION 21 11 00

DIVISION 22 Plumbing

Date of Revision	Description of Revision	Purpose for Revision	Revision Initiated By
Jan. 26, 2012	Pg 63-Toilet/Urinal fixtures & flush valves	Lower water use	Plumbing
Jan. 26, 2012	Pg 66-C.1-"close coupled" not a requirement for pumps	Maintenance	Plumbing
Nov. 9, 2012	22 05 00 2.02A, 4 thru 9	Modified	John Gossman
Nov. 9, 2012	22 05 19 3.02A, 3 added	With coil piping drawings	John Gossman
Nov. 9, 2012	22 05 19 3.02B, 2	Modified	John Gossman
Nov. 9, 2012	22 05 23 2.02A Many items **BOLD**	For clarity	John Gossman
Nov. 9, 2012	22 05 29 2.02, 1 and 2	Text added for clarity	John Gossman
Nov. 9, 2012	22 05 29 2.02B, 10iii **BOLD**	For clarity	John Gossman
Nov. 9, 2012	22 05 29 2.02D, 1 thru 3 **BOLD**	For clarity	John Gossman
Nov. 9, 2012	22 05 53 2.02D, 4 BOLD	For clarity	John Gossman
Nov. 9, 2012	22 07 19 3.02B2/B4 modified		John Gossman
Nov. 9, 2012	22 11 13 2.01, 4ii	Clarified model	John Gossman
Nov. 9, 2012	22 11 13 2.02,A1, ii modified	DEL solder/use brazed	John Gossman
Nov. 9, 2012	22 11 13 2.02C1/C2 modified	Balance cock clarified	John Gossman
Nov. 9, 2012	22 11 13 3.01D modified		John Gossman
Nov. 9, 2012	22 11 13 3.02D2 deleted. New D6		John Gossman
Nov. 9, 2012	22 11 13 3.02F 3/5/7 AND G2 modified. 3.02J1iii modified.		John Gossman
Nov. 9, 2012	22 11 23 2.02C, 4	Modified	John Gossman
Nov. 9, 2012	22 13 16 3.02A, 2	Modified	John Gossman
Nov. 9, 2012	22 30 00 2.02 D, 5	Clarified downspouts	John Gossman
Nov. 9, 2012	22 30 00 2.02H, 1	Clarified	John Gossman
Nov. 9, 2012	22 40 00 1.01 G/H/I added	Clarity	John Gossman
Nov. 9, 2012	22 40 00 2.02G-End of Classrm sink	Eyewash added	John Gossman
Nov. 9, 2012	22 40 00 2.02G- Shower Trim (handicapped)	Del power flush stool	John Gossman

Nov. 9, 2012	22 40 00 2.02G5	Chicago only	John Gossman
Nov. 9, 2012	22 70 00 2.02E, 1i, C added	Added Mnf.	John Gossman
Dec. 2, 2013	22 30 00 1.09 ADDED – hot water dispensers at classroom sinks NOT ALLLOWED	LCHD clarification – acceptable locations listed in letter	Jim Tishmack

PSD TECHNICAL SPECIFICATION

DIVISION 22 Plumbing

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Part 2: Products

2.01 Manufacturers
2.02 Products

A. PIPE AND FITTINGS

1. Pipe and Fitting Schedule:
2. Standpipe and fire sprinkler piping:

i. Standpipe and fire sprinkler piping shall be black steel, Schedule 40, screwed, or grooved with mechanical joints, UL approved, 175 pound working pressure. Miscellaneous drain lines receiving cooling coil condensate, drip for humidifiers, etc.:

a. Piping shall be Type "DWV" or "L" copper, fittings wrought copper, solder joint.

ii. Compressed air piping in building above ground (shop air):

a. Piping shall be type "L" hard copper with wrought copper or cast brass fittings.

iii. Refrigeration piping:

a. Piping shall be ACR hard drawn copper tubing cleaned, dehydrated and sealed. Use soft drawn dehydrated and sealed seamless copper tube where bending is required except where subject to physical damage. Fittings wrought copper solder fittings. Joints: 15% silver brazing alloy and silver brazing flux or brazed with Surebraze. Support piping as required to prevent damage to pipe. Run nitrogen through pipes 1" and larger when silver soldering.

iv. Domestic water piping: Domestic water piping above grade shall be Type "L" hard copper with wrought copper fittings.

V. Condensate Piping: Condensate piping above grade shall be Type "L" hard copper with wrought copper fittings.

3. Chemistry labs, Science labs, and photo labs:

i. Acid resisting waste in building underground must be used for science and photo labs:

a. Piping shall be AB-5 or other acid resistant pipe such as Schedule 80 polyvinylidene fluoride (PVDF) or schedule 40 polypropylene (PP), mechanical joint, as designed and approved. Fittings with socket ends, same material as pipe. Provide flanged and/or threaded ends where required for connection to

valves and equipment. Joints: Thermoseal fusion welding process in accordance with manufacturer's recommendations. Fuseal, Orion, or prior approved equal.

b. Install neutralizing basin as close to the source of effluent as possible. Provide sufficient length of PVDF pipe downstream of basin to effect dilution in event of failure of the neutralizing basin.

c. Place neutralizing basin in cabinet under sink. Not allowed to be underground. Provide union connections at all connections to tank.

ii. Acid resisting waste and vent in building above ground shall be the same as above except it shall be flame retardant.

4. Art Classrooms: Provide adequate solids interceptors to collect clay particles. Provide union connections on inlet and outlet of interceptors.

i. Acceptable Manufacturers:

a. Zurn.

b. Smith.

c. Josam.

d. Wade

5. Provide standard weight IPS brass nipples and adapters where required between copper tubing and fixtures. Steel, Galvanized or iron nipples are not permitted between copper lines and brass valves or trim.

6. Joints: Joints in all copper domestic piping systems shall be made using 95/5 tin/antimony or equal tensile strength solder that contains no lead. Engelhard "Silvabrite 100," Oatey "Safeflo," or Canfield "Watersafe" are all acceptable. Use flux recommended by solder manufacturer. Absolutely no lead containing solders or fluxes will be allowed in any portion of the work. The District reserves the right to inspect solders, fluxes and joints. Any joint found containing lead solder shall be cause for resoldering all joints made in all systems in the building. **Copper heating and chilling piping systems shall be brazed for 2" pipes and smaller,** except connections to valves and unit ventilators, etc., that may be damaged by the heat.

7. All copper tubing to be reamed to full inside diameter of the tubing.

i. If copper pipe is found NOT reamed at any one location, contractor may be required to disassemble all piping and have a consultant approved by the engineer and school district to verify reaming. Cost for ALL deconstruction and put back to be paid by the contractor whether all locations are non-compliant or not.

8. All welding fittings shall be Tube Turn, Taylor Forge, B&W, Ladish or Yoloy.

9. T-drill, Press Fit type fittings, Shark Bit Fittings, Copper Grooved, Grooved fittings are not acceptable in hydronic, chilled, or domestic water systems.

B. PERMISSIBLE ASSEMBLIES FOR WELDED PIPING SYSTEMS 1. Service working pressure is limited to 160 psig.

2. Weld all black steel piping 2-1/2" and larger except where flanges are required. End to end butt weld joints 3/4" through 2" pipe are allowed only with internal welding rings.

3. Where welding rings are used, machine pipe ends for proper fit.

4. Elbows: Use welding elbows.

5. Tees: Use welding tees. Weldolets are allowed in shop prefabricated assemblies or in lines 5" and larger, providing all slag is removed from inside the piping.

6. Reducers: Use welding reducers.

7. Caps: Use welding caps.
8. Prepare pipe ends in tees, laterals, and reducers for weld penetration in accordance with ASA standards.
9. Mitered elbows, tees, and reducers are prohibited in welded lines.
10. Elbows: Use long radius butt-welding elbows in expansion loops and bends.
11. Use long radius reducing butt-welding elbows at equipment where a 90-degree bend and size change is required.
12. National Certified Pipe Welding Bureau or AWS shall certify welders and procedures.

Part 3: Execution

3.01 Preparation

A. EXCAVATING, TRENCHING, AND BACKFILLING

1. Excavation: Trenches for all underground pipe lines shall not be carried below the required depths except as necessary for special pipe bedding or to remove unstable soil or rock.
2. When work is in public highway or street, paving repairs shall be equal to and comply with municipal agency requirements. If repairs are done by municipal agency, make necessary arrangement with such agency to make the repairs.

3.02 Installation

A. PIPING INSTALLATION 1.

General:

i. Use straight round pipe. Reamed to full size after cutting. Remove all chips from reaming.

ii. Arrange pipe in group runs where feasible. Coordinate locations with all trades. Avoid traps in piping.

iii. Install piping to take advantage of every available means to facilitate thermal expansion of pipe. Provide anchors and guides to control direction of travel. Guides shall be Keflex type B with BH hanger, or Adsco, or type P, for insulated pipe. Provide ample length to maintain 25% engagement with maximum pipe travel. Provide anchors for domestic water piping serving automatic dishwashers.

iv. All domestic water, hydronic, gas lines to be installed plumb, level, or graded as directed by code or contract documents.

v. Waste and vent, storm drainage, and condensate lines to be installed plumb and pitched per code or as directed per contract or documents.

2. Expansion loops shall be used for expansion compensation. Install anchors at both ends of pipe lengths served by expansion loops so that pipe movement due to expansion is directed toward the expansion loop without damaging the building construction. Both sides of the expansion loop shall be anchored. As a minimum, locate one guide 4 pipe diameters and the second guide 14 pipe diameters from each side of the expansion loop. Both sides of the expansion loop shall have two guides.

3.03 Cleaning and Protection

A. DISINFECTING AND SPECIAL CLEANING

1. When a new system is to be connected to an existing system, isolate the new system for cleaning and flushing if applicable. Reaming chips must be removed by flushing, cleaning strainers, etc.

END OF SECTION 22 05 00

SECTION 22 05 19 – METERS AND GAUGES FOR PLUMBING PIPING

Part 1: General

1.01 Summary

A. Comply with MSS-92-1980, Valve Users Manual.

1.02 Related Sections

1.03 Definitions

1.04 Submittals Required

1.05 Quality Assurance

1.06 Scheduling

1.07 Delivery, Storage, and Handling

1.08 Regulatory Requirements

Part 2: Products

2.01 Manufacturers

2.02 Products

A. PRESSURE GAUGES

1. Pressure Gauges: Three-inch minimum face diameter, 1/4" pipe thread bottom mount, steel case, accuracy 1% of full scale or better.
2. Pressure gauges in pipelines shall be phosphor bronze bourdon tube with stainless steel movement.
3. Gauges shall be compound, pressure or vacuum as required with 4-1/2 inch diameter dial. Each gauge shall be complete with pulsation dampener, and 1/4" or 3/8" ball valve. Gauges on steam and steam condensate lines shall also have a siphon loop.
4. The gauges shall be located and mounted to be conveniently read by a person standing on the equipment room floor. Accuracy shall be 1/2 percent. Case shall be aluminum.
5. For water or air services, use a bronze bourdon tube, steam services, a stainless steel tube, and materials for corrosive services shall be custom selected by the Engineer.
6. Maximum Range: Approximately double the expected working pressure of the service.
7. Install with an isolation valve and a drain valve between the gauge and the isolation valve.
8. Install a pressure snubber and needle valve in services with rapid pressure pulses at pump locations.
9. White face with black lettering.
10. Have the capacity to be calibrated with a screwdriver.
11. Acceptable Manufacturers:
    i. Ashcroft. ii. Dwyer. iii. Foxboro. iv. Honeywell. v.

Johnson. vi.
Marsh. vii.
Marshalltown.
viii. Meriam.
ix. Mueller Brass. x. U.S. Gauge.
xi. Weiss. xii.
Trerice.
xiii. Or approved equal

12. Manometers and gauges calibrated in pressures less than 50 inches of water shall be by Dwyer or Meriam.

B. THERMOMETERS

1. Painted vertical metal case at least 8" long with a glass or Lucite face.
2. Furnish and install thermometers in pipe lines and equipment as scheduled and/or indicated. Thermometers shall be Taylor, Moeller, Rochester, Weiss, Trerice, or approved equal. Nine inch scale with separable socket, cast aluminum case, red reading mercury, adjustable industrial type complete with thermometer wells. Scale range shall be 30°F to 240°F with 2-degree divisions.
3. Thermometer installation will not be accepted unless easily read by an operator standing on the floor.
4. Bottom or back pipe thread connection.
5. Use thermal wells with heat transfer enhancement compound in piping services.
6. Range: At least 50% higher than the highest expected temperature of the service and at least 20 degrees lower than the lowest expected temperature.
7. Accuracy: 1% of full scale or better.

C. PRESSURE AND TEMPERATURE SENSING PLUGS*

1. Provide where indicated 1/4" NPT fitting to receive either a 1/8" O.D. temperature or pressure probe. Fittings shall be brass with valve core suitable for 275°F. Plugs shall be complete with gasketed cap and units shall be rated for 1000 psi. "Pete's Plug" by Peterson or Nordel, Model 45PT-N- 1-1/2".
2. Provide for use with Pete's Plug, two 2" dial pocket testing thermometers, having a range of 0 to 250°F, and two 2" pressure gauges having a range of 0 to 150 psi. (Acceptable manufacturers are the same as above.)

Part 3: Execution

3.01 Preparation

3.02 Installation A. SPECIAL DEVICES

1. Install a pressure-temperature tap on each side of each pump and heat transfer device such as coils, heat exchangers, radiators and radiant panels.
2. Install one hydronic balancing valve as defined above in series with each air handling unit coil, heat exchanger, each section of fin tube radiators or radiant panels. A section is defined as that assembly controlled by one stat/temperature control valve combination. Provide isolation valves and unions on each side of control valve. Circuit setters are not to be used as isolation valves.
3. See following coil piping details.

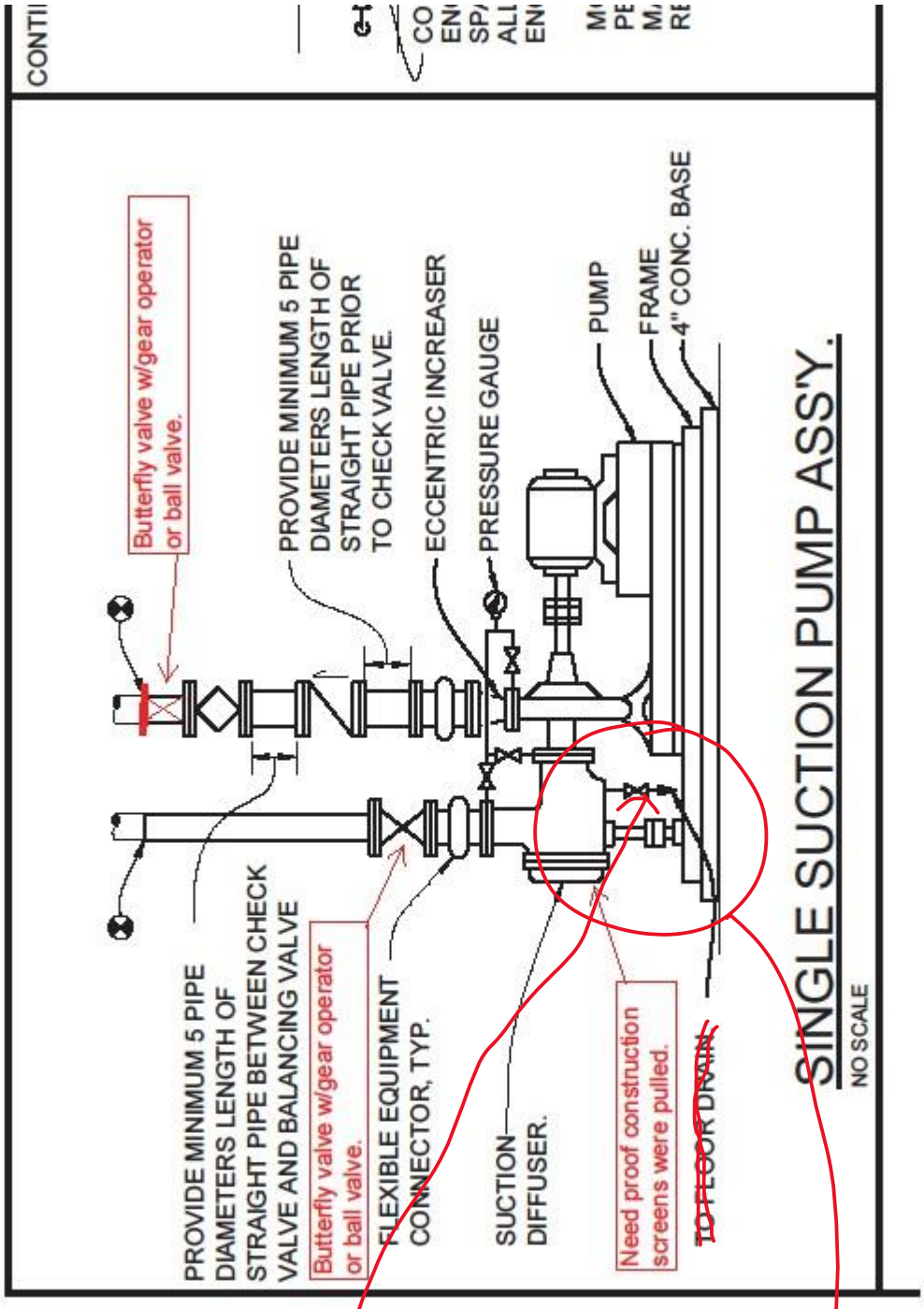
4. Expansion tanks, air separators and other devices heavier than 200 pounds may not be suspended from overhead without written permission from the Structural Engineer.
5. Provide a wrench operated main gas shut off valve, for Fire Department use, outside the building and upstream of the meter. Coordinate with PSCo for location and who provides valve.
6. Flow (paddle) Switches shall be used where required to prove flow through low head pumps, usually boiler and coil circulators. The Engineer shall carefully and fully detail flow switch installation. Provide isolation valves and unions on both sides of flow switches.

B. IDENTIFICATION

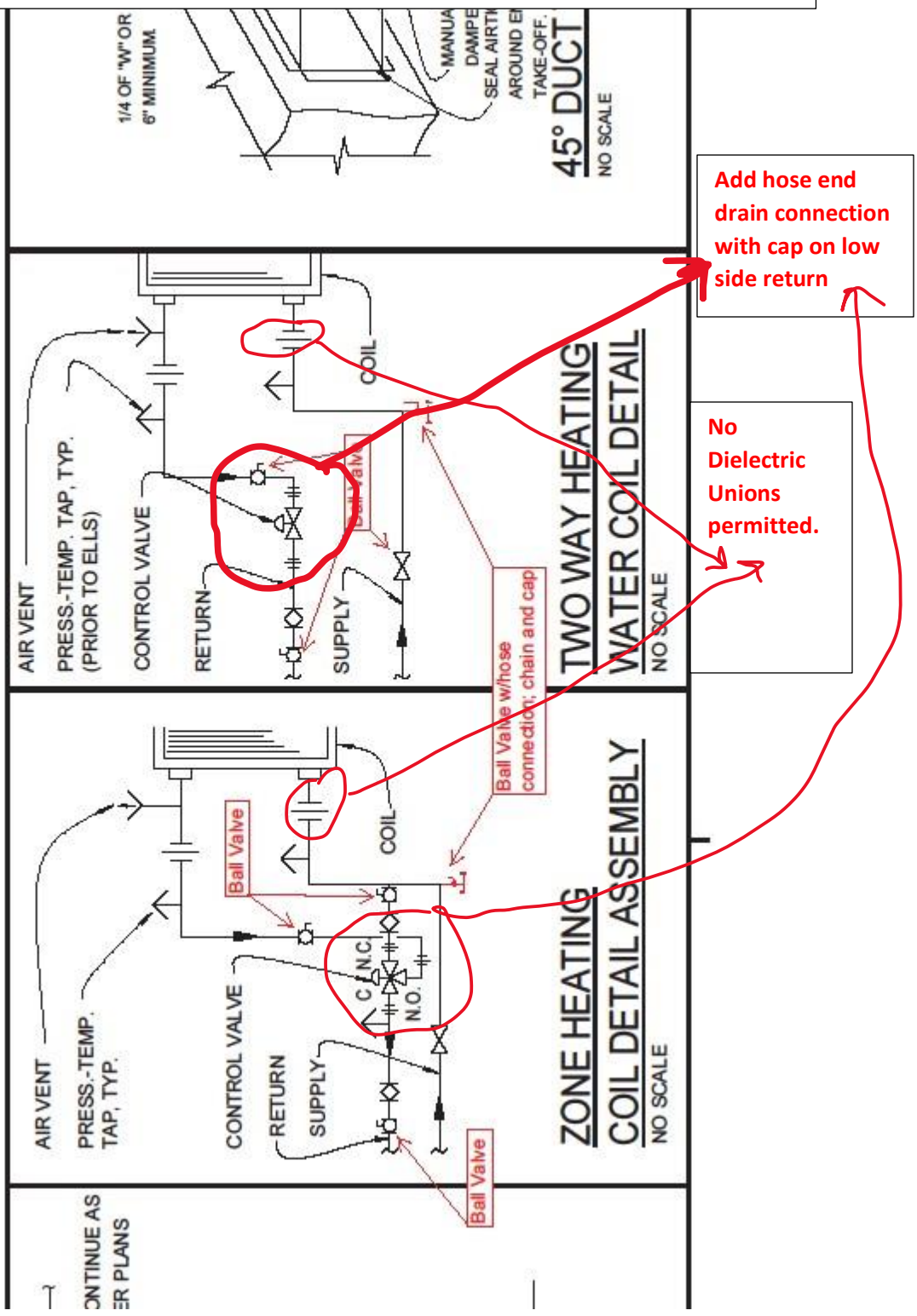
1. Label all mechanical devices in accordance with ANSI Standards.
2. Label all valves with tags indicating service and number. Tags 1-1/2" in diameter, brass, with 1/4" high black letters. Securely fasten with chain and hook. Match service abbreviations given on mechanical drawings. Show all valve tag numbers on red line drawings at valve locations. All valves located behind access panels or located above ceiling tiles are to be labeled per section 22 05 53 2.02, D, 4.
3. Do not paint or insulate over nameplates.
4. Label mechanical equipment with 4" x 6" engraved plastic laminate signs with 1" high letters. C. TESTING

1. Test all operating devices. Keep written records of all tests, at minimum: the date of the test, system or subsystem tested; test medium and pressure used; duration of test; test results; name and signature of individual performing test.

3.03 Cleaning and Protection


SINGLE SUCTION PUMP ASS'Y.
NO SCALE
PROVIDE MINIMUM 5 PIPE DIAMETERS LENGTH OF STRAIGHT PIPE BETWEEN CHECK VALVE AND BALANCING VALVE
Butterfly valve w/gear operator or ball valve.
FLEXIBLE EQUIPMENT CONNECTOR, TYP.
SUCTION DIFFUSER.
Need proof construction screens were pulled.
TO FLOOR DRAIN
PROVIDE MINIMUM 5 PIPE DIAMETERS LENGTH OF STRAIGHT PIPE PRIOR TO CHECK VALVE.
ECCENTRIC INCREASER
PRESSURE GAUGE
PUMP
FRAME
4" CONC. BASE
Butterfly valve w/gear operator or ball valve.
Hose end ball valve
Support Suction Diffuser

These details apply to valving installed in cabinet units or outside units (contactor or factory)



END OF SECTION 22 05 19

SECTION 22 05 23 – GENERAL-DUTY VALVES AND UNIONS FOR PLUMBING

Part 1: General

1.01 Summary

A. Comply with MSS-92-1980, Valve Users Manual.

1.02 Related Sections

1.03 Definitions

1.04 Submittals Required

1.05 Quality Assurance

1.06 Scheduling

1.07 Delivery, Storage, and Handling

1.08 Regulatory Requirements

Part 2: Products

2.01 Manufacturers

2.02 Products A.

Valves

1. Provide shut-off valves in lines serving each piece of equipment such as wall hydrants and sill cocks. Provide ball valve isolation on each side of equipment such as mixing valves, control valves, circuit setters, pumps, coils, water heaters, plumbing fixtures, eyewash stations, etc. Also isolate each major zone, building wing, loop, etc. Circuit setters are not to be used as isolation valves. Provide isolation valves on all branches off mains.
2. Globe and check valves shall be manufactured by the following:
   i. Stockham ii. Crane iii. Nibco iv. Red and White v. Jenkins vi. or Powell.
3. Butterfly valves shall be manufactured by the following:
   i. Stockham ii. Mueller iii. Centerline iv. DeZurik v. Keystone vi. Red and White vii. Nibco viii. or Crane.
4. Ball valves shall be full port and manufactured by the following:
   i. Apollo ii. Jomar iii. Nibco iv. or Red and White.
5. Wafer check valves shall be manufactured by the following:

i. Stockham ii.
Centerline iii.
DuoCheck iv.
or Metraflex.

6. Valves by other manufacturers must have prior approval. **All butterfly valves shall have gear operators.**
7. Valve Schedule:
   i. Shut-off valves for domestic water, compressed air and heating water shall be full flow ball valves, rated at 600 psig WOG.
      a. Apollo 77: Bronze Threaded or Soldered Ball Valve
      b. Nibco 585: Bronze Threaded or Soldered Ball Valve
      c. Red & White 5044/5049: Bronze Threaded or Soldered Ball Valve
      d. Jomar Bronze Threaded or Soldered Ball Valve

   ii. Where ball valves are used in insulated piping, handle extensions shall be provided. Extension shall be manufactured as an option for the valve furnished and shall extend the handle a minimum of 1/4" beyond the insulation jacket. Handles cannot be altered to allow for insulation. iii. Swing check valves shall be spring type, bronze, with swing regrinding seat and renewable disc. Class 125.
      a. Stockham Fig. Number:
         1. B-309: Bronze Soldered End
         2. B-310: Bronze Threaded End
         3. B-340: Flanged End
         4. Or approved equal iv. Wafer check valves shall be Stockham Fig. Number WG-970 or approved equal. v. Balance valves for domestic water and heating water shall be rated at 200 psig minimum working pressure, 250 deg. F. minimum working temperature. The body shall be bronze with pressure differential ports, positive shut-off and memory stop.

      Balance valves are not to be used as isolation valves.
      a. Armstrong: CBV-S or CBV-T
      b. ~~Bell and Gossett:~~ ~~Circuit Setter Plus CB~~
      c. Tour & Anderson: STA Series
      d. Flowset FDI

   vi. Drain valves shall have 1/2" garden hose threaded adapter with brass cap (no plastic), ball valve only, and vacuum breaker installed.

   vii. All plug cocks must me serviceable.

   viii. Shut-off valves for gas shall be lubricated eccentric plug valve ball, double seal seats, and seal, rated 175 pound WOG. DeZurik 400 series, Milliken 600 series or approved equal. viii. Any hose bib or hose thread connection must have vac. breaker.
8. Manufacturers are listed only as examples to illustrate a type and establish a level of quality, not to limit the choice of supplier.
9. No copper alloy in steam or condensate services.
10. Globe valves for steam or condensate service: Cast steel bodies, stainless steel plugs and stellite seats.
11. Rising stems for globe valves. **All valves to be full port ball valves.**

12. UL and FM list valves intended for fire protection service.
13. Natural gas service: Iron body lubricated plug type with lever or gear operators. Must have ability to be re-lubricated.
14. Hydronic balancing valves: Integral flow measuring taps, memory set, and locking indicating handles, Barco, Gerand, Illinois, or engineer-approved equal.
15. Freeze proof wall hydrants for outdoor service, Woodford or engineer-approved equal.
16. UL list solenoid valves intended for fuel gas shut off. (ASCO brand)
17. Provide unions on inlet and outlet of valve, provide isolation valve on inlet side of solenoid valves.
18. Butterfly: Full flanged or lug—no wafers. **All butterfly valves are to have gear operators**.

B. UNIONS

1. Make connections at each piece of equipment with unions or flanges located for quick/easy disconnect for maintenance. Provide unions or flanges on:
   i. Control Valves.
   ii. Equipment. iii.
   Meters.
   iv. Tanks.
2. Unions shall be installed at the coil connection for all unit ventilators.
3. Use the same materials and finish as the piping system.
4. Use dielectric nipples or flanges where copper or brass piping is connected to ferrous piping or equipment. Epco Model FX, FB, EA. (All junctions of dissimilar metals)
   i. Dielectric nipples are to be used between steel and copper piping on hydronic and chilled systems.
   ii. **Dielectric unions are not to be used**.
5. Unions and flanges are not required at equipment where flanged valves, strainers, control valves, etc., are used.
6. Omit unions and flanges in straight pipe runs or in concealed locations, except for flanged valve applications.
7. Union Schedule:
   i. Copper Piping:
      a. All pipe sizes: Copper, ground joint union. Chase 402, Mueller WC407.
   ii. Hot-water heating, compressed air, natural gas.
      a. Piping sizes 2" and smaller:
         1. Malleable iron unions with ground joint brass to iron seat, 150 pound working steam pressure. Grinnell 463, Stockham 694, black or galvanized.
         2. Flexible gas connectors shall not be used. All ground joint unions must have upstream shutoff. Connectors to be heavy duty, quick couple type as approved by PSD and the Engineer, except:
            i. Commercial grade braided gas connectors, with tether, shall be used for gas-fired cooking equipment in kitchens (as required by Health Dept,) Examples are ranges, fryers, etc.
            ii. Stainless Steel braided flex gas connectors required on generators.
         3. Pipe sized 2-1/2" and larger (welded):

i. Forged steel flanges, 150 pound, welding neck or slip on with raised faces and 1/16" Garlock 9712 EPDM or Gylon Style 3565 Envelon gaskets and carbon steel bolts. Grinnell Fig. 1911 and 1921. Tube Turn Series 15, Walworth.

4. Pipe sizes 2-1/2" and larger (screwed):

i. Cast iron flanged unions, threaded, galvanized or black, 175-pound water, gasket type with carbon steel bolts. Grinnell 487, Stockham 489. **Part 3: Execution**

3.01 Preparation

3.02 Installation: A.

Valving:

1. Provide valves on all water and gas piping lines before they enter and after they leave a basement, crawl space or trench. Install shut off valves for all plumbing groups. Install an accessible wrench operated plug valve on the gas main outside before it enters the building.

3.03 Cleaning and Protection

END OF SECTION 22 05 23

SECTION 22 05 29 – HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

Part 1: General 1.01

Summary

A. Types of supports and anchors specified in this section include the following:
   1. Horizontal-Piping Hangers and Supports.
   2. Vertical-Piping Clamps.
   3. Hanger-Rod Attachments.
   4. Building Attachments.
   5. Saddles and Shields.
   6. Spring Hangers and Supports.
   7. Miscellaneous Materials.
   8. Roof Equipment Supports.
   9. Anchors.
   10. Equipment Supports.

B. Supports and anchors furnished as part of factory- fabricated equipment are specified as part of equipment assembly in other Division 23 sections.

1.02 Related Sections

1.03 Definitions

1.04 Submittals Required A. Product Data:

B. Shop Drawings:

C. Product certificates.

D. Maintenance Data:

1.05 Quality Assurance

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of supports and anchors, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.06 Scheduling

1.07 Delivery, Storage, and Handling

1.08 Regulatory Requirements

Part 2: Products

2.01 Manufacturers

A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

1. Pipe Hangers and Supports:
   i. B-Line Systems Inc.
   ii. Carpenter and Patterson, Inc.
   iii. Fee & Mason Mfg. Co.; Div. Figgie International iv. Grinnell Corp.
   v. PHD Manufacturing, Inc. vi.
   Elcen Metal Products Company
   vii. Michigan Hanger Company
   viii. ITT Grinnell Corp.
   ix. Unistrut Metal Framing Systems
   x. Hubbard Enterprises (Supports for domestic water piping) xi. Specialty Products Co. (Supports for domestic water piping.
2. Saddles and Shield:
   i. Grinnell Corp. ii.
   Pipe Shields, Inc.
   iii. Insulation Pipe Supports Manufacturing
   iv. Insulated Saddle Shield Insert Product Inc.
   v. Future Market Industries, Inc. vi.
   Michigan Hanger Company vii. Component Products Co.
   viii. Value Engineered Products, Inc.
3. Roof Equipment Supports:
   i. Custom Curb, Inc.
   ii. Pate Co.
   iii. Thycurb Div.; Thybar Corp.

2.02 Products A.

General

1. Provide pipe hangers, supports, anchors, and guides as specified herein, conforming to manufacturer's standardization society specification SP-69. Locate at changes in direction and at concentrated loads. Hanger design shall permit vertical adjustment and lateral movement to allow pipe expansion. Double nut hangers where piping is subject to water hammer, i.e. near flush valves and solenoid valves. <u>All insulated pipe will have insulation inserts with shield at all hanger locations.</u>
2. Bear hot piping directly on insulation shields and cold piping on insulation, shielded as described under article for insulation. <u>All insulated pipe will have insulation inserts with shield at all hanger locations.</u>
3. Provide pipe hangers of ample diameter for cold piping insulation and vapor barrier jacket.
4. Use carbon steel adjustable hangers as follows:

i. Steel / cast iron, 2-1/2" and larger. Grinnell Fig. 260, Fee and Mason Fig. 239, Elcen Fig. 12.
ii. Steel, plastic and cast iron, 2" and smaller. Grinnell Fig. 69, Fee and Mason Fig. 400, Elcen Fig. 202.
iii. Copper pipe 2" and smaller. Grinnell Fig. CT-69, Fee and Mason Fig. 389, Elcen Fig. 389.

5. Three or more pipes may be supported on trapeze hangers. Isolate copper pipe from bearing on the cross member with an electrically insulating material.
   i. Trapeze hangers shall be "Unistrut" or equal, double channel with drop rods. Where pipes are to be supported on trapeze hanger, provide "Unistrut" or equal speed clamps. Isolate copper pipe from cross member as specified above. Clamps may be placed over insulation.
   ii. All insulated piping supported by a trapeze hanger to have 360 degree insulation inserts and clamped with Unistrut type pipe clamps.
6. Support horizontal steel piping per SP-69 or as follows, whichever is more stringent:

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1-1/4"	3/8"	8 ft.
1-1/2" to 3-1/2"	1/2"	8 ft.
4" & 5"	5/8"	12 ft.
6"	3/4"	12 ft.

7. Support horizontal copper piping per SP-69 or as follows, whichever is more stringent:

Nom. Tubing Size	Rod Diameter	Maximum Spacing
Up to 1-1/2"	3/8"	6 ft.
2" to 2-1/2"	3/8"	8 ft.
3"	1/2"	9 ft.

8. Support horizontal hub and spigot pipe at every hub, 10 ft. max. spacing.
9. Support horizontal hubless cast iron pipe at every joint and at each horizontal branch connection. Sway brace to prevent shear.
10. Support plastic every 4 feet.
11. Support vertical piping as follows:
    i. Steel: Every other floor.
    ii. Cast Iron and Copper: Every floor, 10 ft. max. intervals.
    iii. Plastic: Every floor plus 5' spacing between floors.
12. In existing concrete frame structures, support pipe hangers from the sides only of beams or joists using austempered ramset fasteners or Phillips red head concrete anchors. Follow manufacturer's load recommendations.
13. In reinforced concrete structures, support pipe hangers and ducts from concrete inserts as follows:
    i. Loads to 400 pounds light weight concrete inserts, Grinnell Fig. 285, Elcen Fig. 86, Fee and Mason Fig. 186.
    ii. Loads 400 to 1430 pounds: Universal concrete insert, Grinnell Fig. 282, Elcen Fig. 64, Fee and Mason Fig. 2570.
    iii. Set inserts in concrete forms obtain approval of their locations in ample time to permit pouring of concrete as scheduled; provide reinforcing rods for pipe sizes over 3" and for duct sizes as directed. iv. In areas where concrete slab will form finished

ceiling, take care to have inserts finish flush with concrete slab surface and to make neat appearance.

14. In steel framed structures, support pipe hangers from beam clamps, attachments and brackets bolted to steel joists or beams. Use steel washer plates for pipe supported from steel joists, Grinnell Fig. 60, Elcen Fig. 84, Fee and Mason Fig. 91. Hang near joist panel point, where possible. Bolting to steel deck is prohibited. Hang pipes over 5" diameter from more than 1 joist. Absolutely no piping shall be supported directly on the roof joists.
15. Hanging from one pipe to another is prohibited.
16. Anchor pipe with steel collars or saddles fitted with lugs and bolts, Keflex BA or Adsco. Install anchor braces and turnbuckles as required for stability. Attachment in a manner injurious to the structure is prohibited.

B. PIPE HANGERS & SUPPORTS

1. Hangers and support components shall be factory fabricated of materials, design, and manufacturer complying with MSS SP-58.
    i. Components shall have galvanized coatings where installed for piping and equipment that will not have field-applied finish.
    ii. Pipe attachments shall have nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.
2. Adjustable Clevis Hanger: MSS Type 1.
    i. Steel Pipe, size 3/8" thru 12", Grinnell fig. 260. ii.
    Copper Pipe, size 1/2" thru 4", Grinnell fig. CT-65.
    iii. Cast Iron Pipe, size 4" thru 24", Grinnell fig. 590.
3. Adjustable Swivel Ring: MSS Type 10.
    i. Steel Pipe, size 1/2" thru 2", Grinnell fig. 69; size 2-1/2" thru 8", Grinnell figs. 69 or 70.
    ii. Copper Pipe, size 1/2" thru 4", Grinnell fig. CT-69.
4. Pipe Clamps: MSS Type 8.
    i. Steel Pipe, size 3/4" thru 20", Grinnell fig. 261.
    ii. Copper Pipe, size 1/2" thru 4", Grinnell fig. CT-121.
5. U Bolts: MSS Type 24.
    i. Steel Pipe, size 1/2" thru 36", Grinnell fig. 137.
    ii. Copper Pipe, size 1/2" thru 8", Grinnell fig. 137C.
6. Straps: MSS Type 26.
    i. Steel Pipe, size 1/2" thru 4", Grinnell fig. 262.
7. Pipe Stanchion Saddle: MSS Type 37.
    i. Steel Pipe, size 4" thru 12", Grinnell fig. 259.
8. Yoke & Roller Hanger: MSS Type 43
    i. 2-1/2" thru 20", Grinnell fig. 181.
9. Hanger Rods: Continuous threaded steel.
10. Hangers:
    i. Hot Pipes:
        a. 1/2" through 1-1/2": Adjustable wrought steel ring.
        b. 2" through 5": Adjustable wrought steel clevis.
        c. 6" and Over: Adjustable steel yoke and cast iron roll. ii. Cold Pipes:

a. 1/2" through 1-1/2": Adjustable wrought steel ring.
b. 2" and Over: Adjustable wrought steel clevis.

iii. Multiple or Trapeze: Structural steel channel (with web vertical), with welded spacers and hanger rods. Provide cast iron roll and stand for hot pipe sizes six inches and over. Provide hanger rods one size larger than for largest pipe in trapeze. If the deflection at center of trapeze exceeds 1/360 of the distance between the end hangers, install an additional hanger at mid-span or use a larger channel. **On trapeze type hangers, provide pipe clamps on all piping. Clamps on insulated piping shall be sized for the insulation O.D. to allow for pipe movement.**

11. Wall Supports for Horizontal Pipe:

i. 1/2" through 3-1/2": Steel offset hook. ii. 4" and Over: Welded steel bracket and wrought steel clamp. Provide adjustable steel yoke and cast iron roll for hot pipe 200°F and over and sizes six inches and over.

12. Upper Attachments:

i. For attaching hanger rods to structural steel I-beams:

a. Provide adjustable beam clamp, Elcen No. 95 with No. 235 rod socket or equal. Attach to bottom flange of beam.

ii. For attaching hanger rods to bar joists:

a. When bottom chord is constructed of structural steel angles, provide Elcen No. 84H square washer or equal with nut. Place hanger rod between backs of the two angles and support with the washer on top of the angles. Spot weld washer to angles.
b. When bottom chord is constructed of round bars, provide Elcen No. 137 bar joint washer or equal.

iii. All hanger rods to be supported by bar joist or structural steel. Thread rod not to be secured from roof deck.

C. FLOOR, WALL, AND CEILING PLATES

1. Plates shall be installed on all exposed pipe passing through walls, floors, or ceilings. Plates shall be as manufactured by Ritter Pattern and Casting Company, 120 Walker Street, New York, New York 10013, or approved equal, chrome plated steel plates with set screw and concealed hinge. Cut plates to fit flush at close-spaced piping locations.

D. SADDLES AND THERMAL SHIELD INSERTS

1. **General: Provide saddles [thermal shield inserts] under all insulated piping hangers and thermal shield inserts on all piping through floors, wall and roof construction penetrations. Size saddles and shields for exact fit to mate with pipe insulation or a minimum of 1" thick for uninsulated pipe thermal shield inserts.**
2. **Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.**
   i. Grinnell Figs 160-165.
3. **Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.**
   i. Grinnell Fig. 167.
4. Thermal Shield Inserts: Provide 100-psi average compressive strength, waterproof, asbestos free calcium silicate, encased with a sheet metal enclosure. Insert and shield

shall cover the entire circumference or the bottom half circumference of the pipe and shall be of length recommended by the manufacturer for pipe size and thickness of insulation or the thickness of the wall, roof or floor construction.

E. MISCELLANEOUS MATERIALS

1. Steel Plates, Shapes, and Bars: ASTM A 36.
2. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards.

F. ROOF EQUIPMENT SUPPORTS

1. General: Construct roof equipment supports using minimum 18-ga galvanized steel with fully mitered and welded corners, 3" cant, internal bulkhead reinforcing, integral base plates, pressure treated wood nailer, 18-ga galvanized steel counterflashing and rigid insulation.
2. Configuration: Compensate for slope in roof so top of support is dead level.

Part 3: Execution

3.01 Preparation A.

INSPECTION

1. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 Installation

A. INSTALLATION OF BUILDING ATTACHMENTS

1. Install building attachments on structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.

B. INSTALLATION OF HANGERS AND SUPPORTS

1. Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69 and SP-89. Arrange for grouping of parallel runs of horizontal piping to be supported together on field fabricated, heavy-duty trapeze hangers where possible. Install supports with maximum spacing complying with MSS SP-69. Where piping of various sizes is supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.
2. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories.
3. Support fire-water piping independently from other piping systems.
4. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.
5. Install hangers and supports to allow controlled movement of piping systems, to permit freedom of movement between pipe anchors, to facilitate action of expansion joints, expansion loops, expansion bends and similar units and within 1'-0" of each horizontal elbow.
6. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

7. Pipe Slopes: Install hangers and supports to provide slopes, and so that maximum pipe deflections allowed by ANSI B31.9 Building Services Piping Code is not exceeded.
8. Insulated Piping: Comply with the following installation requirements.
    i. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
    ii. On trapeze type hangers, provide pipe clamps on all piping. Clamps on insulated piping shall be sized for the insulation O.D. to allow for pipe movement.
    iii. Saddles: Install Protection saddles MSS Type 39 where insulation without vapor barrier. Fill interior voids with segments of insulation that match adjoining pipe insulation. iv. Thermal Shield Inserts: Install thermal shield inserts MSS Type 40 on all insulated piping. Thermal shield inserts shall span an arc of 360 degrees and shall have dimensions in inches not less than the following:
    v. Insert material shall be at least as long as the protective shield. vi. Thermal Hanger Shields: Install, with insulation of same thickness as piping.

NPS	LENGTH	THICKNESS
1/4 THROUGH 3-1/2	12	0.048
	12	0.060
5 & 6	18	0.060

9. Install hydronic piping (copper and steel) hangers with the following minimum rod sizes and maximum spacing:

SIZE (NPS)	MAX. SPAN IN FEET	MIN. ROD SIZEINCHES
1	7	3/8
1-1/2	9	3/8
2	10	3/8
3	12	1/2
4	12	5/8

10. Support vertical runs at each floor.
11. Install steel natural gas piping with the following minimum rod size and maximum spacing:

SIZE (NPS)	MAX. SPAN IN FEET	MIN. ROD SIZE - INCHES
1/2	6	3/8
3/4 TO 1	8	3/8
1-1/4 or larger (horizontal)	10	1/2
Vertical, all sizes	every floor level	

12. Install horizontal water distribution piping with the following maximum spacing and minimum rod sizes:

Nom. Pipe Size Inches	Steel Pipe Max. Span-Ft.	Copper Tube Max. Span-Ft.	Min. Rod Dia. Inches
Up to 1/2	6	6	3/8
3/4 & 1	8	6	3/8
1-1/4	10	6	3/8
1-1/2	10	6	3/8
2	10	10	3/8
2-1/2	10	10	1/2
3	10	10	1/2
4	10	10	5/8 (1/2 for copper)

13. Install sanitary drainage and vent systems with the following maximum spacing and minimum rod sizes:

Pipe Material	Max Horizontal Spacing in Ft.	Max Vertical Spacing in Ft.
Cast-Iron Pipe	5	15
Copper Tubing - 1-1/4" and smaller	6	10
Copper Tubing - 1-1/2" and larger	10	10

14. Support horizontal cast iron pipe as follows:
    i. Hub & Spigot: All sizes - One hanger to each joint.
    ii. No-Hub: All sizes
        a. With Clamp-All and Anaheim Series 4000 stainless steel couplings and MG cast iron couplings: one hanger to each joint.
        b. With all other stainless steel band type couplings: one hanger to each side of joint.
        c. Support all horizontal cast iron pipe within 18 inches of each joint and with 5 feet maximum spacing between hangers, except that pipe exceeding 5 feet in length shall be supported at intervals no greater than 10 feet.
        d. Use hanger rods same size as for steel.
        e. Support vertical cast iron pipe at each story height and at its base. Secure vertical hub and spigot pipe immediately below the hub. Support vertical nohub pipe so that the weight is carried from the pipe to the support and not from the joint to the support.
15. Provide copper or copper plated hangers and supports for copper piping or provide sheet lead packing between hanger or support and piping. All insulated piping to have insulation inserts.
16. Place a hanger within one foot (0.305 m) of each horizontal elbow.

17. Use hangers which are vertically adjustable 1-1/2 inch (38.1 mm) minimum after piping is erected.
18. Support vertical steel and copper piping at every story height but at not more than 15 foot intervals for steel and 10 feet for copper.
19. Where several pipes can be installed in parallel and at same elevation, provide uni-strut trapeze hangers. Provide pipe clamps on all pipes supported on trapeze hangers, sized for the O.D. of the pipe insulation insert and shield, to allow for pipe movement.
20. Where practical, support riser piping independently of connected horizontal piping.
21. All insulated pipes shall have thermal shield insert [insulation protection saddles] at all support points. All piping shall have thermal shield inserts at each penetration thru wall, floor and roof.
22. Each pipe drop to equipment shall be adequately supported. All supporting lugs or guides shall be securely anchored to the building structure.
23. Install all couplings with torque wrench, torqued to inch pounds as specified by the manufacturer.
24. Securely anchor and support plumbing domestic water piping in chases or walls. Use factory manufactured clamps and brackets connected to fixture carriers, waste/vent piping or brackets connected to studs. Wires or straps will not be permitted.
    i. When copper supplies are connected to flush valves, support the tubing by the studs or by a fixture carrier, not by clamping to waste/vent piping. ii. Prevent copper tubes from making contact with steel brackets using duct tape, fire retardant polyethylene inserts or other dielectric insulating material.
    iii. Place supports every ten feet on vertical pipe and every five feet on horizontal pipe.
25. Hang all insulated pipe at the point of support in the following manner:
    i. Thermal Shield Insert: Provide thermal shield insert of the same thickness as adjoining insulation for insulated pipe. The entire 360 degrees shall be waterproof, asbestos free, calcium silicate.
        a. If the pipe hanger spacing exceeds ten (10) feet or if there are to be pipe rollers, utilize a double thick shield on bearing surface.
        b. On domestic cold water, chilled water and horizontal roof drain pipe the thermal shield insert shall extend 2 inches beyond the construction material and the sheet metal shield shall span an arc of 360 degrees. All hangers shall be properly sized to accommodate the thermal shield insert and no hanger shall penetrate or crush any of the insulating material.
26. Install anchors and fasteners in accordance with manufacturer's recommendations and the following:
    i. In the event a self-drilling expansion shield or machine bolt expansion shield is considered to have been installed improperly, the Contractor shall make an acceptable replacement or demonstrate the stability of the anchor by performing an on-site test under which the anchor will be subjected to a load equal to twice the actual load.
    ii. Powder-driven fasteners may be used only where they will be concealed after the construction is complete. Where an occasional fastener appears to be improperly installed, additional fastener(s) shall be driven nearby (not closer than 6 inches) in undisturbed concrete. Where it is considered that many fasteners are improperly

installed, the Contractor shall test load any 50 successively driven fasteners. If 10 percent or more of these fasteners fail, the Contractor shall utilize other fastening means as approved and at no additional cost to the Owner.

iii. Hangers for piping and ducts shall be attached to cellular steel floor decks with steel plates and bolted rod conforming to the steel deck manufacturer's requirements. Where the individual hanger load exceeds the capacity of a single floor deck attachment, steel angles, beams or channels shall be provided to span the number of floor deck attachments required. iv. Welding may be used for securing hangers to steel structural members. Welded attachments shall be designed so that the fiber stress at any point of the weld or attachment will not exceed the fiber stress in the hanger rod.

C. SLEEVES AND SEALS 1. General:

i. Encase all insulated pipes penetrating fire rated walls and floors in 360 degree metalshielded insulation inserts as manufactured by Pipe Shields, Inc. or equal. Extend insulation insert on all domestic cold water, chilled water and refrigerant lines 1" beyond sheet metal shield.

2. Pipes:

i. Pipes

a. Pipes penetrating fire rated concrete or masonry construction, whether insulated or not, shall be provided with sheet metal or pipe sleeves fitted into place at time of construction. In poured concrete, the sleeves shall be steel pipe with a full circle, continuously welded water stop plate to also act as a sleeve anchor. When installing Link-Seal (see paragraph f) the sleeve and Link-Seal shall be of matched sizes. Otherwise, sleeves shall be of such size to provide all around clearance of 1/4" to 1". Seal entire space between pipe and sleeve with fire stopping as specified in paragraph A.

b. Sleeves in non-fire rated or non-bearing walls, floors or ceilings, new or existing construction, shall be steel pipe or galvanized sheet metal with lock-type longitudinal seam. Pack all open spaces on each end with mineral wood or other non-combustible material, positively fastened in place. Asbestos is not acceptable.

c. Where a pipe of any description passes through a concrete floor, the sleeve shall extend at least 2" above the finished floor, except when using the ProSet Systems.

d. At Contractor's option, where uninsulated pipes penetrate cast-in-place concrete floors, the "ProSet Systems", Atlanta, Georgia, sleeving may be employed.

e. For pipes penetrating foundation walls, water-proofing membrane floors or other places where water leakage could be encountered, install Link-Seal wall sleeves by Thunderline Corporation in manner recommended by the manufacturer.

3. Seals:

i. General:

a. Seal all holes or voids where mechanical systems penetrate fire rated floors and walls with a fire stopping sealant having a fire rating equal to or greater than that of the

construction being penetrated, but not less than 2 hours. The sealant shall meet the requirements of ASTM E-814, ASTM E-119 and UL-1479. It shall be installed with strict adherence to the manufacturer's instructions and according to the product's UL Laboratory listing. The use of asbestos in any form is not permitted. ii. Types of Seals:

a. Intumescent (3M Company CP25 Caulk and 303 Putty)
b. Expanding Foam (Dow Corning 3-6548 Silicone RTV Foam)
c. Refractory Putty (SOHIO Carborundum Fire Putty)

iii. Method of Use:

a. Intumescent type: For insulated pipe, install insulation through the sleeve with a continuous vapor seal if required. Install intumescent seal in the annular space between the pipe insulation and the pipe sleeve. Refer to manufacturer's data sheets for maximum annular space allowable and thickness of material required to maintain the rating of the construction being penetrated in conformance with applicable UL Fire Stop Classification for the product.
b. Expanding foam: For insulated pipe, terminate the insulation on both sides of the wall or floor being penetrated and fill the space between the construction and the bare pipe with the foam. For uninsulated pipe, continue pipe through the penetration and proceed as with insulated pipe.
c. Refractory putty: For insulated pipe, provide a 360 degree metal-shielded calcium silicate insulation insert as specified in paragraph "A." Pack and seal the entire space between shield and sleeve with refractory putty. When sealing bare pipe, omit the metal-shielded insert.

iv. Escutcheons:

a. In finished parts of the building, after painting is completed, install chromium plated escutcheons on all pipes passing through walls and floors.

D. METAL FABRICATION

1. Cut, drill, and fit miscellaneous metal fabrications for pipe anchors and equipment supports. Install and align fabricated anchors.
2. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
3. Field Welding: For procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, comply with those listed on project drawings and the following:
    i. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
    ii. Obtain fusion without undercut or overlap. iii. Remove welding flux immediately. iv. Finish welds at exposed connections so no roughness shows after finishing and contours at welded surfaces match adjacent contours.

E. ADJUSTING

1. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve slope of pipe.
2. Touch-Up Painting: Immediately after erection of anchors and supports, clean field welds and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA-1 requirements for touch-up of field-painted surfaces.

i. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous.

3. For galvanized surfaces clean welds bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

3.03 Cleaning and Protection

END OF SECTION 22 05 29

SECTION 22 05 48 – VIBRATION AND SEISMIC CONTROL FOR PLUMBING PIPING AND EQUIPMENT

Part 1: General 1.01

Summary

A. Types of vibration control products specified in this section include the following:

1. Neoprene Pads.
2. Vibration Isolation Springs.
3. All-Directional Anchors.
4. Neoprene Mountings.
5. Spring Isolators, Free-Standing.
6. Spring Isolators, Vertically-Restrained.
7. Thrust Restraints.
8. Fabricated Equipment Bases.
9. Isolation Hangers.
10. Flexible Pipe Connectors.

1.02 Related Sections

1.03 Definitions

1.04 Submittals Required A. Product Data:

B. Shop Drawings:

C. Maintenance Data:

1.05 Quality Assurance

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of vibration control products, of type, size, and capacity required, whose products have been in satisfactory use in similar service for not less than 5 years.

1. Obtain vibration control products from single manufacturer.
2. Engage manufacturer to provide technical supervision of installation of support isolation units produced, and of associated inertia bases (if any).

1.06 Scheduling

1.07 Delivery, Storage, and Handling

1.08 Regulatory Requirements

Part 2: Products

2.01 Manufacturers

A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

1. Vibration Control Products:
2. Mason Industries, Inc.
3. Peabody Noise Control, Inc.

2.02 Products

A. VIBRATION CONTROL MATERIALS AND SUPPORT UNITS

1. Neoprene Pads: Oil-resistant neoprene sheets of manufacturer's standard hardness and cross-ribbed or waffled pattern.
   i. Mason Industries Type W.
2. Vibration Isolation Springs: Wound-steel compression springs, of high-strength, heattreated, spring alloy steel with outside diameter not less than 0.8 times operating height; with lateral stiffness not less than vertical stiffness and designed to reach solid height before exceeding rated fatigue point of steel.
   i. Color coated springs for ease of identification.
   ii. Spring shall have a minimum of 50% additional travel to solid.
3. Neoprene Mountings: Provide neoprene mountings consisting of neoprene element bonded between 2 steel plates that are neoprene-covered to prevent corrosion. Provide minimum rated deflection of 0.35". Provide threaded hole in upper plate and 2 holes in base plate for securing to equipment and to substrate.
   i. Mason Industries Type ND.
4. Spring Isolators, Free-Standing: Provide vibration isolation spring Type C between top and bottom loading plates, and with pad-type Type B isolator bonded to bottom of bottom loading plate. Include studs or cups to ensure centering of spring on plates. Include leveling bolt with lock nuts and washers, centered in top plate, arranged for leveling and anchoring supported equipment as indicated.
   i. Include holes in bottom plate for bolting unit to substrate as indicated.
   ii. Mason Industries Type SLFH.
5. Spring Isolators, Vertically-Restrained: Provide spring isolators Type C in housing that includes vertical limit stops. Design housing to act as blocking during erection, and with installed height and operating height being equal. Maintain 1/2" minimum clearance around restraining bolts, and between housing and springs. Design so limit stops are out of contact during normal operation.
   i. Mounting used out of doors shall be hot dipped galvanized, spring shall be cadmium plated. ii. Mounting used out of doors shall have certified calculation by a registered professional engineer showing ability to withstand 109 MPH wind load in 3 principal axis.
   iii. Mason Industries Type SLR.
6. Thrust Restraints: Provide horizontal thrust restraints consisting of spring elements in series with neoprene pad. Select spring deflection same as for equipment loading. Design so thrust restraints can be pre-set and adjusted in field. Attach horizontal restraints at centerline of thrust and symmetrically on either side of unit.
   i. Provide same deflection as isolated equipment. ii. Select load to provide 1/4" maximum displacement under full system operating pressure.
   iii. Mason Industries Type WBI.
7. Isolation Hangers: Hanger units formed with brackets and including manufacturer's standard compression isolators. Design brackets for 5 times rated loading of units.

Fabricate units to accept misalignment of 15 deg. off center in any direction before contacting hanger box, and for use with either rod or strap type members, and including acoustical washers to prevent metal-to-metal contacts.

i. Provide vibration isolation spring Type C with cap in lower pad-type isolator rubber hanger element in bottom, securely retained in unit.

ii. Provide neoprene element, with minimum deflection of 0.35", securely retained in hanger box.

iii. Mason Industries Type 30N.

8. Riser Isolators: Suspend risers from, or support risers by, spring hangers Type ND or spring isolators Type F. Wherever possible, anchor risers at central point with resilient anchors, Type D. Provide hanger or mounting deflection of 0.75" except in those expansion locations where additional deflection is required to limit deflection or load changes to +25% of initial deflection. Provide sliding guides held in position by resilient anchors, located between anchor points and end of piping.
9. Flexible Pipe Connectors:

i. For non-ferrous piping, provide bronze hose covered with bronze wire braid with copper tube ends or bronze flanged ends, braze-welded to hose.

a. Mason Industries Type BBF.

ii. Flexible Pipe Connectors: Provide EDPM construction consisting of multiple plies of nylon tire cord fabric and elastomer molded and cured in hydraulic rubber presses. Provide straight connector, rated at 125 psi at 220 deg. F (104 deg. C).

a. Mason Industries Type MFNC.

Part 3: Execution

3.01 Preparation A.

INSPECTION

1. Examine areas and conditions under which vibration control units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Owner or his representative.

B. PERFORMANCE OF ISOLATORS

1. Manufacturer's Recommendations: Comply with manufacturer's recommendations for selection and application of vibration isolation materials and units to achieve minimum static deflection and displacement requirements.

C. APPLICATIONS

1. General: Select vibration control products in accordance with ASHRAE Handbook, 1991 HVAC Applications Volume, Chapter 42 "Sound and Vibration Control", Table 34.
2. Piping: For piping connected to equipment mounted on vibration control products, install isolation hangers Type N, for first 3 points of support for pipe sizes 4" and less, for first 4 points of support for pipe sizes 6" through 8", and for first 6 points of support for pipe sizes 10" and over.

i. Where applicable, apply restraint system in accordance with SMACNA GFSR 1982.

3. Fan Sets: All fan sets should have thrust restraints when operating over 2" W.C. S.P. unless they are mounted on a concrete inertia base in which case the inertia base will not allow fan movement. The fan position at operating and stop positions should not move more than 1/4" displacement at these two conditions.

4. Earthquake Restraint: IF NEEDED install Type H seismic snubber.

3.02 Installation A.

INSTALLATION

1. General: Comply with manufacturer's instructions for installation and load application to vibration isolation materials and units. Adjust to ensure that units do not exceed rated operating deflections or bottom out under loading, and are not short- circuited by other contacts or bearing points. Remove space blocks and similar devices (if any) intended for temporary protection against overloading during installation.
2. Install units between substrate and equipment as required for secure operation and to prevent displacement by normal forces.
3. Adjust leveling devices as required to distribute loading uniformly onto isolators. Shim units as required where substrate is not level.
4. For air handling equipment, install thrust restraints and also wherever thrust exceeds 10% of equipment weight.
5. Locate isolation hangers as near overhead support structure as possible.
6. Weld riser isolator units in place as required to prevent displacement from loading and operations.
7. Flexible Pipe Connectors: Install on equipment side of shutoff valves, horizontally and parallel to equipment shafts wherever possible.

B. EXAMINATION OF RELATED WORK

1. Installer of vibration isolation work shall observe installation of other work related to vibration isolation work, including work connected to vibration isolation work; and, after completion of other related work (but before equipment startup), shall furnish written report to Engineer listing observed inadequacies for proper operation and performance of vibration isolation work. Report shall cover, but not necessarily be limited to the following:
    i. Equipment installations (performed as work of other sections) on vibration isolators.
    ii. Piping connections including flexible connections. iii. Ductwork connections including provisions for flexible connections.
    iv. Passage of piping and ductwork which is to be isolated through walls and floors.
2. Do not start-up equipment until inadequacies have been corrected in manner acceptable to vibration isolation installer.

C. DEFLECTION MEASUREMENTS

1. Upon completion of vibration isolation work, prepare report showing measured equipment deflections theoretical floor deflection and isolation efficiency for each major item of equipment.

3.03 Cleaning and Protection A.

ADJUSTING AND CLEANING

1. Clean each vibration control unit, and verify that each is working freely, and that there is no dirt or debris in immediate vicinity of unit that could possibly short- circuit unit isolation.

END OF SECTION 22 05 48

SECTION 22 05 53 – IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

Part 1: General 1.01

Summary

A. Types of identification devices specified in this section include the following:

1. Plastic Pipe Markers.
2. Plastic Tape.
3. Plastic Duct Markers.
4. Valve Tags.
5. Valve Schedule Frames.
6. Engraved Plastic-Laminate Signs.
7. Equipment Markers.
8. Plasticized Tags.

1.02 Related Sections

1.03 Definitions

1.04 Submittals Required A. Product Data:

B. Schedules:

1.05 Quality Assurance

A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years. B. Codes and Standards:

1. ANSI Standards: Comply with ANSI A 3.1 for littering size, length of color field, colors, and viewing angles of identification devices.

1.06 Scheduling

1.07 Delivery, Storage, and Handling

1.08 Regulatory Requirements

Part 2: Products

2.01 Manufacturers

A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

B. Mechanical Identification:

1. Westline Products
2. Brady (W.H.) Co.; Signmark Div.
3. Seton Name Plate Corp.

2.02 Products

A. MECHANICAL IDENTIFICATION MATERIALS

1. General: Provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.

B. PLASTIC PIPE MARKERS

1. Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, colorcoded pipe markers, complying with ANSI A13.1.
2. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125 deg. F. (52 deg. C.) or greater. Cut length to extend 2" beyond each end of plastic pipe marker.
3. Small Pipes: For external diameters less than 6" (including insulation if any), provide fullband pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
    i. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
    ii. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 1-1/2".
4. Large Pipes: For external diameters of 6" and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height (and of required length), fastened by one of the following methods:
    i. Steel spring or non-metallic fasteners.
    ii. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 11/2" wide; full circle at both ends of pipe marker, tape lapped 3".
    iii. Strapped-to-pipe (or insulation) application of semi- rigid type, with manufacturer's standard stainless steel bands.
5. Lettering: Comply with piping system nomenclature or to match existing building lettering nomenclature system and abbreviate only as necessary for each application length.
6. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

C. PLASTIC TAPE
1. General: Provide manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, not less than 3 mils thick.
2. Width: Provide 1-1/2" wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6", 2-1/2" wide tape for larger pipes.
3. Color: Comply with ANSI A13.1.

D. VALVE TAGS
1. Brass Valve Tags: Provide 18-gauge polished brass valve tags with stamp-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener.
    i. Provide 1-1/2" diameter tags.
    ii. Fill tag engraving with black enamel.
2. Valve Tag Fasteners: Provide manufacturer's standard solid brass chain (wire link or beaded type), and solid brass S- hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.
3. Access Panel Markers: Provide mechanical equipment identification as indicated in this section.
4. **Identify all valves located above ceilings or behind access panels using Dymo embossing Tape punched with M-3 Dymomite hand embossing tool. Punch out 3/32" holes at each side of label and secure with Parker-Kalon self-taping screws in addition to adhesive.**

E. VALVE SCHEDULE FRAMES

1. General: For each page of valve schedule, provide glazed display frame, with screws for removable mounting on masonry walls. Provide frames of finished hardwood or extruded aluminum, with non-yellowing Plexi-glas.

F. EQUIPMENT IDENTIFICATION

1. Identify all key equipment, thermostats, controls, relays, dampers, valves, etc., using Dymo embossing Tape punched with M-3 Dymomite hand embossing tool. Punch out 3/32" holes at each side of label and secure with Parker-Kalon self-taping screws in addition to adhesive.
    i. Embossing tape equipment identification specified shall apply to identification labeling of mechanical equipment above ceilings or ceiling access doors. Provide this type of labeling at the ceiling to locate equipment from the occupied space.
2. For mechanical equipment exposed to view throughout the building, located in mechanical rooms or on the roof, provide engraved plastic laminate identification, black with white core, minimum size 2" x 4", with 1" high lettering. Equipment labels shall be fastened with self-tabbing stainless steel screws. Provide contact-type permanent adhesive where screws should not penetrate the substrate.

G. PLASTICIZED TAGS

1. General: Manufacturer's standard pre-printed or partially pre-printed accident-prevention tags, of plasticized card stock with matt finish suitable for writing, approximately 3-1/4" x 5-5/8", with brass grommets and wire fasteners, and with appropriate pre-printed wording including large- size primary wording (as examples; DANGER, CAUTION, DO NOT OPERATE).

H. LETTERING AND GRAPHICS

1. General: Provide numbers, lettering and wording as indicated and approved by the Owner/Engineer for proper identification and operation/ maintenance of mechanical systems and equipment.

Part 3: Execution

3.01 Preparation

3.02 Installation

A. GENERAL INSTALLATION REQUIREMENTS

1. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

B. PIPING SYSTEM IDENTIFICATION

1. General: Install pipe markers of the following type on each system and include arrows to show normal direction of flow.
2. The requirement of labeling the mechanical system components and the quality of the identification shall be emphasized in areas exposed to the student population, including, but not limited to, the stairways, the gymnasium, the cafeteria, the mechanical yard, the art room, the music room and roof areas visible from the second floor.
3. Plastic pipe markers. Install on pipe insulation segment where required for hot non-insulated pipes.

4. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
5. Near each valve and control device.
6. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
7. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
8. At access doors, manholes and similar access points which permit view of concealed piping.
9. Near major equipment items and other points of origination and termination.
10. Spaced intermediately at maximum spacing of 25' along each piping run, except reduce spacing to 15' in congested areas of piping and equipment.
11. On piping above removable acoustical ceilings.

C. VALVE IDENTIFICATION

1. General: Provide valve tag on valves in each piping system. List each tagged valve in valve schedule for each piping system. List valve tag locations on redline drawing at location of valves.
    i. Building services main shut-off valves.
    ii. Each individual system main shut-off valves. iii. Each individual system floor shut-off valves.
    iv. Each individual system major branch shut-off valves.
2. Mount valve schedule frames and schedules in mechanical equipment rooms where directed by Owner.

D. MECHANICAL EQUIPMENT IDENTIFICATION: See Section 23 05 53.

3.03 Cleaning and Protection

A. Adjusting: Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.
B. Cleaning: Clean face of identification devices, and glass frames of valve charts.

END OF SECTION 22 05 53

SECTION 22 07 16 – PLUMBING EQUIPMENT INSULATION

Part 1: General

1.01 Summary

A. Equipment Insulation: Fiberglass. Calcium Silicate

1.02 Related Sections

1.03 Definitions

1.04 Submittals Required A. Product Data:

B. Samples:

1.05 Quality Assurance

1.06 Scheduling

1.07 Delivery, Storage, and Handling

1.08 Regulatory Requirements

Part 2: Products

2.01 Manufacturers

A. Manufacturer: Subject to compliance with requirements, provide product by one of the following:

1. Mechanical Insulation:

i. Schuller (formerly Manville Corp.) ii. Owens-Corning Fiberglas Corp. iii. CertainTeed Corp. iv. Knauf Fiber Glass v. Manson vi. Armstrong World Industries, Inc.

2. Jacketing & Covering Products:

i. Childers ii. Ceel-Co (PVC for interior applications) iii. Zeston (PVC for interior applications)

2.02 Products

A. Rigid Fiberglass Equipment Insulation: ASTM C 612, Class 2. "K" factor shall be maximum 0.28 at 200°F. mean temperature, 3.0 lb. density, 850oF temperature limit.

B. Flexible Fiberglass Equipment Insulation: ASTM C 553, Type I, "K" factor shall be maximum 0.45 at 250°F. mean temperature. 850oF temperature limit.

C. Calcium Silicate Equipment Insulation: ASTM C 533, Type I, Block. "K" factor shall be maximum 0.87 at 1000°F. mean temperature, compression strength 200 psi for 5% compression, transverse strength 60 psi.

D. Jacketing Material for Equipment Insulation: Provide pre- sized glass cloth jacketing material, not less than 7.8 ounces per square yard, or metal jacket at Installer's option. E. Provide Zeston type fittings. No mitered joints.

Part 3: Execution

3.01 Preparation A. INSPECTION

3.02 Installation

A. EQUIPMENT INSULATION: All standard locations.

1. Insulate each item of equipment specified above with the following types and thicknesses of insulation:

i. Flexible Elastomeric Sheet: 3/4" thickness for surface temperatures above 35°F (2°C), 1" thickness for surface temperatures below 35°F (2°C).

2. Insulate each item of equipment specified above with the following types and thicknesses of insulation:

i. Fiberglass: 2" thick. Do not use for equipment above 450°F (232°C).

B. INSTALLATION OF EQUIPMENT INSULATION

1. General: Install equipment thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.
2. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.
3. Maintain integrity of vapor-barrier on equipment insulation and protect it to prevent puncture and other damage.
4. Do not apply insulation to equipment, mufflers, breechings, or stacks while hot.
5. Apply insulation using staggered joint method and double layer construction. Apply each layer of insulation separately.
6. Cover insulated surfaces with all-service jacketing neatly fitted and firmly secured. Lap seams at least 2". Apply over vapor barrier where applicable.
7. Do not insulate boiler manholes, handholes, cleanouts, ASME stamp, and manufacturer's nameplate. Provide neatly beveled edge at interruptions of insulation.
8. Provide removable insulation sections with aluminum jacket and stainless steel bands to cover parts of equipment which must be opened for maintenance; include metal vessel covers, fasteners, flanges, frames and accessories.
9. Equipment Exposed to Weather: Protect outdoor insulation from weather by installation of aluminum jacketing, as recommended by manufacturer.

C. EXISTING INSULATION REPAIR

1. Repair damaged sections of existing mechanical insulation, both previously damaged or damaged during this construction period. Use insulation, install new jacket lapping and sealed over existing.

3.03 Cleaning and Protection

A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

B. Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 22 07 16

SECTION 22 07 19 – PLUMBING PIPING INSULATION

Part 1: General 1.01

Summary

A. Piping System Insulation: Fiberglass.

1.02 Related Sections

1.03 Definitions

1.04 Submittals Required A. Product Data:

B. Samples:

1.05 Quality Assurance

A. Manufacturer's Qualifications: not less than 3 years.

B. Installer's Qualifications: Firm with at least 5 years successful installation.

1.06 Scheduling

1.07 Delivery, Storage, and Handling

1.08 Regulatory Requirements

Part 2: Products

2.01 Manufacturers

A. Manufacturer: Subject to compliance with requirements, provide product by one of the following:

1. Mechanical Insulation:
   - i. Schuller (formerly Manville Corp.)
   - ii. Owens-Corning Fiberglas Corp.
   - iii. CertainTeed Corp.
   - iv. Knauf Fiber Glass
   - iv. Manson
   - v. vi. Armstrong World Industries, Inc.

2. Jacketing & Covering Products:
   - i. Childers
   - ii. Ceel-Co (PVC for interior applications)
   - iii. Zeston (PVC for interior applications)

2.02 Piping Insulation Materials:

A. Fiberglass Piping Insulation: ASTM C 547, Class 1 unless otherwise indicated, “K” factor shall be maximum 0.24 at 75f mean temperature, jacket with tensile strength of 35 lbs/in, mullen burst 70 psi, beach puncture 50 oz. in/in, permeability .02 perm factory applied vapor barrier jacket and adhesive self-sealing lap joint.

B. Jackets for Piping Insulation: ASTM C 921, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at installers option.

1. Encase pipe fittings insulation with one-piece premolded PVC fitting covers, fastened as per manufacturer’s recommendations.

2. All exterior piping insulated shall be encased with aluminum jacketing. The jacketing shall be manufactured from T3003 (or T/5005) H14 to H19 aluminum alloy with 3/16” corrugations and shall have a factory attached 1 mil thick polyethylene moisture barrier continuously laminated across the full width of the jacketing. Jacketing shall be .016” thick minimum. Provide matching factory fabricated covers for 90 and 45 degree elbows, tee fittings, flange fittings, valve bodies, blind ends, reducers, and other fittings necessary to make the covering system complete, waterproof and weatherproof.

3. Where piping is specified to be exposed in finished areas and mechanical rooms, all insulated piping shall have PVC jacketing and fitting covers as manufactured by Ceel-Co 550Z with a 25/50 flame/smoke rating not less than 15 mil thick.

C. Staples, bands, wires, and cement: As recommended by insulation manufacturer for applications indicated.

D. Adhesives, sealers, and protective finishes: As recommended by insulation manufacturer for applications indicated and additional finishes as specified.

2.03 Products

A. PIPE AND DUCT SLEEVES

1. Provide sleeves for all pipes and ducts passing through floors, roofs, walls, and full height partitions. Ducts passing through gypsum board walls do not require sleeves.
2. For sleeves passing through fire rated walls/floors, fill void with fire stop material.
3. At points where a duct passes through a fire rated wall/floor and a fire damper is being installed, the duct sleeve can be eliminated.
4. Pipe Sleeves:
    i. Floor Sleeves in Exposed Areas: Schedule 40 PVC pipe, reamed, extending 2" above floor in equipment rooms and wet areas and 1/4" above the floor in all other locations.
    ii. Masonry Wall Sleeves: Schedule 40 PVC pipe reamed, and finished flush with wall.
    iii. Gyp Wall Sleeves and Sleeves through Existing Construction: Schedule 40 PVC ends terminating flush with the wall.
    iv. Roof Sleeves and Floor Sleeves in Concealed Locations (chases): Schedule 40 PVC.
    v. Make pipe sleeves 1/2" larger inside diameter than the outside diameter of the pipe or pipe insulation, where insulated. Fabricate sleeves from new materials, with ends cut square.
    vi. Floor Sleeves, where water is to be kept out: Fill with graphite packing and caulking compound.
    vii. Exterior Wall Sleeves: Schedule 40 steel pipe reamed, welded flange in the middle of the wall, ends finished flush, or Schedule 40 PVC, finished flush. Pack void annular space with oakum and lead to provide a watertight joint. viii. Where plastic pipe passes through fire rated shaft walls and fire rated partition walls having a fire rating of 2 hours or more, provide Schedule 40 steel or cast iron pipe sleeve extending 12" or more on each side of wall.
5. Duct Sleeves for round ducts up to 12" in diameter.
    i. Roof, floor and partitions sleeves: Schedule 40 PVC; terminate flush with wall, or 2" above floor in equipment rooms and wet areas; 1/4" above floor in all other areas.
    ii. Sleeves through bearing walls: Schedule 40 PVC pipe reamed and finished flush with wall.
    iii. Make sleeves 1/2" larger inside diameter than the outside diameter of duct.

6. Provide prepared openings for rectangular ducts and round ducts over 12" diameter. Furnish exact locations and sizes of boxing forms for these openings in masonry, concrete, and other building construction. Openings shall be 1" larger than outside dimensions of ducts.
7. Sleeve Flashing, Caulking: For sleeves passing through membrane waterproofing or lead safe, provide 16 oz. soft sheet copper of 4 pound lead per square foot flashing extending 9" beyond sleeve in all directions; secure to waterproofing or lead safe; turn down flashing into space between pipe and sleeve, insert oakum gasket, pour lead, caulk water tight. Over air plenums caulk all sleeves with polysulfite base sealing compound conforming to ASA A116.1 (Thiokol).
    i. Where sleeves are indicated with flashing flanges provide Josam, or equal, 26420 series threaded riser sleeve with anchor lugs, flashing flange, steel pipe extensions.
8. Pipe and Duct Sleeves through Existing Construction:
    i. This Contractor shall provide all openings for pipes and ducts passing through existing walls, footings, roofs and floors.
    ii. Openings for pipes shall be core drilled 1/2" larger than the outside pipe or insulation diameter. After installation, seal around pipes. Coordinate opening locations such that no structural members are damaged.
    iii. Where larger portions of existing construction are removed for a number of pipes, provide individual sleeves for each pipe. This Contractor shall then grout around sleeves to match existing construction. Reinforce mesh, angles, etc., shall be used to provide structural stability to the new grouting. iv. Openings for ducts shall be neatly cut to the shape of the duct and 1" larger than the outside dimension. After installation, seal around ducts. Coordinate opening locations such that no structural members are damaged.
    v. Where larger rough openings are made, Contractor shall provide sleeve and grout as stated above.

Part 3: Execution

3.01 Inspection:

A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.

B. Workmanship shall be first class and of the highest quality, poor installation or bad appearance as determined by the engineer shall be due cause to reject the entire project in whole and retainage will be withheld until corrective action is completed to the engineer’s satisfaction.

3.02 Installation:

A. Plumbing Piping System Insulation

1. Insulation Omitted: Insulation Omitted: Omit insulation on chrome-plated exposed piping (except for handicapped fixtures), air chambers, unions, balance cocks, flow

regulators, drain lines from water coolers, drainage piping located in crawl spaces or tunnels, buried piping, fire protection piping, and pre-insulated equipment.

2. All damaged insulation shall be replaced in whole, repair of damaged insulation will not be accepted.

3. Cold Piping: Application Requirements: Insulate the following cold water piping systems with fiberglass 1” insulation.

i. Potable and non-potable cold water piping.

ii. Interior above ground horizontal storm water piping.

iii. Roof drain bowls.

4. Hot Piping: Application Requirements: Insulate the following hot water piping systems with fiberglass 1” thick for pipe sizes up to and including 2”, 1-1/2” thick for pipe sizes over 2”.

i. Potable hot water and tempered piping.

ii. Potable hot water and tempered recirculating piping.

iii. Hot drain piping.

B. INSTALLATION OF PIPING INSULATION

1. Do not insulate cleanouts and access openings. Neatly bevel and finish up to edges of such openings.

2. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded. Use PVC Zeston type covers. Mitered joints are not acceptable.

3. Extend piping insulation without interruption through walls, floors and similar piping penetrations.

4. Provide insulation inserts with shields at all supports. Butt pipe insulation against pipe hanger insulation inserts. For all piping apply wet coat of vapor barrier lap cement on butt joints and seal all joints and seams with 3" wide vapor barrier tape or band.

5. Piping Exposed to Weather: Protect outdoor insulation from weather by installing outdoor protective jacketing as recommended by manufacturer.

i. All longitudinal joints shall be installed so they are directed downward. All joints shall be sealed.

ii. Provide color-coded insulation jacketing on all interior piping exposed in finished areas and in mechanical rooms.

C. EXISTING INSULATION REPAIR

1. Repair damaged sections of existing mechanical insulation, both previously damaged or damaged during this construction period. Use insulation, install new jacket lapping and sealed over existing

3.03 HVAC Piping System Insulation:

A. Insulation Omitted: Omit insulation on unions, flexible connections. And expansion joints. Insulation may be omitted inside of cabinet unit heaters, and fan coils for hot piping. Hot and cold piping routed inside air handler units shall be insulated.

B. Cold Piping (40 deg. F to ambient):

1. Application Requirements: Insulate the following cold HVAC piping systems with fiberglass 1-1/2” thick for pipe sizes up to and including 4”, 1-1/2” thick for pipe sizes over 4”.

i. Chilled water supply and return piping.

ii. Cold condensate drain piping.

C. Hot Low Pressure Piping: (to 250 deg. F):

1. Application Requirements: Insulate the following hot low pressure HVAC piping systems (water piping up to 250 deg F) with fiberglass 1" thick for pipe sizes up to and including 2", 1-1/2" thick for pipe sizes over 2".

i. Hot water supply and return piping.

D. Insulation of Piping Exposed to Weather: Protect outdoor insulation from weather.

1. Jacket shall be factory applied aluminum, 0.016" thick, and laminated vapor barrier. Jacket shall have "Z" groove weathertight seal and each joint shall be sealed with snap straps containing permanent plastic sealing compound and secured by ½" wide stainless steel bands located on 24" centers. Fittings shall be insulated and mitered sections of the same kind of material. All joints shall be sealed with a sealing compound and preformed aluminum bands. All joints and seams shall be caulked with clear silicone. Locate all longitudinal seams at the bottom of piping to minimize joint exposure to weather.

E. All Piping Exposed to Exterior:

1. Application Requirements: Insulate the following sub-freezing HVAC piping systems with fiberglass 3" thick for pipe sizes up to and including 8", 4" thick for pipe sizes over 10".

a. Exterior Chilled Water Piping.

2. Install insulation over the top of heat cable.

3. Provide weatherproof jacketing as specified. Seal all joints water tight.

END OF SECTION 22 07 19

SECTION 22 11 13 – FACILITY WATER DISTRIBUTION PIPING

Part 1: General

1.01 Summary

1.02 Related Sections

1.03 Definitions

1.04 Submittals Required A.

Product Data.

B. Shop Drawings

C. Certification of Compliance

D. Test Reports

E. Manufacturer Data. F. Maintenance Data

1.05 Quality Assurance

A. Welding Materials and Procedures: Conform to ASME BPV SEC IX, except to conform to ANSI/ASME B31.1 for systems with operation temperature over 250 degrees F (121 degrees C).

1.06 Scheduling

1.07 Delivery, Storage, and Handling

A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.08 Regulatory Requirements A.

EXTRA STOCK

1. Maintenance Stock: Furnish one valve key for each key operated wall hydrant, hose bibb, or faucet installed.

Part 2: Products

2.01 Manufacturers

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Balance Cocks:
   i. Flowset FDI
2. Hose Bibbs and Faucets:
   i. Chicago 952-CP for exposed locations.
   ii. Bathrooms to use concealed box type Woodford B24/B79 Chrome or approved equal.
3. Wall Hydrants:
   i. Josam Mfg. Co.
   ii. Smith, (Jay R.) Mfg. Co. iii. Woodford Mfg. Co.
   iv. Zurn
4. Backflow Preventers:
   i. Watts Regulator Co. Watts 909 QT only.
5. Relief Valves:
   i. A.W. Cash Valve Mfg. Corp.
   ii. Watts Regulator Co. iii. Conbraco Industries, Inc.
6. Water Hammer Arresters:
   i. Josam ii. Woodford
   iii. J.R. Smith Mfg. Co.
   iv. Precision Plumbing Products
   iv. Wade
   v. vi. Watts Regulator Co.
7. Dielectric Waterway Fittings:
   i. Victaulic Company of America
8. Water Tempering Valves
   ~~i. Powers~~
   ii. Leonard Dual Stage Hydrostatic
9. Vacuum Breakers For Hose Connections:
   i. Cash (A.W.) Valve Mfg. Corp.
   ii. Conbraco Industries, Inc.

iii. Watts Regulator Co.

2.02 Products

A. PIPE AND TUBE MATERIALS

1. Water service and water in building underground including service to fire riser:
   i. Piping 3" and larger shall be Ductile-iron, AWWA C-15076, with cement mortar lining. Fittings: Cast iron, conforming to ASA 21.10, cement mortar lined. Join pipe and fitting with mechanical fittings. ii. Piping 2-1/2" and smaller, Type "K" soft drawn copper water tube. Fittings: wrought copper, silver brazed. There shall be no buried fittings under the building.
2. Domestic Water Distribution Piping:
   i. All unnecessary traps in circulating lines shall be avoided. ii. All water pipe underground outside of building shall be buried a minimum of 5'-0" deep. Where waste and water piping is run in the same trench, installation shall conform to all governing codes. Install tracer wire on all exterior utilities. Terminate in an approved termination box.

B. GENERAL DUTY VALVES

C. SPECIAL DUTY VALVES

1. Balance Cocks: 400 PSI WOG, 2 piece, ball valve, handle, memory stop. Balance Cocks are not to be used as isolation valves.
2. Balance Cocks: Flow measuring valves shall consist of a 300 psi rated ball valve with bronze body, chrome plated ball, teflon seats and heavy duty steel handle with vinyl grip. The venturi section of the valve shall be integrally designed with the ball section and sized for maximum flow accuracy and pressure recovery. The flow section shall be furnished with two dual-core temperature/pressure taps with color coded removable retained safety cap assemblies. The unit shall have a ground-joint union especially designed for minimum turbulence and to allow for full service. Valves shall be furnished with shipping/insulation sleeve for ease of access to the temperature/pressure test ports and also to allow adjustments of the valve handles without removing the insulation. Balance cocks are not to be used as isolation valves. i. Flowset

D. PIPING SPECIALTIES

1. Water Hammer Arresters: Bellows type, with stainless steel casing and bellows, pressure rated for 250 psi, tested and certified in accordance with PDI Standard WH-201.
   i. Install water hammer arresters with isolation valve in accessible location.
   ii. Provide lockable access doors located in accordance with architectural recommendations. iii. Units shall be sized in accordance with the following schedule.

Designation	Fixture Unit Rating	Model or Figure Number		
		J.R. Smith	Josam	Wade
SA-1	1-11	5005	75001	W-5
SA-2	12-32	5010	75002	W-10
SA-3	33-60	5020	75003	W-20

2. Strainers:
3. Hose Bibbs

i. HB-1 -Unfinished and Equipment Rooms: Rough chrome plated bronze body, renewable composition disc, tee handle, 3/4 inch NPT inlet, 3/4 inch hose outlet.
   a. Chicago Faucet No. 998, Woodford No. 24 or Y24

ii. HB-2 - Finished Rooms with Floor Drains: Concealed box type hose bib, polished chrome plated bronze body, with renewable composition disc, tee handle, 3/4 inch NPT inlet, 3/4 inch hose outlet, backflow protected.
   a. Woodford Model B79, or equivalent.

4. Wall Hydrants

i. WH-1 Concealed box-type type non-freeze wall hydrant; all brass with polished bronze face plate, "T" handle loose key, integral vacuum breaker, self draining body and shank, 3/4" male hose thread outlet, 3/4" male or female thread inlet, renewable seat; shank length to extend thru primary exterior wall sufficient distance to prevent freezing.
   a. Woodford Model B65 5.

Backflow Preventers:

i. BFP-1 (Reduced pressure type): All bronze (3/4"-2")/ductile iron (2-1/2" - 10") body with two independently operating, spring loaded check valves and one differential relief valve with automatic intermediate atmospheric vent. Pressure in intermediate zone to activate relief valve when there is a 2 psig. differential between the zone and the upstream side of the first check valve. The relief valve shall remain open until a positive pressure differential is re-established. Assembly to be furnished with fullport, positive shut off isolation valves, in-line strainer, union connections, funnel, and all test cocks.

Assembly to have approval of National Sanitary Foundation, U.S.C. Foundation for Cross Connection Control,

   a. State and or Local Authorities.
   b. Watts No. 909 QT (only)

6. Pressure Reducing Valves - Air/Water (Direct Acting)

i. PRV-1 and PRV-2 Low and High Capacity (15 to 120 GPM): All bronze pressure reducing valves, sensitive spring and diaphragm for accurate pressure control; manual adjustment for outlet pressure integral strainer, female thread connections. See detail on mechanical plans for size, capacity and piping arrangement.
   a. Watts No. 223

7. Thermostatic Mixing Valves

i. TMV-1: Exposed type, all bronze thermostatically controlled mixing valve with stainless steel piston, fail safe automatic shut-down if either hot or cold water pressure fails; union connection.
   a. Leonard TM Series dual stage for high usage. Leonard High Low TM Series.

8. Pressure/Temperature Relief Valves (PTRV):

i. Fully automatic, all bronze pressure/temperature relief valve with test lever and extension thermostatic element; temperature relief setting at 210 deg. F and pressure setting at 150 psig; valve to meet ASME Standards and comply with the latest AGA ratings. Relief opening to be piped to an indirect connection at nearest floor drain.

9. Use point of use tempering valves at all sink locations as required by code. All point tempering valves must meet ASTM 1070. The Powers type thermostatic mixing valve will not be required.

E. HEATING WATER AND GLYCOL PIPING, ABOVE GROUND 1. Copper Tubing: ASTM B88, Type L, hard drawn.

i. Fittings: ASME or B16.22, solder wrought copper.

ii. Joints:

a. 2 inch (75mm) and Under: ASTM B32 solder, grade 95TA or ANSI/AWS A5.8, BcuP-6 silver braze.

b. 2-1/2" or larger steel shall be welded.

2. All Hydronic copper piping shall be silver brazed. Silver brazing material to equal Harris Stay Silver with minimum 5% silver content or equal. The only exception is when connecting to equipment that could be damaged by excessive heat.

F. HEAT PUMP PIPING, BURIED

1. PIPE AND FITTINGS

i. Hot water heating in building below ground:

a. Piping shall be Type "K" soft drawn copper tubing. There shall be no buried fittings under the building.

2. .Single Wall Type.

i. Pipe:

a. High Density Polyethylene Pipe manufactured to controlled dimensions, specifications, and requirements per ASTM D3035. Resins shall be pipe grade resin, possessing ASTM D3350 cell classification No. 345464C. Resin shall be listed in PPI TR4. Pipe shall be virgin resin with an allowance for on-site manufacturer re-processed resin. Recycled resin shall not be permitted.

b. Marking. Each pipe shall be permanently indent marked with the manufacturer's name, nominal pipe size, pressure rating, relevant ASTM standards, cell classification number, and date of manufacture. ii. Fittings:

a. Molded fittings shall be manufactured to the dimensions, specifications, and requirements of ASTM D2683 (for socket fusion fittings), ASTM D3261 (for butt/saddle fusion fittings), or ASTM F1055 (for electrofusion fittings). The material used in the manufacture of the fitting shall be the same approved base resin material as the connecting pipe.

b. Marking. Each fitting shall be permanently marked with the manufacturer's name, nominal pipe size, pressure rating, relevant ASTM standards, and lot number.

iii. Joints. Joints shall be made using heat fusion, flanging, transition fittings, and prooftested, approved mechanical couplers. Trained and qualified construction crew staff shall make all fusion joints.

G. HEAT PUMP PIPING, ABOVE GROUND

1. PIPE AND FITTINGS

i. Domestic water (hot, circulating hot and cold water) in building above ground:

a. 3" and smaller: Piping shall be Type "L" hard drawn copper water tube, per ASTM B88. Fittings wrought copper, solder joint. There shall be no water lines run in exterior walls.

b. All underground piping to be insulated with armoflex type insulation, insulation size to be determined by engineer.

ii. Heating Water and Chilled Water Piping:

a. 2 Inches and smaller:

1. Type L hard drawn copper, wrought copper fittings. Silver solder with 5% silver content (Harris StaySilv 5 Silver Brazing Alloy, or equal) for all brazed joints except when connecting to equipment that could be damaged by excessive heat. No heating or chilled piping to be located in exterior walls.

b. 2-1/2 Inches and Larger:

1. Schedule 40, black steel with flanged or welded joints.
2. Fittings: Standard weight, seamless steel, butt weld type.
3. Flanges: 150 lb. forged steel slip-on or welding neck type.
4. Bolting: Regular square head machine bolts with heavy hexagonal nuts. H. Gaskets: Thickness, material type suitable for fluid to be handled, design temperatures, and pressures

1. 2” and smaller to be Copper Tubing: ASTM B88, Type L, hard drawn.
   i. Fittings: ASME B16.18, cast brass or B16.22, solder wrought copper brazed.
   ii. Joints:
2. 2-1/2” and larger to be steel pipe with welded fittings.

I. EQUIPMENT DRAINS AND OVERFLOWS

1. Copper Tubing: ASTM B88, Type L, hard drawn.
   i. Fittings: ASME B16.22 solder wrought copper.
   ii. Joints: Solder, lead free, ASTM B32, Grade 50 TL.
   iii. Provide unions at all equipment drain points.

Part 3: Execution

3.01 Preparation

A. Verify all dimensions by field measurements. Verify that all water distribution piping may be installed in accordance with pertinent codes and regulations, the original design, and the referenced standards.

B. Examine rough-in requirements for plumbing fixtures and other equipment having water connections to verify actual locations of piping connections prior to installation. C. Do not proceed until unsatisfactory conditions have been corrected.

D. Ream pipe and tube ends. Remove burrs. Bevel plain and ferrous pipe. If pipe at any point in the project is found not reamed, contractor may be required to disassemble all piping installed and have a 3rd party (approved by engineer and PSD) verify reaming is complete. Costs for destructive research, whether more areas are found defective or not, shall be the responsibility of the contractor.

E. Remove scale and dirt on inside and outside before assembly.

F. Provide piping connections to equipment with flanges or unions.
G. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
H. After completion, fill, clean, vent, and chemically treat systems. Notify PSD Plumbing department before all cleaning/flushing and schedule them to be onsite to witness clean and flush.
I. Condensate drains to be run to floor drain. If possible, avoid using condensate pump. Condensate pump only allowed as las resort.

3.02 Installation

A. PIPING INSTALLATION

1. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.
2. Install piping to conserve building space, and not interfere with use of space and other work. Install piping so ceiling tile can be removed for access.
3. Do not install underground piping when bedding is wet or frozen.
4. Group piping whenever practical at common elevations.
5. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
6. Provide clearance for installation of insulation and access to valves and fittings.
7. Provide access where valves and fittings are not exposed.
8. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level, for hydronic systems; bottom of pipe level for steam and refrigeration systems.
9. Where pipe support members are welded to structural building framing, scrape, brush, clean, and apply one coat of zinc to rich primer to welds.
10. Prepare pipe, fittings, supports, and accessories, for finish painting.
11. Install valves with stems upright or horizontal, not inverted.
12. Install polyethylene tape on buried fittings and joints, extending 4 inches (100 mm) each side of fitting or joint. Clean area to receive tape with solvent.
13. ~~Underground Steel Pipe~~. Do not use steel pipe underground. Use PE pipe and transition fittings. Provide sleeves where piping comes through the ground. Provide tracer wire on all underground utilities.
    i. ~~Holiday test 100 % of underground coated steel piping systems with high voltage test device. Ensure zero voids and holidays prior to backfilling. Submit written report.~~
    ii. ~~Provide cathodic protection; provide supervision by anode manufacturer's representative.~~
    iii. ~~Provide isolation fittings (dielectric) at building.~~

B. PIPE AND TUBE JOINT CONSTRUCTION

C. HOT WATER HEATING SYSTEMS:

1. The hot water heating system shall have manual air vents at all high points and at all points where drops occur in lines. Actual locations of manual air vents shall be marked on As Built Drawings.
2. Provide low point drains at all low points in system. Note all low points on As Built Drawings.

D. GENERAL APPLICATION
   1. Install union downstream of valves and at equipment or apparatus connections.
   2. Install ball or butterfly valves for shut-off and to isolate equipment part of systems.
   3. Install ball valve, or butterfly valve for balancing/throttling, bypass, or manual flow control services; however, ball valves shall be specifically shown in manufacturer's published product data as being suitable for continuous throttling.
   4. Provide spring loaded non-slam check valves on discharge of condenser water pumps.
   5. Use butterfly valve operators as follows:
      i. All sizes to have gear operators.
   6. Provide ¾ inch (20 mm) ball drain valves at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest drain.

E. VALVE APPLICATIONS
   1. General Duty Valve Applications:
      i. Shut-off duty: Use ball valves only.
      ii. Throttling duty: Use ball valves only.

F. INSTALLATION OF VALVES
   1. Sectional Valves: Install sectional valves on each branch and riser, close to main, where branch or riser serves 2 or more plumbing fixtures or equipment connections. For sectional valves 2" and smaller, use ball valves; for sectional valves 2- 1/2" and larger, use ball valves only.
   2. Shutoff Valves: Install shutoff valves on inlet of each plumbing equipment item, and on inlet of each plumbing fixture. For shutoff valves 2" and smaller, use ball valves; for shutoff valves 2- 1/2" and larger, use ball valves only.
   3. Drain Valves: Install drain valves on each plumbing equipment item, located to completely drain equipment for service or repair. Install drain valves at the base of each riser, at low points of horizontal runs, and elsewhere as required to completely drain distribution piping system. For drain valves 2" and smaller, use ball valves; for drain valves 2-1/2" and larger, use ball valves only. All drains that are not piped to a drain are to have a ¾" hose connection with chain and cap. (Apollo 78-200-01).
      i. All Drain valve caps to be brass. Plastic caps are not permitted.
   4. Check Valves: Install swing check valves on discharge side of each pump.
   5. Balance Cocks: Install in each hot water recirculating loop, discharge side of each pump. Balance cocks are not to be used as isolation valves.
   6. Hose Bibbs: Install on exposed piping, with vacuum breaker.
   7. Wall Hydrants: Install with vacuum breaker. All hose bibs are to have an isolation valve installed for maintenance and repairs.

G. INSTALLATION OF PIPING SPECIALTIES
   1. Install backflow preventers at each connection to mechanical equipment and systems, and in compliance with the plumbing code and authority having jurisdiction. Locate in same room as equipment being connected. Pipe relief outlet thru air gap and without valves, full-size to nearest floor drain. Provide floor drain at each backflow preventer, size as required to meet backflow. (i.e. – 1" device requires 2" drain; 2" device requires 4" drain.
   2. Install pressure regulating valves with inlet and outlet shutoff valves, and balance cock bypass. Install pressure gauge on valve outlet. Provide unions on both sides of PRV.

H. EQUIPMENT CONNECTIONS

1. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures AS CODE REQUIRES.
2. Mechanical Equipment Connections: Connect hot and cold water piping system to mechanical equipment. Provide shutoff valve and union for each connection, provide drain valve on drain connection. For connections 2-1/2" and larger, use flanges instead of unions.

I. FIELD QUALITY CONTROL

1. Inspections: Inspect water distribution piping as follows:
    i. Do not enclose, cover, or put into operation water distribution piping system until it has been inspected and approved by the authority having jurisdiction.
    ii. During the progress of the installation, notify the plumbing official having jurisdiction, at least 48 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the plumbing official. PSD Plumbing department to be notified 48 hours before all testes and inspections.
        a. Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed-in after system is roughed-in, and prior to setting fixtures.
        b. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to insure compliance with the requirements of the plumbing code.
    iii. Reinspections: Whenever the plumbing official finds that the piping system will not pass the test or inspection, make the required corrections and arrange for reinspection by the plumbing official.
    iv. Reports: Prepare inspection reports, signed by the plumbing official.
2. Test water distribution piping.

J. Hose Bibbs and Wall Hydrants:

1. Locations:
    i. Each mechanical room where there is cold potable water service.
    ii. Inside Kitchen iii. Gang toilet rooms. (Key closed wall hydrant – box type.) iv. Mechanical penthouses, if heated. v. Boiler room.
    vi. Wall hydrant every 200 feet of exterior perimeter.
    vii. Wall hydrant outside at the kitchen service entrance.
    viii. Custodial closets.
2. Provide freeze-proof outside wall hydrants with inside ball and drain valves in heated areas for winter shut off.

K. Minimum Locations of Floor Drains:

1. Mechanical rooms.
2. Kitchen.
3. Every toilet room.
4. Mechanical penthouses.
5. Emergency drench showers.
6. Custodial closets.
7. ***All backflow preventor locations.***

3.03 Cleaning and Protection A.

ADJUSTING AND CLEANING

1. **Flushing and cleaning of water distribution piping shall be witnessed by a Poudre School Representative. Provide minimum of 24 hours notice prior to performing work.**
2. Clean and disinfect water distribution piping as follows:
    i. Purge all new water distribution piping systems and parts of existing systems, which have been altered, extended, or repaired prior to use.
    ii. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction, or in case a method is not prescribed by that authority, the procedure described in either AWWA C651, or AWWA C652, or as described below:
        a. Flush the piping system with clean, potable water until dirty water does not appear at the points of outlet.
        b. Fill the system or part thereof, with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system, or part thereof, and allow to stand for 24 hours.
        c. Drain the system, or part thereof, of the previous solution, and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.
        d. Following the allowed standing time, flush the system with clean potable water until chlorine does not remain in the water coming for the system.
        e. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.
3. Prepare reports for all purging and disinfecting activities.
4. Domestic Water Systems:
    i. General: All new potable water systems shall be cleaned as herein specified prior to testing or application of insulation. Testing must be witnessed by District and State Department of Health personnel and report filed with the District to receive final payment.
    ii. Notification: Notify State Department of Health in writing, 48 hours in advance of the beginning of the cleaning process. iii. Witness: The cleaning process will not be deemed acceptable unless witnessed and approved by the State Department of Health's representative. iv. Procedure: Comply with City of Fort Collins standards or Colorado State Department of Health requirements, whichever is more stringent.
    v. Report: The report shall contain the following and be submitted to the District's Project Manager within 24 hours of the cleaning:
        a. Date, time, and place of cleaning.
        b. Duration.
        c. Person responsible.
        d. Solutions concentration and temperature.
        e. Signature of State Department of Health representative.
        f. Results.
    vi. The report and its timely submission shall be required for final payment.
5. Heating Water System:

i. Notification: Notify District's Project Manager and PSD Plumbing Department 24 hours in advance of the beginning of the cleaning process. The cleaning process will not be deemed acceptable unless witnessed and approved by the District's representative. This shall be a requirement for final payment.

ii. Procedure: Flush all systems with clean city water until the discharge is clear. Clean or replace the baskets of all strainers after cleaning.

iii. Drain system, and fill system with clean water, mixed with propylene glycol with inhibitors to 30% by volume. If there is excess propylene glycol, turn remaining over to Owner.

END OF SECTION 22 11 13

SECTION 22 11 23 – FACILITY NATURAL GAS PIPING

Part 1: General

1.01 Summary

A. This section includes distribution piping systems for natural gas and manufactured gas within the building and extending from the point of delivery to the connections with gas utilization devices.

Piping materials and equipment specified in this section include:

1. Pipes, fittings, and specialties.
2. Special duty valves.

B. This section does not apply to LP-gas piping; industrial gas applications using such gases as acetylene and acetylenic compounds, hydrogen, ammonia, carbon monoxide, oxygen and nitrogen; gas piping, meters, gas pressure regulators and other appurtenances used by the serving gas supplier in distribution of gas.

C. Gas pressures for systems specified in this section are limited to 5 psig.

D. Products installed but not furnished under this section include gas meters which will be provided by the utility company, to the site, ready for installation.

1.02 Related Sections

1.03 Definitions

1.04 Submittals Required.

A. Product data

B. Shop drawings C. Record Drawings:

D. Maintenance data E.

Welders' qualification

F. Test reports.

1.05 Quality Assurance

A. Manufacturer's Qualifications: not less than 5 years.

B. Installer Qualifications: minimum of 5 previous projects similar in size and scope to this project

1.06 Scheduling

1.07 Delivery, Storage, and Handling

1.08 Regulatory Requirements

A. EXTRA MATERIALS

1. Valve Wrenches: Furnish to Owner, with receipt, 2 valve wrenches for each type of gas valve installed, requiring same.

Part 2: Products

2.01 Manufacturers

A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

1. Gas Cocks:

i. Jenkins Bros. ii. Lunkenheimer Co.

iii. Stockham.

2.02 Products

A. PIPE, TUBING AND JOINTING MATERIALS

1. Natural gas in building above ground:

i. Piping shall be black steel, Schedule 40, plain ends for welding for 2-1/2" and above. Fittings welded, standard weight. Joints welded as recommended by AWS or NCPWB.

ii. For 2" and smaller, piping shall be black steel, Schedule 40, screw ends. Fittings black malleable iron screwed, standard weight 150 lb. banded. Minimize gas piping inside the building by running pipe on the roof wherever possible. Support pipe on roof with Bizon Pipe Jacks, or as per manufacturer's recommendations for single ply membrane roofs. Entire pipe shall be primed and painted by the painting contractor to prevent rusting. Support pipe at 10 ft. intervals for 1-1/4" pipe and larger, and at 8 ft. intervals for 3/4" or 1" pipe. Pipe installed in a return air plenum must be welded. No screwed fittings.

2. Natural and LP gas buried in ground:

i. Polyethylene pipe (PLEXCO Yellow pipe PE 2406 or approved equal) with iron pipe transition risers. Install tracer wire in trench above poly pipe before backfilling. -or-

ii. ~~Piping shall be black steel, Schedule 40, plain ends for welding. Fittings welded, standard weight. Joints welded as recommended by AWS or NCPWB. Tape all joints and mill wrap all pipe and fittings~~. Steel pipe underground is not permitted.

B. NATURAL GAS PIPING SPECIALTIES

1. Protective Coating: Provide factory applied polyethylene tape, having the following properties:

i. Overall thickness; 20 mils.

ii. Synthetic adhesive. iii. Water vapor transmission rate.

iv. Gallons per 100 square inch: 0.10 or less.

v. Water absorption, percent: 0.02 or less.

vi. Prime pipe and fittings with a compatible primer prior to application of tape.

vii. Pipe wrapping shall conform to the following schedule:

viii. During application of wrap, if the ambient temperature is 40oF or less, use only Scotchwrap No. 40 tape. If ambient temperature is 40oF or more, use only Scotchwrap No. 50.

Pipe Size	Tape Width	Scotchwrap No.	
		Standard	Cold
1/4 - 3/4 inch	1 inch	50	40
1 - 1-1/2 inch	2 or 4 inch	50	40
2 inch and larger	4 inch	50	40
Color backing		Black	Green

2. Flexible Connectors: Corrugated type 304 stainless steel flexible pipe with stainless steel braid

and heavy flexible armor shield. Flexible connectors to be used on kitchen equipment connections only. C. VALVES

1. Special duty valves are specified in this section by their generic name. Refer to Part 3, "VALVE APPLICATION," for specific uses and applications for valve specified.
2. Gas Cocks 2 Inch and Smaller: 150 psi WOG, bronze body, straightaway pattern, square head, threaded ends.
3. Gas Cocks 2-1/2 Inch and Larger: MSS SP-78; 175 psi, lubricated plug type, semi-steel body, single gland, wrench operated, flanged ends.
4. Gas Line Pressure Regulators: Single stage, steel jacketed, corrosion-resistant gas pressure regulators; with atmospheric vent, elevation compensator; with threaded ends for 2 inch and smaller, flanged ends for 2-1/2 inch and larger; for inlet and outlet gas pressures, specific gravity, and volume flow. Provide gas cocks and unions on both sides of regulators.
5. Gas Safety Valves: Gas safety valve latched open when energized, free handle design, manual reset, and a visual position indicator.

Part 3: Execution

3.01 Preparation

3.02 Installation

A. INSTALLATION OF PIPE

1. Gas Piping (Natural):
    i. All gas piping shall be installed with plugged drip pockets at low points. Pipe shall be extended to all gas equipment in building. The entire gas piping installation shall be in accordance with the latest requirements of the AGA and NBFU. All gas piping in return air plenums must be welded—no screwed fittings.
    ii. Valves or cocks and unions shall be installed on inlet pipe to all equipment, including safety valves where required or noted to be installed.
2. Compressed Air Piping:
    i. Drip pockets shall be provided at low points of piping for eliminating moisture.
    ii. Piping shall be connected near top of receiver with union and valve. Connections at equipment shall consist of a valve and union. iii. Install pipe tee at compressor, so that quick coupler may be added later to service condenser coil on air dryer.

3. Concealed Locations: Except as specified below, install concealed gas piping in an air-tight conduit constructed of Schedule 40, seamless black steel with welded joints. Vent conduit to the outside and terminate with a screened vent cap.
    i. Above-Ceiling Locations: Gas piping may be installed in accessible above-ceiling spaces (subject to the approval of the authority having jurisdiction), whether or not such spaces are used as a plenum. Valves shall not be located in such spaces. ii. Piping In Partitions: Concealed piping shall not be located in solid partitions. Tubing shall not be run inside hollow walls or partitions unless protected against physical damage. This does not apply to tubing passing through walls or partitions.
    iii. Prohibited Locations: Do not install gas piping in or through a circulating air duct, clothes chute, chimney or gas vent, ventilating duct, dumb waiter or elevator shaft. This does not apply to accessible above-ceiling space specified above.
4. Drips and Sediment Traps: Install a drip leg at points where condensate may collect, at the outlet of the gas meter, and in a location readily accessible to permit cleaning and emptying.
   Do not install drips where condensate is likely to freeze.
    i. Construct drips and sediment traps using a tee fitting with the bottom outlet plugged or capped. Use a minimum of 3 pipe diameters in length for the drip leg. Use same size pipe for drip leg as the connected pipe.
5. Use fittings for all changes in direction and all branch connections.
6. Install gas piping at a uniform grade upward to risers, and from the risers to the meter, or service regulator when meter is not provided, or the equipment.
7. Connect branch outlet pipes from the top of horizontal lines, not from the bottom or sides.

B. NATURAL GAS PIPING SPECIALTIES 1. Protective Coating:
    i. Provide protective coating on piping and fittings that will be in contact with material or atmosphere exerting a corrosive action, or piping buried in floors. Protective coating shall be applied at the factory.

   2. Flexible Connectors:
    i. Provide flexible braided stainless steel connectors with full size quick coupler for all kitchen gas appliance equipment only.
    ii. Connectors shall be of lengths required to displace equipment for complete cleaning under and around gas appliance. Equip flexible connectors with quick couplers and tether.

C. VALVE APPLICATIONS

   1. Shut-off duty: Use gas cocks.

D. VALVE INSTALLATIONS

1. Install valves in accessible locations, protected from physical damage. Tag valves with a metal tag attached with a metal chain indicating the piping systems supplied.
2. Install a gas cock both sides of each gas pressure regulator. Where two gas pressure regulators are installed in series in a single gas line, a manual valve is not required at the second regulator.
3. Install pressure relief devices so they can be readily operated to determine if the valve is free; so they can be tested to determine the pressure at which they will operate; and examined for leakage when in the closed position. Pipe atmospheric vent to outdoors.

4. Valves shall be installed with unions or other means to facilitate removal or repair without disassembly of connecting piping.
5. Gas Safety Valves:
    i. Install gas safety valves in wall boxes.
    ii. Coordinate electrical requirements with contractor. Provide neoprene grommets for all piping and electrical conduit entering and existing cabinets.

E. TERMINAL EQUIPMENT CONNECTIONS
1. Install gas cock upstream and within 6 feet of gas appliance. Install a union or flanged connection downstream from the gas cock to permit removal of controls.
2. Sediment Traps: Install a tee fitting with the bottom outlet plugged or capped as close to the inlet of the gas appliance as practical. Drip leg shall be a minimum of 3 pipe diameters in length. Provide valve above drip leg so gas service does not have to be shut down. The valve can be used to isolate the equipment being served.
3. Flexible Hose Gas Connectors: For use connecting to vibrating equipment; corrugated Type 304 stainless steel flexible pipe with stainless steel braid.

F. ELECTRICAL BONDING AND GROUNDING

G. SPARE PARTS
1. Valve Wrenches: Furnish to Owner, with receipt, 2 valve wrenches for each type of gas valve installed, requiring same.

3.03 Cleaning and Protection

END OF SECTION 22 11 23

SECTION 22 13 16 – SANITARY WASTE AND VENT PIPING

Part 1: General

1.01 Summary
A. This section specifies building sanitary drainage and vent piping systems, including drains and drainage specialties.

1.02 Related Sections

1.03 Definitions

1.04 Submittals Required A. Product Data:
B. Shop Drawings:
C. Record Drawings:
D. Maintenance Data:

1.05 Quality Assurance
A. Regulatory Requirements: Comply with the provisions of the following:
1. Plumbing Code Compliance: Comply with applicable portions of International Plumbing Code.
2. ANSI Compliance: Comply with applicable ANSI standards pertaining to materials, products, and installation of soil and waste systems.
3. ASSE Compliance: Comply with applicable ASSE standards pertaining to materials, products, and installation of soil and waste systems.

4. PDI Compliance: Comply with applicable PDI standards pertaining to products and installation of soil and waste systems.
5. PVC Pipe: Only Contractor's personnel which have received training in the installation of this material and meet the manufacturer's qualifications shall do the assembly of such material.

1.06 Scheduling

1.07 Delivery, Storage, and Handling

1.08 Regulatory Requirements

Part 2: Products

2.01 Manufacturers

A. Manufacturer: Subject to compliance with requirements, provide drainage and vent systems from one of the following:

1. Drainage Piping Specialties, including drains and cleanouts:
    i. Josam Mfg. Co.
    ii. Smith (Jay R) Mfg. Co. iii. Zurn Industries Inc; Hydromechanics Div.
    iv. Wade

2.02 Products

A. DRAINAGE PIPING SPECIALTIES
1. Vent Flashing Sleeves: Cast-iron caulking type roof coupling for cast-iron stacks, cast-iron threaded type roof coupling for steel stacks, and cast-bronze stack flashing sleeve for copper tubing.
2. Vandal – Proof Vent Caps: Cast Iron dome secured with Allen Key set screws. J.R. Smith Model 1748 or equivalent. Vent cap must be compatible with type of vent flashing installed. Plastic vent caps are not permitted.

B. CLEANOUTS
1. Floor Cleanout: Round, cast iron body with recessed bronze closure plug; scoriated polished bronze frame and cover plate. No floor cleanouts in carpeted floors.
2. Wall Cleanout: Cleanout tee with raised head brass plug tapped for 1/4-20 thread; flat style chrome plated wall cover plate with holes for 1/4" bolt; 1/4-20 threaded bolt with chrome plated flat head.
3. Surface Cleanout: Cast iron body ferrule with raised head brass plug. Medium duty cast iron manhole cover and ring 12" diameter to be set in a minimum 24” X 24” X 4” thick concrete pad, Neenah No. R-1791-A.
4. Line Cleanout: Cast iron tapped cleanout ferrule with raised head brass plug.

C. FLOOR DRAINS
1. Floor drain.
    i. FD-1 Toilet Rooms and Finished Areas
        a. Round cast iron body with flashing collar and cast iron ring, 6 inch round nickel bronze adjustable strainer head with secured square hole grate, bottom waste outlet. Jay R. Smith Fig. 2005-A
    ii. FD-2 Boiler and Mechanical Rooms

a. Round cast iron, medium duty, shallow body drain with flashing collar and cast iron ring, 8" round tractor type non-tilt slotted grate, bottom waste outlet. Jay R. Smith Fig. 2210

2. All floor drains will require a trap primer per code.

D. FLOOR SINKS

1. Floor drain.

i. FS-1 Indirect Waste Drain - Kitchen Sinks

a. Square, cast iron, porcelain enameled interior, sump body drain 8" deep x 12" square with flashing collar and cast iron ring, 12" square nickel bronze removable half top grate with cast aluminum dome bottom strainer, bottom waste outlet. b. Jay R. Smith Fig. 3120

ii. FS-2 Indirect Waste Drain - Kitchen Equipment

a. Square, cast iron, porcelain enameled interior, sump body drain 6" deep x 8" square with flashing collar and cast iron ring, 8" square nickel bronze removable half top grate, cast aluminum dome button strainer, bottom waste outlet. b. Jay R. Smith 3100

Part 3: Execution

3.01 Preparation

3.02 Installation

A. INSTALLATION

1. The installation of off-set closet flanges is prohibited.
2. All floor drains are to be provided with P-trap the same size as the floor drain. All floor drains are to have trap primers.
3. Provide flashing membrane for all floor drains in structure above slab on grade level.
4. Lubricate cleanout plugs with mixture of graphite and linseed oil. Prior to building turnover remove cleanout plugs, relubricate and reinstall using only enough force to ensure permanent leakproof joint.
5. Provide flashing for all floor drains, floor cleanouts and shower drains above grade. Make watertight with Chloraloy 240 underslab moisture vapor barrier as manufactured by the Nobel Co. of Grand Haven, Michigan. Flashing shall extend at least 24" from drain rim into floor membrane or on structural floor. Fasten flashing to drain clamp device and make watertight, durable joint. Provide flashing collar extension with all drains and cleanouts installed above grade.
6. Provide full-size clean-outs in all restroom groups. Do not locate floor clean-outs in carpeted areas.
7. **Cross-type drainage fittings shall not be installed in waste piping.**
8. All bathrooms to have floor drains.

B. HANGERS AND SUPPORTS: See specific section.

C. INSTALLATION OF PIPING SPECIALTIES

1. Install backwater valves in sanitary building drain piping. For interior installation, provide minimum 13" dia. cleanout cover flush to floor centered over backwater valve cover and of adequate size to remove valve cover for service. Only install as required by code.
2. Above Ground Cleanouts:

i. As required by plumbing code; ii. At each change in direction of piping greater than 45 degrees below slab; iii. At minimum intervals of 50';
iv. At base of each vertical soil or waste stack at 12" AFF; v. At sinks and urinals on grade; vi. At each upper terminal; vii. At egress of building (surface cleanout).
viii. At each water closet or toilet group.

3. Cleanouts Covers: Install floor and wall cleanout covers for concealed piping, and in accessible locations.
4. Flashing Flanges: Install flashing flange and clamping device with each stack and cleanout passing through waterproof membranes.
5. Vent Flashing Sleeves: Install on stacks passing through roof, secure over stack flashing in accordance with manufacturer's instructions.

D. PIPE AND TUBE JOINT CONSTRUCTION

1. Install pipes and pipe joints in accordance with appropriate sections.

E. INSTALLATION OF FLOOR DRAINS

1. Install floor drains at low points of surface areas to be drained. Set tops of drains flush with finished floor.
2. Trap all drains connected to the sanitary sewer with minimum trap size that of drain connected.
3. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.
4. Position drains so that they are accessible and easy to maintain.
5. Provide trap primers for all drains. F. WASTE, VENT, AND STORM PIPING:

1. All waste, vent, and storm drain piping shall be properly pitched at 1/4 inch to the foot (or 2%) minimum for 4" and smaller pipe and 1/8 inch (or 1%) minimum for 5 inch and larger. Piping shall be properly supported so that it will not sag and form pockets. Exceptions must be approved in writing by Poudre School District, and approved by the Administrative Authority.
2. The manufacturer's recommendations shall be carefully followed when installing pipe using neoprene gasket joints.
3. Locate vertical hubs of underground piping below partition walls for concealment. In locations where hubs will project beyond finish partition wall, set hubs 1" below finished floor.
4. All waste, vent, and storm pipe underground outside of building shall be buried a minimum of 3'-6" deep. Install tracer wire on all exterior utilities. Terminate in an approved termination box.
5. Where waste lines from fixtures are to be acid resistant, the vents shall also be acid resistant through roof. G. CLEANOUTS:

1. Full size brass cleanout plugs.
2. Wall cleanouts located 4" to 6" above floor with chrome-plated covers. Bottom of cleanout cover shall be 1" minimum above top of baseboard.
3. Provide at 50 feet maximum intervals for all pipe sizes and wherever pipes change direction 45 degrees or more.

4. Scored brass cover for floor cleanout installed flush with the floor.
5. Outside of building starting 10 feet from perimeter wall:
    i. Locate every 100 feet.
    ii. Heavy cast iron tractor cover set in 2' x 2' x 6" concrete block.
    iii. 4" size acceptable in pipes larger than 4".
6. Submit proposed locations of cover plates to PSD.
7. Do not install floor cleanouts in carpeted areas.
8. If a cleanout must be installed in a carpeted area, use a wall cleanout.

H. SERVICE CONNECTIONS

1. Provide new sanitary and storm sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

I. CONNECTIONS

1. Piping Runouts to Fixtures: Provide drainage and vent piping runouts to plumbing fixtures and drains, with approved trap; but in no case smaller than required by the plumbing code.
2. Locate piping runouts as close as possible to bottom of floor slab supporting fixtures or drains. J. FIELD QUALITY CONTROL 1. Inspections:
    i. During the progress of the installation, notify the plumbing official having jurisdiction and PSD Plumbing Department at least 48 hours prior to the time such inspection must be made.
        a. Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed-in after system is roughed-in, and prior to setting fixtures.
        b. Final Inspection: Arrange for a final inspection to observe the tests specified and to insure compliance with the requirements of the plumbing code.
    ii. Reinspections: Whenever the piping system fails to pass the test or inspection, make the required corrections, and arrange for reinspection.
    iii. Reports: Prepare inspection reports, signed by the plumbing official.
2. Post-Installation Inspection: **The installing contractor shall perform a visual inspection of all below-grade building drain mains using a video camera. Video tapes or CD's of each main shall be recorded, accurately labeled for review by the Owner's representative and the Engineer.** The Owner shall be provided with a copy of the video tapes/CDs. Owner to be notified of time of video inspection and have option to be present.

3.03 Cleaning and Protection

END OF SECTION 22 13 16

SECTION 22 13 23 – SANITARY WASTE INTERCEPTORS

Part 1: General

1.01 Summary

1.02 Related Sections

1.03 Definitions

1.04 Submittals Required A.
Product Data:
B. Shop Drawings:
C. Record Drawings:
D. Maintenance Data:

1.05 Quality Assurance
A. Manufacturer's Qualifications: not less than 5 years.
B. Codes and Standards:
1. PDI Compliance: Test and rate grease interceptors in accordance with PDI Standard G101, "Testing and Rating Procedure for Grease Interceptors."

1.06 Scheduling

1.07 Delivery, Storage, and Handling

1.08 Regulatory Requirements

Part 2: Products

2.01 Manufacturers
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Grease Interceptors:
i. Copeland Enterprises, Inc.
ii. Front Range Pre-Cast Concrete iii. Colorado Precast

2.02 Products
A. GREASE INTERCEPTORS
1. Unit shall be pre-cast concrete, as manufactured by Copeland Enterprises, Inc., 904 S. Lipan, Denver, CO 80223, Phone No. 936-4817, Front Range Precast Concrete, ***Colorado Precast, or approved equal.***
i. **No multi-piece grease traps shall be accepted**. Grease traps must be one-piece vault with lid as per the Colorado Precast Concrete Specifications.
2. Variations: Provide the following construction feature variations:
i. Lift out sediment bucket.
ii. Enzyme opening.
3. Unit shall be complete with internal baffle for secondary compartment of one-third the total capacity, and concrete cover, with manholes.
4. Unit shall be reinforced with 6x6, 10/10 mesh and three No. 4 horizontal re-bar in walls. Cover reinforced with No. 5 re-bar at 8" o.c. and No. 5 around manholes.
5. **Install approved sill cock within 25' of all grease traps.**
6. Manholes to Grease Trap:

i. Manholes shall be constructed of pre-cast concrete rings manufactured to ASTM specifications, and laid up in cement mortar. Construct to conform with City***, and State*** Standards with the top to meet a 24" diameter cast iron manhole ring and cover. Cover must be flush with finish grade. Provide heavy duty type ring and cover, gas-tight, Model 1073.

Part 3: Execution

3.01 Preparation

3.02 Installation

3.03 Cleaning and Protection

END OF SECTION 22 13 23

SECTION 22 14 13 – FACILITY STORM DRAINAGE PIPING

Part 1: General

1.01 Summary

A. This section specifies storm drainage and vent piping systems, including drains and drainage specialties.

1.02 Related Sections

1.03 Definitions

1.04 Submittals Required A. Product Data:

B. Shop Drawings:

C. Record Drawings:

D. Maintenance Data:

1.05 Quality Assurance

1.06 Scheduling

1.07 Delivery, Storage, and Handling

1.08 Regulatory Requirements

Part 2: Products

2.01 Manufacturers

A. Manufacturer: Subject to compliance with requirements, provide drainage and vent systems from one of the following:

1. Drainage Piping Specialties, including drains and cleanouts:

i. Josam Mfg. Co.

ii. Smith (Jay R) Mfg. Co. iii. Zurn Industries Inc; Hydromechanics Div.

iv. Wade

2.02 Products

A. PIPE AND FITTING

1. Building storm and sanitary sewer below grade: Cast iron bell & spigot with resilient gasket joints**. Schedule 40 solid core PVC pipe and fittings. Purple Primer must be used. Foam core pipe will not be accepted. Cross Fitting will not be accepted.**
2. Sanitary, storm and roof drains above grade: Cast iron no-hub, bell & spigot, or copper type DWV. No drain shall be less than 2" nor any drain less than 3" extended more than 20'. Cross fittings are not to be used.

B. STORM DRAINAGE, VENT AND SUBSURFACE DRAINAGE PIPE AND FITTINGS

C. DRAINAGE PIPING SPECIALTIES: See Section 22 13 16.

D. ROOF DRAINS

1. Roof drain.

i. RD-1

a. Cast iron body with sump, removable cast iron vandal-proof dome strainer, cast iron flashing flange and cast iron ring with integral gravel stop, underdeck clamp.
Jay R. Smith Fig. 1010

ii. OFD-1 Overflow Drain

a. Cast iron body with sump, removable cast iron vandal-proof dome strainer, cast iron flashing flange and cast iron clamp with integral gravel stop, cast iron underdeck clamp, 3-1/2" high water dam standpipe under dome strainer; where standpipe is set down in sump drill four 1/4" dia. holes, spaced evenly, at base of standpipe for sump drainage.

b. Jay R. Smith Fig. 1070

Part 3: Execution

3.01 Preparation

3.02 Installation A. INSTALLATION

1. Install overflow roof drains with the inlet flow line located a maximum 2" above the lowest point of roof.

B. PIPE AND TUBE JOINT CONSTRUCTION

1. Install pipes and pipe joints in accordance with appropriate sections.

C. INSTALLATION OF ROOF DRAINS

1. Install roof drains at low points of roof areas, in accordance with the roof membrane manufacturer's installation instructions.
2. Install drain flashing collar or flange so that no leakage occurs between roof drain and adjoining roofing. Maintain integrity of waterproof membranes, where penetrated.
3. Position roof drains so that they are accessible and easy to maintain. D. Building Sanitary and Storm Sewer:

1. Locate sewer lines not closer than ten feet horizontally from potable water lines except that if the top level of the sewer is three feet or more below the bottom level of the water line, the horizontal distance between the lines may be reduced to six feet. ***Provide tracer wire on all exterior utilities, terminated tracer wire in an approved termination box.***

2. Where sewer lines cross potable water lines the distance between shall not be less than three feet and the sewer line constructed of standard weight cast iron or Class 50 ductile iron.

3. When encountering unstable soil or when the sewer excavation is through solid shale, slate, sandstone or similar hard material, bed the pipe in 3/4" to 1-1/2" crushed rock or gravel 6" all around the pipe. E. Roof Drains:

1. Locate at the midspans of the roof steel.
2. Provide flexible connections to risers.
3. Drain to storm sewer or on-site above grade drainage.
4. Where internal overflow drains are required. do not connect to the roof drain piping. Extend separate lines to the storm drain outside the building.
5. Discharge roof drains into public storm sewers and not over sidewalks or at the tops of embankments, ***do not locate at exterior door locations.*** Locate effluent to preclude soil erosion.

3.03 Cleaning and Protection

END OF SECTION 22 14 13

SECTION 22 16 00 – KITCHEN PIPING

Part 1: General 1.01

Summary

A. This section specifies kitchen piping systems.

1.02 Related Sections

1.03 Definitions

1.04 Submittals Required A. Product Data:

B. Shop Drawings:

C. Record Drawings:

D. Maintenance Data:

1.05 Quality Assurance

1.06 Scheduling

1.07 Delivery, Storage, and Handling

1.08 Regulatory Requirements

Part 2: Products

2.01 Manufacturers

2.02 Products

A. PIPE AND FITTING

1. Exposed connections to equipment located in areas scheduled to have carpet or resilient floor coverings, as in a kitchen.

i. Red brass, standard weight screwed ends, full iron pipe size chrome plated. Fittings brass standard weight, screwed, chrome plated.

B. NO KITCHEN WATER LINES ARE TO BE LOCATED IN EXTERIOR WALLS. Pipes can be mounted to interior of walls (under counters) if they are insulated and have washable surface casing.

C. Kitchen Hose bibs/hose connections must have appropriate backflow prevention devices. All outdoor hose-bibs are to be "Woodford" key-type with vandal-proof cover and have an access panel for isolation valves. Kitchen should have a Hose-bib outside of kitchen within 30 feet of grease trap.

D. Kitchen Water Supply is to be 140 Degrees F., with the exception of hand wash sinks. (Check Larimer County health regulations on hand wash sink temps.)

E. Kitchen Sanitary and grease cleanouts are to be installed in the floor (when not in carpeted areas) and made accessible. (Not behind disposal or dish machine, for example), if necessary cleanouts can be in exterior walls with a cover-plate.

F. Kitchen Shut-off Valves are to be easily accessible either behind kitchen equipment or in ceiling or access panels. Plumbing is to be done so that valves are easily reached inside access panels. This applies to kitchen equipment and HVAC valves.

Part 3: Execution

3.01 Preparation

3.02 Installation

3.03 Cleaning and Protection

END OF SECTION 22 16 00

SECTION 22 30 00 – PLUMBING EQUIPMENT

Part 1: General

1.01 Summary

A. SCOPE OF THE WORK
   i. Sanitary Drainage System.
   ii. Storm Drainage System.
   iii. Domestic Water System.
   iv. Plumbing Fixtures.
   v. Compressed Air System.
   vi. Natural Gas System.

B. CONNECTIONS TO MISCELLANEOUS EQUIPMENT

C. SANITARY AND STORM SEWER SERVICE
   1. Provide minimum 3'6" cover over sewer line(s) outside of building. Provide main cleanout where sewer(s) leaves building. ***All exterior utilities are to have tracer wire installed. Terminate in an approved termination box.***

D. NATURAL GAS SERVICE
   1. All underground gas service shall be approved piping; i.e., (P.E.) by gas with tracer wire.

E. WATER SERVICE
   1. Job specific. ***All exterior utilities are to have tracer wire. Terminate in an approved termination box.***

1.02 Related Sections

1.03 Definitions
1.04 Submittals Required
1.05 Quality Assurance
1.06 Scheduling
1.07 Delivery, Storage, and Handling
1.08 Regulatory Requirements
1.09 LCHD – letter at end of section regarding Instant Hot Water Dispensers.

Part 2: Products

2.01 Manufacturers

2.02 Products A. CLEANOUTS*

1. Provide cleanouts as manufactured by Josam, Jay R. Smith, Wade, or Zurn. Cleanouts shall be full line size through 4" pipe.
2. Cleanout covers shall be "brass," square raised or recessed caps.
3. Inside caulk or spigot connections, bronze cleanout plug, straight threaded with tapered shoulder and caulked lead seat. Plugs shall be removed, doped, and reinstalled just tight enough to prevent leakage.
4. Screwed pipe cleanouts-bronze pipe threaded plug with four raised square lugs or counter sunk plug.
5. Floor Cleanouts (FCO): Frame and cover threaded for 1-1/2" vertical adjustment, threads protected with shield to be removed when concrete is set. Covers: Nickel bronze round frame and cover, deep flange tractor type. Extra heavy type in heavy traffic areas, and with carpet retainer top for carpeted floors. **(Cleanouts will not be located in carpeted areas.)**
6. Wall Cleanouts (WCO): Square nickel bronze frame and cover with minimum opening of 6" x 6".
7. Grade Cleanouts (GCO): Cast iron cleanout with round, heavy-duty scoriated, non-tilt cast iron top, adjustable to finished grade level. Set GCO in 2' x 2' x 4" deep concrete pad, minimum.
8. Cleanouts: Located at changes in direction of pipe run and shall consist of 'Y' fittings and eighth bends. Cleanouts shall be provided at the base of all vertical stacks with the cleanout plug located approximately 12 inches above the floor and extended to wall access cover. Cleanouts in horizontal runs above ground shall consist of 'Y' fittings with cleanout plugs. Cleanouts must be provided in every 100 ft. of horizontal run, and as per the ***International*** Plumbing Code. Cleanouts in carpeted floors should be avoided if at all possible. Use wall C.O.'s or C.O.'s in adjacent floors not carpeted.

B. FLOOR DRAINS*

1. Provide floor drains of type specified herein. Sizes and locations shall be as indicated. Drains specified herein are Zurn. Josam, Wade, or J.R. Smith meeting specifications will be acceptable.
2. Floor drains shall be cast iron with double drainage flange, nickel-bronze rim and strainer. Provide clamping ring when installed in floors that have waterproof membrane. Drains connected to cast iron soil pipe shall have spigot outlets.
3. Trap primers shall be ***Used on all floor drains and floor sinks.***
4. Floor drains in slabs on ground.

i. FD-1 Floor Drains shall be Z-415 with 6" diameter Type 'B' strainer and Z1000 cast iron deep seal P-trap.

5. Floor, shower, and area drains in slabs above ground.

i. Floor drains shall be Z-415 with 6" diameter Type 'B' strainer and Z1000 cast iron deep seal 'P' trap. All exposed parts to be nickel bronze. Clamping ring will be required for floor drains in mechanical equipment room(s). Strainers for drains in equipment room may be brass in lieu of nickel-bronze.

C. FLOOR SINK*

1. Floor sink FS-1 shall be epoxy or porcelain coated cast iron, acid resisting, 12" x 12", acid resisting anti-splash dome strainer, ***Foot Traffic rated grate.*** (acid resisting), 8" deep, 3" inside caulk bottom outlet, wrapped with water resistant wall covering 6" above faucets; i.e., tile or equivalent; Zurn Z-1901 or equivalent.

D. ROOF DRAINS*

1. Drains specified herein are Josam. Zurn, Wade, or J.R. Smith OR APPROVED EQUAL.
2. No plastic domes shall be accepted. Domes must be bolted down. Tar is unacceptable. ***With no-hub bottom outlet***
3. Roof drains shall be cast iron, combination clamping ring and gravel guard, under deck clamp, aluminum or cast iron dome enclosing entire drain sump, insulation extension sleeve of the same thickness as insulation. Where metal deck is used, provide a steel roof sump formed to receive roof drain without any raise in insulation at roof drain.

   i. RD-1: 21500-3-10. ii. ORD01: Same as above, except provide option 16 3" internal waterguard (standpipe) for drains used as overflow drains.
4. Provide 42" x 42" 4 pound per square foot lead pan or 16 ounce cold rolled copper flashing flanges for each drain.
5. Downspout nozzles shall be all bronze construction with threaded inlet and wall flange. Nozzles shall be similar to Josam 25010. Do not place downspouts where they could drain to exterior walking path.

E. VENTS THROUGH ROOF

1. Flash vents through roof with 24" x 24" x 4 lb. minimum size sheet lead. Extend lead five inches above the vent and turn down into vent pipe. Do not install vents within two feet of roof edge, parapet or wall line of an "on-the-roof structure."
2. All plumbing vents through the roof shall terminate with cast iron vandal proof vent caps. Vent caps shall be similar to Wade W-3680, or equal by Josam, Smith, or Zurn.

F. SHOCK ABSORBERS*

1. Shock absorbers shall be furnished and installed at all solenoids and other quick closing valves and flush valves. Provide and install access doors for all shock absorbers. Each shock absorber shall have a shut-off ball valve for replacement. Shock absorbers shall be the gas filled stainless steel bellows type, sized and installed per requirements of PDI-WH-201. Josam, Smith, Wade, or Zurn.

G. BACKFLOW PREVENTER*

1. Shall be the reduced pressure type with atmospheric vent.
2. Bronze body and accessory construction and replaceable seats.
3. Bronze body ball valve test cocks and 1/4 turn ball valves on inlet and outlet.
4. With bronze strainer, flanged adapter ends or unions, and air gap fitting.

5. Manufacturer and model:
    i. Watts Model 909, all sizes, ***only***

H. PRESSURE REDUCING VALVE*
1. Where main pressure exceeds 80 psi, provide, a domestic water pressure reducing valve as manufactured by Watts, Fisher, or approved equal. Provide isolation valves and unions on both sides of all PRVs.
2. Valve shall be of bronze body construction with renewable stainless steel seat, adjustable outlet pressure, and suitable for inlet pressures up to 150 psig. Valve shall be initially set for 60 psig discharge pressure.
3. Install main shut-off valve not more than 5' AFF.
4. Backfill:
    i. Backfill within 2 feet of manhole shall be free from rocks and lumps. Dispose of excavated material promptly.

I. ACID NEUTRALIZING BASIN*
1. Centralized sinks to drain to tanks above slab or under cabinets must have unions on each side.

J. EMERGENCY GAS SHUT-OFF*
1. Provide a control panel near teacher's desk in each lab or shop designated on plans to include:
    i. Push-button "Off" for gas solenoid valve.
    ii. Key-operated valve open. iii. Pilot light for valve open.
2. Panel to be 8" x 6" x 4" deep, stainless steel front, as made by ASCO Model AEP 7200, 24 volt, or prior approved equal.
3. Provide a 24V gas solenoid shut-off valve for each room wired to control panel by Mechanical Contractor. ASCO Model 8030 A17, 1/2" pipe size.
4. Provide manual shut-off and union upstream solenoid shut-off.

K. THERMOSTATIC MIXING VALVE* 1. Acceptable Manufacturers:
    i. ~~Powers Hydroguard No. 431~~.
    ii. Leonard TM Series Dual Stage
    iii. Approved Equal.
2. Mixing valve shall be capable of instant compensation for fluctuations in supply pressure and/or temperature of either supply to provide constant mixed water temperature at variable flow rates. Valve shall have a thermostatic element capable of accurate control of water temperatures between 95 and 115 degrees F. Valve shall have automatic safety feature for safe shutdown in event of failure of either the cold or hot supply. Valve shall be bronze or copper construction and tested to 300 lb. working pressure. Mixing valve trim shall include spring loaded check valves, strainers and screwdriver stops. Polished chrome plated, less cabinet. ___ GPM at ___ psi pressure differential. With thermometer on outlet. Provide Leonard TM Series Dual Stage.

Part 3: Execution

3.01 Preparation

3.02 Installation

3.03 Cleaning and Protection

END OF SECTION 22 30 00

LARIMER COUNTY
COMMITTED TO EXCELLENCE

DEPARTMENT OF HEALTH AND ENVIRONMENT

1525 Blue Spruce Drive
Fort Collins, Colorado 80524-2004
General Health (970) 498-6700
Environmental Health (970) 498-6775
Fax (970) 498-6772

February 22, 2013

Mr. Jim Tishmack
Plumbing Department
Poudre School District
2407 LaPorte Avenue
Fort Collins, Colorado 80521

Dear Mr. Tishmack,

This letter is to follow up on our recent conversation concerning installation of Instant Hot Water Dispensers at classroom sinks and kitchen labs in schools within Poudre School District. As discussed, installation of these devices to supplement the school's existing water heating system would not be allowed due to the potential scolding hazards associated with them. In addition, Section 3-606 of the Rules and Regulations Governing Schools in the State of Colorado requires hot water delivered to sinks to be maintained between 90°F – 120°F.

The devices are not intended to supplement a water heating system, but to provide hot water, approximately 200°F, for the preparation of hot beverages and instant foods such as cereals and soups. A single device installed in a cafeteria, teachers lunchroom or kitchen lab would be allowed, if it is utilized for beverage of food preparation only.

Thank you for your inquiry and please feel free to contact me at 498-6780 if you have any additional questions.

Sincerely,

Jim Devore, REHS
Environmental Health Specialist

Cc J.Holcombe via jholcomb@psdschools.org

SECTION 22 31 00 – WATER TREATMENT

Part 1: General 1.01

Summary

A. Includes necessary equipment, chemicals, and service for the following systems:
   1. Cleaning of Piping Systems
   2. Sterilization of Domestic Water System

B. Provide service program, including chemicals if applicable, for a period of one year from start-up date of equipment, including the following:
   1. Initial water analysis and recommendations.
   2. Systems start-up assistance.
   3. Training of operating personnel.
   4. Periodic field service and consultation.
   5. Customer report charts and log sheets.
   6. Laboratory technical assistance.

1.02 Related Sections

1.03 Definitions

1.04 Submittals Required A. Product Data:

B. Record Drawings:

C. Maintenance Data:

1.05 Quality Assurance

A. Manufacturers and Representative Qualifications. Not less than 5 years, and shall have full-time service personnel located within the trading area of job site.

1.06 Scheduling

1.07 Delivery, Storage, and Handling

1.08 Regulatory Requirements

A. EXTENDED MAINTENANCE SERVICES

1. Agreement to Maintain: Prior to time of final acceptance, submit four copies of "Agreement for continued Service and Maintenance" for water treatment system, for Owner's possible acceptance. Offer terms and conditions for furnishing chemicals and providing continued testing and servicing, and including replacement of materials and equipment, for one-year period with option for renewal of Agreement by Owner.

Part 2: Products

2.01 Manufacturers

A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

1. Water Treatment Vendors:

i. U.S. Filter ii. H-O-H Chemical

iii. Clearwater Systems Corporation

2.02 Products

A. Consider systems that avoid use of chemical systems to achieve the water quality parameters.

Part 3: Execution

3.01 Preparation

3.02 Installation

3.03 Cleaning and Protection

A. CLEANING OF PIPE LINES AND BOILERS

1. **All cleaning and flushing of hydronic systems shall be witnessed by a Poudre School District Plumbing Department Representative. Provide minimum 24 hours notice prior to performing work.**
2. The Water Treatment Contractor shall be responsible for furnishing the cleaning material and supervising the cleaning of the chilled and/or heating piping.
3. The system to be cleaned shall be filled with a solution of 10% by weight of a heavy duty alkaline liquid cleaner. The cleaner shall be capable of wetting and penetrating heavy soil deposits of oil or grease, and keeping these products in suspension, for removal through flushing the system to drain.
4. The cleaning solution shall be circulated for a minimum of 8 hours. At the end of the eight hours, the system shall be flushed to drain, and then refilled with fresh water, taking care to remove any entrapped air from the system.
5. At the end of the cleaning period, the system shall be chemically treated as specified. In no case shall the system being cleaned be left in an untreated condition for more than 8 hours.
6. At the conclusion of the cleaning operation, the Water Treatment Contractor shall certify in writing that the system was cleaned as specified.

B. CHLORINATION

1. Acceptable products are:
    i. Liquid Chlorine Fed. Spec. BB-C120B Hypochlorite Fed. Spec 0-C-114, Type 11, Grade B Fed. Spec. 0-S-60D, Grade A or B
2. After all pressure tests have been performed and piping has been flushed clean, the chemical treatment contractor shall be responsible for sterilizing the domestic water lines.
3. Chlorination procedures shall comply with local code and health department regulations.
    i. Before commencing the chlorination process, the Water Treatment Contractor shall post signs at each water fountain, and on each restroom door, stating that the water is not fit for drinking, and that the water is being chlorinated. ii. Introduce sufficient chlorine into the domestic water system to provide a dosage of not less than 50 parts per million at each faucet and valve. The chlorine solution shall then be allowed to stand for a minimum of 24 hours in the system. iii. At the end of 24 hours test shall be made for residual chlorine at the extreme end of the system from the point where chlorine was introduced. If chlorine residual is less than 10 ppm, the chlorination procedure shall be repeated. iv. Flush the system with a clean supply of water until the chlorine residual in the system is reduced to less than 1 ppm, or to the chlorine residual of the supply water. During the flushing, each faucet and valve in the system shall be opened and closed a minimum of 4 times.
    v. After 24 hours, the water treatment representative will have samples taken and tested by an independent laboratory. The system must be free of bacteriological

contamination. If the system is contaminated, it shall be re-chlorinated until a satisfactory test is made.

vi. The Water Treatment Contractor shall write a letter, informing the Mechanical Contractor that the building has been successfully chlorinated, and that the water is fit for human consumption.

C. TESTING
   1. Closed Systems:
      i. Provide a Nitrite "Drop Test" kit for determining the level of Nitrite or Molybdate in the closed system.

D. SYSTEM START-UP
   1. The Water Treatment Supplier shall put the system into operation, and make adjustments necessary for proper operation.
   2. The Water Treatment Supplier shall provide a written report indicating that the start-up has been completed and that all Water Treatment Equipment is operating properly.

E. TESTING AND CLEANING
   1. Sample all treated water systems at one-week intervals after start-up for period of 4 weeks and prepare certified test report for each system being treated.
   2. Start-up test, and adjust water conditioners in presence of manufacturer's authorized representative. Operate units including regeneration, back washing, rinsing and flushing. Adjust unit to maintain required steady state effluent water quality.
   3. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

F. CLOSEOUT PROCEDURES
   1. Provide services of manufacturer's technical representative for one 8 hour day to instruct Owner's personnel in operation and maintenance of water treatment systems.

END OF SECTION 22 31 00

SECTION 22 33 00 – DOMESTIC WATER HEATERS

Part 1: General

1.02 Summary

1.03 Related Sections

1.04 Definitions

1.05 Submittals Required A.

Product Data:

B. Shop Drawings:

C. Wiring Diagrams:

D. Record Drawings:

E. Maintenance Data:

F. Certificates:

1.06 Quality Assurance

A. Manufacturer's Qualifications: not less than 5 years.

B. SPECIAL PROJECT WARRANTY

1. Warranty on Heat Exchanger, and Burner: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, heat exchangers, and burners with inadequate or defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation.

i. Warranty Period: 10 years from Date of Substantial Completion for the pressure vessel 5 years from date of Substantial Completion for the heat exchanger.

1.07 Scheduling

1.08 Delivery, Storage, and Handling

1.09 Regulatory Requirements

Part 2: Products

2.01 Manufacturers

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Commercial Gas-Fired:

i. ~~AERCO.~~

ii. Bradford White EF Series

iii. Lochinvar

iv. Navian Tankless Water Heaters

2.02 Products

A. COMMERCIAL GAS-FIRED WATER HEATERS

1. General: Provide certification of design by AGA under Volume III tests for commercial water heaters for delivery of 180 deg F (82 deg C) water.

2. The flame monitoring system shall incorporate a U/L recognized combustion safeguard system utilizing interrupted spark ignition and a rectification type flame sensor. An electrohydraulic double seated safety shall be an inherent part of the gas train.
3. Water heater shall incorporate electric probe type low water cutoff and dual over temperature protection including a manual reset in accordance with ASME and CSD-1. Remote fault alarm contacts and sensor failure detection shall be standard equipment. Heater shall operate on 120/1/60.
4. Water Heater shall include integral factory wired operating controls to control all operation and energy input. Control of discharge water temperature shall be set through an internal setpoint with a field adjustment of 100F to 200F. Units shall maintain discharge temperature within specified range through domestic water flow variations from 0 to 100%.
5. Heater shall be capable of maintaining the outlet temperature within an accuracy of +/-4F. This shall be accomplished by modulation of firing rate from 100% to 7% of rated input. Units shall operate with an Inverse Efficiency Curve, with known Part Load Value Efficiencies. Maximum efficiency shall be achieved at minimum firing input.
6. Accessories: Provide brass drain valve; 3/4" pressure and temperature relief valve; and radiant floor shield.
7. Controls: Provide gas pressure regulator; pilot gas regulator; thermostat; and temperature limit control.

B. GAS-FIRED WATER HEATER AND STORAGE TANK*

1. Gas water heater to be Bradford White EF series minimum thermal efficiency of 92% provide separate storage tank and pumping system as needed.

2. Provide check valve on DCW to DHW boiler systems to prevent backflow. (See Valve spec)
3. Centralize H_2O heating with HWC.
4. Tank shall be a separate vertical glass-lined tank, with heavy gauge steel jacket with baked enamel finish. R-16 foam insulation. Cathodic protection. Provide T/P rated relief valve, mercury industrial type thermometer and other accessories and connections as recommended by the manufacturer and/or as detailed.
5. Make taps accessible with union on drain outlet.
6. Units shall be as manufactured by Bradford White, 199,000 Btuh input, and 181 gph recovery at 100-degree temperature rise at sea level. Model TJV-120A tank, 119 gallon storage each, or equal.

Part 3: Execution

3.01 Preparation

3.02 Installation

A. INSTALLATION OF WATER HEATERS

1. Support: Place units on concrete pads, orient so controls and devices needing service and maintenance have adequate access.
2. Piping: Connect hot and cold water piping to units with shutoff valves and unions. Connect recirculating water line to unit with shutoff valve, check valve, and union. Extend relief valve discharge to closest floor drain.
3. Gauges: Provide thermometers on inlet and outlet piping of water heaters, in accordance with Basic Mechanical Materials and Methods Section "Meters and Gauges."

4. Gas-Fired Water Heaters: Connect gas supply to gas line with drip leg, tee, gas cock, and union; full size of unit inlet connection. Locate piping so as not to interfere with service of unit.
    i. Flue: Connect flue to draft hood with gas-tight connection. Provide flue of minimum size as flue outlet on heater. Comply with gas utility requirements.

B. FIELD QUALITY CONTROL

1. Start-Up: Start-up, test, and adjust gas-fired water heaters in accordance with manufacturer's start-up instructions, and utility company's requirements. Check and calibrate controls, adjust burner for maximum efficiency.

C. CLOSEOUT PROCEDURES

1. Training: Provide services of manufacturer's technical representative for 1-half day to instruct Owner's personnel in operation and maintenance of water heaters.
    i. Schedule training with Owner, provide at least 7-day notice to Contractor and Engineer of training date.

3.03 Cleaning and Protection

END OF SECTION 22 33 00

SECTION 22 40 00 – PLUMBING FIXTURES

Part 1: General

1.01 Summary

A. Where there is a conflict between the International Plumbing Code and the International Building Code, the latter prevails.

B. Locate a shut-off ball valve on the water main at the point where it enters the building. Clearly label it as the water main shut off.

C. Provide a pressure-reducing valve, if required, on the water main just downstream of the main shut off ball valve to limit the pressure in the building to 80 psig.

D. The potable water supply system including specialties, valves, pipe and fixtures shall meet the current *Primary Drinking Water Regulations* published by the Colorado Department of Health.

E. Water Service Sizing: Given the enormous difference in the cost of fees for upsizing water tap and meter, careful consideration must be given to both plumbing and irrigation design and sizing. For example, Elementary Schools normally do not need more than a 2" service. F. Sink/Drinking Fountain Combination:
    1. *May be used outside toilet rooms provided the toilet rooms have separate hand washing sinks.
    2. *May NOT be used in science rooms, art rooms, or other spaces where toxic materials are present.

G. No wrist blade handles

H. No column showers

I. No 8” spread Lav Faucets

1.02 Related Sections

1.03 Definitions
1.04 Submittals Required
1.05 Quality Assurance
1.06 Scheduling
1.07 Delivery, Storage, and Handling
1.08 Regulatory Requirements

Part 2: Products

2.01 Manufacturers

A. Floor and Area Drains: Cast iron with a double drainage flange. Acceptable manufacturers:
   1. Josam.
   2. Zurn.
   3. J.R. Smith.
   4. Wade
   5. Or approved equal

B. Roof Drains: Cast iron body with removable cast iron or aluminum dome strainer (no plastic). Acceptable manufacturers:
   1. Josam.
   2. Zurn.
   3. J. R. Smith
   4. Wade
   5. Or approved equal

C. Outside sillcocks by Josam, Smith, Zurn, or Woodford.

2.02 Products

A. Cleanouts of cast iron only.

B. Grease, solids, or oil interceptors:
   1. Concrete only.
   2. Conform to UPC Chapter 7.
   3. Submit sizing calculations to the applicable water and sewer district.

C. Provide one key operated switch and a natural gas normally closed solenoid valve in each lab that uses gas. Mount the key switch on a double gang box with a red pilot light to indicate that the valve is energized and open. Pipe the solenoid to shut off all gas to the lab gas jets. Valve, switch and pilot, 120 VAC. Valve UL listed. The key must be removable in either the on or the off position. D. Provide properly sized neutralization vessels for chemistry labs.

E. Backflow Preventers: ***Watts 909QTU only.***

F. Shock Absorbers: Josam "Absorbotron" water hammer arresters or similar placed in appropriate locations near fixtures that have quick shut off.

G. PLUMBING FIXTURE TYPES*
   1. The plumbing fixtures shall be Kohler, American Standard, vitreous china, white. The stainless steel sinks shall be Elkay or Just only.
   2. The exposed flush, waste, and supply pipes at the fixtures shall be chromium plated brass pipe, iron pipe size. Fittings and traps for brass pipe shall be cast brass, chromium plated.

3. Install chromium-plated brass wall or floor plates with setscrew where piping passes through walls or floors.
4. Chromium-plated brass, same shall mean polished brass, first nickel plated and finished with chromium plate.
5. Furnish faucets, key stops and traps for all fixtures and equipment; Chicago Faucet.
6. Toilet seats shall be Beneke, Bemis, Olsonite or approved equal. Solid plastic; white only.
7. All lavatories and sinks shall be furnished with 3/8" S.P.S. flexible tube supply pipes, key stops and escutcheons, ***Tempered water shall be provided at all hand washing sinks and classroom sinks. Per ASSE1070 or CSA B125.3***.
8. All lavatories and sinks shall be furnished with 1-1/4" tailpiece, cast brass chrome plated 11/4" traps and tailpieces for lavatories and 1-1/2" traps and tailpieces for sinks with cleanout 1-1/2", 17-gauge tubing waste to wall and wall escutcheons.
9. All fixtures fitted to the walls or floor shall be ground square and true and be sealed with mildew resistant non-hardening clear or white silicon bead, with Engineer's approval.
10. The following schedule establishes the standards to which each type of fixture must conform and the plumbing fixture portfolios shall completely illustrate and describe each type.
11. Fixture Mounting Heights: Mount fixtures to the following heights above finish floor: i. Water Closet:
    - a. Standard: 14 inches to top of bowl rim
    - b. Handicapped: 17 - 19 inches to top of seat

    ii. Urinal:
    - a. Standard: 22 inches to top of bowl rim
    - b. Handicapped: 17 inches to top of bowl rim
    - c. Elementary schools iii. 17 inches to top of bowl rim

    Lavatory:
    - a. Standard: 31 inches to top of basin rim
    - b. Handicapped: 33 inches to top of basin rim

    iv. Drinking Fountain:
    - a. Handicapped: 36 inches to top of spout maximum
12. Wall hung fixtures from concrete block shall be supported by wall hangers and fixtures hung from stud partition walls shall have internal wall carriers (submit shop drawings for review) as manufactured by Josam, Wade, Zurn, or approved equal.
13. No off-set flanges shall be used for water closets. Shim with sheet lead if required.
14. Drinking fountains to be hydration station, Oasis Barrier Free Versacooler II, in all new construction and remodels.

PLUMBING FIXTURE TYPES: (Fixture examples from Kohler. American Standard is also approved by PSD Plumbing shop.)

SAMPLE FIXTURES FROM PAST PROJECTS:

Classroom Sink*

Fixture: Elkay LR-2219, Type 302 stainless steel, 18 gauge, self-rimming, and sound deadened. 22" x 19-1/2" O.D. and 18" x 14" x 7-1/2" deep bowl with faucet ledge. Drain shall be Elkay LK-35.

Faucet: ***Chicago Faucet # 527 with DB6AJKCP spout, .5 GPM aerator and 369 handles. With ¼ turn ceramic cartridges.***

Bubbler: Chicago 748-665 CP self-closing, push-button, with adjustable stream regulation. Mount in front fight side in faucet ledge.

Classroom Sink*

Fixture: Elkay DRKR-2220 single compartment, Type 302 stainless steel, 18 gauge, self-rimming,

Fixture: Kohler K-7827-K or K-16010-3.2-bowl, 18-gauge stainless sinks.

Faucet: ***Chicago Faucet # 527 with DB6AJKCP spout, .5 GPM aerator and 369 handles. With ¼ turn ceramic cartridges.***
Chicago 748-665 CP
0.5 GPM aerator

Work Sink*

Fixture: Elkay LR-2022, Type 302 stainless steel, 18 gauge, self-rimming and sound deadened. 22" x 19" O.D. and 16" x 16" x 7-1/2" deep bowl with faucet ledge. Drain shall be Elkay LK-35.
and sound deadened. 22' x 19' O.D. and 13-1/2" x 16" x 7-1/2" deep bowl with faucet ledge. Drain shall be Elkay LK-35 (***4 holed punched, 3 for faucet and 1 for bubbler.)*** Set sink so cold water is first handle reached.

Faucet: ***Chicago Faucet # 527 with DB6AJKCP spout, .5 GPM aerator and 369 handles. With ¼ turn ceramic cartridges.***
Chicago 748-665 CP

Faucet: 1 rigid gooseneck spout, 0.5 GPM aerator and ***369*** lever handles.
Chicago 748-665CP

Bubbler: Self-closing, push-button, with adjustable stream regulation. Mount in front right side in faucet ledge.
Chicago 748-665CP

Art room sinks to have clay traps installed. Provide unions on inlet and outlet of traps. Do not install bubbler at art room sinks. Provide an eyewash in each artroom, science room, and tech ed room.

Teachers' Lounge and Home Ec Sinks* *3 HOLE*

Faucet: Chicago 748-665 CP

Lavatory (Wall Hung, Handicapped)*

Fixture: Kohler Greenwich K-2027 with offset drain K-13885 or equivalent American Standard. White vitreous china, 20" x 27" O.D. Absolutely no wide-spread lavatory faucets.

Supplies/Drain: K-13885 1-1/4" offset drain with strainer. K-13711 3/8" I.P.S. supplies with loose key stop, 32753 tailpiece, and K-8998 1-1/4" brass P-trap.

Faucet: Chicago ***802-VE2805CP with ¼ turn ceramic cartridges.*** 0.5 GPM aerator.

Carrier: Concealed arm carrier Josam 17100-67.

Lavatory (Wall Hung)*

Fixture: Kohler Greenwich K-2032. White vitreous china, and 5" high integral back. 20" x 18" O.D. 14" x 10" bowl, with 4" faucet centers.

Faucet/Drain:

Chicago 802-VE2805CP with ¼ turn ceramic cartridges. Drain to be perforated grid drain. 0.5 GPM aerator**.**

Carrier: Concealed arm carrier Josam 17100-67.

Lavatory—Countertop (Oval)

Fixture: Kohler Pennington K-2196-4 20" x 17" vitreous china, self-rimming, countertop lavatory, 4" centers.

Faucet/Drain: Same as L-1 above.

Shower Trim (Handicapped)*

Delta 11T514

Valve: Pressure balanced valve with integral stops, lever handle, volume and temperature limit stops, 2.50 GPM flow restrictor, or equal by Moen Moentrol.

Head: Wall/hand shower with flexible metal hose, wall connection, and flange. 24" slide bar for hand shower mounting.

Water Closet (Floor Mounted, Siphon Jet)*

Fixture: Kohler Wellworth K-4406, 1.28 GPF elongated bowl, 1-1/2" top spud, rim at 15" AFF, White. No wall mounted water closet allowed. Equals by American Standard.

Flush Valve: Sloan Royal 111-1.28 toilet flush valve, 1.28 GPF. Equals by Zurn.

Seat: Olsonite #95, Solid Plastic.

Closet Bolts: 5/16" Solid Brass.

Water Closet (Floor Mounted, Siphon Jet, Handicapped)*

Fixture: Kohler Highline K-4405, 1.28 GPF elongated bowl. 1-1/2" top spud, 18" high, White. ADA

Flush Valve: Sloan Royal 111-1.28, 1.28 GPF toilet flush valve. Equals by Zurn.

Seat: Olsonite #95, Solid Plastic.

Closet Bolts: 5/16" Solid Brass.

Urinal*

Fixture: Kohler Bardon K-4904-ET, 0.125 GPF urinal. Wall hung with block wall type carrier, siphon jet with ¾" inlet top spud. Outlet threaded 2" inside. Equals by American Standard or Crane. All urinals to have removable strainers.

Flush Valve: Sloan Royal 186- 0.125 exposed urinal flush valve. 0.125 GPF. Equals by Zurn.

Drinking Fountain (Wall Hung, Handicapped)*

Fixture: Haws 1118. Stainless steel one-piece fountain with rounded front and bottom cover plate. 6-1/2"H x 20"L x 12"W overall dimensions. With #5010 bubbler and mounting plate for CMU wall.

Fixture: Hydration Station

Single unit Oasis P8SBF with Oasis PWEBF bottle counter and bottle filler. Double unit standard and handicapped height Oasis P8SBFSL with PWEBF bottle counter and bottle filler.

Mop Service Basin (Terrazzo, Corner)*

Fixture: Stern-Williams EBC-150. 36" x 36" x 6". Cast brass drain with nickel bronze strainer. Provide with aluminum cap for exposed sides. Set in Durabond 90 or sand and cement. Wrapped with water-resistant wall covering 6" above faucet.

Faucet: ***Chicago 897-RCF with ¼ turn ceramic cartridges.***
Sink fitting with integral stops, bucket hook on spout, 3/4" hose thread end, vacuum breaker, adjustable top brace, inlets on 8" centers, chrome finish

Wash Fountain (Handicapped)*

Fixture: ***WF-1 Bradley Model MG-3 Express Lavatory System. With powered infrared activation. .5 gpm flow rate. The infrared sensor to automatically shut water flow off after 30-45 seconds if sensor is covered or blocked. 110/24 VAC plug in transformer. Vernatherm thermostatic mixing valve with combination stop, strainer and check valves. Provide ball valve shut offs upstream of regulating equipment.***

Drinking Fountain (Cuspidor Combination)

Fixture: Haws Model 2403, semi-recessed, wall-hung, stainless steel drinking fountain cuspidor, self-closing bubbler, automatic volume regulator, piping to spreader furnished, flush is activated when fountain is used. Unit to be furnished with trap and cleanout to wall.

Service Sink–Floor Mounted

Fixture: Fiat Model MSB-3624 mop service basin, 36" x 24" x 10" molded stone with shelf, combination dome strainer and lint basket. Set in Durabond 90 or sand and cement. Wrapped with water-resistant wall covering 6" above faucet.

Faucet: ***Chicago 897-RCF with ¼ turn ceramic cartridges.***
Service sink faucet with bucket hook, hose end, vacuum breaker, top brace, and stops in shank. Cast brass drain with strainer and socket for 2" outlet, caulk connection.

Shower (Trim)

Fixture: Pressure balancing valve with volume control, back-to-back capability, chrome lever handle and stops, adjustable shower head, arm, and flange. Valve same as SH-1.

Emergency Shower/Eyewash* ***8300-8309***

Fixture: Haws Model combination emergency shower and eyewash. ***SP829SS***

Shower Head: Model stainless steel 10" diameter.

Valve: Chrome-plated brass 1-1/4" self-closing ball valve.

Eyewash: **11" Diameter stainless steel bowl with Axion MSR eye/face wash head with inverted directional flow, antimicrobial protection, laminar flow, and integral flow control.**

Standard: 1-1/4" stainless steel pipe with 9" floor flange.

Other: Use brass fitting and pipe on eyewash water (no galvanized).

Or equal by Fisher Scientific, Guardian, or Bradley.

Part 3: Execution

3.01 Preparation

3.02 Installation

A. Terminate vents with a vandal proof ***cast iron*** cap that prevents the insertion of obstructive objects. Install a check valve in each gas jet in labs to prevent water being injected into the gas line.

B. Make no connection from the potable water lines to any service that contains ethylene glycol antifreeze or water treatment chemicals even if that connection is protected by a backflow preventer.
C. Ethylene glycol is ONLY allowed in chilled water systems and must be protected by an approved pressure reduced Backflow Preventer.

3.03 Cleaning and Protection

END OF SECTION 22 40 00

SECTION 22 70 00 – PUMPS

Part 1: General 1.01

Summary

A. For water or water/glycol pumping services.
B. The Consultant shall specify and include in the Equipment Schedule two operating points for any pump that may operate under more than one condition; i.e., one pump or two pumps running.

1.02 Related Sections

1.03 Definitions

1.04 Submittals

A. Two copies for each pump service offered.
B. Certified dimensional drawings including locations, sizes and types of each piping connection, baseplate mounting details and electrical connections.
C. Installation, maintenance, disassembly, operating and parts-list manuals.
D. Recommended spare parts list.
E. Characteristic design curve.
F. Standard manufacturer's catalog data.

1.05 Quality Assurance

1.06 Scheduling

1.07 Delivery, Storage, and Handling

1.08 Regulatory Requirements

A. HI - Hydraulic Institute - *Standard for Centrifugal Pumps.*
B. ASTM - American Society for Testing and Materials.
C. NEC - National Electrical Code.
D. NEMA - National Electrical Manufacturer's Association.

Part 2: Products

2.01 Manufacturers

A. Acceptable manufacturers for water pumps larger than 1/2 HP:
    1. Taco
B. Acceptable manufacturers for water pumps 1/2 HP and less:

1. Taco. ***Use cartridge pumps whenever possible.***

2.02 Products

A. SINGLE ASSEMBLY FRAME-MOUNTED ON A COMMON BASEPLATE:
   1. Pump.
   2. Electric drive motor.
   3. Shaft coupling and guard.
   4. Baseplate.
   5. Pressure gauges and pressure/temperature taps.

B. SERVICE
   1. Performance specified by the Engineer.
   2. Vibration shall be such that the value of self-excited vibration velocity is less than 0.10 inch/second when measured with a vibration meter on the frame or bearings of the pump assembly in any of the three axes. The pump and motor assemblies shall be both statically and dynamically balanced so as not to exceed the vibration limits.
   3. ***All motors to be "Premium Efficiency."***
   4. The nameplate horse power rating without consideration of the service factor, shall not be exceeded at any point along the performance curve of any pump at its rated rpm.

C. CONSTRUCTION DETAILS FOR PUMPS LARGER THAN 1/2 HP
   1. Horizontal centrifugal end suction or split case, cast iron bronze fitted.
   2. Constantly rising characteristic curve from design point to minimum flow.
   3. Bronze impeller.
   4. Regreasable ball bearings.
   5. John Crane mechanical seals with carbon seal rings and ceramic seats.
   6. Non-ferrous metal nameplate with manufacturer's name, model number, GPM, head, impeller diameter and RPM.
   7. ***Suction Diffusers to be used on base mounted pumps.*** **Suction diffusers to be supported. Provide proof construction screen has been removed after system has been flushed.**

D. Bronze fitted in-line centrifugal pumps of 1/2 HP or less may be used as circulators or boosters in heating, hot potable or other closed loop water systems. In-line pumps larger than 1/2 HP are strongly discouraged. If space limitations do not permit base mounted pumps, the choice of inline pumps will be decided jointly by the Engineer and the District.

E. HOT WATER HEATING PUMP AND DOMESTIC HOT WATER CIRC PUMPS*
   1. Pumps shall be of type and have characteristics as scheduled and shall be as specified herein. Pumps shall have mechanical seals designed for hot water service to 220 degrees F, steel shafts, renewable wearing rings, bronze impellers, and casings designed for 150 PSIG working pressure. Pumps, except close-coupled type, shall have flexible couplings of nonmetallic or single barrel spring design. Multiple spring couplers will not be accepted.
      i. Acceptable Manufacturers:
         a. Taco
         b. Bell & Gossett
         c. Armstrong
         d. Grundfos
         e. Wilow

2. Pump manufacturer shall machine the pump impellers, if necessary, to meet capacities scheduled. Pumps shall be dynamically balanced prior to shipment.
3. Sump pump discharge above ground:
    i. Piping shall be type "L" hard drawn copper water tube with directional fittings wrought copper solder joint. Valves to be rated for appropriate temperature.

Part 3: Execution

3.01 Preparation

3.02 Installation

A. Place unions or flanges between the pump and the isolation valves on the suction and discharge lines so that the pump may be removed for service without cutting the piping. Provide for temporary "by-pass" when pump is removed.

B. Include pressure gauges and P/T taps in the suction and discharge lines in locations that will provide a reasonably accurate check of pump performance, and on both sides of the strainer.

C. Field level and alignment:

1. Level and align pumps and motors on bases and foundation pads in accordance with the manufacturer's instructions and within their recommended tolerances using and indicating micrometer. Do this prior to connecting any piping or electrical to pump.
2. Recheck levels and alignment after piping and electrical connections are made and prior to placing each pump in operation. Make adjustments to assure that the thrust is balanced, that the shaft rotates freely when turned by hand, and that the pump is quiet.
3. **Verify alignment and vibration with PSD Plumbing department.**
4. When adjustments are complete, tighten bolts and grout pump and motor. Lubricate pumps in accordance with manufacturer's recommendations after completion of system installation and prior to startup.

3.03 Cleaning and Protection

END OF SECTION 22 70 00