SECTION 22 00 00

INTRODUCTION

PART 1- GENERAL

A. OVERVIEW
   1. This guideline specification is for the Consulting Engineers and outlines minimum requirements for the District. The Consulting Engineer should apply these guidelines consistent with the budget constraints. The Consulting Engineer must select among the mechanical systems, size and specific equipment and materials within the budget and design limits. The guidelines are based upon considerable experience with the purpose of providing the best values for the available money.
   2. The applicable provisions elsewhere in Divisions 21, 22, and 23 shall apply.
   3. Related Requirements:
      a. Basic Mechanical Regulations: Section 23 00 03
      b. Basic Mechanical Materials and Methods: Section 23 00 04
      c. Mechanical Noise and Vibration: Section 23 05 48
      d. Mechanical Identification: Section 23 05 53
      e. Mechanical Insulation: Section 23 07 00
      f. Demonstrations: Section 23 05 95
      g. System Starting: Section 23 05 97
      h. Condensate Piping: Section 23 21 15
      i. Project Close-Out: Section 23 90 00

B. DESIGN
   1. The Consulting Engineer is required to provide a complete and workable design. The Consulting Engineer is responsible and accountable for his/her work. If in the opinion of the Consulting Engineer any portion of these guideline specifications or system performance function will not be complied with, the Engineer will notify the District in writing.

C. DISTRICT REVIEW
   1. The review of the documents by the District is intended to assist the Consulting Engineer to comply with the guideline specification. The District's review does not relieve the Consulting Engineer of the responsibility, accountability, completeness, and workability of the design.
   2. Review Policy: Documents reviewed by the District shall be prepared in the form of redlined plans and annotated specifications. These documents shall then be reviewed by the Consulting Engineer.
   3. Notification of non-compliance: When any portion of the guideline specifications will not be met, the Consultant shall notify the School District in writing.

END OF SECTION

SECTION 22 01 00

PLUMBING PIPNG

PART 1- GENERAL

A. SUMMARY- SECTION INCLUDES
   1. Domestic Hot and Cold Water Piping
   2. Sanitary Drainage and Vent Piping
   3. Grease Drainage Piping
   4. Roof Drainage Piping and Drains
   5. Floor Drainage Piping and Drains
   6. Valves and Specialties
   7. Cleanouts
   8. Anti-Siphon Equipment
   9. Rough-In for Equipment and Fixtures
   10. Water Meter and Meter Valves, Readout Station and Accessories
   11. Acetylene and Oxygen Piping
   12. Acid Waster and Vent piping
   13. Welding Equipment
B. REFERENCED STANDARDS- MINIMUM CRITERIA
   1. AWWA Standard C651-86
   2. ANSI
   3. ASTM
   4. International Plumbing Code
C. SUBMITTALS
   1. Shop Drawings and Product Data:
      a. Floor, Roof and Area Drains
      b. Cleanouts
      c. Storm Leader Expansion Joints
      d. Overflow Roof Drains
      e. Downspout Nozzles
      f. Wall Hydrants and Hose Bibbs
      g. Shock Absorbers
      h. Acid Neutralization Tanks
      i. Solids Interceptors and Plaster Traps
      j. Grease Interceptor
      k. Welding equipment
      l. Piping, Fittings and Couplings
   2. Operating and Maintenance Data:
      a. Shock Absorbers
      b. Acid Neutralization Tanks
      c. Solid Interceptors and Plaster Traps
D. RESTRICTIONS/CRITICAL CRITERIA
   1. Water Distribution System
      a. Design Criteria:

1) Route piping as direct as possible to required connections, and call for piping to slope to drain valves at low points for complete system drain down.
2) Specify drain valves at accessible points within the system.
3) Coordinate routing with other trades and with building construction.
4) Specify connections to all equipment and fixtures indicated on the drawings or specified herein.
5) Provide ball valves for branch lines off main, sub-main take-offs and main take-offs.
6) Provide building shut-off and separate hose end drain valves with vacuum breaker at main service entry.

2. Sanitary and Storm Sewer System
   a. Installation:
      1) Run soil and waste piping at a grade of not less than 2.08%. Run storm piping at a grade of not less than 1.04%.
      2) Do not install vents within 2’ of roof edge, parapet or wall line of an “on-the-roof” structure.
      3) Do not install vents within 15’ of outside air intakes. Extend vents up to 2’-0” above outside air intake elevations where 15 foot separation cannot be attained.
      4) Extend all vent terminations a minimum of 2’-0” above surrounding roof elevations.
      5) No combination waste and vent, horizontal or vertical wet venting systems shall be installed unless specifically reviewed and approved by the District Staff.
3. Grease Drainage System
   a. Installation:
      1) Run grease drainage piping at a grade of not less than 2.08%.
      2) Combination waste and vent systems are not allowed for grease drainage systems.
4. Floor Drains and Floor Sinks
   a. Specify floor drains and floor sinks with deep seal P-traps and vent as required.
   b. Specify stainless steel floor sinks at commercial dish machines and at other locations within the food service area where elevated discharge water temperatures are anticipated.
   c. Specify stainless steel receptors at locations where indirect waste may be corrosive (condensing gas fired appliances).
   d. Specify floor drains and sinks of corrosive resistant materials where they are to be installed in areas subject to chemical disposal.
5. Cleaning
   a. Domestic Water Systems:
      1) Clean piping of dirt, debris, slag, solder, burrs and restrictions by flushing with water or acid to remove or dissolve foreign particles that may be within the piping system.

2) Sanitize potable water piping in accordance with AWWA Standard, C651, "Disinfecting Water Mains", latest edition and all local jurisdictional requirements.

PART 2- PRODUCTS

A. PIPE AND PIPE FITTINGS
   1. Domestic Hot and Cold Water- Inside Building:
      a. Above grade: Type L copper with wrought copper fittings and no-lead solder joints.
         1) Hot Water Circulation Piping:
            a) Utilize long radius elbows on all hot water circulation systems utilizing copper fittings.
            b) At consultants option, the use of AquaTherm Green Piping systems will be allowed.
      b. Below grade:
         1) 3" and smaller: Type K hard drawn copper with wrought copper fittings and silver brazed joints.
            a) Specify annealed copper for small individual equipment connections needing to extend below slab on grade; limit pipe length, joints and fittings below slab in these locations will not be allowed.
         2) Larger than 3":
            a) Class 22 cement lined cast iron with cast iron fittings and hub and spigot joints with mechanical clamp.
            b) AWWA C900 PVC with cast iron OD dimensions, ASTM F477 gaskets and ASTM D3139 joints; coordinate pressure classification with jurisdictional water department
   2. Sanitary Drainage- Inside Building:
      a. Above grade:
      4" and smaller: Cast iron no-hub pipe and fittings with elastomeric couplings and stainless steel shield and clamp assembly.
         1) Larger than 4": Cast iron no-hub pipe and fittings with elastomeric couplings and extra wide, heavy duty stainless steel shield with heavy duty clamps.
      b. Below grade:
         1) Service weight cast iron bell and spigot pipe and fittings with elastomeric joints.
         2) Schedule 40 solid core PVC with PVC fittings and solvent cement joints.
         3) Where discharge water temps will exceed the temperature rating of PVC, utilize cast iron specified above.
   3. Grease Drainage Piping:
      a. Above Grade:
         1) Epoxy coated cast iron no-hub pipe and fittings with elastomeric couplings and heavy duty stainless steel shield with heavy duty clamps.
         2) Schedule 40 solid core PVC with PVC fittings and solvent cement joints where located within crawlspace and where drainage discharge temperatures will not exceed 120 degrees F.

b. Below grade:
    1) Epoxy coated service weight cast iron bell and spigot pipe and fittings with elastomeric joints.
    2) Schedule 40 solid core PVC with PVC fittings and solvent cement joints.
    3) Where discharge water temps will exceed the temperature rating of PVC, utilize cast iron specified above.

4. Vent Piping:
    a. Above grade: Cast iron no-hub pipe and fittings with elastomeric couplings and stainless steel shield and clamp assembly.
    b. Below grade:
        1) Service weight cast iron bell and spigot pipe and fittings with elastomeric joints.
        2) Schedule 40 solid core PVC with PVC fittings and solvent cement joints.
5. Roof Drainage- Inside Building:
    a. Above grade: Cast iron no-hub pipe and fittings with elastomeric couplings and extra wide, heavy duty stainless steel shield with heavy duty clamps.
        1) Coordinate with district staff for specifying Black Swan coupling sealant at all no-hub couplings installed on storm water drainage systems.
    b. Below grade:
        1) Service weight cast iron bell and spigot pipe and fittings with elastomeric joints.
        2) Schedule 40 solid core PVC with PVC fittings and solvent cement joints.
    c.
6. Equipment Drains and Overflows: Type L or M hard drawn copper with wrought copper, bronze or cast brass fittings and no lead solder joints.
    a. Where exposed in finished spaces, piping shall be polished chrome plated or painted with Chrome Paint.
7. Acetylene Piping: Type L hard copper with wrought copper seat fittings made up with no lead solder.
8. Oxygen Piping: Type L hard copper with wrought copper seat fittings and silver brazed joints.
9. Acid Waste and Vent:
    a. Schedule 40 flame retardant polypropylene with compatible fittings with fused joints in concealed locations and mechanical joints where piping is accessible.
    b. PVDF with drainage pattern fittings and fusion welded joints.
    c. CPVC with drainage pattern fittings and solvent cement welded joints.
        1) Obtain approval from jurisdictional entities prior to specifying.
    d. All piping systems specified for installation within air distribution plenums shall be tested to ASTM E-84 for flame spread and smoke development.

B. UNIONS AND COUPLINGS
1. 2” and Under:
    a. For threaded ferrous piping: ANSI/ASTM 150 PSI malleable iron ground join unions.
    b. For copper piping: ANSI BIG-22 WROT Copper.
2. 2 1/2” and Over:
    a. For ferrous piping: ASTM 181, Grade l, 150 PSI forged steel slip-on flanges.
    b. For copper piping: 150 PSU bronze flanges.

c. Gaskets: 1/16” thick preformed synthetic red rubber for cold water systems, black rubber for hot water system.

3. Dielectric Unions: Use dielectric unions at connections to water heater and storage tanks, as well as between dissimilar metals, i.e. steel valves and copper pipe.

C. PLUMBING SPECIALTIES

1. Shock Absorbers (Water Hammer Arrestors):
   a. General: Provide Plumbing and Drainage Institute (PDI) approved types and sizes as scheduled or required.
   b. Acceptable Manufactures:
      1) Jay R. Smith
      2) Josam
      3) Wade
      4) Wilkins
      5) Zurn
      6) Sioux Chief
      7) Precision Plumbing Products.
2. Hose Bibbs:
   a. General: Provide hose thread outlet with vacuum breaker in each mechanical room having a floor drain and elsewhere as indicated with finish as scheduled.
   b. Acceptable Manufactures:
      1) Exposed Locations:
         a) Chicago
         b) Wade
         c) Woodford
         d) Zurn
      2) Recessed Locations:
         a) Woodford
         b) Wade
         c) Josam
         d) Zurn
3. Wall Hydrants:
   a. General: Provide wall hydrants, non-freeze as schedules. Hydrants to be self-draining type with integral vacuum breaker and satin nickel face.
   b. Acceptable Manufactures.
      1) Woodford
      2) Wade
      3) Josam
      4) Zurn

D. ROOF DRAINS AND ACCESSORIES

1. Acceptable Manufacturers:
   a. Jay R. Smith
   b. Josam

c. Wade
d. Zurn

2. Flashing: Provide flashing pans for each drain or pairs of drains where roof drains and overflow drains are adjacent.

E. FLOOR DRAINS, TRENCH DRAINS, AREA DRAINS AND FLOOR SINKS
1. Acceptable Manufacturers:
a. Floor Drains, Area Drains and Floor Sinks:
1) Jay R. Smith
2) Josam
3) Wade
4) Zurn
b. Acid resistant Floor Drains:
1) Enfield
2) Orion
3) Zurn
c. Trench Drains:
1) Aco
2) Polydrain
3) J.R. Smith
4) Zurn
2. Flashing: Provide 24” x 24” flashing pans for each drain located above slab on grade areas including areas over accessible crawlspaces.
3. Specify floor sinks with secured, non-tilting style grates in food service areas.
4. Specify stainless steel floor sinks at the kitchen dish machine and at 3-compartment sinks.
5. Trench drain grates shall be selected based on the specific application and location, coordinate selections with district staff during the design phase.

F. CLEANOUTS AND CLEANOUT COVERS
1. Acceptable Manufacturers:
a. Jay R. Smith
b. Josam
c. Wade
d. Zurn
2. Flashing: Provide 24” x 24” flashing pan with clamp device for each floor cleanout located above slab on grade areas including areas over accessible crawl spaces.

G. WATER METER
1. Comply with the Local Water Department Standards. Provide valves, sleeves, couplings, by-pass, remote read-out station, accessories as required and appropriate. Coordinate with Civil Engineer as to whether interior or exterior location of water meter(s).

H. ACID NEUTRALIZATION TANKS
1. General: Provide high density polyethylene tank of seamless construction with accessible lid and mechanical joint connections.
2. Acceptable Manufactures:
a) Enfield
b) Orion

c) Zurn

3. Specify for contractor to furnish and fill the tank prior to operation with approved neutralization agent such as limestone or marble chips, one to three inches in size, to a level just below tank outlet. Water shall be added to the tank after placement of neutralization agent.

I. GREASE INTERCEPTOR

1. General: Reinforced precast concrete designed for H-2O wheel loads of 16,000 lbs. or greater. Provide complete with internal baffle, inlet, outlet, baffle fitting and vent openings. Separate reinforced precast concrete lid with lift rings and 24" round access openings. Provide precast concrete riser rings and heavy duty gas-tight manhole frames with solid lid. Where allowable, specify a dual manhole lid with the inner lid gasketed and secured to limit vapors from escaping through the single manhole lid.
2. Acceptable Manufacturers:

    a. Copeland
    b. Faust
    c. Carder

J. SOLIDS INTERCEPTORS

1. General: Provide on-floor type with top access, internal deep seal trap and removable sediment bucket.
2. Acceptable Manufacturers:
    a. Jay R. Smith
    b. Josam
    c. Wade
    d. Zurn

END OF SECTION

SECTION 22 11 15

CONDENSATE PIPING

PART 1- GENERAL

A. SUMMARY- SECTION INCLUDES
    1. Condensate Piping
B. RESTRICTIONS/CRITICAL CRITERAI
    1. Route piping in orderly fashion to indirect waste receptors connecting to the building sanitary drainage system or to other approved points of discharge...
    2.
    3. Rough-in connection to condensing equipment. Coordinate with condensing equipment specifying engineer for locations and condensate flow rates anticipated.
    4. Provide condensate drain lines for each rooftop unit specified with cooling capacity. Trap shall be full size of unit opening and provide minimum 4” water seal. Discharge condensate to roof with splash block, coordinate splash block locations with roofing manufacturer, protect existing roofing systems from damage.
    5. Provide condensate drain lines for OA intake louvers and intake hoods. Refer Section 23 31 13.

PART 2- PRODUCTS

A. PIPING
    1. Above grade, Cooling Coil Condensate: DWV copper with drainage pattern fittings and no-lead soldered joints. .
    2. Above Grade (Combustion Condensate): Refer to Section 22 01 00, utilize approved piping materials for corrosive drainage service with drainage pattern fitings.
        a. Specify approved condensate neutralization kits and detail connection requirements in accordance with manufacturer’s installation instructions.
        b. Extend and discharge to approved indirect waste receptor.

END OF SECTION

SECTION 22 11 19
PLUMBING VALVES AND SPECIALTIES

PART 1- GENERAL

A. SUMMARY- SECTION INCLUDES
   1. Valves
   2. Specialties
   3. In-Line Circulation Pumps
B. REFERENCED STANDARDS (MINIMUM CRITERIA)
   1. Comply with applicable requirements of the following standards:
      a. National Certified Pipe Welding Bureau (NCPWB)
      b. ASME Boiler Pressure Code
      c. American Society of Sanitation Engineers (ASSE)
      d. American Water Works Association (AWWA)
      e. ANSI B31 Code for Pressure Piping
      f. Underwriters' Laboratories Inc. (UL)
      g. International Plumbing Code
      h. National Fire Protection Association (NFPA)
      i. National Electrical Manufacturer's Association (NEMA)
      j. National Electrical Code (NEC)
      k. American Welding Society (AWS)
      l. American National Standards Institute (ANSI)
      m. National Sanitation Foundation (NSF)
C. SUBMITTALS
   1. Product Data:
      a. Valves
      b. Specialties
      c. In-Line Circulation Pumps
   2. Operating and Maintenance Data:
      a. Valves
      b. Specialties
      c. In-Line Circulation Pumps
D. RESTRICTIONS/CRITICAL CRITERIA
   1. Valves
      a. Install ball valves for shut-off and isolating service, to isolate equipment, parts of system or vertical risers on piping smaller than 3-inch. Utilize butterfly style valves for pipe sizes 3-inch and larger.
      b. Gate valves will only be allowed at the main water service entry into the building where the service size is 3-inch or larger. Flanged ends with resilient seated wedge, ductile iron with stainless steel trim.
      c. Install plug valves or angle valves for throttling service and control device or meter bypass.

d. Provide ball type drain valves at main shut-off valves, low points of piping and apparatus.
e. Specify all valves and specialties sized 2-inch and smaller, coming in contact with potable water to be of low or no lead content in accordance with ANSI-NSF-61.

PART 2- PRODUCTS

A. VALVES
1. Acceptable Manufacturers:
a. Ball Valves:
1) Conbraco-Apollo
2) Grinnell-Tyco
3) Milwaukee
4) Nibco
b. Butterfly Valves:
1) Conbraco-Apollo
2) Grinnell-Tyco
3) Keystone
4) Milwaukee
5) Nibco
c. Gate Valves:
1) Clow
2) Nibco
3) Mueller
4) Milwaukee
d. Plug Valves:
1) Clow
2) DeZurick
3) Milliken
4) Nordstrom
e. Globe Valves:
1) Conbraco-Apollo
2) Grinnell-Tyco
3) Milwaukee
4) Nibco
5) Hammond
f. Angle Valves:
1) Conbraco-Apollo
2) Grinnell-Tyco
3) Milwaukee
4) Nibco
5) Hammond
g. Check Valves:
1) Conbraco-Apollo
2) Grinnell-Tyco

3) Milwaukee
4) Nibco
5) Hammond

h. Balancing Valves (Calibrated):
1) Flow Design-Flowset
~~2) Griswold Controls~~
3) ITT Bell & Gossett
4) Taco

2. General: All valves of a given type shall be of one (1) manufacturer and shall be listed with the Manufacturers' Standardization Society of the Valve and Fittings Industry.
3. Valve Connections:
   a. Thread pipe sizes 2" and smaller.
   b. Flange pipe sizes 2 1/2" and larger.
   c. Solder or screw to solder adapters for copper tubing.
   d. Provide butterfly valve with tapped lug body 200 PSI minimum working pressure, when used for isolating service. Valves shall be rated for bi-directional dead head end service to full working pressure of valve with downstream flange removed.
   e. Ball valves, gate valves, globe valves and plug valves on domestic water service shall meet the requirements of NSF 61.
4. Gate Valves: 4" and larger for main domestic water entry only: Iron body, bronze or stainless steel trim, rising stem, OS&Y bolted solid wedge with resilient seat, bolted bonnet, flanged ends, 125 SWP, 200 WOG.
5. Globe or Angle Valves:
   a. 2" and smaller: Bronze, union bonnet, Teflon disc, 150 SWP, 300 WOG, soldered or screwed ends.
   b. 3" and larger: Cast iron body, bronze trim, rising stem OS&Y, renewable Teflon disc, bolted bonnet, 125 SWP, 200 WOG, flanged ends.
6. Ball Valves: Bronze or forged brass, swing-away design, full port, chrome plated bronze or stainless steel ball with Teflon seats, 125 SWP, 400 WOG, screwed or soldered ends. Ball valves on domestic water service shall meet the requirements of NSF 61.
7. Plug Valves:
   a. 2" and smaller: Bronze, swing disc, solder or screwed ends.
   b. 2 1/2" and larger: Iron body, bronze trim, rising stem, OS&Y, renewable composition disc, flanged ends.
8. Drain Valves: Bronze, compression stop or ball style with nipple and cap or hose thread.
9. Balancing Valves: Bronze body/brass ball construction with glass and carbon filled TFE seat rings, differential pressure readout ports across valve seat area fitted with internal EPT inserts and check valves, ¼" NPT tapped drain/purge port, memory stop, calibrated nameplate and solder connections. Valve shall be designed for positive shut-off. Design pressure 200psig @ 250°F.
10. Check Valves:
    a. Swing check valves:
       1) 2" and smaller: Bronze, horizontal swing disc, renewable Teflon seat, solder or screwed ends, 150 lbs. SWP, 300 WOG.

2) 3” and larger: Cast iron body, bronze trim, horizontal swing disc, renewable bronze disc and seat, flanged ends, 125 lb. SWP, 200 WOG, bolted bonnet.

b. Spring loaded silent check valves:

1) 2” and Smaller: Lead free bronze body, stainless steel trim, in-line lft type with resilient disc, 250 CWP.

2) 3” and Larger: Cast iron body, bronze trim, spring loaded, renewable bronze seat and disc, wafer type, stainless steel springs, 250 lb. WOG.

11. Valve Operators:

a. Provide suitable handwheels for gate, globe or angle and drain valves, lever handles for ball valves.

b. Provide one (1) plug cock wrench for every ten (10) plug cock sizes 2” and smaller, minimum of one (1). Provide each plug cock size 3” and larger with a wrench with set screw.

c. Provide chain operators for valves 4” and larger located more than 7 feet from floor in equipment rooms. Extend chains to 5 feet from floor and hook to clips arranged to clear aisles.

12. Pressure Ratings: Unless otherwise indicated, use valves suitable for minimum 125 PSIG saturated steam pressure and 200 PSIG non-shock cold water, oil or gas.

B. SPECIALTIES

1. Reducing Valves:

a. Acceptable Manufacturers:

1) Conbraco-Apollo

2) Wilkins

3) Watts

4) Cash/Acme

2. Pressure and temperature Relief Valves:

a. Acceptable Manufacturers:

1) Conbraco-Apollo

2) Watts

3) Cash/Acme

3. Reduced Pressure Backflow Preventers:

a. Acceptable Manufacturers:

1) Ames Fire and Waterworks.

2) Conbraco-Apollo

3) Watts

4) Febco

5) Wilkins

4. Thermostatic Mixing Valves:

a. Acceptable Manufacturers:

1) Bradley

2) Conbraco-Apollo

3) Powers

4) Leonard

C. PUMPS (DOMESTIC HW CIRC PUMP)
   1. Acceptable Manufacturer:
      a. Bell and Gossett
      ~~b. Grundfos Matt Backer 303.408.5075~~
      c. Paco
      d. Taco.
   2. Description: In-line sealless cartridge type circulation pump specifically designed for domestic potable hot water circulation applications, flanged or threaded inlet and outlet connections.
   3. Close coupled pumps are preferred over split coupled circulators, coordinate with school district staff prior to specifying split coupled domestic circulation pumps.
   4. The use of self-balancing or variable speed pumps shall be investigated and reviewed with district staff during the design.
   5. Controls for the pump shall enable pump operation based on building occupancy; on-off control shall be through a temperature sensing element which will shut the pump off once the system return water temperature has reached a determined set point.

End of Section

SECTION 22 11 23

NATURAL GAS SYSTEMS

PART 1- GENERAL

A. SUMMARY- SECTION INCLUDES
   1. Natural Gas Systems:
      a. Natural Gas Piping
      b. Valves and Specialties
B. REFEREMCED STANDARDS (MINIMUM CRITERIA)
   1. General: Installation shall be in accordance with NFPA 54, International Fuel Gas Code and local doe enforcement agencies.
C. SUBMITTALS
   1. Product Data:
      a. Pipe, Pipe Fittings, Gas Cocks and valves
      b. Pressure Regulating Valves
      c. Gas Cabinets
   2. Operating and Maintenance Date:
      a. Gas Cocks and Valves
      b. Pressure Regulating Valves
D. RESTRICTIONS/CRITICAL CRITERIA
   1. Locate gas entry into building as close to exterior building wall as possible. Provide two bollards where pipe enters the building to protect piping from damage.

PART 2- PRODUCTS

A. NATURAL GAS PIPING
   1. Above Grade
      a. 2” and smaller- exposed location: Schedule 40 black steel with 150 lb. malleable iron fittings and threaded joints or Corrugated Stainless Steel Pipe (Trac-Pipe only) with Auto Flare fittings.
      b. 2” and smaller- inaccessible location: Schedule 40 black steel with standard weight socket weld fittings and welded joints.
      c. Over 2”- exposed location: Schedule 40 black steel with seamless steel butt weld fittings and welded joints.
      d. Over 2”- inaccessible locations: Schedule 40 black steel with standard weight socket weld fittings same thickness as pipe and welded joints.
      e. Aluminum tubing for gas piping at burners and relief vent shall not exceed 24 inches in length. Remaining piping to be steel.
   2. Below Grade: Approved polyethylene (PE) plastic gas pressure pipe, tubing and fittings, and socket heat fusion joints or factory wrapped Schedule 40 black steel with welded fittings and joints.

B. VALVES AND SPECIALTIES
   1. Valves General:
      a. ¾" and smaller: Screwed, Nordstrom 142 (200 Lb.)
      b. 1" and larger: Lubricated plug valve, flanged, 150 lb. WSP, 200 lb. WOG, all iron (semi-steel), wrench operated, Homestead figure 602.
      c. 8" and larger: Lubricated plug valve, flanged, 150 lb. WSP, 200 lb. WOG, all iron (semi-steel) , wrench operated, Homestead figure 602-A.
   2. Pressure Regulating Valves: Provide gas fired equipment with gas pressure regulators of size and capacity required to reduce gas pressure to proper operating pressure.
   3. Gas Solenoid Valve: Aluminum valve body with nylon disk and stainless steel springs. Ambient temperature range of 32°F to 77°F. Explosion proof solenoid with Class H high temperature coil; ASCO Redhat II
   4. Science Gas Cabinet:
      a. Provide independent manual and automatic natural gas shut-off capabilities for each laboratory or prep room that requires natural gas service as part of the curriculum. Both valves shall be located within a recessed metal cabinet, positioned within the space served, immediately adjacent to the egress door and shall be labeled "Gas Shutoff".
      b. Provide key actuated control switches with integral pilot lights and emergency push-button off capabilities for control of gas solenoid valves. Control switches shall be located within the room or area served and shall be positioned immediately adjacent to the egress door and shall be labeled "Emergency Gas Shutoff Control".
         a. Interface with fire alarm system and laboratory power controls.
   5. Gas Pipe Conduit:
      a. Underground Exterior: Schedule 40 PVC socket type where crossing below sidewalks or other paved site surfaces to limit future disruption to pavement; extend conduit a minimum of 3'-0" beyond surface pavement being traversed.
      b. Below floor slab:
         a. Galvanized steel, extended a minimum of two (2") inches above floor slab at both ends with terminations located in an accessible location within the building.
         b. Piping extending through slabs to work benches or other equipment shall be provided with floor utility channels or trenches complete with non-slip covers which will allow access to the piping without damaging interior building finishes.
   6. Science Lab Gas Outlets: Deck or backsplash mounted, single or double turret with quarter turn ball style, full flow valves, and serrated nozzle outlet with indexed lever handle. Outlet complete with integral check valve.
      a. Approved Manufacturers:
         i. Chicago Faucet Company
         ii. T&S Brass
         iii. Watersaver Faucet.
   7. Quick Disconnect Couplings
      a. Approved Manufacturers:
         1) Dormont
         2) Approved Equal

b. Description: Approved, listed quick disconnect device with nipple and coupling, positive shut-off.

END OF SECTION

SECTION 22 15 13

COMPRESSED AIR SYSTEMS

PART 1- GENERAL

A. SUMMARY- SECTION INCLUDES
    1. Compressed Air Systems:
        a. Compressed Air Piping
        b. Valves and Specialties
B. REFERENCED STANDARDS (MINIMUM CRITERIA)
    1. ASME
C. SUBMITTALS
    1. Product Data:
        a. Pipe, Fittings, Valves and Specialties
        b. Air Compressor
    2. Operating and Maintenance Data:
        a. Valves and Specialties
        b. Air Compressor
D. RESTRICTIONS/CRITICAL CRITERIA
    1. Piping:
        a. Provide valved drip connections at low point of piping system.
        b. Install take-offs to outlets from top of main with shut-off valve after take-off.
        c. Specify flexible connections at all inlet and outlet piping connections to compressors and receivers.
    2. Locate compressors in areas where noise generation will not be of concern (service areas). Where compressors must be located within or adjacent to educational spaces, coordinate with district staff to ensure acoustical treatment requirements are addressed during the design phase, an acoustical engineer may be required.
    3. Ensure that vibrational forces are addressed during the design, specifically when compressed air equipment is located on structural flooring systems.
    4. Coordinate air quality with district staff and if possible, end users; specify compressors capable of delivering air at the pressures and volumes required for the service intended with air dryers where dry air is required.
    5. Specify inlet connections with filters and silencers where generated noise is of concern.

PART 2- PRODUCTS

A. AIR COMPRESSOR
    1. Acceptable Manufacturers:
        a. Quincy
        b. Ingersol Rand
    2. Accessories: Provide filters, regulators, air dryer, safety valve, automatic tank drain, belt guard and intake filter silencer as detailed on Drawings.

3. Select the type and style of compressor based on the duty and application intended. Reciprocating compressors are most frequently used, sliding vane or rotary screw machines may be appropriate based on pressures and volumes required.

B. COMPRESSED AIR PIPING
   1. Type K hard copper with wrought copper or cast brass fittings.
   2. No-lead solder joints for systems operating below 100 psig.
   3. Brazed or press-fit joints shall be specified for systems operating over 100 psig.
   4. Schedule 40 black steel with 150 lb malleable iron fittings and threaded joints will be acceptable where the application for clean dry air is not applicable.
   5. Where larger pipe sizes are anticipated, investigate stainless steel tubing or the use of flared fittings and joints in copper tubing applications.

C. SPECIALTIES
   1. Quick Disconnect Coupling- Acceptable Manufacturers:
      a. Quincy
      b. Binks
      c. Approved Equal

END OF SECTION

SECTION 22 40 00

PLUMBING EQUIPMENT

PART 1- GENERAL

A. SUMMARY- SECTION INCLUDES
   1. Domestic water heating equipment and accessories.
B. REFERENCED STANDARDS (MINIMUM CRITERIA)
   1. ASHRAE/IESNA 90.1- Compliance: Applicable requirements in ASHRAE/IESNA 90.1-Latest Edition.
   2. ASME Compliance:
      a. Where ASME-code construction is required, specify commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
   3. Where ASME-code construction is required, specify commercial, finned-tube water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV. For gas fired appliances, specify compliance with ANSI/CSA.
   4. For electrical appliances, specify compliance with NFPA 70.
   5. For indirect fired appliances such as side-stream water heaters or indirect water heating equipment, specify compliance with ASME.
C. SUBMITTALS
   1. Product Data:
      a. Domestic Water Heating Equipment.
      b. Storage Tanks.
      c. Accessories
   2. Operating and Maintenance Data:
      i. Domestic Water Heating equipment
D. RESTRICTIONS/CRITICAL CRITERIA
   1. Water Heater: Provide minimum five (5) year manufacturer's warranty in accordance with this section. Coordinate warranty period with School District Staff during design process.
   2. Water Storage Tank: Provide minimum five (5) year manufacturer's warranty in accordance with this section. Coordinate warranty period with School District Staff during design process.
   3. Provide System Startup per Section 23 05 97.
   4. Provide Demonstrations per Section 23 05 95.

PART 2- PRODUCTS

A. General: Provide all water heating systems with the following accessories unless otherwise required by the equipment manufacturer:
   1. Specify inlet and outlet isolation valves to each water heater and independent storage tank. Confirm ASME ratings on separate storage tanks.
   2. Specify thermometers on outlets from each water heating system and storage tank. Coordinate placement for ease of readability.

3. Specify combination pressure temperature relief valve conforming to ANSI Z21.22 at each storage heater or unfired storage tank.
4. Specify vacuum relief valve on inlet piping to each bottom fed water heating system or storage tank. Vacuum relief valve shall conform to ANSI Z21.22.
5. Confirm manufacturer recommended service clearances are maintained to allow for proper maintenance, servicing and removal of water heating systems and components.
6. Specify labeling and identification in accordance with other sections of this guideline. Coordinate with district staff for specific numbering requirements at facilities with multiple water heating systems.
7. Coordinate flue and combustion air to the exterior with other building systems.
8. Where natural gas fired appliances are specified, call for gas shut-off, dirt leg and union at appliance connection.
9. Where condensing appliances are specified, call for condensate neutralization kits and detail required installation.
10. Coordinate with district staff for specific building automation system interface.
11. Coordinate housekeeping pad requirements. Provide a minimum 4” high pad.

B. GAS FIRED DOMESTIC STORAGE WATER HEATER
1. General: Specify natural gas fired domestic water storage heater with integral storage tank complete as called for in equipment list on drawings.
2. Water heaters shall be tested in accordance with ANSI Z21.10.1 and Z21.10.3.
3. Water heaters shall meet ASME Boiler and Pressure Vessel Requirements.
4. Provide pressure relief and temperature relief valve, or combination pressure/temperature relief valve complying with ANSI Z21.22.
5. Acceptable Manufacturers:
   a. Bock Water Heaters
   b. HTP
   c. Lochinvar, LLC
   ~~d. PVI Industries, LLC~~

C. HIGH-EFFICIENCY, GAS WATER HEATERS:
1. Specify Compliance with ANSI Z21.10.3/CSA 4.3.
2. Manufacturer's proprietary design to provide at least 88 percent combustion efficiency at optimum operating conditions.
3. Storage-Tank Construction: ASME-code steel with 150-psig minimum working-pressure rating.
4. Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets; anode-less linings preferred.
5. Acceptable Manufacturers:
   a. Aerco
   b. Bock Water Heaters
   c. Lochinvar
   ~~d. PVI~~

D. FINNED-TUBE, GAS WATER HEATERS:
1. Specify Compliance with ANSI Z21.13 for hot-water boilers.
2. Packaged unit with boiler, storage tank, pump, piping, and controls.

3. Horizontal, straight, or coiled finned-copper tube heat exchanger with bronze headers and burner for natural gas fuel.
4. Insulation: Comply with ASHRAE/IESNA 90.1.
5. Steel jacket with enameled finish.
6. Adjustable, storage tank temperature-control fitting and flow switch, interlocked with circulator and burner.
7. Automatic, high-temperature-limit cutoff device or system.
8. Intermittent electronic ignition complying with ANSI Z21.20.
9. Hot-Water Storage Tank:
    a. ASME Boiler and Pressure Vessel Code: Section VIII.
    b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings; anode-less materials preferred.
    c. Insulation: Comply with ASHRAE/IESNA 90.1.
    d. Jacket: Steel with enameled finish.
    e. Anode Rods: Factory installed, magnesium.
10. Circulating Pump:
    a. UL 778, all-bronze, centrifugal, in-line pump.
11. Acceptable Manufacturers:
    a. HTP
    b. Laars
    c. Lochinvar
    ~~d. Raypak~~
    e. RBI

E. INSTANTANEOUS, GAS WATER HEATERS
1. Instantaneous water heater complying with ANSI Z21.10.3/CSA 4.3, except storage is not required.
2. Construction: Copper piping or tubing complying with NSF 61 barrier materials for potable water, without storage capacity.
    a. Heat Exchanger: Copper tubing.
    b. Insulation: Comply with ASHRAE/IESNA 90.1-latest edition.
    c. Burner: For use with tankless water heaters and for natural-gas fuel.
    d. Automatic Ignition.
    e. Adjustable thermostat.
    f. Metal with enameled finish.
3. Support bracket for wall mounting.
4. Acceptable Manufacturers:
    a. Bosch
    b. Noritz
    c. Paloma
    d. Takagi
    e. Rinnai

F. BRAZED PLATE HEAT EXCHANGERS
1. Double wall style with interstitial space vented to atmosphere,
2. Stainless steel construction meeting requirements for potable domestic water applications.

3. Specify for specific fluid temeperature and pressure applications.
4. Acceptable Manufacturers:
    a. Brazetek
    b. ITT Bell & Gossett
    c. Taco, Inc.

G. HOT WATER STORAGE TANKS
1. ASME-code steel with 150 psig minimum working-pressure rating where connected to systems with an input rating greater that 199,999 btu/h.
2. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets; anode-less materials are preferred, otherwise specify with replaceable anode rods for corrosion protection.
3. Steel exterior jacket with enameled finish.
4. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
5. Specify access manway or cleanout opening to facilitate servicing and inspection.
6. Specify with drain valve and combination pressure/temperature relief valve.
7. Acceptable Manufacturers:
    a. HTP
    b. Lochinvar
    ~~c. PVI~~
    d. Wessels

H. EXPANSION TANKS
1. Steel, pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
2. Acceptable Manufacturers:
    a. Amtrol, Inc.
    b. Calefactio.
    c. Watts Water Technologies Co.
    d. Wessels Co.

END OF SECTION

SECTION 22 40 13

PLUMBING FIXTURES AND TRIM

PART 1- GENERAL

A. WORK INCLUDED
    1. Fixtures and Trim:
        a. Plumbing Fixtures
        b. Water Coolers and Drinking Fountains
        c. Carries, Trim and Accessory Items
        d. Shower Valves, Systems and Bases
    2. Water Conservation Fixtures:
        a. All flush valve water closets shall be specified to not exceed 1.28 gallons per flush.
        b. All urinals shall be specified to not exceed 0.125 gallon per flush.
        c. The engineer shall specify manufacturers which meet this ultra low water usage criteria. Not all manufacturers listed in this specification currently meet this criteria. As manufacturers design their product to meet this ultra low water usage criteria, they may be included in the Engineer's specifications as acceptable manufacturers following review and approval by the District.
B. SUBMITTALS
    1. Product Data:
        a. Plumbing Fixtures
        b. Water Coolers and Drinking Fountains
        c. Carriers, Trim and Accessory Items
        d. Showers and Shower Bases
    2. Operating and Maintenance Data:
        a. Plumbing Fixtures:
        b. Water Coolers and Drinking Fountains
        c. Carriers, Trim and Accessory Items
        d. Showers and Shower Bases

PART 2- PRODUCTS

A. ACCEPTABLE MANUFACTURERS
    1. Cast Iron and Vitreous China Fixtures and Trim:
        a. Kohler
        b. American Standard
        c. Toto
        d. Sloan
    2. Multi-Station Lavatory Systems and Lavatory Decks:
        a. Bradley
        b. Sloan
        c. Willoughby Industries.

3. Stainless Steel Fixtures and Trim:
    a. Elkay
    b. Just
4. Electric Water Cooler/Drinking Fountains:
    a. Haws
    b. Elkay
    c. Halsey Taylor
5. Mechanical and Electronic Flush Valves:
    a. Sloan
    b. Kohler
    c. TOTO
6. Closet Seats:
    a. Kohler
    b. Church
    c. Olsonite
    d. Beneke
7. Mop Basins and Shower bases
    a. Fiat
    b. Sterns Williams
    c. Florestone
8. Faucets:
    a. Lavatory Electronic Metering:
        1). Chicago Faucet Co.
        2). Kohler
        3). Sloan Basys (Preferred)
        4). T&S Brass.
    b. Lavatory Mixing:
        1). Chicago Faucet Co.
        2). T&S Brass.
        3). Delta HDF Commercial.
        4). Kohler.
    c. Sink Mixing
        1). Chicago Faucet Co.
        2). T&S Brass
        3). Delta HDF Commercial
        4). Elkay
        5). Just
9. Shower Valves and Systems:
    a. Bradley
    b. Acorn
    c. Sloan (PWT)
10. Emergency Plumbing Fixtures:
    a. Acorn
    b. Bradley

c. Haws

11. Fixture Support Carriers:
    a. Jay R. Smith
    b. Josam
    c. Wade

B. PLUMBING ACCESSORIES
1. Accessories:
    a. Traps: Provide each fixture with trap, easily removable for servicing and cleaning. Provide 17 gauge cast brass P-tap with cleanout for each lavatory and sink, except as specifically noted.
    b. Provide chrome plated rigid or flexible supplies to fixtures with screwdriver stops, reducers, and escutcheon.
    c. Provide hose faucets and hose connections with vacuum breakers.
    d. Finish wall and floor penetrations with set screw type chrome plated cast brass escutcheons.
    e. Cover fixture bolts with china bolt caps of the same color as the fixture and set in place with plaster of paris.
    f. All supply valves shall have renewable seats.
    g. All water supplies to fixtures shall be provided with quarter-turn stops.

C. FIXTURE REQUIREMENTS
1. All water closet and urinal spuds shall be brass, plastic spud inlets will not be allowed.
2. Specify multi-station lavatory systems with integral spray and sensor; installations within new construction shall be specified as hard wired, specify battery powered units for retrofit applications where power connections have not been previously provided.
3. Flush Valves:
    a. Specify flush valves with electronic actuation unless specifically directed otherwise by district staff.
    b. Specify side mounted operators for electronic flush valves.
    c. Specify hard wired flush valves in new construction projects, battery powered units in areas where retro-fit valves are to be installed.
4. Faucets:
    a. Lavatory faucets shall be specified with hard wired power connections in all new construction projects. Specify battery powered units in all retrofit applications.
    b. Coordinate with district staff for specific style of manual faucets at lavatory locations, electronic metering style lavatory faucets are preferred however, manual faucets may be required by the jurisdictional health department in certain locations.
    c. Specify sink faucets to meet the program requirements, coordinate with district staff prior to making final selections; double compartment sinks for use by students should be specified with restricted swing spouts to prevent over-rotation and resultant water damage.

5. Electric Water Coolers and Drinking Fountains:
    a. Specify electric water coolers with bottle fillers nearby main building entries, athletic facilities and common student gathering spaces.
    b. Specify drinking fountains only in classroom wings and similar low occupancy spaces.
    c. Coordinate specific locations with district staff for retro-fit applications.
6. Shower Valves and Systems:
    a. Specify individual shower valves at all coaches areas.
    b. Coordinate with district staff for multi-user shower stations; coordinate with health authority and architect for floor slope and required drainage system connections.
    c. Specify electronic shower systems with timer control in areas subject to continuous use (pool and athletic locker spaces).
    d. Specify shower bases as directed by the architectural design, shower bases for accessible shower stalls shall be designed to comply with current accessibility standards; where sloped threshold may allow for water to collect outside the shower enclosure, specify a floor drain to be installed.
7. Emergency Fixtures:
    a. Specify emergency fixtures at locations and counts required for compliance with ANSI and OSHA requirements.
    b. Specify mixing valves with flow capacities meeting the flow requirements for individual or combination fixtures.
    c. Investigate options for recessed or concealed equipment rather than exposed pedestal mounted equipment. District preference is to have equipment within student use areas recessed to minimize on vandalism.
8. Fixture Support Carriers:
    a. Coordinate chase and wall thicknesses to allow for proper fixture carrier and piping installation.
    b. All individual wall hung lavatory bowls shall be specified with concealed arm carriers. Secure vertical uprights to floor with lag bolts in accordance with manufacturer’s installation instructions.

END OF SECTION