

**Jefferson County School District, R-1
Support Services**

TECHNICAL GUIDELINES

**DIVISION 22 – December 1, 2007
Plumbing**

DIVISION 22 - PLUMBING

22 00 10 Plumbing Criteria & Systems – December 1, 2007

- The Jefferson County School District, R-1 Educational Specifications contain criteria for plumbing systems and supplement these Guidelines.
- Where there is a conflict between the IPC and the IBC, the latter prevails.
- Install plumbing control devices in "Readily Accessible" locations as defined by Chapter 1, Article 100, of the applicable National Electrical Code.
 1. Operating plumbing equipment, such as pumps, is prohibited in ceiling spaces.
- When reusing or connecting to existing piping, clarify to what extent the contractor is to clean and test the existing system.
- Connections to existing pipe shall be made with new isolation valves.
- In the absence of other information, standards of the following organizations apply:
 1. ADA – Americans With Disabilities Act
 2. AGA – American Gas Association
 3. ANSI – American National Standards Institute
 4. ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
 5. ASME – American Society of Mechanical Engineers
 6. AWWA – American Water Works Association
 7. IAPMO - International Association of Plumbing and Mechanical Officials
 8. IBC – International Building Code
 9. IFGC – International Fuel Gas Code
 10. IMC – International Mechanical Code
 11. IPC – International Plumbing Code
 12. NEC – National Electrical Code
 13. NEMA – National Electrical Manufacturers Association
 14. PDI - (Plumbing and Drainage Institute)
 15. UL – Underwriters Laboratories
 16. Local water and sewer districts
- All material listed as to be delivered to the District at Final Acceptance of the project shall be documented in a single list to be signed as being accepted by the District Project Manager.

END SECTION 22 00 10

22 05 13 Common Motor Requirements for Plumbing Equipment – December 1, 2007

- Motor Starters:
 1. Work is restricted to specific products of specific manufacturers that have been previously approved by Jefferson County School District, R-1.
 - a. Allen Bradley
 - b. Cutler-Hammer
 - c. Furnas
 - d. S & S - Sprecher & Schuh
 - e. Square D

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2. Provide motor starters by the manufacturer as an integral feature of motorized equipment.
3. Standard magnetic contactor-type with HAND-OFF-AUTO switch, overload heaters, 120 volt control transformer, single phase protection, under voltage protection and spare normally open (NO) and normally closed (NC) contacts for control by Division 23 09 XX
 - a. NEMA enclosure appropriate for the service or 3R for wet areas
4. Use magnetic starters for motors 0.75 HP and larger.
- Electrical Motor Drives:
 1. Work is open to any product or material meeting the requirements of this Technical Guideline.
 2. Motor Characteristics:
 - a. Motors 0.75 HP and larger: 480 volt, three phase
 - b. Motors smaller than 0.75 HP: 120 volt, single phase
 - c. Frequency: 60 hz
 - d. Voltage Rating: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.
 - e. Service factor: 1.15 for Open Drip Proof (ODP) and Totally Enclosed Fan Cooled (TEFC)
 - f. Enclosure: Open Drip Proof (ODP)
 - g. Duty: Continuous duty at ambient temperature of 105 F and at altitude of the project
 - h. Motor Efficiency: Conform to IEEE-112 and NEMA MG1, Table 12-10.
 - i. Motor wiring: Terminate in a NEMA terminal box mounted on the motor case and of the manufacturer's standard size. The terminal box shall have a bolt type copper ground connector.
 3. Polyphase Motors:
 - a. Description: NEMA MG1, Design B, medium induction motor.
 - b. Stator: Copper windings.
 - c. Rotor: Squirrel cage.
 - d. Bearings: Double shielded, prelubricated ball bearings.
 - e. Insulation: Class F.
 - f. Code Letter:
 - (1) 15 HP and larger: NEMA starting Code F or G
 - (2) Smaller than 15 HP: Manufacturers' standard
 - g. Enclosure:
 - (1) 7.5 HP and larger: Cast iron
 - (2) Smaller than 7.5 HP: Rolled steel
 4. Single Phase Motors:
 - a. Type:
 - (1) Permanent split capacitor (PSC)
 - (2) Induction start, capacitor run (ISCR)
 - (3) Capacitor start, capacitor run (CSCR)
 - (4) Shaded pole (SP)
 - (a) For motors 1/20 hp and smaller only
 - b. Thermal protection:
 - (1) Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating or

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(2) Bearings:

- (a) Ball type for belt connected motors and other motors with high radial forces on motor shaft. Sealed, prelubricated sleeve type on other motors.

END SECTION 22 05 13

22 05 19 Meters and Gages for Plumbing Piping – December 1, 2007

- Work in this section is open to any product or material meeting the requirements of this Technical Guideline.
- Solar Digital Thermometers:
 1. Scale Range:
 - a. Hot Water and Hot/Chilled Water: 30 to 300 F, with 2 F scale divisions
 - b. Chilled Water: 30 to 100 F, with 2 degree scale divisions
 2. ASTM E1; high impact ABS plastic housing with aluminum movable parts, NEMA 4 rating; minimum 2.5 inch by 4 inch display readout; adjustable angle; stem for separable socket (length to suit installation); solar powered with battery backup
 3. Install thermal conducting compound in well prior to installing thermometer.
 4. Manufacturers:
 - a. Terrice: H. O. Terrice Co.
 - b. Weiss Instruments, Inc.
 - c. Winters Instruments
- Pressure Gages:
 1. ASME B40.1, phosphor-bronze bourdon-tube type with bottom connection; dry type; case: 4 ½” diameter with glass lens, connection: brass ¼” NPS, scale: white coated aluminum with permanently etched markings; accuracy: Grade A, plus or minus 1% of middle 50% of scale; range: 2 times operating pressure of connected equipment
 2. Manufacturers:
 - a. Dresser Industries, Inc.
 - b. Terrice: H. O. Terrice Co.
 - c. Weiss Instruments, Inc.
- Test Plugs:
 1. Installation at inlets and outlets of each: hydronic coil in air handling systems, duct zone coil, inline coil pump, boiler, chiller, heat exchanger or hot water heater.
 2. Nickel-plated, brass body test plug with ½” NPS connection; 500 PSIG minimum pressure rating, core inserts: two, self-sealing valves, suitable for inserting 1/8” OD probe; core material: -30 F to 275 F range, rated for ethylene or propylene glycol, cap: gasketed and treaded cap with retention chair or strap
 3. Manufacturers:
 - a. FlowDesign, Inc.
 - b. Peterson Equipment Co, Inc.
 - c. Sisco Manufacturing Co.
 - d. Terrice: H. O. Terrice Co.
- Venturi-Type Flow Elements and Meters:
 1. Orifice-type balancing devices are prohibited.

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2. Bore size shall be selected so that readout at specified flow is between 7.0 and 27.0" w.g.
 3. Flow measuring devices, 2" and smaller may be a combination measuring device and balancing/shutoff valve or separate venturi with separate remote balancing/shutoff valve.
 - a. Non-ferrous pressure die-cast construction, 300 PSIG pressure rating at 250 F; accuracy: plus or minus 3%, venturi/ball valve with integral flow measuring taps, adjustable memory set and full size locking indicating handl.
 4. Flow measuring devices, 2 ½" and larger shall consist of a venturi and separate balancing valve; venturi shall be cast steel with weld ends or machined stell for butt welding; pressure rating of 150 PSIG at 250 F; accuracy: plus or minus 3%
- Manufacturers:
 1. Barco
 2. FlowDesign, Inc.
 3. Gerand Engineering Co.
 4. Preso Meters Corp.

END SECTION 22 05 19

22 05 23 General-Duty Valves for Plumbing Piping – December 1, 2007

- Work in this section is open to any product or material meeting the requirements of this Technical Guideline.
- Comply with ANSI MSS SP-92-1999, *MSS Valve Users Guide*.
 1. Ball, butterfly, check and stop and drain valves
 - a. Ball valves:
 - (1) Two-piece, copper-alloy ball valves: Bronze body with full port, chrome plated bronze ball; reinforced TFE seats; extended neck, 600 PSIG minimum CWP (cold working pressure) rating and blowout-proof stem
 - b. Check Valves:
 - (1) Swing check valves, 2 ½" and smaller:
 - (a) MSS SP-80; Class 125, 200 PSIG CWP; horizontal swing, Y-pattern, ASTM B62 cast-bronze body and cap, rotating bronze disc with rubber or composition seat, threaded or soldered end connections.
 - (2) Swing Check Valves, 3" and larger:
 - (a) MSS SP-71, Class 125, 200 PSIG CWP; ASTM A 126 cast iron body and bolted cap, horizontal swing bronze disc, flanged end connections.
 - c. Stop and Drain Valves:
 - (1) Nominal ¾": MSS SP-110; class 150, 400 PSIG CWP, ASTM B 584 cast-bronze body and bonnet, 2 piece construction; chrome plated ball, full port; blowout-proof; bronze or brass stem, EPDM seats and seals, garden hose thread (GHT) male and cap chained to valve, vinyl-covered steel lever handle.
 - d. Butterfly valves:
 - (1) Full flanged or lug
 - (2) Wafer configuration is prohibited.
 - e. Ferrous-Alloy Butterfly Valves, General:
 - (1) MSS SP-67, Type I for tight shutoff, extended neck, stainless steel stem, field replaceable EPDM sleeve and stem seals. Capable of bidirectional dead end

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service to full rated working pressure of the valve upon removal of the downstream flange.

(2) Single-Flange, 175 PSIG CWP Rating: Wafer-lug type with one or two piece stem

(3) Flanged, 175 PSIG, CWP Rating: Flanged-end type with one or two piece

- Fuel gas shut off solenoid valves:
 1. UL listed for intended use.

END SECTION 22 05 23

22 05 53 Identification for Plumbing Piping and Equipment – December 1, 2007

- Work in this section is open to any product or material meeting the requirements of this Technical Guideline.
- Comply with ANSI/ASME A13.1, *Scheme for the Identification of Piping Systems*
- Provide markers and labels for plumbing pipes and equipment.
- Pipe Identification
 1. Identify service and direction of flow on all piping.
 2. Provide identification markings at valves, equipment, terminal points, both sides of piping passing through walls and floors and at approximately every 40 feet.
 3. Use an arrow with each pipe identification marker.
 4. The arrow shall always point away from the marker and in the direction of the flow.
 5. Color and height of arrow to be same as the marker.
 6. If flow can be both directions, use a double-headed arrow.
- Include a list of the wording, symbols, letter size, and color coding used for plumbing identification in each maintenance manual.
- Pipe Markers (below grade):
 1. Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service
 2. Install markers 6 inches to 8 inches below finished grade directly above buried pipe.
 3. Tracer tape required on non-metallic pipe.
- Pipe Markers (above grade): Use one of the following methods:
 1. Pressure sensitive markers:
 - a. Brady type B-350 flexible film identification markers and tape
 - b. Apply in accordance with manufacturer's recommendations. Marker adhesion will be tested for permanence.
 - c. Replace any markers showing loose corners, bubbles, or other failings.
 2. Stenciled markings:
 - a. Prohibited
 3. Plastic wrap around labels taped in place
 - a. Install preformed and lettered plastic markers completely around pipe in accordance with manufacturer's instructions.
 4. Apply markers so lettering is in the most legible position.
 - a. For overhead piping, apply on the lower half of the pipe where view is unobstructed and readable from floor level.
 5. Valve tags are not required.
- No piping over communications rooms, electrical closets and IDF rooms.

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- Equipment Identification:
 1. Tags or labels shall match the equipment designation on the drawings.
 2. Tags:
 - a. Shall match the equipment designation on the drawings.
 - b. Aluminum, stainless steel or brass 1.5” diameter with edges ground smooth
 - c. Evenly space and stamp 0.25 inch high letters and numbers into the metal surface
 3. Labels:
 - a. Shall match the equipment designation on the drawings
 - b. White plastic laminate with black engraving, black plastic laminate with white engraving, or standard brass bars
 - c. Provide labels to uniform size commensurate with the size of the equipment to which attached.
 - d. Minimum 0.5” high letters
 - e. Pressure sensitive embossed labels are prohibited.
 - f. Install with adhesive or stainless steel mechanical fasteners.
 - (1) Installation on panels or cabinets containing line voltage shall be adhesive only.
 - g. Adhesive labels:
 - (1) Degrease and clean surfaces to receive adhesive.
 - (2) Apply with sufficient adhesive to ensure permanent adhesion.
- Electric Power Controls:
 1. Identify switches, control panels, major control components magnetic starters, relays etc. with Equipment Labels attached outside the panels or cabinets.
 2. Include in the identification the connecting or controlled equipment drawing designation.
 3. Identify zone valve, pressure electric, electric pressure switches, relays and starters with Equipment Tags or Labels.
- Installation:
 1. Do not paint or insulate over nameplates or labels.
 2. Install tags with corrosion resistant chain or cable.
 3. Identify equipment above lay-in ceiling with colored tag affixed to the ceiling grid and offset toward the ceiling tile intended to be removed for service.
 - a. RED: Fire protection
 - b. BLUE: Plumbing
 - c. YELLOW: HVAC
 4. Use following identification of services:
 - a. Dual Temperature Water (2-pipe heating/cooling): Chilled/Hot Water Supply/Return (C/HWS and C/HWR)
 - b. Hot Water Supply/Return (hydronic): HWS / HWR
 - c. Chilled Water Supply/Return (hydronic): CHWS / CHWR
 - d. Condenser Water Supply / Return: CWS / CWR
 - e. Cold Water (domestic): CW
 - f. Hot Water (domestic): HW
 - g. Hot Water Circulation (domestic): HWC
 - h. Condensate: Condensate.

END SECTION 22 05 53

22 07 00 Plumbing Insulation – December 1, 2007

- Work in this section is restricted to specific manufacturers that have been previously approved by Jefferson County School District, R-1 Facilities Services.
 1. Certainteed
 2. Knauf
 3. Manville
 4. Owens-Corning
- Provide materials with flame spread index of 25 or less and smoke development index of 50 or less as tested in accordance with ASTM E84 (NFPA 255).
- Insulate roof drain bowls with fiber glass with all-service jacket and a heavy coat of brushed on vapor barrier.
 1. Insulate the roof drain bowl fasteners.
- Insulate hot and cold services and horizontal portions of roof drains to conform with current edition of ASHRAE Fundamentals Handbook.
- Field-applied Jackets:
 1. ASTM C921, Type 1; Standard PVC fitting covers: factory-fabricated fitting covers manufactured from 20-mil thick, high impact, ultraviolet-resistant PVC
- Equipment and tank insulation:
 1. All-service jacket indoors
 2. Aluminum cladding outdoors
 3. Either flexible fiberglass blanket meeting ASTM C 553, Type 1 or rigid fiberglass board meeting ASTM C 612, Class 1A
 4. Do not insulate pumps or expansion tanks.
- Install insulation per manufacturer's recommendation as a minimum standard.
- Self sealing laps on cold water pipes and horizontal portions of roof drains:
 1. Staple at 6 inches o.c.
 2. Paint with vapor proof sealant.

END SECTION 22 07 00

22 11 00 Facility Water Distribution – December 1, 2007

- Where noted, work in this section is restricted to specific manufacturers that have been previously approved by Jefferson County School District, R-1.
- The potable water supply system including specialties, valves, pipe and fixtures shall meet the requirements of the Safe Drinking Water Act (SDWA), current edition of *Colorado Primary Drinking Water Regulations*, IPC or these Technical Guidelines, whichever is more restrictive.
- Size domestic water pipe in accordance with Plumbing Code and with a maximum pressure drop of 6.0 feet per 100 feet.
- Because of the significant cost of tap and sewer connection fees, careful consideration must be given to plumbing system design and sizing.
 1. For example, elementary schools are normally served with a 2" service, middle schools with a 2.5" service, and high schools with a 3" service.
 2. Irrigation usage is not additive to the total water demand.

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3. Renovations may require retrofitting existing plumbing fixtures to maintain the smallest service size.
- Provide water hammer arresters (shock absorbers) in potable water lines in accordance with Plumbing and Drainage Institute Standard, WH-201.
- Do not place water pipe below slabs on grade.
 1. The possible exception is the main building entry.
- Provide shut-off valves and unions to isolate each item of equipment, branch circuit or section of piping. Required locations include:
 1. On water main inside the building at the point where it enters the building.
 - a. Clearly label it as “Water Main Shut Off”.
 2. On water lines before they enter and after they leave a basement, crawl space or trench
 3. On plumbing groups of more than four fixtures and wall hydrants (freeze proof hose bibbs)
 4. Isolation valves will be provided for groups of 4 or more fixtures to accommodate service.
- Faucets or Hose Bibbs are required at:
 1. Bathrooms with more than four fixtures
 2. Heated mechanical penthouses
 3. Boiler rooms
- Wall hydrants with inside ball shut-off valve are required at:
 1. Every 200 feet of exterior perimeter
 2. Kitchen service entrance
- Remove handles from hose bibbs and wall hydrants accessible to occupants.
 1. Deliver them to the District.
- Use air gap fitting connection from the potable water lines to any service that contains glycol antifreeze or water treatment chemicals even if that connection is protected by a back-flow preventer.
- Utility extension for future Temporary Facilities: See 33 05 16
- Solder containing lead is categorically prohibited.
- Valves which are installed above ceilings are to be only over minimally occupied areas and not above classrooms.
- Pipe in a horizontal chase with one or more exterior surfaces.
 1. Provide forced ventilation from one conditioned area to another area. System will consist of an exhaust fan, 1 temperature sensor per 100 linear feet of chase and current switch for fan status. Exhaust fan operation is regulated from the temperature control system, Division 23 09 XX. An alarm will be generated when outdoor temperature is below 35 F and upon sensing either a chase temperature of below 40 F or loss of exhaust fan status 60 seconds after the fan has been commanded to start. Alarm will be a Category 1 and directed to Jefferson County School District Security at 809 Quail, Building 1.
- Pipe in exterior walls is not recommended.
 1. If required, provide heat or warm air circulation.
- Potable water piping:
 1. Above grade: Type L Copper. ASTM B88M, type B
 2. Below grade less than 5 feet from building lines: Type K copper ASTM B88M, type A

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3. Below grade more than five feet beyond building lines: AWWA approved PVC
- Drains and Condensate piping:
 1. Type DWV ASTM-B306 or Type L hard ASTM B88
- Backflow Preventer:
 1. Open to any product or material meeting the requirement of this Technical Guideline.
 2. Reduced pressure type backflow preventer (backflow assembly) approved by the Foundation for Cross Connection Control and Hydraulic Research at the University of Southern California
 3. Preventer to be lead-free in sizes as are commercially available
 - a. Sizes 0.75" to 1.0"
 - b. Manufacturer:
 - (1) Wilkins; Model 375
 4. Air gap fittings are the preferred method of preventing backflow. If a preventer is required on other than building service, discuss with the District Engineer.
 5. Building and irrigation services:
 - a. Reduced pressure type as required by water purveyor
- Expansion Tanks:
 1. Restricted to specific manufacturers that have been previously approved by Jefferson County School District, R-1.
 2. Manufacturers:
 - a. Amtrol
 - b. Armstrong
 - c. Bell & Gossett
 - d. Taco
 - e. Thrush
 - f. Wessels
 - g. Wilkins
 3. Closed hydro-pneumatic diaphragm or bladder type, ASME labeled, designed for potable water systems
- Wall Hydrants:
 1. Restricted to specific manufacturers that have been previously approved by Jefferson County School District, R-1.
 - a. Outside sillcocks:
 - (1) Manufacturers:
 - (a) Josam
 - (b) Woodford
 - (c) Zurn
 - b. Freeze proof wall hydrants for outdoor service:
 - (1) Manufacturer:
 - (a) Woodford
 - (b) Zurn
- Relief Valves:
 1. Restricted to specific manufacturers that have been previously approved by Jefferson County School District, R-1.
 - a. Bell & Gossett.
 - b. Farris
 - c. Kunkle

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- d. McDonnell-Miller
- e. Watts
- 2. Bronze or iron body, bronze trim, bronze lifting gear, ASME rated direct spring loaded type, lever operated, non-adjustable factory set discharge pressure
- Pressure Reducing Valve:
 - 1. Restricted to specific manufacturers that have been previously approved by Jefferson County School District, R-1.
 - a. Armstrong
 - b. A.W. Cash
 - c. Bell & Gossett
 - d. Fisher
 - e. Taco
 - f. Zurn
 - 2. All bronze, adjustable spring and diaphragm; integral strainer, female thread connections
- Shock Absorbers (water hammer arresters):
 - 1. Work is restricted to specific products or specific manufacturers that have been previously approved by Jefferson County School District, R-1.
 - a. Josam - Absorbotron II
 - b. Sioux Chief – Hydra-Rester
 - c. Zurn - Shoktrol
- Circulating pumps:
 - 1. Restricted to specific manufacturers that have been previously approved by Jefferson County School District, R-1.
 - a. Amtrol
 - b. Armstrong
 - c. Bell & Gossett
 - d. Grundfos
 - e. Oberdorfer
 - f. Taco
 - 2. All bronze in-line centrifugal or cartridge pumps with motors 0.5 HP or less constructed for domestic water service shall be used as circulators
 - 3. Pump:
 - a. Certified dimensional drawings including locations, sizes and types of each piping connection, mounting details and electrical connections
 - b. Installation, maintenance, disassembly, operating and parts-list manuals
 - c. Recommended spare parts list
 - d. Characteristic design curve
 - e. Standard manufacturer's catalog data
 - 4. Place isolation valves on pump suction and discharge.
 - a. Pump shall have integral mechanical connections so it may be removed for service without cutting the piping.
 - 5. Include pressure gauges in the suction and discharge lines in locations that will provide a reasonably accurate check of pump performance.
- Pipe Material and Manufacturers Markings:
 - 1. When reviewing submittals, include a careful check that pipe origin, manufacture and markings meet criteria in the International Plumbing Code.

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- Sanitize potable water piping in accordance with current edition of AWWA Standard C651-86, *Disinfecting Water Mains*, and subsequent addenda or these Technical Guidelines, whichever is more restrictive.
- Test water pipe at 120 psig or 1.5 times service static pressure, which ever is greater, for two hours with no sign of leaks or pressure loss.
 1. Test shall be witnessed by Jefferson County School District, R-1 Project Manager, Commissioning Engineer, and/or Design Engineer.
- Test all operating devices.
 1. Keep written records of all tests, including at a minimum:
 - a. The date of the test
 - b. System or subsystem tested
 - c. Test medium and pressure used
 - d. Duration of test
 - e. Test results
 - f. Name and signature of individual performing test

END OF SECTION 22 11 00

22 13 00 Facility Sanitary Sewerage – December 1, 2007

- Work is open to any product or material meeting the requirements of this Technical Guideline.
- Line Size:
 1. All lines shall be a minimum of 2 inches.
 2. All lines greater than 20 feet in length shall be a minimum of 3 inches.
- Cleanout locations:
 1. Interior:
 - a. Wall cleanouts. Bottom of cleanout cover shall be 1 inch minimum above top of baseboard and 6 inches above floor.
 - b. Floor cleanouts at 50 feet maximum intervals for all pipe sizes or when pipes change direction more than 135° in the horizontal.
 2. Exterior
 - a. First clean out 10 feet from perimeter wall and every 100 feet thereafter.
 - b. Set heavy cast iron tractor cover set in 2 feet x 2 feet x 6 inches concrete block.
 - c. 4 inch size acceptable in pipes 4 inches and larger
- Cleanouts shall be cast iron with full size brass cleanout plugs.
 1. Floor cleanout covers scored brass installed flush with the floor
 2. Wall cleanouts are preferred in carpeted areas.
- Floor drains or floor sinks less than 3 inches shall include integral cleanouts.
- Utility extension for future Temporary Facilities: See 33 05 16
- Vents shall be terminated with vandal proof caps.
- Floor Sinks:
 1. Facility needs a riding type floor cleaning machine.
 - a. These require a floor sink in a janitorial closet on each level accessible by the cleaning machine.
 - b. Architect to provide a 48” wide door at that closet location to allow the cleaning machine to access the floor sink.

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- Floor Drains minimum locations:
 1. Mechanical Rooms
 2. Mechanical Penthouses
 3. Toilet rooms, with more than one water closet, emergency drench showers and/or eye wash stations
 - a. Floor drains shall be set so the top of drain is flush with finished floor.
 - b. Floor drains located in kitchen areas shall be coordinated with the Kitchen Equipment Contractor. The intent is to prevent equipment legs or stands from being located over floor drains or floor drain covers.
- Building Drainage and Sewer Lines:
 1. Locate lines not closer than 10 feet horizontally from potable water lines except that if the top level of the drain line is 3 feet or more below the bottom level of the water line, the horizontal distance between the lines may be reduced to 6 feet.
 2. Where lines cross potable water the horizontal distance between lines shall not be less than 3 feet.
 - a. Joints shall not be less than 5 feet from water line.
 - b. The drainage or sewer line shall be constructed of service weight cast iron.
 3. When encountering unstable soil or when the line excavation is through solid shale, slate, sandstone or similar hard material, bed the pipe in gravel 6 inches all around the pipe.
- Sewerage Piping:
 1. Pipe, Cast Iron, Service weight:
 - a. No-hub:
 - (1) No-hub with stainless steel clamps
 - b. Bell & spigot:
 - (1) Bell and spigot with neoprene compression gaskets
 2. Buried drainage and vent pipe under structure or concrete walks and drives:
 - a. Cast iron bell & spigot only
 3. Buried drainage and vent pipe not under structure or concrete walks and drives:
 - a. Cast iron no-hub
 - b. Cast iron bell & spigot
 4. Above grade interior drainage and vent pipe:
 - a. Cast iron no-hub
 - b. Cast iron bell & spigot
- Above grade interior vent and equipment drains:
 1. Cast iron no-hub
 2. Copper, DWV type L
- Grease Interceptors:
 1. Design to conform with IPC Appendix H.
 2. Colorado State Plumbing jurisdiction has defined school kitchens as “single service kitchens”.
 - a. Architect to provide District with written acceptance of grease interceptor sizing from local sanitation district prior to CD drawing phase.
 3. Interceptor design shall include tank vent.
 4. All equipment, drains, sinks, fixtures, (including dishwashers and garbage disposers) in the kitchen will be discharged through the interceptor.
 5. All interior piping shall be Schedule 40 PVC.

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- Sump Pumps:
 1. Evaluate pumps are required for the following areas:
 - a. Boiler room
 - b. Mechanical room
 - c. Elevator pit
 - d. Orchestra pit
 2. Sumps may be installed during construction without requiring a sump pump. These types of installation need to have empty electrical conduits for power wiring and remote alarm wiring.
 3. Sumps with pumps require remote alarming to be tied into the Building Automation system, Division 23 09 13
 - a. Local alarming of high sump water level is discouraged as these areas typically are not attended on a daily basis.
 - b. Remote alarming may be considered a Category I as identified in Division 23 09 13. This will be determined on an individual project basis.

END SECTION 22 13 00

22 14 00 Facility Storm Drainage – December 1, 2007

- Work in this section is open to any product or material meeting the requirements of this Technical Guideline unless noted otherwise.
- Provide flexible connections to risers.
- Cleanout Locations:
 1. Interior
 - a. Wall cleanouts:
 - (1) Bottom of cleanout cover shall be 1 inch minimum above top of baseboard or minimum of 6 inches above floor whichever is the greater dimension.
 - b. At bottom of vertical drops from ceiling spaces
 2. Exterior:
 - a. 10 feet from perimeter wall and every 100 feet thereafter
 - b. Heavy cast iron tractor cover set in 2 feet x 2 feet x 6 inch concrete
 - c. 4 inch size cleanout is acceptable in pipes 4 inches and larger.
- Cleanouts:
 1. Cast iron with full size brass cleanout plugs
- Roof Drains:
 1. Restricted to specific manufacturers that have been previously approved by Jefferson County School District, R-1 Facilities Services.
 - a. Josam
 - b. Jay R Smith
 - c. Wade
 - d. Zurn
 2. Cast iron body with:
 - a. Removable cast iron or aluminum dome strainer
 - (1) Plastic domes are prohibited.
 - b. Flashing clamp device

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- c. Under-deck clamp
- d. Gravel stop
- 3. 4 inch drains are preferred.
 - a. 3 inch drains are permitted with approval of Jefferson County School District, R-1 Engineer.
- 4. Controlled flow drains are prohibited.
- 5. Sump all drains.
- 6. Overflow piping shall be a separate drain to a minimum 5 feet beyond the building.
- 7. Drain to storm sewer or on-site above grade drainage.
- 8. Roof drain discharge over sidewalks or at the tops of embankments is prohibited.
- 9. Locate roof drains at mid-spans of the roof structure, not a bearing.
- 10. Each major roof area or level should have dedicated separate piping to the storm drain.
 - a. Do not permit water to flow from level to level.
- 11. Minimum two or more widely separated drains per roof section
- Building Storm Drainage Piping:
 - 1. Buried under structure or concrete walks and drives:
 - a. Cast Iron Service weight:
 - (1) Hub and spigot with neoprene compression gaskets
 - 2. Above grade and buried not under structure, concrete walks or drives:
 - a. Cast Iron Service weight:
 - (1) No-hub with stainless steel clamps or hub and spigot with neoprene compression gaskets
 - 3. When encountering unstable soil or when the drainage pipe excavation is through solid shale, slate, sandstone or similar hard material, bed the pipe gravel 6 inches all around the pipe.

END SECTION 22 14 00

22 34 00 Fuel-Fired Domestic Water Heaters – December 1, 2007

- Work in this section is open to any product or material meeting the requirements of this Technical Guideline.
- Potable Water Heaters
 - 1. Natural gas-fired, natural draft or powered burners
 - a. Water heaters are required to be independent of the building heat. (i.e., no side stream heat exchangers fed from the building heating boilers).
 - 2. Instantaneous gas or electric booster heaters may be acceptable for kitchens or other special applications.
 - a. Discuss application with Jefferson County School District, R-1 Engineer.
 - 3. Vertical storage tanks preferred over horizontal
 - 4. Combined storage tank and burner assembly preferred over split systems
 - 5. High efficiency insulation over glass lined tank
- Design separate systems for kitchens and the remainder of the school.
- Building system is to generate, store and deliver 120°F water to a mixing valve which will control the water temperature supplied to the facility (not including kitchen) at 110°F.

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1. System shall be readily adjustable to 140°F minimum and designed to run at that temperature for sterilization.
- Kitchen system is to generate, store and deliver 140°F domestic water to kitchen.
 1. Kitchen lavatories require tempering valves at the lavatory to reduce water temperature to 110°F.
- Installation:
 1. Water heaters to be located on 4 inch concrete pad or slab
 2. Valves, pumps, thermometers and accessories to be readily accessible and no higher than 6 feet 6 inches above finished floor
 3. Thermometers
- Provide re-circulation systems with all bronze circulator pumps.
 1. Pump shall be controlled from temperature control system, 23 09 XX.
- Water heaters shall be removable without removing valves, pumps, etc.
- Install unions on both sides of relief valves.

END SECTION 22 34 00

22 42 00 Commercial Plumbing Fixtures – December 1, 2007

- Work in this section is restricted to specific products of specific manufacturers that have been previously approved by Jefferson County School District, R-1.
- Gang type lavatories, urinals, and showers are prohibited.
- Fittings:
 1. Acceptable manufacturers
 - a. American Standard
 - b. Chicago Faucet
 - c. Crane
 - d. Delta – Commercial Series
 - e. Eljer
 - f. Elkay
 - g. Fisher
 - h. Kohler
 - i. Nibco
 2. Fixtures piping exposed to view:
 - a. Brass chrome finish and finished with chrome escutcheons where pipe penetrates walls and floors
 3. Install a stop valve without a handle on each water service to each fixture.
 4. Deliver a minimum of 2 loose handles or 1 handle per 3 stop valves, whichever quantity is greater.
 5. Provide vacuum breakers at all outlets with hose connections.
 6. Lavatories:
 - a. Use 4 inch hot to cold spacing.
 7. Kitchen and mop sinks:
 - a. Use 8 inch hot to cold spacing.
 8. Single-handle mixing faucets are not permitted.
 9. Handles shall be cross or star.
 - a. Wrist blade shall be used on ADA fixtures only.

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10. Finish:
 - a. Polished chrome plated brass in kitchens and exposed areas
 - b. Rough cast bronze or brass for custodial service areas and mechanical spaces
11. Gooseneck faucets with top vacuum breakers and tapered serrated hose connections at lab sinks
12. Except for washers, all internal parts shall be metal, plastic and composite parts are prohibited.
- Fixtures:
 1. Acceptable manufacturers for water closets, urinals, lavatories, kitchen sinks, janitor sinks and non-refrigerated drinking fountains:
 - a. American Standard
 - b. Crane
 - c. Eljer
 - d. Kohler
 2. Cast iron porcelain coated only
 - a. No solid porcelain units except drinking fountains
 3. Lavatories will mount in floor set cabinets or wall set counter tops.
 4. Water closets shall be floor mounted or wall mounted with extra heavy floor mounted carriers.
 5. Urinals shall be wall mounted with extra heavy floor mounted carriers.
 6. Water closets:
 - a. 1.6 gpm class IV
 7. Water closets seats:
 - a. Open front
 - b. Elongated bolts
 - c. No seat cover
 8. Flush valves:
 - a. Manufacturer:
 - (1) Sloan – Model: G2 Optima Plus
 - (2) Zurn – Model: AquaSense
 - b. Battery powered, automatic flush valves
 - (1) AC electrical wired flush valves are prohibited.
 9. Custodial service sinks:
 - a. Cast iron with rim guards and P-trap
 10. Mop Sink:
 - a. Fiber Glass or Precast terrazzo
 - b. 12" deep
 - c. Stainless steel guards on threshold
 11. Science sinks:
 - a. Pre-cast terrazzo, epoxy resin or stainless steel with acid resistant coating
- Combination lavatory and drinking fountain fixtures:
 1. Prohibited in Art, Auto Mechanics, Science, Stagecraft, Woodshop classrooms or any classrooms where toxic material may reside.
 2. May be used adjacent to toilet rooms provided the toilet rooms have separate hand washing sinks.
- Photo Lab Developing sink:
 1. Manufacturer:
 - a. Leedal, Inc.; Chicago, IL

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- b. Approved equivalent
 - (1) Verify with District Purchasing to ensure consistency.

END SECTION 22 42 00

22 43 00 Healthcare Plumbing Fixtures – December 1, 2007

- Work in this section is open to any product or material meeting the requirements of this Technical Guideline.
- Clinic
 - 1. Wall mounted mixing valve
 - a. With hand held shower on 6 foot hose
 - (1) Coordinate hose length and location of floor drain to ensure any wheelchair bound occupant when located above the floor drain can be completely rinsed.
 - b. Hand operated normally closed on-off lever
 - 2. Locate floor drain near wall out of normal traffic pattern.
 - 3. Verify with Architect for acceptable wall surfaces in the area of the shower.

END OF SECTION 22 43 00

22 45 00 Emergency Plumbing Fixtures – December 1, 2007

- Work in this section is restricted to specific products of specific manufacturers that have been previously approved by Jefferson County School District, R-1.
- Water service to Emergency Shower or Eyewash shall be tempered to tepid.
 - 1. Temperature range as specified in ANSI Z358.1 – 2004
- Showers and eyewashes:
 - 1. Comply with ANSI Z358.1, Current edition.
 - 2. Drench shower:
 - a. Free standing galvanized steel with stainless steel head and grab handle
 - b. Manufacturer:
 - (1) Haws Model 8100
 - 3. Combination shower and eyewashes:
 - a. Manufacturer:
 - (1) Haws Model 8300
- Eyewash:
 - 1. Locate eyewashes preferably no more than 20 feet from any point in the lab but in no case more than 50 feet.
 - a. Verify Code requirements.
 - 2. Counter-top swing away
 - a. Flow rate not less than 0.4 gpm for a minimum of 15 minutes
 - b. Stay open valve with a paddle handle operable with most any part of the body
 - c. Mounting height to accommodate occupant ages
 - d. Conspicuously label each eyewash or shower with a plastic sign: “EMERGENCY EYEWASH [AND/OR SHOWER]”
 - e. Manufacturers:
 - (1) Haws - Model 7612

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(2) Flynn – Model SE1040 or SE1005 mounted next to a lab sink

- Floor Drains:
 1. Include a drain with each Emergency fixture that does not discharge into an approved fixture.
 2. Drains shall be:
 - a. Oversized, with small openings in the grate (to reduce vandalism)
 - b. Include integral clean out.
 - c. Secure with tamper proof screws.

END OF SECTION 22 45 00

22 47 00 Drinking Fountains and Water Coolers – December 1, 2007

- Work in this section is restricted to specific manufacturers that have been previously approved by Jefferson County School District, R-1.
 1. Elkay
 2. Halsey Taylor
 3. Haws
 4. Oasis
- Refrigerated water coolers of stainless steel wall mounted handicap design made without lead solder.
- Refrigerated drinking fountains shall use only HFC-134A refrigerant.
- All drinking fountains and water coolers shall have vandal-resistant bubblers.

END OF SECTION 22 47 00

22 60 00 Facility Gas Distribution – December 1, 2007

- Work in this section is open to any product or material meeting the requirements of this Technical Guideline.
- Install wrench-operated, iron body, lubricated plug type with square nut actuator and matching nut wrench:
 1. Outside where gas enters building
 2. Entry and exit to basements, crawl spaces or trenches
 3. On gas branch line serving temporary facilities outside where line exits the building
- Install approved isolation fitting on ferrous underground gas pipe 6 inches above grade. Required by IPC.
- Utility extension for future Temporary Facilities:
 1. See Section 33 05 16
- Install gas service and enclosure to conform to current Xcel Energy installation standards.
- Install gas meter and building isolation valve in chiller enclosure when possible.
- Give careful consideration when placing gas meter immediately adjacent to a low level roof where either the gas piping or the gas meter enclosure presents an easy means for vandals to access the roof.
- Gas piping will be buried a minimum of 18” below finished grade.
- Natural gas piping

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1. Pipe:
 - a. ASTM-A53, Grade B, Schedule 40
(1) ASTM A120 is prohibited.
 - b. Below grade:
(1) PE (polyethylene) pipe as allowed by the IPC
 - c. Above grade
(1) Schedule 40 steel
2. Solenoid valve bodies:
 - a. Iron, steel or natural gas compatible brass
3. Fittings:
 - a. Steel pipe:
 - (1) 2 inches and smaller:
 - (a) Threaded class 150 black malleable iron
 - (2) 2.5 inches and larger:
 - (a) Flanged or butt weld, ASTM B31
4. Pressure regulator vent piping:
 - a. Schedule 40 steel or rigid copper
(1) Soft copper or aluminum is prohibited.

END OF SECTION 22 60 00

22 63 00 Gas Systems for Laboratory and Healthcare Facilities – December 1, 2007

- Work in this section is open to any product or material meeting the requirements of this Technical Guideline.
- Science Classroom subsystem:
 1. Normally includes piping from the boiler room to the gas outlets in the classrooms
 2. May need to be flooded with a liquid chemical solution.
 - a. To accommodate this possibility, the subsystem shall be separated into multiple sections that can be isolated, flooded and drained.
 3. Arrange all piping to drain to identified low points.
 4. Provide capped tees at low points.
 5. Install pipe at a minimum of 6 inches above floor.
 6. Weld pipe above the ceiling
 7. Install valves, capped tees, etc. in enclosures isolated from the above ceiling space with grills to make them a part of the occupied space.
 8. Review piping arrangement with Jefferson County School District, R-1 Engineer.
- Gas Safety Valve (GSV):
 1. The gas supply to any classroom requires a manual shut off valve at the branch connection to main, Gas Safety Valve (GSV), and wall mounted Control Panel upstream of all points of use.
 2. 120 VAC, UL listed, solenoid with iron, steel or natural gas compatible brass body
 3. Mount GSV in an air tight enclosure open to the occupied space and separated from the return air plenum.
 - a. Within the enclosure, install unions on either side of the GSV and a manual isolation valve upstream of the inlet side union.
- 4. Control Panel:
 - a. 120 VAC, keyed on, push button off, red pilot light to indicate valve open

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- b. Push button shall be large red with “OFF” engraved in the face.
- c. Key shall be removable in any position.
- d. Locate Control Panel at the primary classroom exit.
- e. Control Sequence:
 - (1) “Key On” energizes pilot light and valve to open.
 - (2) “Push Button Off” de-energizes pilot and normally closed valve.
- f. Manufacturers:
 - (1) ASCO
 - (2) Warwick

END OF SECTION 22 63 00

22 66 00 Chemical-Waste Systems for Laboratory and Healthcare Facilities – Dec. 1, 2007

- Work in this section is open to any product or material meeting the requirements of this Technical Guideline.
- Install a dilution trap beneath every sink of each science room.
 - 1. Manufacturer:
 - a. IPEX Inc.
 - (1) Model: W611 with clear base.
 - b. Orion Fittings, Inc; a division of Watts Water Technologies, Inc.
 - c. Georg Fischer Piping Systems
 - d. Spears Manufacturing Company
 - 2. Trap size to have 1.0 to 2.0 gallon capacity depending upon manufacturer
 - 3. Trap must have IAPMO stamp.
 - 4. Installation to include acid resistant piping between the outlet of the sink and the inlet to the trap.
 - 5. Piping from the outlet of the trap can be cast iron and that can be connected into the building sanitary.
 - 6. Some trap selections cannot be supported from the piping alone.
- Stagecraft Area:
 - 1. Solids interceptors are prohibited.
- Art Classrooms:
 - 1. Under cabinet solids interceptors for art classrooms.
 - 2. Coordinate basket removal clearance requirements with clearance under cabinet.
 - a. Solids Interceptor:
 - (1) Zurn - Model Z-1180

END OF SECTION 22 66 00