A. ACCEPTABLE PIPING MATERIALS

1. Above Grade: Type L hard drawn copper tubing with wrought copper sweat fittings, 95/5 tin antimony solder for joining 2" and smaller pipe. 15% silver brazing conforming to AWS classification BCuP-5 for joining 2-1/2" and larger piping.

2. Below Grade: Type K hard drawn or soft copper tubing, with wrought copper sweat fittings, all connections brazed with 15% silver brazing conforming to AWS classification BCuP-5, wrap pipe with 1 layer of 10 mil tape. Soft copper tubing with radius bends shall be used to minimize below grade fittings. (Note: Pipe layouts which place water piping under the building slab should be avoided whenever other alternatives are feasible.)

3. Below grade, beyond building footing, 3" and smaller piping, alternate material: Schedule 80 PVC pipe with socket fittings and solvent cement joints.

4. Below grade, beyond building footing, 4" and larger: Cement-mortar lined Class 150 ductile iron pipe with bell and spigot joints and cast-iron fittings. Specify restraining method: thrust blocks or restrained joints. Restrained joints should be called out for pipe configurations where thrust blocking will be difficult.

5. Below grade, beyond building footing, 4" and larger, alternate material: Class 200 AWWA C-900 PVC with bell and spigot joints and cast-iron fittings. Specify restraining method: thrust blocks or restrained joints. Restrained joints should be called out for pipe configurations where thrust blocking will be difficult.

B. WATER PRESSURE REDUCING VALVES

1. Provide a pressure reducing valve (PRV) which will limit the supply pressure to 80 PSI at the domestic water entry point to each building. This PRV shall be provided on water services with pressure below 80 PSI as well as above in order to provide additional protection in the event of a loss of pressure control in the campus water mains.

2. For low system pressures where a PRV may cause an undesirable pressure loss an exception to this requirement may be granted upon obtaining approval from the University’s Representative.
3. Provide compound PRV’s where required to accommodate a large range of flows.
4. Fire water should not be reduced in pressure. Separate fire water from domestic water ahead of the PRV.

C. VALVING

1. Water piping systems shall be provided with manual isolation valves at the following locations:
   a. At branch connections to underground system mains.
   b. At all building points of entry.
   c. On both sides of piped in devices which may need to be removed for servicing including water meters, back flow preventers, pressure reducing valves, strainers, pumps, etc. The devices shall be removable without draining down the building system.
   d. Exception: On small branch lines (1 inch and less) where the quantity of building water is small, the valve on the downstream side of the device may be omitted.
   e. At each floor where branch piping connects to a riser.

D. DOMESTIC / INDUSTRIAL HOT WATER

1. For water conservation, all systems shall be designed to provide near immediate hot water at fixtures by using either a hot water circulation pump or electric heat tape. An exception to this is small systems with a short distance (50 feet or less) between the water heater and the fixture. Verify with the University Representative whether heat tape or circulation will be used on a project by project basis.
2. For systems with a hot water circulation, verify that the pump is not over selected and that the pipe velocities due to circulation will be reasonably low. (Copper fitting failure due to high velocity scouring has been a problem). Grunfos Alpha Series Pumps are preferred.
3. Domestic hot water heaters shall be gas fired, to minimize campus electrical demand as well as energy use cost.
   a. Exceptions:
      1) Domestic hot water in buildings served by the campus central heating water system should be provided from a storage tank equipped with a
double wall heat exchanger. (An exception to this may be allowed in the case of buildings with very low anticipated domestic hot water usage).

2) Lavatories with small usage which are remotely located from a central system may be provided with hot water from a small electric storage type water heater with a maximum electrical demand of 1.5 kW. This exception shall not apply to shower usage. Instantaneous electric water heaters are not permitted due to high electrical demand.

4. Provide separate heating sources for domestic hot water and space heating water except for buildings served by the campus central heating water system.

5. Water heaters shall be installed in a sheet metal drain pan (smitty pan) with drain outlet piped to a safe location on the building exterior or floor drain.
   a. Exception: Water heaters installed on a concrete floor slab where leakage would not damage the floor or building. Provide a floor area drain in the vicinity of the water heater.

6. All hot water piping shall be insulated.

7. Water systems shall be designed to prevent water hammer. Provide properly sized shock arrestors adjacent to all quickly closing valves including toilet flush valves, washing machines, dish washers, and solenoid valves. Provide a ball valve below each shock arrestor to allow for removal without system drain down. Provide access doors for all shock arrestors in concealed locations. Shock arrestor locations and sizes should be positively identified within the contract documents.

E. DISINFECTION

1. All potable water systems shall be disinfected and analyzed for bacteriological content. (Note: On Cal Poly projects, fire protection systems should also be disinfected, since they are installed without approved backflow protection.) No fire system shall be installed without back flow prevention.

2. Bacteriological analysis shall be completed by a third-party laboratory approved by the Cal Poly Office of Environmental Health & Safety (EH&S). The laboratory shall be submitted via the University Representative for approval by EH&S a minimum of 72-hours prior to conducting disinfection. Analysis results shall be submitted via the University Representative to EH&S to certify compliance with the specifications. Disinfection procedure shall be repeated should EH&S indicate that compliance with the applicable regulations has not been achieved. Plumbing shop representative shall be given a copy of the results before the system can be put in service.
3. Provide an industrial water system for non-potable uses at all wet laboratories, faucets with serrated tip for hose connections, dark rooms, and all other locations using toxic or hazardous materials and requiring water service for uses other than drinking. Backflow protection shall be by a reduced pressure principal type back flow preventer.

END OF SECTION 22 11 16