PART I - GENERAL

A. Description

This section includes requirements for materials for the installation Structured Plumbing systems for hot water delivery. Figures 1 and 2 contain drawings of the Structured Plumbing concept.

B. Submittals

1. Provide plumbing layout showing location of hot water priming loop, length of branch and twig lines, diameter of hot water priming loop and all branch and twig lines, location of on-demand pump and location of all activation mechanisms.
2. Provide materials list showing materials utilized.
3. Provide Certificates of Compliance with all applicable codes.

Figure 1: STRUCTURED PLUMBING® with a dedicated return line
PART 2 – DEMAND CONTROLLED HOT WATER PRIMING SYSTEMS

A. Materials

1. **D’MAND KONTROLS® SYSTEM**
   a) The pump shall operate “on-demand”, meaning that it shall receive a signal to turn on from a user shortly prior to the desired hot water draw. The pump shall not operate continuously, on a timer, on an aquastat based temperature controller or by a combination of timer and aquastat. Show the location of the pump on the plumbing layout.
   b) The pump must have the capacity to overcome the pressure drop in the hot water priming loop and still move the water relatively quickly. The smaller the diameter, the longer the length and the more additional restrictions to flow (such as 90 degree turns through elbows and tees), the greater the pressure drop. In general, the greater the pressure drop in the hot water priming loop, may require D’MAND® System with a higher GPM and FT. of Head.
   c) Follow the sizing guidelines recommended by the manufacturers of **D’MAND KONTROLS®** Pumping Systems.

2. **CONTROLS AND ACTIVATION**
a)  The controls shall be electronic and operate on the principal of shutting off the pump with a rise in temperature (Delta-T). If the thermo-sensor that measures temperature rise fails to operate, the electronic controls must have a lock out to prevent operation above 105o F degrees. The electronic controls shall also have an electronic fail-safe to prevent extended operation of the pump if the sensor fails or is damaged.

b)  Hard Wired Activation Mechanisms
(1)  Button. Buttons shall be normally-open, momentary close switches. These may be LED lite.

(2)  Motion Sensor. Motion sensors shall make a momentary contact when motion is sensed. The motion sensors operate on only 12 volts and are designed to sense motion and heat, weight and height. After the signal is sent, the sensor shall go into a lock out mode for a short period of time. Even if the sensor is activated again sending a signal the electronic controls will not allow the pump to restart while the circulation loop is still hot. There are two times a circulation pump should not run, one, “if there is no demand for hot water and two, if hot water is already in the line”.

Other including flow switch or door switch.

Other methods of activation are light switches, master control stations and sound activation.

c) Wireless Activation Mechanisms

- Button. Same as above.
- Motion Sensor. Same as above.

3. Demand Controlled Pumping Systems include the pump, electronic controls and activation mechanisms. These systems must be certified to meet nationally accepted plumbing and electrical standards (for example, IAPMO/UPC and ETL ETLC). Acceptable manufacturers of these systems are Advanced Conservation Technology ACT, Inc. D’MAND KONTROLS® SYSTEM.

B. EXECUTION

1. D’MAND KONTROLS® PUMP SYSTEMS
   a) Install pump(s), controls and activation mechanisms in accordance with applicable codes and manufacturer’s instructions.
   b) Pump(s) shall be installed to facilitate repair and replacement

2. Activation Mechanisms
   a) In general, provide one activation mechanism for each hot water location. Provide an explanation if less than one activation mechanism per location is needed. Show location of all activation mechanisms on the plumbing layout.
   b) Hard Wired Activation Mechanisms
(1) Button located on a switch plate in a convenient location. Buttons may be installed directly into a wall location without a switch plate.

(2) Motion Sensor located to trigger when someone gets near the hot water location. There are occasions where motion sensors are located in door locations as you enter the home from a garage area.

(c) Wireless Activation Mechanisms Button.

d) Give these to the homeowner so that they can put them where convenient. Possible locations include, near the kitchen sink, at the head of the bed in the master bedroom, in the laundry room, on the mirror in the guest bathroom.

(1) Motion Sensor located to trigger when someone gets near the hot water location.

e) Other including flow switch or door switch

(1) Refer to manufacturers of Demand Controlled Pumping Systems to select one of these activation mechanisms.

3. Hot Water Priming Loop-Structured Plumbing®

a) System shall have a line that returns water to the hot water heater. Either a dedicated return line shall be installed (See Figure 1), or the cold water line may be used as a temporary return (See Figure 2). A dedicated return line is recommended if motion sensors are used to activate the pump. Show the location of the hot water priming loop on the plumbing layout.

b) A check valve is included in every D’MAND KONTROLS® System. The supply portion of the hot water priming loop shall be sized in accord is included in every D’MAND KONTROLS® System in compliance with applicable plumbing codes. The hot water priming loop shall have a minimum diameter of ¾ inch nominal anywhere in the loop including the return from the last fixture to the water heater. This applies to both dedicated and cold-water line returns.

c) Locate all hot water outlets no more than 10 plumbing feet (or less) from the hot water priming loop. The distance includes all fittings and shall be measured from the loop to the place where the pipe serving each fixture comes through the wall or floor, or connects to the valve (such as for showers and tubs, which are generally hidden).

d) Keep the restrictions to flow in the hot water priming loop to a minimum by minimizing the number of fittings.

(1) Rigid Pipe (e.g. copper and CPVC, and larger diameters of Cross-linked Polyethylene (PEX) and PEX-Al-PEX

(a) Elbows – minimize to the extent practical the number of hard 90 degree elbows since these have a major impact on the equivalent feet and increase the resistance that the pump must overcome. Use manufactured wide sweeping elbows or
bendable copper. Preferred radius is 10-15 times the nominal pipe diameter.

(b) Couplings – minimize the number, particularly when the couplings are internal fittings. In general, makes the joints at the tees for the twigs or branches.

(2) Flexible Pipe (e.g. copper, PEX, PEX-Al-PEX and CPVC)

(a) Elbows – minimize the number to the extent practical of hard 90 degree elbows since these have a major impact on the equivalent feet and increase the resistance that the pump must overcome. Use the tubing’s flexibility to make the bends. Follow manufacturer’s instructions for minimum radius on all bends.

(b) Couplings – minimize the number, particularly when the couplings are internal fittings. In general, makes the joints at the tees for the twigs or branches.

4. Twig and Branch Lines

a) A twig line serves one hot water outlet (faucet, shower, appliance, etc.). A branch line serves two or more outlets. A trunk line or hot water priming loop serves many outlets and the main line serves the building.

b) Select the diameter of the twig lines in accordance with the UPC or the IPC, in general ½ or less. Each outlet should be served with its own twig line. Example exceptions include: a branch line serving two sinks so that the total distance from the water heater to each sink is less than 10 plumbing feet, or a water heater serving a sink and a shower or tub/shower combo.

c) Minimize the number of fittings in the twig and branch lines to the extent practical, particularly hard elbows and internal fittings of all types.

5. Insulation

a) All hot water lines shall be insulated from the water heater to as near as practical to every fixture. This includes the supply portion of the hot water priming loop, the dedicated return line and all twig and branch lines.

b) The wall thickness of the insulation shall be equal to the nominal diameter of the pipe that is being insulated. (In California, T-24 currently requires 1 inch wall thickness (approximately R-6) on the hot water priming loop, the dedicated and on the entire line to the kitchen outlets, regardless of the diameter of the pipe.)

c) Install in accordance with the pipe insulation manufacturer’s specifications. Pay particular attention to details at elbows and tees and all joints. Select insulation that does not shrink, particularly in length, over time.

6. Commissioning the system

a) Purge all pipes before installing the pump to remove air and other unwanted materials.
b) Get the water heater(s) up to the desired temperature in accordance with the water heater manufacturer’s instructions.

c) Follow the manufacturer’s instructions applicable to each pump, control and activation mechanism to ensure that the system is operating correctly.

d) Preheat the hot water priming loop to check for proper operation.

e) Measure how much water comes out of each fixture before hot water arrives. It should be approximately two cups at all fixtures except those for which an exception has been approved.

7. Customer Education

a) Provide the homeowner with all warranty and operational material supplied by the manufacturer. Instructions need to explain how to prime or preheat the circulation loop. This information should advise the customer how and when the system should be turned off to prevent damage and what to do in the event of a water or electricity outage.

Warranties

**ACT D’MAND KONTROLS® SYSTEM** has a minimum of a 5 year warranty on the electronics and pump systems.