

# Primary-Secondary Pumping "Rules of Thumb"

Primary-secondary pumping has been around since 1954. Most of the applications for this pumping technique, pioneered by Bell & Gossett, have been in large commercial systems such as chilled water campus systems, dual temperature change-over systems, and freeze protection for make-up air systems.

In recent years though, there has been renewed interest in this technique for smaller, light commercial - and even residential - applications. In fact, multiple hot water boiler applications, when installed correctly, must use primary-secondary pumping.

Radiant in-floor heating has become very popular too. To meet the design water temperatures of radiant systems, the mixing of some cooler return water with some hot water from a cast iron boiler must take place, and the most effective method for accomplishing this is through primary-secondary pumping. Most residential cast iron boiler manufacturers have limitations on the water temperature maintained in their boiler, but, when using these boilers with radiant heating systems, primary-secondary pumping is an effective way to raise the return water's temperature.

In the late '70s and early '80s, commercial buildings such as apartments and smaller schools incorporated a method of reset through the use of a 3- way motorized valve. Based upon outdoor temperatures, the valve would reposition itself to deliver just the right amount of heat to satisfy the building's heat loss. However, the problem with a lot of these installations was that there was no means provided for measuring the return temperature of the water entering the boiler. Under certain conditions, a tremendous amount of cool water would enter the boiler, causing thermal shock and possibly cracking boiler sections. However, a simple boiler loop pump, piped using primary-secondary methods, would prevent this problem.

Primary-secondary pumping is simple in theory as well as operation. It is based on a simple fact: when two circuits are interconnected, flow in one will not cause flow in the other if the pressure drop in the piping common to both is eliminated.

## RULES OF THUMB

### #1 THE COMMON PIPE

The key to all primary-secondary applications is the use of a common pipe which interconnects the primary and secondary circuits. The length of this pipe should be kept very short in order to keep the pressure drop very low, and the supply and return tees to the secondary circuit should be a maximum of four pipe diameters apart. By keeping the pressure drop very low, water that is flowing in the primary loop will not flow into the secondary circuit until its circulator turns on.

### #2 THE SECONDARY CIRCULATOR

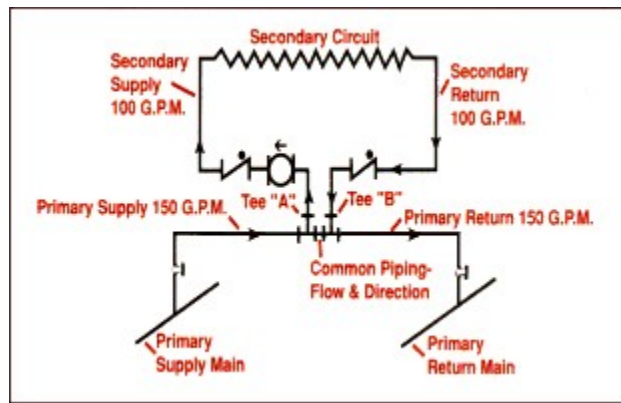
A separate circulator is installed in the secondary circuit to establish flow. This circulator is sized to move the flow rate and to overcome the pressure drop of its circuit only. The circulator should be located so it is pumping away from the "common piping" and discharging into the secondary circuit. This causes an increase in pressure in the secondary circuit rather than a reduction in pressure which would occur if the pump were located on the return pumping towards the common pipe.

### #3 THE LAW OF THE TEE

This rule determines the flow rate and direction of flow that occurs in common piping. It is based on the relationship of the primary and secondary flow rates, and there are three possibilities to evaluate:

- 1.Primary flow more than secondary
- 2.Primary flow equal to secondary
- 3.Primary flow less than secondary

This rule of thumb is best described by a simple statement: flow into a tee must equal flow away from the tee.



#### #4 FLO-CONTROL VALVES

Flo-Control valves are recommended to prevent any flow into the secondary circuit induced by either the slightest pressure drop that may exist on the common pipe or by gravity heads. Because gravity flow can occur within a single pipe, two Flo-Control valves are best, one on the supply and one on the return. However, if the secondary circuit's return is underslung, only one valve is needed.

For more detailed information on primary- secondary pumping, contact your local B&G representative. They are well "primed" on this and many other hydronic subjects. Ask for B&G's bulletin TEH- 775 Primary-Secondary Pumping Application Manual.

Reprinted from CounterPoint October 1997, Vol. 4, Issue 2