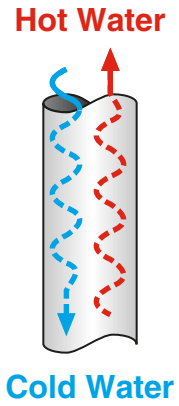
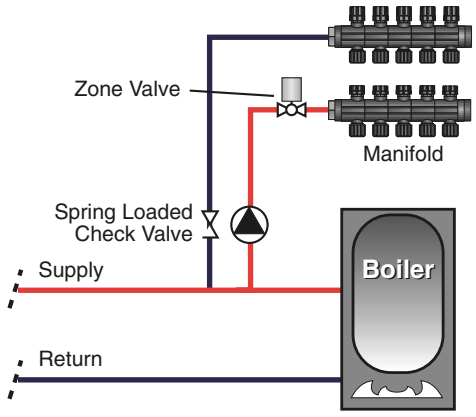
It is Nature's way that any heat imbalance in different parts of a hydronic piping system will find equilibrium in due course. Nature always establishes a *wormhole* (by the difference in water properties at different temperatures) allowing those BTUs to escape from one part of a system (high temperature) to another (low temperature) in an inconspicuous way. Hot water in a boiler can spot a cool piping loop above it.



Since heated water tends to rise (due to density discrepancy), and does so if given the opportunity, a buoyancy-driven flow (gravity flow) can occur easily and naturally. This unintentional flow of heated water in a hydronic system is a nuisance when it makes floors warm on a hot summer day. It is just as irritating, when it causes the indirect water heater to create its own convective loop through the system piping, and uses it to release heat when the pump is not running.

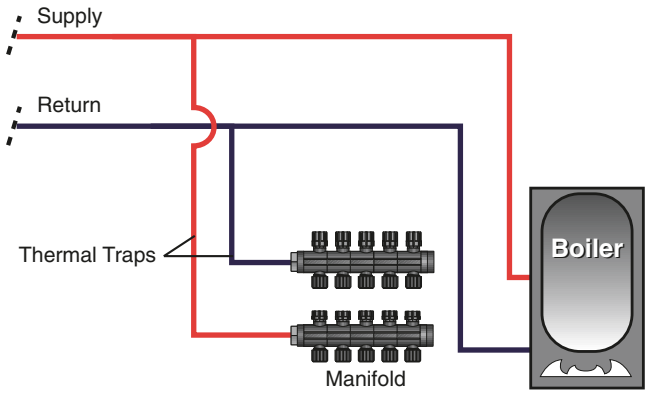
One of the objectives of any hydronic heating system is to control the movement of heated water. To minimize or eliminate uncontrolled gravity-driven flow, the installation of a thermal trap, or flow check valve (or spring-loaded check valve) on the return side of every branch of piping interfacing with a high temperature circuit is *mandatory*. To create the thermal trap, route the return pipe approximately 16" below the connection point to the high temperature side.



How long the thermal trap should keep the buoyancy flow at bay can be established by equilibrium between,

1. the frictional force between the flowing water and the pipe material, and

2. the buoyancy force as a result of the density difference of water due to the temperature gradient.



To cover the wide variations that could arise in any hydronic system installation (such as using pipe of a size larger than necessary, and temperature swings wider than would be expected under certain circumstances), a 16" length is normally suggested with enough of a margin for the safety factor. However, thermal traps of shorter length are equally sufficient and efficient in minimizing the buoyancy-driven flow if the right size of pipe is used and the system is not expected to be subject to wide temperature swings for a prolonged period. Over the years, field installation experiences have shown that there have been fewer gravity flow issues in properly installed systems where thermal traps with lengths as short as 8 inches are used. Should space be a constraint for an installation, a thermal trap of a length shorter than the suggested 16 inches can be considered, provided that the piping is properly installed and correctly sized.

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