

We have seen many varying return systems in the buildings in which we worked. If we take a close look at the why, typically, the designer or installing contractors did what they perceived as the least costly piping installation.

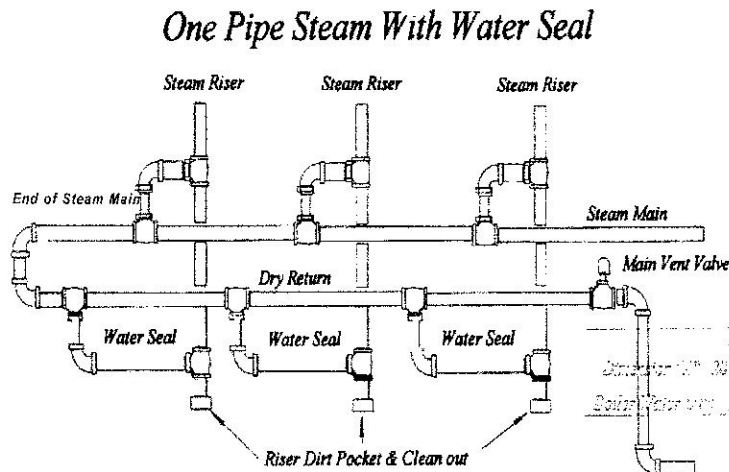
Often, the choice of using a dry return as opposed to a wet return seems to have been what someone decided they wanted to do.

One-pipe steam systems with wet returns are superior to steam systems with dry returns because a water seal is built into steam systems with wet returns. The standing boiler water level creates the water seal. Water seals separate the steam side from the return side of the system. The water seal prevents steam from crossing from the steam side to the return side of the steam heating system. This water seal keeps all the steam in the steam side of the heating system. *In effect, the water seal is a nonmechanical steam trap or check valve.*

In steam heating, two types of dry returns are used. One dry return is used to return the condensate to a boiler and keep the boiler and piping system in equilibrium. Typically, that dry return is charged with steam pressure and found on one-pipe steam systems and two-pipe steam systems without steam traps.

The second dry return piping system carries condensate water discharged from steam traps to a combination pump and receiver. This dry return is usually at atmospheric pressure or less. Since steam does not enter the dry return, the dry return must be separated from the boiler by use of a boiler return trap and vent valve, steam trap, condensate pump, vacuum condensate pumps, check valves, or combinations of each. Remember, the boiler creates steam pressure and water is pushed out of the return tapping of the boiler to the zone of lower pressure, the condensate return piping.

In one- and two-pipe steam systems without steam traps, water seals can be used on one or more steam and return risers. A water seal cannot be installed at the end of the steam main.



Steam pressure must be present in the dry return. Look at the steam main and dry return. Steam has a clear path to the water seal created by the boiler waterline. Note the location of the vent valve. That vent valve assures that steam will fill both the steam main and the dry return.

Steam pressure on both sides of the water seal keeps the water seal in a state of equilibrium and prevents the seal from being blown out. Condensate stacks up in the return risers. When the weight of water in the return riser exerts sufficient pressure (greater than steam pressure), water will flow out of the water seal toward the boiler. Remember, the water's of condensation return to the boiler is governed by simple rules of physics. Gravity is the primary rule and simply explained that what goes up must come down.

In the sketch on page 16, three steam risers, a steam main, and wet return are shown. Water seals, combined with relief drips at the base of the steam risers, cause steam to flow in one direction. The water seals assure that steam will not flow up the bottom of the steam riser. Additionally, water returning from each riser is directed to the dry return. As a result, the steam main carries a small amount of condensate; that condensate is generated by the heat loss of the steam main pipes. Condensate from the steam risers and heating elements (radiators or convectors) is diverted away from the steam main and directed to the bottom of the dry return.

Water seals, in combination with relief drips, can correct many problems in an existing steam system. What is important is that when a water seal is used, the installer must make sure that steam pressure will always be present on both sides of the water seal. If pressure equalization does not occur, the water seal will be pushed out. This will result in banging and sometimes impede or stop the flow of steam to a riser or risers.

In all installations larger than 100,000 BTUH, the "A" dimension at the end of a dry return or drop leg to the wet return must be no less than 28 inches above the boiler waterline.

A water seal can be used in many steam systems. The water seals shown were found in buildings built in the late 1800s and early 1900s.