

COBREX[®]

INSTANTANEOUS

Steam-fired Domestic Hot Water Generator

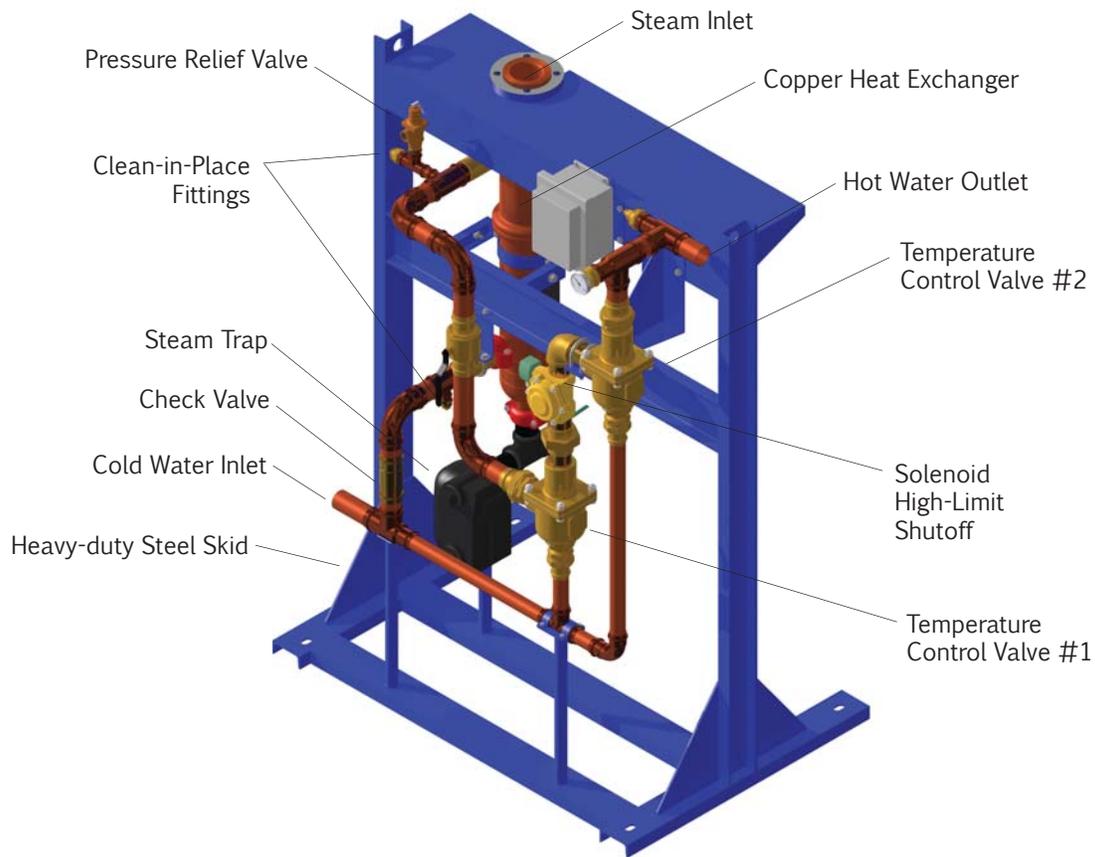


- 100% Copper and Brass, Double-Wall, Shell-and-Tube Heat Exchanger
- Single-Pass, Counterflow Design
- No Steam Valve Required at ≤ 15 psi Steam
- $\pm 4^{\circ}\text{F}$ Outlet Water Temperature Control Under All Domestic Water Flow Conditions
- Up to 6,000,000 Btuh Output
- From 20 to 120 gpm Hot Water Delivery
- Solenoid Valve Over-temperature Protection
- Fully Packaged and Skid Mounted



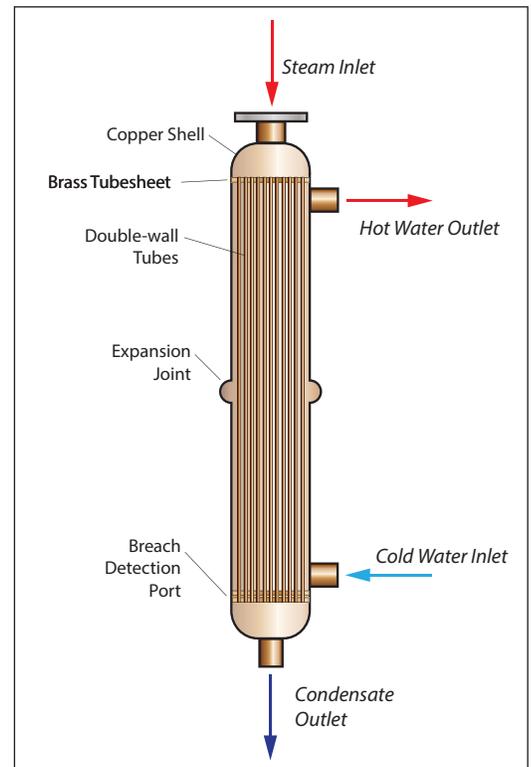
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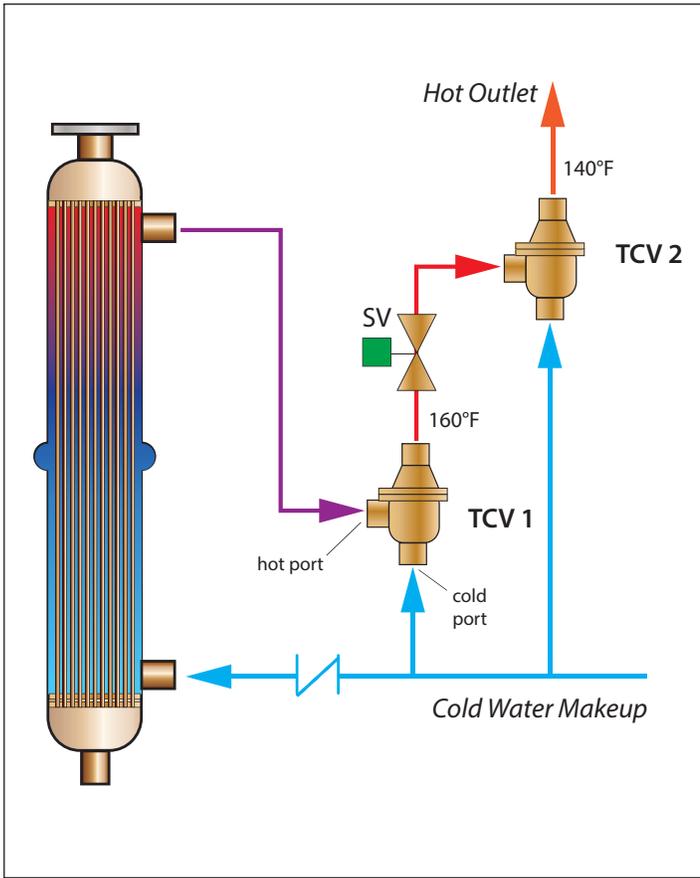
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The COBREX heat exchanger is a shell-and-tube design with domestic water in the shell and steam/condensate in the tubes. The exchanger is vertically oriented and single-pass. Steam and water paths are 100% counterflow and provide the greatest possible temperature differential at all points in the heat exchanger. The domestic water side also contains several baffles to create a circuitous and high velocity flow. This allows large amounts of hot water to be generated from a remarkably small heat exchanger.

The straight, copper, double-wall tubes are brazed into brass tube sheets and contained within a solid copper shell. The exchanger is ASME stamped to Section VIII for 150psi maximum allowable working pressure (MAWP).



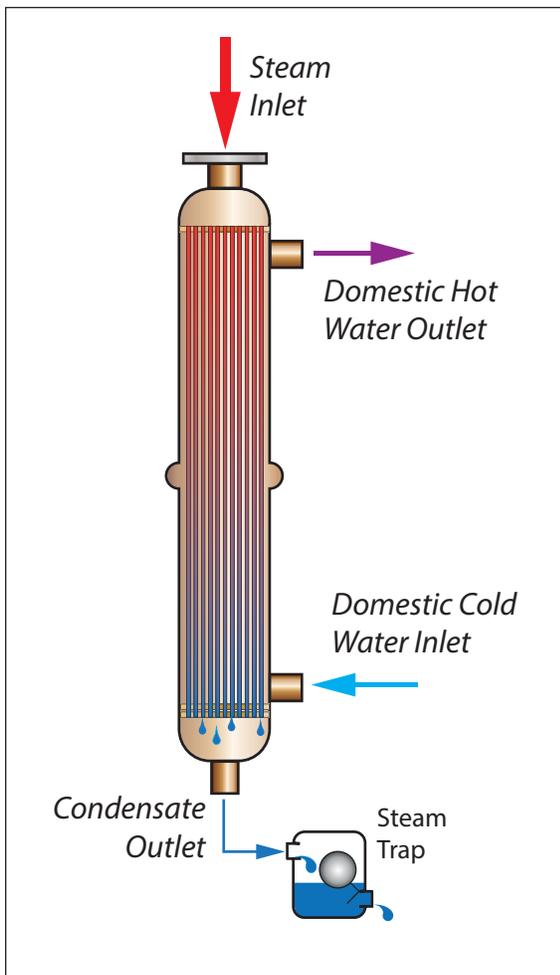


Domestic Water Temperature Control

Domestic hot water temperature is controlled by two temperature control valves piped in series. The heated water exiting the exchanger flows through a temperature control valve (TCV 1) where the water is blended with entering cold water to deliver a temperature 20°F above the ultimate desired delivered temperature. The water exiting TCV 1 then enters the hot port of the second control valve (TCV 2) where the hot water is again blended with cold water to deliver the desired domestic water temperature exiting the water heater.

The temperature of the domestic water exiting TCV 2 is constantly monitored. If an over-temperature condition occurs, the monitoring thermostat closes the safety valve (SV) and only the cold water entering TCV 2 is allowed to flow to the building through the control valve.

Temperature control is accurate to + or - 4°F under all variable flow conditions and + or - 2°F under relatively constant flow.



Steam Control through Condensate Control

Steam flow is controlled entirely by the rate in which the steam condenses, which is determined entirely by the demand for hot water and the resulting flow of cold domestic water into the heat exchanger. A steam trap regulates the flow of condensate from the heat exchanger and ensures that proper heat transfer occurs.

This process occurs naturally. As steam condenses to liquid, its volume is reduced immensely. The resulting pressure drop causes more steam to fill the void.

The process is also precise. The system is attempting to achieve equilibrium on both sides of the heat exchanger. Steam will continue to condense until the water is the same temperature as the saturated steam at a given pressure. As long as cold water enters the exchanger, condensing will continue at a rate equal to the available temperature rise of the potable water. When equilibrium is achieved, condensing stops along with steam flow.

With supply steam pressure of 15 psi or less, no steam valve is required. Higher supply pressure will require a steam pressure regulator to reduce inlet steam pressure to 15 psi.

Temperature Blend-down, Steam-fired Domestic Water Heating

High-temperature blend-down is a domestic water heating approach where water is initially heated by a steam heat exchanger to more than 200°F and is then blended with cold water through control valves to achieve the required outlet water temperature. This approach replaces the modulation of steam to control domestic water temperature and instead relies on blending flow of the entering cold water and the provided hot water through infinitely modulating temperature control valves. Rather than “chasing” a domestic hot water set point by metering steam into the exchanger, the design allows the steam to always transfer all of its available heat and achieves the desired domestic water set point after the fact.



A properly sized COBREX water heater is sized to always provide ample amounts of heated water for blend down.

The concept is not new and blend-down water heaters have been available for more than 60 years. The COBREX has improved the concept through the use of dual-temperature control valves piped in series for greater temperature accuracy. The COBREX design allows the water heater to respond to changes in both the entering water temperature and the domestic hot water demand (flow rate), which is essential in buildings with domestic hot water circulation. Previous designs could respond only to variations in flow and not temperature.

Since its introduction, PVI's dual-valve design has been proven in more than 1000 installations.

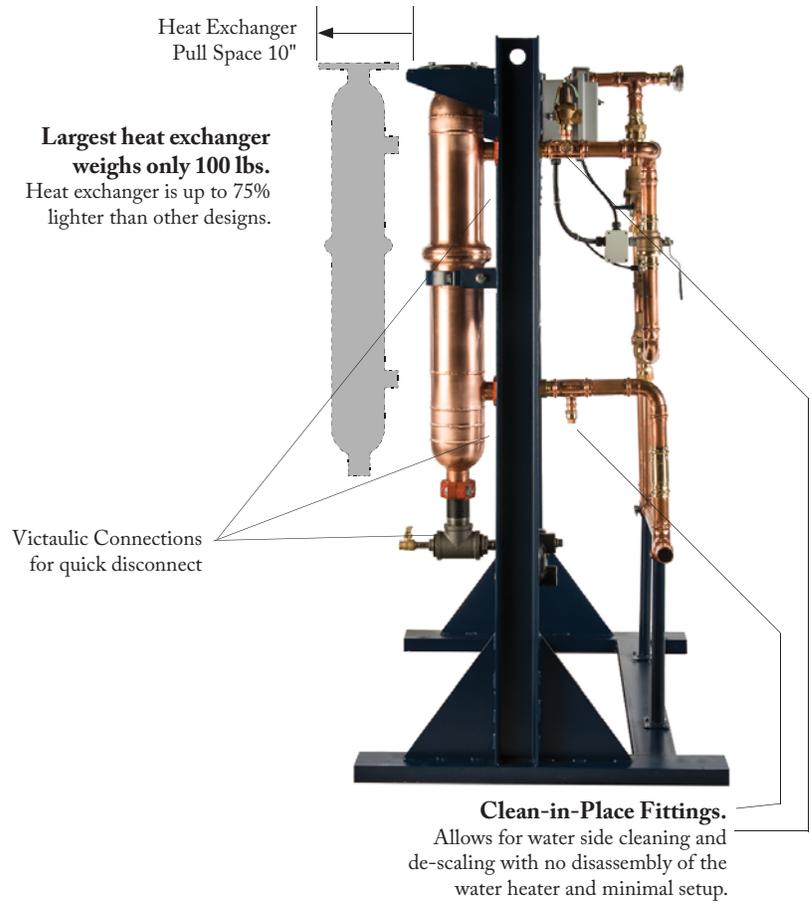
The standard settings for final delivered water temperature are either 120°F, 140°F, or 160°F. Different outlet temperature systems are available as custom configurations. Being fixed temperature systems, the valves are tamper-proof. The temperature control valves are specifically designed for PVI for extremely tight temperature control for potable water applications.

Electronic Monitoring Capability for Building Automation Systems

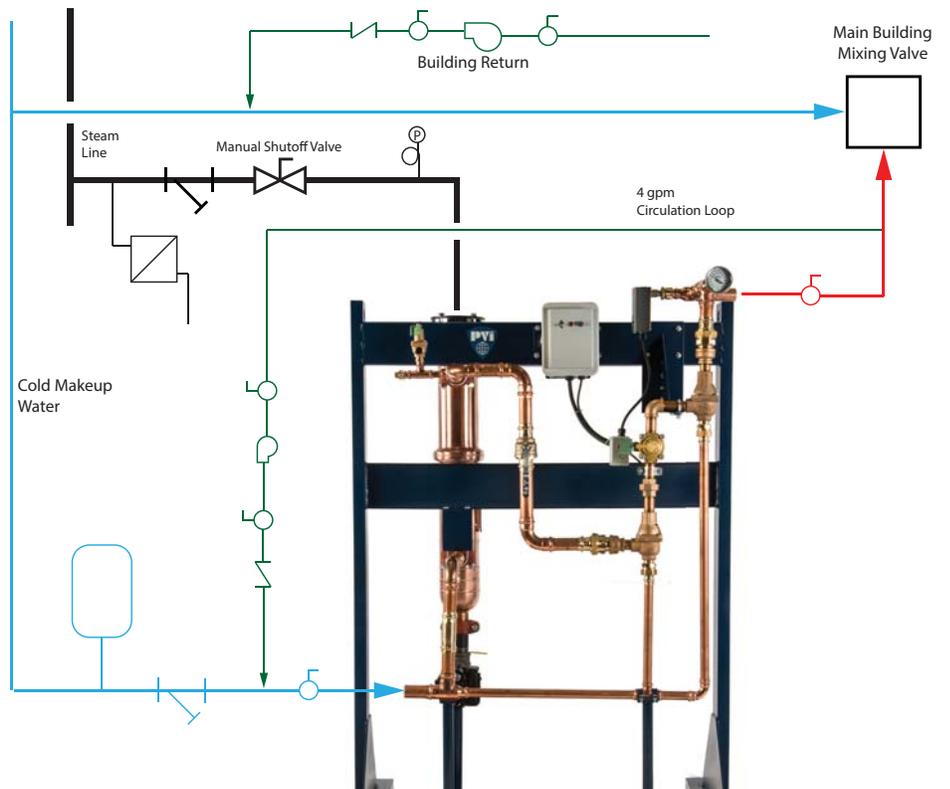
Optional electronic interface is available for read-only MODBUS communication to a BAS for the monitoring of alarms and outlet temperatures. Gateways are available for Lonworks and Bacnet.



Maintenance and Service Features

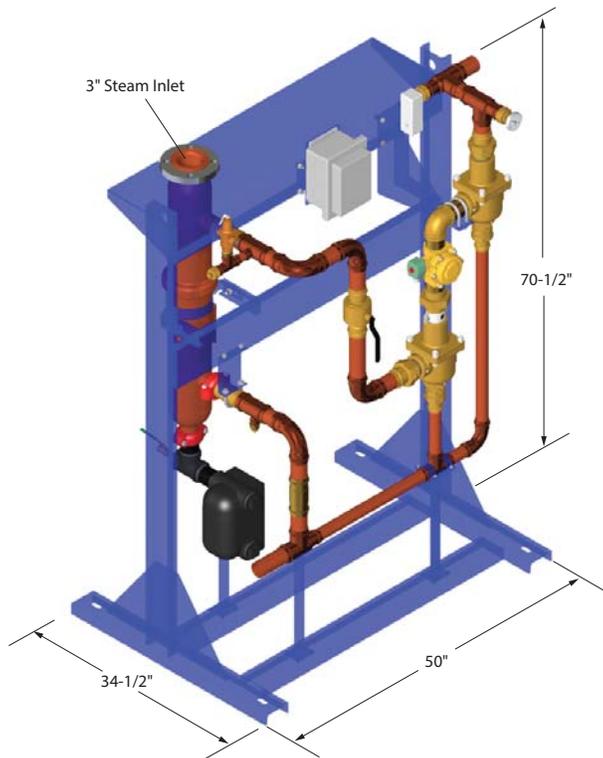


Typical Piping Arrangement

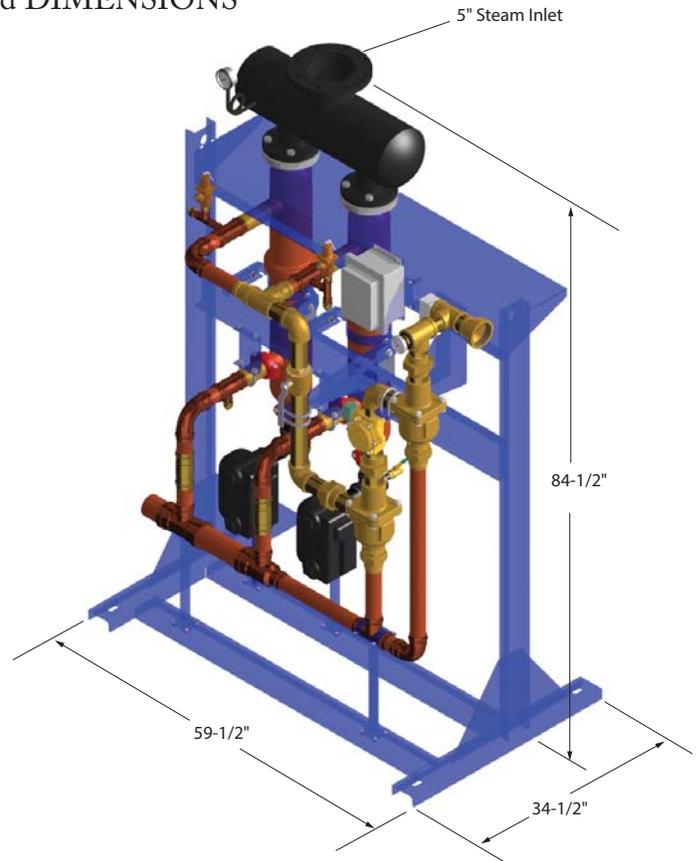


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PERFORMANCE and DIMENSIONS



Single Heat Exchanger Models
(4 Product Configurations Available)



Dual Heat Exchanger Models
(2 Product Configurations Available)

Temperature Rise	Inlet Steam Pressure (psi)	Recovery Range (gpm)	Output Range (MBTU)
40°F to 120°F	5	30 - 75	1200 - 3000
	10		
	15		
40°F to 140°F	5	20 - 50	1000 - 2500
	10	20 - 60	1000 - 3000
	15	30 - 60	1500 - 3000
40°F to 160°F	5	30 - 40	1800 - 2400
	10	30 - 40	1800 - 2400
	15	30 - 50	1800 - 3000

Temperature Rise	Inlet Steam Pressure (psi)	Recovery Range (gpm)	Output Range (MBTU)
40°F to 120°F	5	90 - 120	3600 - 4800
	10		
	15		
40°F to 140°F	5	60 - 100	3000 - 5000
	10	75 - 120	3750 - 6000
	15	75 - 120	3750 - 6000
40°F to 160°F	5	50 - 75	3000 - 4500
	10	50 - 90	3000 - 5400
	15	60 - 90	3600 - 5400