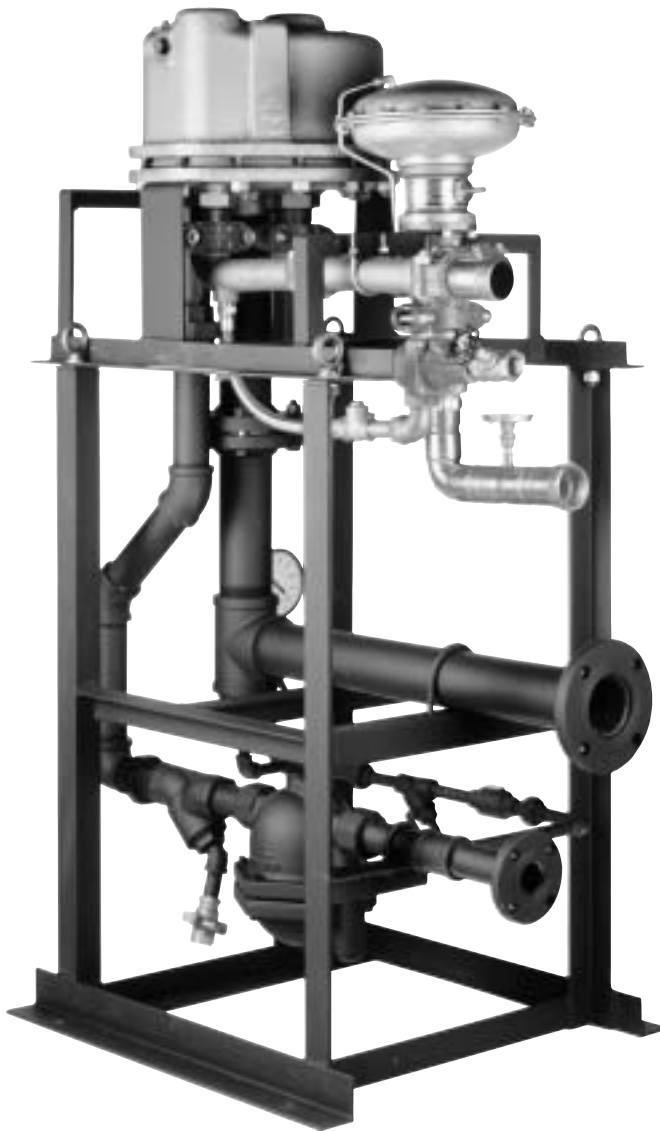


# FFH Series



Steam Fired

*Instantaneous Feed Forward Water Heaters*



**CEMLINE CORPORATION**

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# Operation of Cemline Feed Forward Instantaneous Water Heaters

*Cemline Feed Forward Water Heaters can supply domestic hot water with a temperature range set point of 105 to 180 deg F. Models are available for flow rates from 15 to 120 gallons per minute.*

The Cemline Feed Forward Instantaneous Water Heaters (FFH) use a pressure sensing blending valve to mix overheated hot water with cold water to make hot domestic water. Cold water is passed through the tubes of the heat exchanger while 2 to 15 psig steam is piped to the shell of the heat exchanger which overheats the water in the tubes. A differential pressure sensing head then blends the cold water with the over heated hot water to deliver domestic hot water at a stable temperature with an adjustable range of 105 to 180°F.

The varying pressures from above and below the diaphragm of the blending valve are used to balance the differential pressure sensing head. A sensing line is run from the cold water supply to the top of the blending valve applying pressure downward on the diaphragm of the blending valve. The blended water's pressure is applied upward upon the diaphragm of the valve from below. When the pressure on the diaphragm is even, the valve is closed and hot water is not being sent out to the system.

When there is a demand in the system for hot water the pressure of the blended water begins to decrease. As the blended hot water's pressure drops, the pressure on the diaphragm from the cold water becomes greater than the pressure of overheated hot water on the diaphragm. The greater pressure of the cold water pushes down on the diaphragm, which pushes down on the stem of the blending valve opening up the hot water ports on the valve allowing more overheated hot water to be blended and sent out as hot water into the system.

When the demand for hot water stops the pressure of the blended hot water increases equaling that of the cold water, thus raising the diaphragm and the stem of the blending valve which closes off the opened hot water ports and stops the blending of hot water.

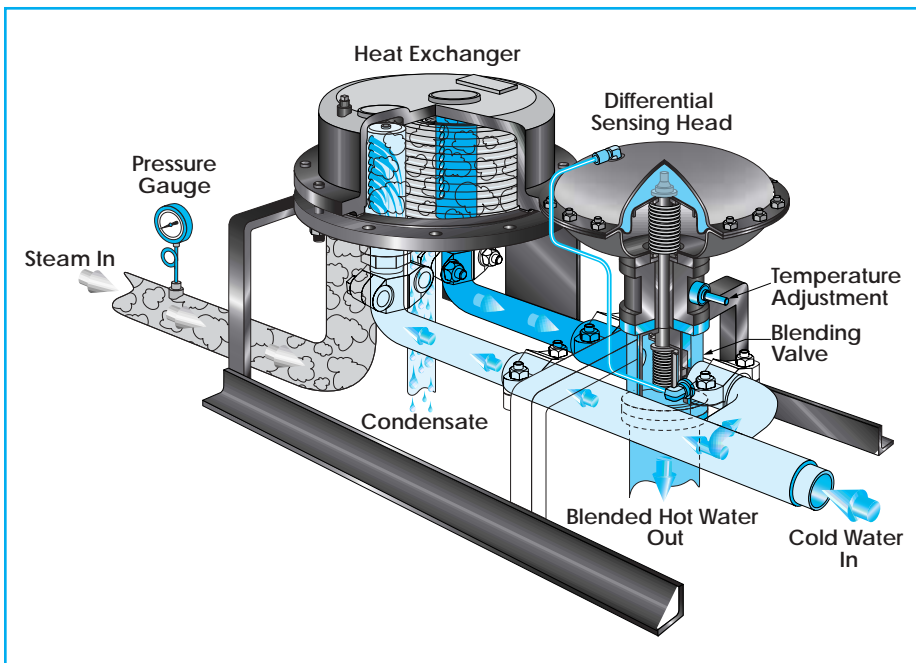
The valve allows for automatic proportioning of the hot and cold water thereby maintaining the desired set temperature even during conditions of uneven flow. The water is blended

quickly, which prevent any lags in response to demand.

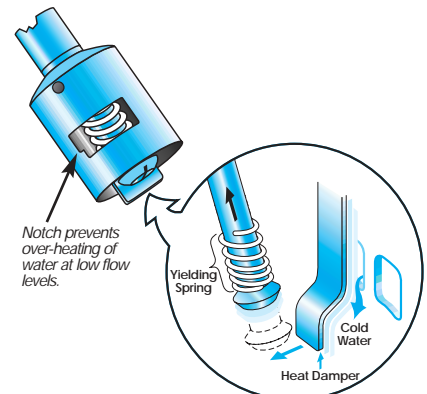
The blending valve is safe and will shut-off in situations of loss of cold water pressure. Should the movement of the blending valve be restricted by foreign debris carried in the water, a yielding spring arrangement allows the diaphragm and stem to move up, uncovering a heat damper in the characterized blending valve. This damper allows cold water to enter the blended mix, eliminating the possibility of over-heating or scalding.

Moving the adjustment rod on the stem of the blending valve easily sets the temperature of the FFH allowing for an easy start-up of the unit. The domestic hot water temperature range is 105 to 180°F.

Cemline FFH units can be completely packaged allowing the customer to receive a water heater that only requires connections to be made to the cold water inlet, hot water outlet, steam in, and condensate out. This is the ideal way to get a FFH heater as it reduces piping times at the job site.



## Two Innovations to Ensure Safety



*Should movement of the blending valve be restricted by foreign matter carried in the water, a yielding spring arrangement allows the diaphragm and stem to move up, uncovering a heat damper in the characterized blending valve. This damper allows cold water to enter the blended mix, eliminating the possibility of over-heating or scalding.*

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# Standard Equipment

## *Cemline Feed Forward Water Heaters*

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*Cemline FFH Water Heaters are normally completely packaged and ready to use. All components are sized, mounted and piped prior to shipment. These heaters come complete and require only connection to services.*

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### Standard Equipment

Heat exchanger:  
Vessel - Ductile Iron rated for 75 PSI  
Coil - Copper tubing rated for 150 PSI  
FFH Models 15, 30, 45, 60, 90: 1/2" O.D. x 18 BWG tubes  
FFH Models 105, 120: 5/8" O.D. x 18 BWG tubes  
Blending valve  
Strainers (main and drip)  
Outlet Water Temperature Gauge  
Main Trap  
Drip Trap  
Steam Pressure gauge (with pigtail)

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### Options

Vessel Material - Cast Steel rated for 150 PSI, Cast Steel 150 PSI ASME 'U' Stamp

Coil Material - Admiralty, 90:10 Copper Nickel, 316 Stainless Steel

Recirculation kit – REQUIRED if the water in the system is being recirculated to the unit (for more information see page 7).

Non-Packaged Unit – Strainers, traps, steam gauge, temperature gauges to be piped at the job site.

Packaged Unit – Completely packaged and skidded unit. The only connections to be made are the cold water inlet, hot water outlet, steam in, and condensate out.

Upstream Pressure Reducing Valve – In some installations the steam pressure supplied will be above 15 psig. In these cases Cemline can provide a pilot operated pressure reducing valve (PRV) to be piped upstream of the FFH that will reduce the steam pressure to 15 psig going to the unit.

Insulation cover – The insulation cover is placed over top of the heat exchanger to prevent heat loss of the heat exchanger. This high quality insulation is an extremely reliable means of minimizing heat loss.

*FFH water heaters are not recommended for water with hardness over 140 parts per million. If water hardness exceeds 140 ppm either put a water softener in the system or use Cemline SEH series water heaters.*

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### Warranty

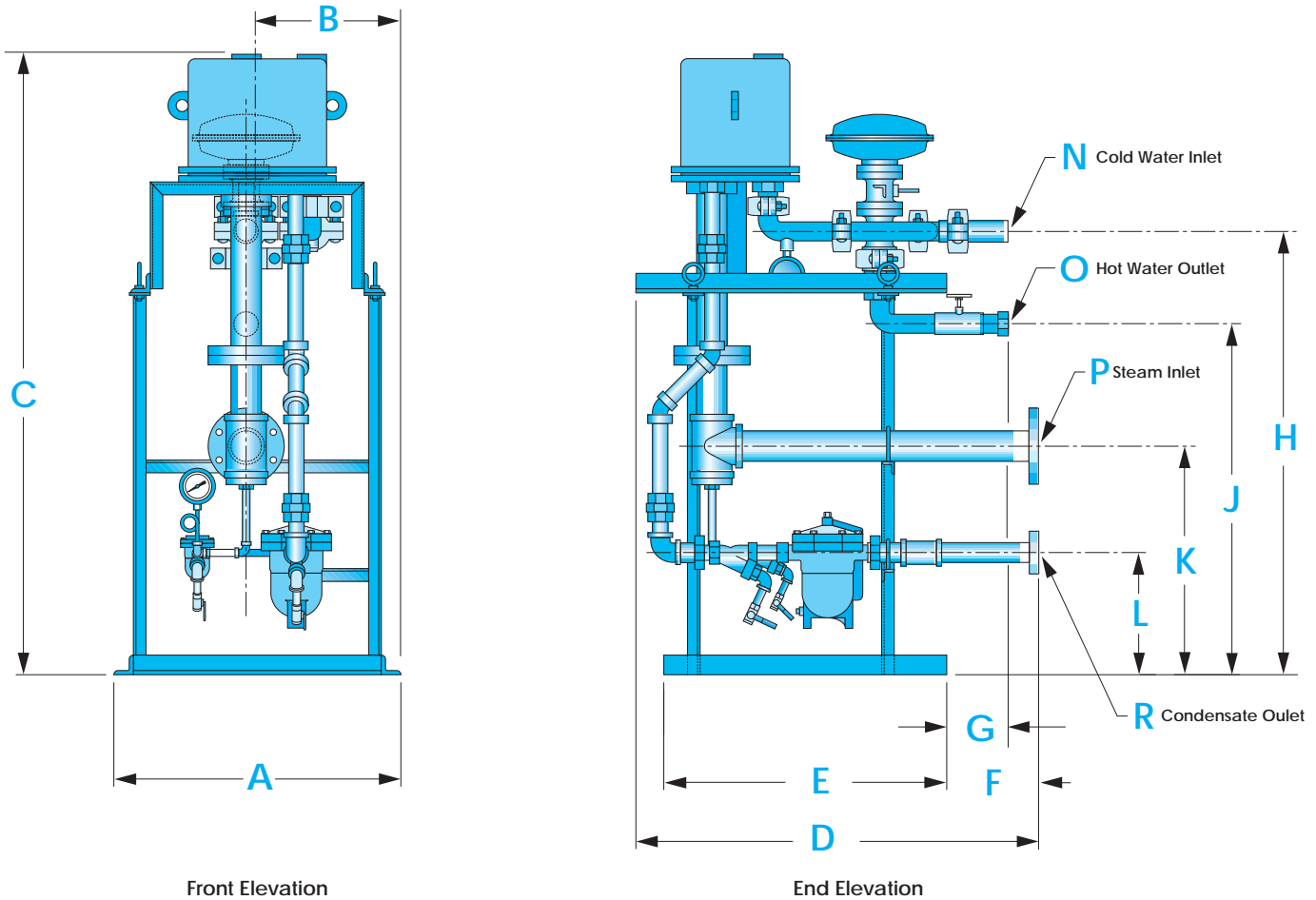
Coil: The heat exchanger coils shall carry an unconditional, non-prorated 10 year guarantee against failure due to thermal shock, mechanical failure or erosion.

Pressure Vessel: The heat exchanger pressure vessel shall carry an unconditional, non-prorated 10 year guarantee against any failure.

# Feed Forward Water Heater (Skid Mounted)

## Dimensional Data

Cemline Skid Mounted Heaters come factory piped and the user need only connect to cold and hot water lines and steam and condensate return lines.



DIMENSIONS (inches)											
Model	A	B	C	D	E	F	G	H	J	K	L
FFH-15, FFH-30	28 $\frac{1}{4}$	14 $\frac{1}{8}$	55 $\frac{1}{2}$	37 $\frac{1}{2}$	30 $\frac{1}{2}$	6 $\frac{3}{8}$	4 $\frac{1}{4}$	45 $\frac{15}{16}$	34 $\frac{5}{8}$	22 $\frac{1}{2}$	12
FFH-45, FFH-60	28 $\frac{1}{4}$	14 $\frac{1}{8}$	58 $\frac{1}{4}$	39 $\frac{5}{8}$	30 $\frac{1}{2}$	8 $\frac{1}{2}$	4 $\frac{3}{8}$	46 $\frac{7}{8}$	35 $\frac{1}{4}$	22 $\frac{1}{4}$	13 $\frac{3}{4}$
FFH-75, FFH-90	28 $\frac{1}{4}$	14 $\frac{1}{4}$	68 $\frac{1}{4}$	42 $\frac{5}{8}$	30 $\frac{1}{2}$	11 $\frac{1}{2}$	4 $\frac{3}{4}$	47 $\frac{5}{8}$	35 $\frac{1}{4}$	19	11
FFH-105, FFH-120	31 $\frac{1}{2}$	15 $\frac{1}{4}$	68 $\frac{1}{4}$	44	30 $\frac{1}{2}$	11 $\frac{1}{2}$	9 $\frac{1}{2}$	47 $\frac{5}{8}$	35 $\frac{1}{4}$	19	11

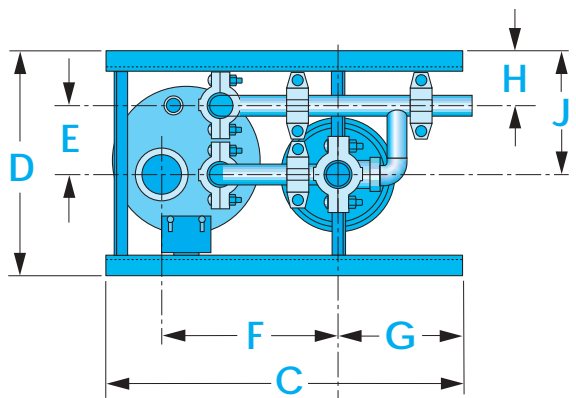
End Connection	FFH-15/30	FFH-45/60	FFH-75/90	FFH-105/120
"N" Cold Water Inlet	1 $\frac{1}{2}$ " MNPT	2" MNPT	2 $\frac{1}{2}$ " MNPT	2 $\frac{1}{2}$ " MNPT
"O" Hot Water Outlet	2" FNPT	2" FNPT	2 $\frac{1}{2}$ " FNPT	2 $\frac{1}{2}$ " FNPT
"P" Steam Inlet	3" 150# Fig. RF	3" 150# Fig. RF	4" 150# Fig. RF	4" 150# Fig. RF
"R" Condensate Outlet	1" 150# Fig. RF	1 $\frac{1}{2}$ " 150# Fig. RF	1 $\frac{1}{2}$ " 150# Fig. RF	1 $\frac{1}{2}$ " 150# Fig. RF

Dimensions are approximate and may vary slightly than shown. All dimensions are in inches. Standard tolerance for location of all pipe connections and envelope dimensions is plus or minus 1/2".

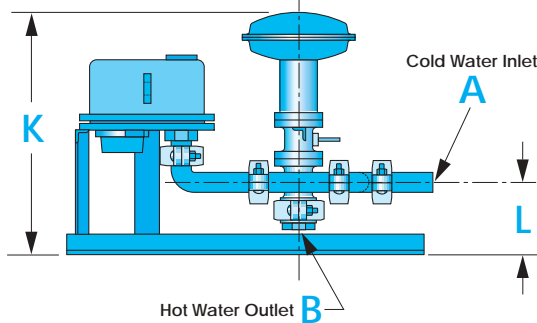
# Feed Forward Water Heater (Non-packaged Units)

## Dimensional Data

*Cemline Non-packaged Units must be field piped similarly to the skid mounted option on page 4. Specifying the skid mounted option eliminates most field piping and the skid mounted option is recommended.*

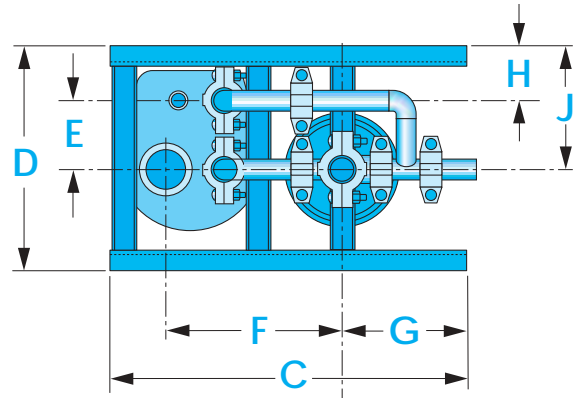


Bottom View

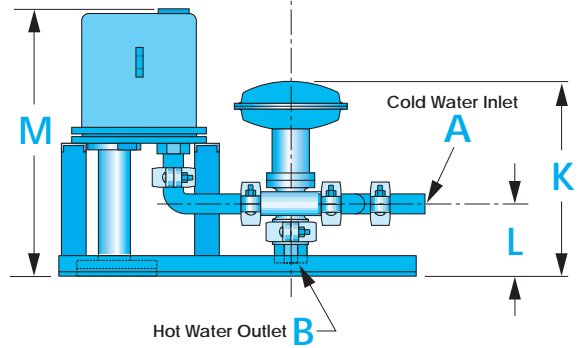


End Elevation

Model FFH-15, 30, 45, 60



Bottom View



End Elevation

Model FFH-75, 90, 105, 120

DIMENSIONS (inches)											
Model	A	B	C	D	E	F	G	H	J	K	L
FFH-15	1½	2	31½	22½	4 <sup>5</sup> / <sub>8</sub>	15 <sup>13</sup> / <sub>16</sub>	10¼	6 <sup>11</sup> / <sub>16</sub>	12 <sup>1</sup> / <sub>16</sub>	17½	5 <sup>23</sup> / <sub>32</sub>
FFH-15*S*	1½	2	31½	22½	4 <sup>5</sup> / <sub>8</sub>	15 <sup>13</sup> / <sub>16</sub>	10 <sup>1</sup> / <sub>16</sub>	5 <sup>7</sup> / <sub>8</sub>	11¼	17½	5¾
FFH-30	1½	2	31½	22½	4 <sup>5</sup> / <sub>8</sub>	15 <sup>13</sup> / <sub>16</sub>	10¼	6 <sup>11</sup> / <sub>16</sub>	12 <sup>1</sup> / <sub>16</sub>	17½	5 <sup>23</sup> / <sub>32</sub>
FFH-30*S*	1½	2	31½	22½	4 <sup>5</sup> / <sub>8</sub>	15 <sup>13</sup> / <sub>16</sub>	10 <sup>1</sup> / <sub>16</sub>	5 <sup>7</sup> / <sub>8</sub>	11¼	17½	5¾
FFH-45	2	2	31½	22½	5 <sup>5</sup> / <sub>8</sub>	17 <sup>13</sup> / <sub>16</sub>	7 <sup>7</sup> / <sub>8</sub>	5 <sup>5</sup> / <sub>8</sub>	12½	17½	5¾
FFH-60	2	2	31½	22½	5 <sup>5</sup> / <sub>8</sub>	17 <sup>13</sup> / <sub>16</sub>	7 <sup>7</sup> / <sub>8</sub>	5 <sup>5</sup> / <sub>8</sub>	12½	17½	5¾

DIMENSIONS (inches)												
Model	A	B	C	D	E	F	G	H	J	K	L	M
FFH-75/90	2½	2½	29 <sup>7</sup> / <sub>16</sub>	24	6 <sup>7</sup> / <sub>8</sub>	13 <sup>15</sup> / <sub>16</sub>	6½	3 <sup>7</sup> / <sub>8</sub>	10¾	19¾	6 <sup>5</sup> / <sub>8</sub>	31
FFH-105/120	2½	2½	34 <sup>3</sup> / <sub>8</sub>	27 <sup>13</sup> / <sub>16</sub>	8	19 <sup>31</sup> / <sub>32</sub>	6 <sup>31</sup> / <sub>32</sub>	7¼	15¼	19¾	6 <sup>5</sup> / <sub>8</sub>	31

\*Steel shell unit rated for 150 psi. For all other units, steel and cast iron dimensions are the same.

# Feed Forward Water Heater

## Sizing Data

The sizing given below covers most applications. Contact factory for selections with different starting and/or ending temperatures.

### Heater Sizing Chart (Gallon Per Minute)

Inlet Temp °F	Set Temp °F	Steam Pressure-PSIG				Model
		2	5	10	15	
40	105 to 110	15	15	15	15	FFH15
		29	30	30	30	FFH30
		44	45	45	45	FFH45
		58	60	60	60	FFH60
		73	75	75	75	FFH75
		87	90	90	90	FFH90
40	120	102	105	105	105	FFH105
		116	120	120	120	FFH120
		14	15	15	15	FFH15
		27	30	30	30	FFH30
		41	45	45	45	FFH45
		54	60	60	60	FFH60
40	140	68	75	75	75	FFH75
		81	90	90	90	FFH90
		95	105	105	105	FFH105
		108	120	120	120	FFH120
		10	11	12	14	FFH15
		20	22	24	27	FFH30
40	150	33	38	41	44	FFH45
		46	54	58	60	FFH60
		58	68	73	75	FFH75
		69	81	87	90	FFH90
		81	95	102	105	FFH105
		92	108	116	120	FFH120
40	160	10	10	11	12	FFH15
		17	19	21	23	FFH30
		29	34	37	39	FFH45
		40	49	53	54	FFH60
		50	61	66	68	FFH75
		60	73	79	81	FFH90
40	180	70	86	93	95	FFH105
		80	98	106	108	FFH120
		-	-	-	-	FFH15
		-	-	-	-	FFH30
		26	31	33	35	FFH45
		34	41	44	46	FFH60
40	180	43	51	55	58	FFH75
		51	61	66	69	FFH90
		60	72	77	81	FFH105
		68	82	88	92	FFH120
		-	-	-	-	FFH15
		-	-	-	-	FFH30
40	180	16	17	19	21	FFH45
		21	23	25	28	FFH60
		26	29	31	35	FFH75
		31	34	37	42	FFH90
		37	40	44	49	FFH105
		42	46	50	56	FFH120

Inlet Temp °F	Set Temp °F	Steam Pressure-PSIG				Model
		2	5	10	15	
60	105 to 110	15	15	15	15	FFH15
		30	30	30	30	FFH30
		45	45	45	45	FFH45
		60	60	60	60	FFH60
		75	75	75	75	FFH75
		90	90	90	90	FFH90
60	120	105	105	105	105	FFH105
		120	120	120	120	FFH120
		15	15	15	15	FFH15
		30	30	30	30	FFH30
		45	45	45	45	FFH45
		60	60	60	60	FFH60
60	140	75	75	75	75	FFH75
		90	90	90	90	FFH90
		105	105	105	105	FFH105
		120	120	120	120	FFH120
		12	13	14	15	FFH15
		23	25	27	30	FFH30
60	150	40	42	44	45	FFH45
		57	59	60	60	FFH60
		71	74	75	75	FFH75
		85	88	90	90	FFH90
		100	103	105	105	FFH105
		114	118	120	120	FFH120
60	160	10	11	12	14	FFH15
		20	22	24	27	FFH30
		35	38	41	44	FFH45
		49	54	57	60	FFH60
		61	68	71	75	FFH75
		73	81	85	90	FFH90
60	180	86	95	100	105	FFH105
		98	108	114	120	FFH120
		-	-	-	-	FFH15
		-	-	-	-	FFH30
		32	37	38	42	FFH45
		42	49	51	56	FFH60
60	180	53	61	64	70	FFH75
		63	73	76	84	FFH90
		74	86	89	98	FFH105
		84	98	102	112	FFH120
		-	-	-	-	FFH15
		-	-	-	-	FFH30
60	180	22	25	29	33	FFH45
		29	33	39	44	FFH60
		36	41	49	55	FFH75
		43	49	58	66	FFH90
		51	58	68	77	FFH105

To calculate the capacity of available alternate coils, multiply the capacity from the table by the following factors:

Coil Materials	Capacity Factor
Admiralty	0.95
Cupro-nickel	0.81

To calculate the #/hr of steam required.  
 $\#/\text{hr} = [(GPH) \times (T2-T1)] \div 100$

To calculate condensate load.  
 $\text{GPM condensate} = \#/\text{hr} \div 500$

GPH = GPM x 60      T2 = Outlet Temperature      T1 = Inlet Temperature

# Recirculation Kit

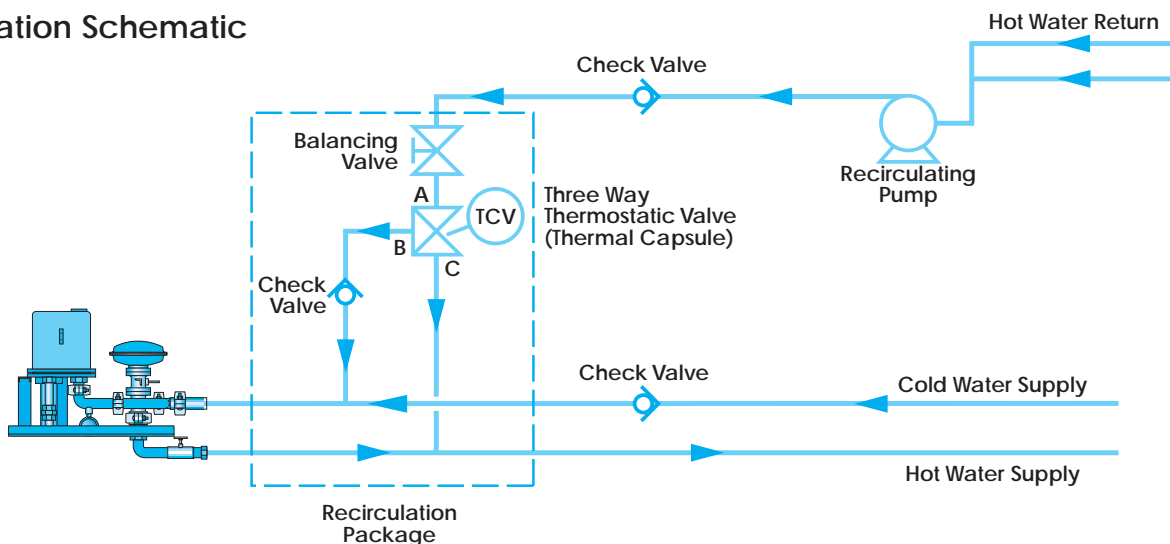
*A recirculation kit is REQUIRED if the water in the system is being recirculated. Temperature control problems will occur if the recirculation kit is not used in a recirculating system.*

When using the Cemline FFH water heater in a water system with recirculated water, a recirculation kit must be used with the heater. Temperature control problems will occur if a recirculation kit is not installed in a recirculated system. The problem experienced is that during times of little or no hot water usage, the recirculated water will be returned to the heater hot. The movement of the water through the system will cause the

blending valve to sense a pressure drop and cause the valve to open and heat the hot water hotter. Eventually the water in the system will become dangerously hot. Therefore when recirculating water it is essential that a recirculation kit be supplied. The recirculation kit allows for the proper mixing of hot and cold water into the system through the use of a balancing valve and a 3-way thermostatic valve. The mixing valve allows for the diverting of hot water

away from the heater if the system temperature is already at the heaters set point. For safety purposes the mixing valve is non-adjustable, preventing accidental changes in the hot water system temperature thus preventing any over-temperature situations. See the operation schematic below.

## Operation Schematic



## Specification

Cemline FFH model \_\_\_\_\_ low pressure steam water heater, for use on 2-15 psig steam consisting of an integrally piped heat exchanger, mounted on a heavy-duty angle iron frame heater control package capable of supplying \_\_\_\_\_ GPM off hot water when heated from \_\_\_\_\_ °F to \_\_\_\_\_ °F with out the use of thermostatic control devices or storage tanks. Heaters shall be capable of maintaining the +/- 3°F over a flow range of a few percent to 100%. The water shall flow through the tubes and steam in the shell. Heater shall be supplied with main and drip trap, main and drip strainer, dial thermometer, and

steam pressure gauge. The unit shall include connections in the manifolds to measure pressures and temperatures.

### Optional Recirculation Kit (Required on Recirculated Water Systems)

The heater shall be equipped with an integral recirculation system with an adjustable valve to set the recirculation temperature. The recirculation system shall be integrally mounted and shall not alter the overall dimensions of the heater.

### Recommended skid mounted package

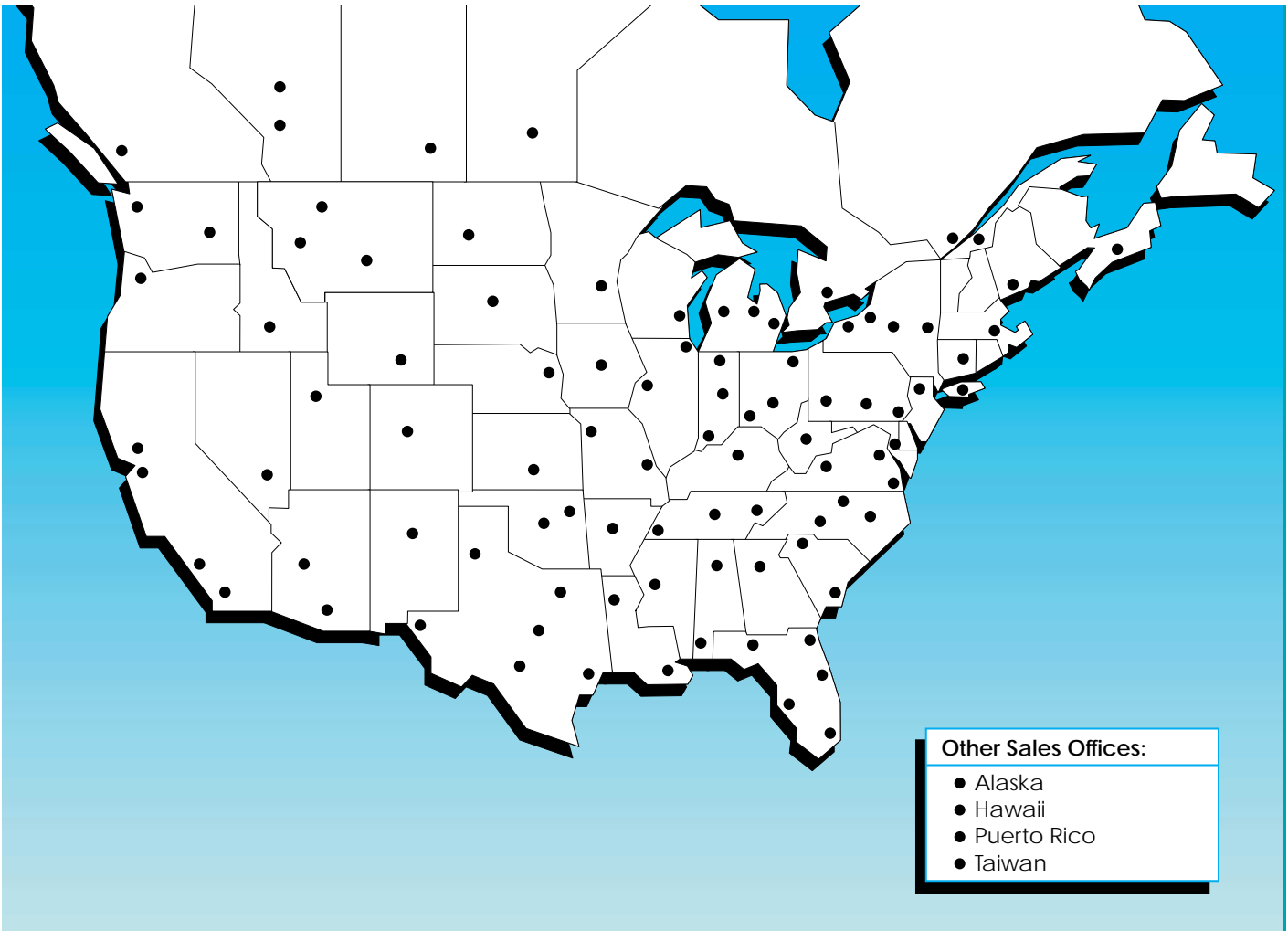
Cemline FFH steam fired water heater shall be factory piped with main and

drip steam traps, main and drip strainers, dial thermometer, and steam pressure gauge. Heater and components shall be mounted on angle iron frame and shall be shipped complete from factory so owner need only connect steam, condensate outlet, cold water inlet and hot water outlet pipes to the package.

Complete package to be pressure tested for leaks.

Unit to be assembled so that is sufficient room between heat exchanger and traps for proper operation.

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