USG Series

Unfired Steam Generators
Generate Clean Steam With Boiler Steam or High Temperature Hot Water as the Energy Source

CEMLINE CORPORATION
P.O. BOX 55 CHESWICK, PENNSYLVANIA 15024
Phone: (724) 274-5430 FAX: (724) 274-5448
www.cemline.com
Cemline® Unfired Steam Generators are designed to produce clean steam with steam or high temperature hot water as an energy source for use where there is a need to produce clean steam.

**Humidification:**
Previously, Boiler House steam was used for humidification purposes. Boiler House steam contains chemicals and additives which are thought to be injurious to health and many jurisdictions now require a clean steam source for steam humidification.

**Sterilization:**
Medical Sterilization and laboratories require steam. A Cemline Unfired Steam Generator is the correct choice for providing clean steam for sterilization.

**Pharmaceutical:**
Many Pharmaceutical applications require clean steam. Cemline Unfired Steam Generators meet this need. Note: This steam is not pure steam for WFI.

**Food Processing:**
Cooking or blanching where steam comes in contact with food requires a source of clean steam. Cemline Unfired Steam Generators meet this need.

**Basic Heating Requirements:**
Complexes which use high temperature hot water as the basic energy source often require Steam Generators in individual buildings for steam heating and other use. Cemline Unfired Steam Generators convert high temperature hot water to steam.
Cemline USG (continued)

Cemline Corporation has an online website www.cemline.com containing informational sections and sizing programs. The Unfired Steam Generator (USG) sizing program allows the customer to size and select a USG. USG specifications and drawings can be downloaded to CAD and/or word processing files. This program is available upon request from Cemline or your Cemline Representative.

Cemline Unfired Steam Generators are available for operation with steam or high temperature hot water as the energy source.

Cemline Unfired Steam Generators are constructed and stamped in accordance with ASME Code and bear the UB stamp as required by the ASME Code. All tanks are registered with the National Board of Boiler and Pressure Vessel Inspectors and an insurance compliance certificates furnished. Unfired Steam Generators to generate 40 psi or greater steam will be 100% x-rayed and heat treated in accordance with the ASME Code.

Cemline Unfired Steam Generators are carefully designed to provide the correct balance of steaming area, coil size and control components to meet the specified requirements.

**Carbon Steel or Stainless Steel Construction:**

**Carbon Steel**

Cemline Unfired Steam Generators can be constructed with a carbon steel shell and steel components. These Unfired Steam Generators would typically be used where the condensate is being returned to the boiler and little or no make-up is used. Carbon Steel Unfired Steam Generators are typically used in building heating systems.

**Stainless Steel**

Cemline Unfired Steam Generators can be constructed of stainless steel where there is no condensate returned and the unit is 100% make-up, such as in steam humidification. A stainless steel USG would also be used with the Unfired Steam Generators that are used for sterilization, food processing, pharmaceutical or deionized water applications. Type 316 stainless steel is typically used.
Cemline Unfired Steam Generators – Control System

Energy Source – Steam/High Temperature Hot Water

Cemline Unfired Steam Generators will shut down on loss of building power. The over pressure safety system is also supplied so that the source steam valve will close upon loss of power. Upon loss of building power, both the feedwater and source steam (or boiler water) will close and the Unfired Steam Generator will shut off.

Basic USG Package Includes:

- ASME Code Constructed and National Board Registered Vessel
- 3” Fiberglass insulation
- 20 gauge steel jacket with hammertone enamel paint
- Structural I-Beam support skid base
- ASME pressure relief valve
- Clean steam pressure readout
- Blowdown valve
- Gauge glass
- Steam Separator
- High pressure & low water cut off
- Solid State Control Module - Steam-trol® (see page 7)
- Feedwater solenoid and check valve

Standard Components With Steam As The Energy Source:

- Source steam pressure gauge
- Steam traps, main and auxiliary
- Steam strainer
- Modulating steam control valve
- Vacuum Breaker

Standard Components With High Temperature Hot Water As Energy Source:

- HTHW thermometer
- Modulating HTHW control valve
Cemline USG steam generators can be furnished with air operated, pilot operated, or electronically operated control valves. All valves are normally closed when no air or pilot pressure or electric signal is present. The valves will close on loss of building power.

(energy source - HTHW or steam): A pneumatically (air) operated steam control valve uses building air connected to a furnished transmitter which monitors the output steam pressure and sends a varying air signal to the source steam controller to modulate the flow of source steam to maintain a constant output steam pressure. Pneumatic set point is field adjustable.

(energy source - steam): A pilot operated steam control valve uses a steam pilot to monitor output steam pressure and automatically modulate the flow of source steam to maintain a constant output steam pressure. A pilot operated controller is field adjustable.

(energy source - HTHW or steam): An adjustable set point electronic control module is wired to the electronically operated control valve and the solid state pressure sensor. The control module compares the set point with the sensed pressure and sends an electric signal to a magnetic linear actuator on the control valve. The magnetic linear actuator modulates the control valve and regulates the amount of steam through the valve to maintain the set point of the controller. When the set point is achieved, the controller sends a signal to the valve actuator and the valve closes.

Cemline provides float and thermostatic traps for both the drip trap and the main trap. Float and thermostatic traps are acknowledged as the correct traps to use with continuously modulating control valves. Float and thermostatic traps provide immediate drainage of condensate and include a built in thermostatic air vent for venting air. The drain orifice is designed to provide a water seal and eliminate the loss of any live steam under all load conditions. Float and thermostatic traps should not be used to lift condensate.
Cemline Unfired Steam Generators are completely packaged and ready for use. All components are sized, mounted and piped prior to shipment. These boilers come complete and require only connections to services.

<table>
<thead>
<tr>
<th></th>
<th>Carbon Steel</th>
<th>Stainless Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shell</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cemline Unfired Steam Generators with a carbon steel shell are used where condensate is returned to the boiler and there is little or no make-up.</td>
<td>Cemline Unfired Steam Generators with a stainless steel shell are used in applications requiring stainless steel. Stainless steel grade furnished is typically 316-L. In a Stainless Steel Unfired Steam Generator, all components in contact with the clean steam can be constructed of the 316-L Stainless Steel.</td>
<td></td>
</tr>
<tr>
<td><strong>Submerged Coils</strong></td>
<td>Carbon Steel</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Cemline Unfired Steam Generators are furnished with a copper U-Bend heating coil rolled into a steel tube sheet for up to 80 psi incoming steam. With source steam of above 80 psi, 90:10 Cupro-nickel tubes are used.</td>
<td>Cemline Unfired Steam Generators are furnished with a stainless steel U-Bend heating coil rolled into a stainless steel tube sheet.</td>
<td></td>
</tr>
<tr>
<td><strong>Piping</strong></td>
<td>Carbon Steel</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Cemline Unfired Steam Generators are furnished with carbon steel piping.</td>
<td>Cemline Unfired Steam Generators are furnished with stainless steel piping on clean steam side.</td>
<td></td>
</tr>
<tr>
<td><strong>High Pressure Cut Off</strong></td>
<td>Carbon Steel</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Cemline Unfired Steam Generators are furnished with a high pressure cut off of incoming energy source via solenoid on pilot or incoming air signal. This safety system is designed to prevent the Unfired Steam Generator from generating steam above the desired set point. This solenoid is also wired to the level controller to close the control valve on the low water condition.</td>
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Cemline Unfired Steam Generators

Steam-trol®

Cemline Steam-trol® Control Module incorporates operating and limit functions in one solid state controller. This controller replaces the current controls used on Cemline Unfired Steam Generators. The controller features an LCD touch screen display of the pressure and on board operating PID pressure control along with settings of high and low pressure safety cut off and alarms. The Steam-trol® simplifies the control of the Unfired Steam Generator, enhances the look of the product, and follows industry trends to touch screen and solid state control.

Features:
- PID Control Signal
- LCD Touch Screen Display
- Modulating Feed Water Control Option
- On-Off Switch
- Single Point Wiring
- Pressure Readout
- High Pressure Set Point
- Low Water Cut Off
- High Water Cut Off
- Blow Down Control
- Remote Pressure readout
- Remote Pressure setting
- Remote ON/OFF Control
- Modus Interface
- LCD Display of functions & Contacts to Notify BAS (Building Automation System) of Functions
  - Power On
  - Low Water
  - High Pressure
  - Water Feed
  - High Water
  - Low Pressure
  - Blow Down
  - Optional Input/Output
Cemline Unfired Steam Generators  
Dimensional Data-Horizontal

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Energy Source: Steam

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For Steam

To accurately size an Unfired Steam Generator, the following information is required:

1. Source Steam Pressure
2. Output Steam Pressure
3. Make-up Water Temperature
4. Pounds per hour of output steam required
   (A safety factor between 1.25 to 1.5 times the total humidification load is recommended to account for start up loads, system heat losses, and to properly match humidifier valve(s) Cv).

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>Boiler Vessel Size</th>
<th>W</th>
<th>H</th>
<th>O</th>
<th>S</th>
<th>E</th>
<th>M</th>
<th>J</th>
<th>I</th>
<th>P*</th>
<th>L</th>
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</tr>
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<tbody>
<tr>
<td>H60USG</td>
<td>20&quot; x 48&quot;</td>
<td>34&quot;</td>
<td>42&quot;</td>
<td>70&quot;</td>
<td>24&quot;</td>
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<td>12&quot;</td>
<td>46&quot;</td>
<td>64&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>H120USG</td>
<td>24&quot; x 63&quot;</td>
<td>38&quot;</td>
<td>46&quot;</td>
<td>84&quot;</td>
<td>28&quot;</td>
<td>67&quot;</td>
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<tr>
<td>H205USG</td>
<td>30&quot; x 72&quot;</td>
<td>44&quot;</td>
<td>49&quot;</td>
<td>95&quot;</td>
<td>34&quot;</td>
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<tr>
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<td>36&quot; x 96&quot;</td>
<td>50&quot;</td>
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<td>123</td>
<td>40&quot;</td>
<td>100</td>
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<td>20&quot;</td>
<td>96&quot;</td>
<td>112</td>
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<tr>
<td>H670USG</td>
<td>42&quot; x 120&quot;</td>
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<td>H1085USG</td>
<td>54&quot; x 120&quot;</td>
<td>68&quot;</td>
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* This dimension is for the longest coil available, shorter coils with a corresponding shorter “P” dimension are available.
Consult factory or your Cemline representative.

** Dimension A and B are sized to suit generated steam capacity.

Given this information, Cemline Corporation or its authorized representative can size the Unfired Steam Generator from the Cemline computer program mentioned above. Please contact Cemline Corporation or your local representative for sizing, or visit www.cemline.com to use the sizing program.

8 Structural Steel Beam Support Skid
• 8" x 6.5 lbs. per ft. for vessel diameters 36" or less.
• 10" x 12 lbs. per ft. vessel diameters 42" and above.
Cemline Unfired Steam Generators
Dimensional Data-Horizontal

Energy Source
High Temperature
Hot Water

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- 8” x 6.5 lbs. per ft. for vessel diameters 36” or less.
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Cemline Unfired Steam Generators

Dimensional Data-Vertical

Energy Source
Steam

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**Cemline Unfired Steam Generators**

**Dimensional Data-Vertical**

**Energy Source**
High Temperature Hot Water

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Cemline's website www.cemline.com features sizing programs that can provide Unfired Steam Generator selection data, specifications, and drawings for those sizing an Unfired Steam Generator.

Cemline Website Contains

- Easy to use sizing programs
- Print-outs with specifications and drawings
- Powerful specifying tool
- Download CAD drawings
- Download isometric piping diagrams
- Plant tour video
- Informational sections
- Installation operation and maintenance manual

USG Selection Data

<table>
<thead>
<tr>
<th>Steam</th>
<th>80</th>
<th>psig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source Steam pressure</td>
<td>10</td>
<td>psig</td>
</tr>
<tr>
<td>Source Steam pressure drop</td>
<td>1000</td>
<td>lb/h</td>
</tr>
<tr>
<td>Pressure of produced steam</td>
<td>15</td>
<td>psig</td>
</tr>
<tr>
<td>Make-up water temperature</td>
<td>70</td>
<td>Deg. F.</td>
</tr>
<tr>
<td>Fouling factor</td>
<td>0.005</td>
<td>Hr-F/sq ft/°F</td>
</tr>
<tr>
<td>Unit configuration</td>
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<td></td>
</tr>
<tr>
<td>Tube bundle pitch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tube diameter</td>
<td>3/4</td>
<td>inch</td>
</tr>
<tr>
<td>Tube thickness</td>
<td>18</td>
<td>gauge</td>
</tr>
<tr>
<td>Tube material</td>
<td>316 stainless steel</td>
<td></td>
</tr>
</tbody>
</table>

Output Data

- Overall heat transfer coefficient: 407.3 Btu/hr-sq ft
- Total heat transfer rate: 1134567.1 Btu/hr
- Surface area of tubing required: 348.2 sq ft
- Source steam flow velocity: 60.6 fps
- Flow rate of source steam: 12771.8 lb/h
- Minimum Valve Cv Required: 1438

Cemline model configuration and dimensions

- Unit configuration: horizontal
- Bundle diameter: 16 inches
- Bundle length: 120 inches
- Tube diameter: 3/4 inch
- Tubing area of this model: 377 sq ft
- Cemline model number: H671USG16120

NOTE: The above design is based on the steam generator being supplied with source steam saturated at the pressure shown. If quality of the source steam is of suspect, designer must correct for it.

USG Selection Data Print Out

View of a portion of the USG screen on Cemline's website
Cemline Unfired Steam Generators
Optional Extras

Cemline Unfired Steam Generators can be supplied with various options as listed below.

Options

Feedwater Preheater/Condensate Recovery Heat Exchanger
The energy from the source steam’s condensate can be recovered by running the make-up water through a preheater. The feedwater heat exchanger preheats the make-up water before it enters the steam generator. This will cool the condensate at the same time heating the make-up water. Either a shell and tube or plate and frame heat exchanger can be used. The heat exchanger materials can be copper, 90:10 copper nickel, and stainless steel.

High Water Cut-off—Option for Unfired Steam Generator
In some unusual situations, it is possible for the solenoid feedwater valve to stick in the open position that could cause the Unfired Steam Generator to fill full with water and flood the entire system. To prevent this from happening, Cemline Corporation offers, as an option, a high water cut-off to close a feedwater ball valve if a high water condition occurs.

This option consists of an electronic probe mounted in the top of the vessel on a carbon steel USG or a stainless steel float on a stainless steel USG connected to a high level switch. The high level switch will send a signal to either an air operated ball valve or an electrically operated ball valve mounted in the feedwater line. Both of these valves are power to open, spring to close.

As the feedwater safety valves require power to open, spring to close, the feedwater valve will close upon loss of power.

Modulating Feed Water Control
Along with the current feed water controls, the Steam-trol® has an option for modulating feed water control. The controller used in conjunction with a 4–20 mA level transmitter and a modulating feed water valve will provide modulating feed water to the Unfired Steam Generator. The benefit of supplying modulating feed water is to reduce suppression of steam production rate when water enters the Unfired Steam Generator.

Additional Make Up Water Feeding Options
All units are furnished with a feedwater solenoid and check valve. Additional make up water options can be added to the Unfired Steam Generator.

Feed Water Pump
Feed water pump which is connected into the city water or make up water line and is started and stopped from a signal from the level controller.

Feed Water Condensate Pump with Receiver:
Feed water from a boiler feed pump unit with condensate tank. The condensate tank is fed with make up water and condensate and on a signal from the level controller on the Unfired Steam Generator starts a pump which pumps the make up water into the Unfired Steam Generator. When the water level in the Unfired Steam Generator is satisfied, an electrical signal from the level controller signals the water feed pump to close.
Cemline Unfired Steam Generators

Blowdown Options

Cemline Unfired Steam Generators can be supplied with various options as listed below.

On Unfired Steam Generators using city water, there will be an accumulation of minerals built up in the boiler. These minerals must be disposed of by a blowdown system. The blowdown system can be as simple as a manual blowdown (standard with Cemline USG’s) where the maintenance person would blow the boiler off manually a set time for a set duration. It is advantageous to offer an automatic blowdown system to insure that blowdown is taking place. Cemline offers two automatic blowdown options.

Automatic Blowdown – Timer Solenoid Valve*

The Cemline 2001 SSCM has a built in interval and duration timer wired to a blowdown solenoid valve. The owner/operator can set an interval between blowdowns in a range from 1 to 160 hours and a blowdown duration range of 1 to 250 seconds. The automatic blowdown is a fairly simple system. The automatic timer blowdown requires the owner/operator of the Unfired Steam Generator to do some analysis to determine what duration and interval he/she wishes to have his blowdown occur.

Automatic Blowdown - TDS Sampling Method*

There is a more sophisticated system, which samples the boiler water and blows the boiler down when the dissolved solids exceed the set point. This is a time sample method which measures the total dissolved solids by opening the blowdown valve for an adjustable time period and measuring the blow off for dissolved solids. If the total dissolved solid exceeds the trip point, the motorized valve will remain open until the fresh water make up dilutes the boiler water to a safe level of total dissolved solids.

Automated Blow Down Location – Surface Blowdown

The Unfired Steam Generator is a distiller creating pure water in the form of steam and leaving behind the minerals and dissolved solids in the water inside the steam generator. As more steam is produced the concentration of minerals and dissolved solids increase inside the steam generator. The concentration of dissolved solids will increase in the water until saturation point is reached. Then, the water can no longer hold all of the dissolved solids and some begin to drop out of the water in the form of suspended solids forming sludge or scale on the tube bundle and vessel. Scale formation on the tube bundle will reduce the capacity of the Unfired Steam Generator.

Higher concentrations of dissolved solids may bring about carry over of make-up water in the form of wet steam. As the total dissolved solids increase so does the surface tension of the water causing the steam bubbles to adhere to themselves making it more difficult for the steam bubbles to burst as they rise to the surface of the boiling water. Therefore, the concentration of dissolved solids tends to be increased at or near top of water level in the steam generator. Reducing the concentration of dissolved solids and suspended solids in the steam generator will provide the desired capacity and dryness of steam.

A Surface Blowdown can be used to remove dissolved solids from the steam generator. Automatic blowdown controls such as a TDS control or timed blowdown can be mounted at the surface allowing the removal of dissolved solids from the water in the generator. Typically surface blowdowns are performed more frequently than bottom blowdowns.

Automated Blow Down Location – Bottom Blowdown

Higher levels of suspended solids may be found in harder make-up water conditions. Suspended Solids tend to collect in the lower part of the unfired steam generator and form scale on the tube bundle. Removal of these suspended solids can be accomplished by bottom blowdown.

Automatic Bottom blowdown controls can be mounted on the bottom blowdown.
Cemline blowdown/condensate coolers are designed to receive blowdown from a steam boiler, flash the blowdown to steam, and cool the condensate going to drain.

Cemline Unfired Steam Generators
Centrifugal Boiler Blow Off/Condensate Cooler

CBO Series

Cemline Blowdown/Condensate Coolers are ASME code constructed and stamped for 150 PSI working pressure. Minimum steel thickness is 3/16”. Where conditions require these vessels can be constructed with 1/4”, 3/8”, or 1/2” steel thickness.

The blowdown enters the tangential inlet where it meets a 90 degree stainless steel wear plate. The wear plate will prevent erosion of the side wall of the vessel. The tangential blowdown entry causes the blowdown to swirl around the circumference of the vessel where part of the liquid will flash to steam and the balance will settle to the bottom of the vessel.

The internal flash will go through the vent to atmosphere and the hot condensate and sludge will fall to the bottom of the vessel where it will activate the thermal control valve which will feed cold water into the drain leg where the cold water and hot condensate will mix. This results in drained liquid temperature which is acceptable for municipal sewage.

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>D</th>
<th>L</th>
<th>H</th>
<th>A VENT</th>
<th>B BLOWOFF</th>
<th>C DRAIN</th>
<th>D COLDWATER</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBO-5</td>
<td>16”</td>
<td>26”</td>
<td>26”</td>
<td>4”-150# FLANGE</td>
<td>1” M.N.P.T.</td>
<td>3” M.N.P.T.</td>
<td>1/2” N.P.T.</td>
<td>44”</td>
<td>8”</td>
</tr>
<tr>
<td>CBO-7</td>
<td>26”</td>
<td>26”</td>
<td>26”</td>
<td>6”-150# FLANGE</td>
<td>1 1/2” M.N.P.T.</td>
<td>4” M.N.P.T.</td>
<td>3/4” N.P.T.</td>
<td>46”</td>
<td>8”</td>
</tr>
</tbody>
</table>
Specifications - Steam as Energy Source

Use this specification for an Unfired Steam generator using steam as primary energy source.

- Unfired Steam Generator shall be as manufactured by Cemline Corporation, Cheswick, PA 15024.

- Unfired Steam Generator shall be furnished as a complete package ready for installation.

- Unfired Steam Generator shall be ASME Code constructed and stamped in accordance with Section VIII, Division I, for Unfired Steam Generators. Unfired Steam Generators shall be registered with the National Board of Boiler and Pressure Vessel Inspectors, and signed copy of shop inspection report shall be furnished. Unfired Steam Generator shall be built in accordance with Section VIII “Unfired Steam Generators” and shall bear the “UB” stamp.

- Unfired Steam Generator vessel shall be pressure vessel quality carbon steel (or 316 grade stainless steel).

- Unfired Steam Generator shall be insulated with not less than 3” of Fiberglass insulation, protected by not less than 20 ga. thick enameled steel jacket.

- Unfired Steam Generator shall be mounted on a suitable I-Beam support skid which shall be permanently welded to the shell.

- Unfired Steam Generator shall have submerged coil of 20 (or 18 or 16) gauge copper (or 316 grade stainless steel or 90:10 copper nickel) tubes expanded into a steel (or stainless steel) tube sheet with cast iron or fabricated steel coil head.

- Unfired Steam Generator shall be furnished with a pilot (or air or electric) operated control valve to modulate the in-coming steam to maintain the desired output of steam pressure ±2 psi. Control valve shall be suitable for 150 psi. Control valve pilot shall monitor output steam pressure and modulate the steam to maintain constant output pressure.

- Unfired Steam Generator shall be factory supplied with dual float and thermostatic traps, one for the coil and one for the drip before the control valve. Unfired Steam Generator shall have an incoming strainer.

- Unfired Steam Generator shall be furnished with a brass/cast steel (or stainless steel wetted parts) ASME Code Section I pressure relief valve or valves with a capacity to relieve the total BTU of output of the generator.

- Unfired Steam Generator shall be furnished with a vessel steam gauge. Unfired Steam Generator shall be furnished with a cast iron float type (or stainless steel electronic) level controller. Water column shall also be furnished with gauge glass. Unfired Steam Generator shall be furnished with tandem blow off.

- All components for the Unfired Steam Generator shall be factory mounted, piped, and tested and the unit shall be shipped from the factory as a complete unit ready for installation. Unfired Steam Generator shall be furnished with a steam separator.

- Unfired Steam Generator shall be supplied with solid state control module with LCD touch screen display and LED pilot lights to indicate on-off, high pressure, low pressure, low water, and water feed. Solid state control module shall allow the owner to set pressure set point and pressure limits on display screen. Solid state control module shall have flashing red alarm light and alarm horn with built in alarm silence relay. Solid state control module shall be supplied with dry contact closure outputs to indicate to building automation controls (BAC) the occurrence of power on, high pressure, low pressure, low water, and water feed. The control module shall allow the BAC to turn the unfired steam generator on or off through a remote relay suitable for 24 VAC, 1 amp. The control module shall allow the BAC to remotely monitor the operating pressure. Control module shall be supplied with an on-off switch and shall be mounted in a NEMA 4 panel. All solenoids and limits shall be 24 VAC.
Specifications - Steam (continued)

- Furnish a factory installed brass (or stainless steel) feed water solenoid valve sized to feed the capacity of the boiler with a maximum pressure drop of 10 psi. Solenoid valve shall be factory wired to the level controller. Furnish a factory installed check valve between the solenoid valve and Unfired Steam Generator.

- Unfired Steam Generator shall be Cemline Model ____________, designed with an output of _____ pounds per hour at ______ psi pressure and feed water of _____ °F. when supplied ______ lb/hr with _____ psi steam to the control valve, and a _____ psi source steam pressure drop.

Options

- **Vacuum Breaker**
  Package shall be supplied with vacuum breaker.

- **Centrifugal Boiler Blow Off Condensate Cooler**
  Package shall include a centrifugal boiler blow off condensate cooler.

- **High Water Cut-Off (Choose Between Air/Electric)**
  High water cut-off shall be factory furnished. High water cut-off shall include an electronic probe (or stainless steel float) mounted in the top of the unit connected to an (air) (electric) operated power to open spring to close ball valve. In the event of high water, ball valve will close.

- **Feedwater Preheater/Condensate Recovery Heat Exchanger**
  Package shall include a make-up water heat exchanger to preheat make-up water. Heat exchanger shall be constructed with copper (or copper nickel or stainless steel) tubes.

- **Modulating Feed Water Control**
  Furnish a factory installed stainless steel modulating feed water valve sized to feed the capacity of the boiler with a maximum pressure drop of 10 PSI. Feed water valve shall be factory wired to the level controller. Furnish a factory installed check valve between the feed water valve and Unfired Steam Generator.

Additional Make Up Water Feeding Options (Choose one, if Required)

- **Feed Water Condensate Pump With Receiver:**
  Furnish a factory installed feed water condensate system consisting of a receiver, inlet strainer, pump, water make-up assembly, NEMA 1 panel with fused starter. Furnish factory installed check valve between the feed water condensate system and the unfired steam generator. Pump shall be factory wired to level controller.

- **Feed Water Pump:**
  Furnish and install a feed water pump with flexible connector, shut off valve, and check valve. Feed water pump shall be factory wired to level controller and furnished with fused starter in a NEMA 1 enclosure.

Automatic Blowdown (Choose One)

- **Automatic Blowdown Timer**
  Furnish a factory installed timed blowdown system consisting of a field programmable 1-160 hour interval and a 1 to 250 second duration timer and solenoid valve for blowing off the Unfired Steam Generator.

- **Automatic Blowdown TDS Sampling Method**
  Time sample feed water system. Furnish a factory installed time sample feed water system consisting of a control which measures the total dissolved solids of the unfired steam generator on a timed basis. If the total dissolved solids exceed the set point shall blow the boiler off until fresh water brings the total dissolved solids level to the desired setting.
Specifications - High Temperature Hot Water as Energy Source

Use this specification for an Unfired Steam generator using high temperature hot water as primary energy source.

- Unfired Steam Generator shall be as manufactured by Cemline Corporation, Cheswick, PA 15024.
- Unfired Steam Generator shall be furnished as a complete package ready for installation.
- Unfired Steam Generator shall be ASME Code constructed and stamped in accordance with Section VIII, Division I, for Unfired Steam Generators. Unfired Steam Generators shall be registered with the National Board of Boiler and Pressure Vessel Inspectors, and signed copy of shop inspection report shall be furnished. Unfired Steam Generator shall be built in accordance with Section VIII “Unfired Steam Generators” and shall bear the “UB” stamp.
- Unfired Steam Generator vessel shall be pressure vessel quality carbon steel (or 316 grade stainless steel).
- Unfired Steam Generator shall be insulated with not less than 3” of Fiberglass insulation, protected by not less than 20 ga. thick enameled steel jacket.
- Unfired Steam Generator shall be mounted on a suitable I-Beam support skid which shall be permanently welded to the shell.
- Unfired Steam Generator shall have submerged coil of 18 (or 16) gauge BWG 90:10 copper nickel (or 316 stainless steel) tubes expanded into a steel (or stainless steel) tubesheet with a fabricated steel coil head.
- Unfired Steam Generator shall be furnished with an air operated 2 (or 3) way control valve to modulate the in-coming HTHW to maintain the desired output of steam pressure ±2 psi. Control valve shall be suitable for 400 psi at 400°F. Control valve pilot shall monitor output steam pressure and modulate the HTHW to maintain constant output pressure.
- Unfired Steam Generator shall be furnished with a brass/cast steel (or stainless steel wetted parts) ASME Code Section I pressure relief valve or valves with a capacity to relieve the total BTU of output of the generator.
- Unfired Steam Generator shall be furnished with a vessel steam gauge, thermometer to monitor the incoming HTHW temperature. Unfired Steam Generator shall be furnished with a cast iron float type (or stainless steel electronic) level controller. Water column shall also be furnished with gauge glass. Unfired Steam Generator shall be furnished with tandem blow off valves.
- All components for the Unfired Steam Generator shall be factory mounted, piped, and tested and the unit shall be shipped from the factory as a complete unit ready for installation. Unfired Steam Generator shall be furnished with a steam separator.
- Unfired Steam Generator shall be supplied with solid state control module with LCD touchscreen display and LED pilot lights to indicate on-off, high pressure, low pressure, low water, and water feed. Solid state control module shall allow the owner to set pressure set point and set pressure limits on display screen. Solid state control module shall have flashing red alarm light and alarm horn with built in alarm silence relay. Solid state control module shall be supplied with dry contact closure outputs to indicate to building automation controls (BAC) the occurrence of power on, high pressure, low pressure, low water, and water feed. The control module shall allow the BAC to turn the unfired steam generator on or off through a remote relay suitable for 24 VAC, 1 amp. The control module shall allow the BAC to remotely monitor the operating pressure. Control module shall be supplied with an on-off switch and shall be mounted in a NEMA 4 panel. All solenoids and limits shall be 24 VAC.
Specifications: High Temperature Hot Water (continued)

- Furnish a factory installed brass (or stainless steel) feed water solenoid valve sized to feed the capacity of the boiler with a maximum pressure drop of 10 psi. Solenoid valve shall be factory wired to the level controller. Furnish a factory installed check valve between the solenoid valve and Unfired Steam Generator.

- Unfired Steam Generator shall be Cemline Model ___________, designed with an output of ____ pounds per hour at _____ psi pressure and feed water of ______°F. when supplied with _______ GPM of _____ °F inlet - _____ °F outlet boiler water.

## Options

- **Vacuum Breaker**
  Package shall be supplied with vacuum breaker.

- **Centrifugal Boiler Blow Off Condensate Cooler**
  Package shall include a centrifugal boiler blow off condensate cooler.

- **High Water Cut-Off (Choose Between Air/Electric)**
  High water cut-off shall be factory furnished. High water cut-off shall include an electronic probe mounted in the top of the unit connected to an (air) (electric) operated power to open spring to close ball valve. In the event of high water, ball valve will close.

- **Feedwater Preheater/Condensate Recovery Heat Exchanger**
  Package shall include a make-up water heat exchanger to preheat make-up water. Heat exchanger shall be constructed with copper (or copper nickel or stainless steel) tubes.

- **Modulating Feed Water Control**
  Furnish a factory installed stainless steel modulating feed water valve sized to feed the capacity of the boiler with a maximum pressure drop of 10 PSI. Feed water valve shall be factory wired to the level controller. Furnish a factory installed check valve between the feed water valve and Unfired Steam Generator.

## Additional Make Up Water Feeding Options (Choose One, if Required)

- **Feed Water Condensate Pump With Receiver:**
  Furnish a factory installed feed water condensate system consisting of a receiver, inlet strainer, pump, water make-up assembly, NEMA 1 panel with fused starter. Furnish factory installed check valve between the feed water condensate system and the Unfired Steam Generator. Pump shall be factory wired to level controller.

- **Feed Water Pump:**
  Furnish and install a feed water pump with flexible connector, shut off valve, and check valve. Feed water pump shall be factory wired to level controller and furnished with fused starter in a NEMA 1 enclosure.

## Automatic Blowdown (Choose One)

- **Automatic Blowdown Timer**
  Furnish a factory installed timed blowdown system consisting of a field programmable 1-160 hour interval and a 1 to 250 second duration timer and solenoid valve for blowing off the Unfired Steam Generator.

- **Automatic Blowdown TDS Sampling Method**
  Time sample feed water system. Furnish a factory installed time sample feed water system consisting of a control which measures the total dissolved solids of the Unfired steam generator on a timed basis. If the total dissolved solids exceed the set point shall blow the boiler off until fresh water brings the total dissolved solids level to the desired setting.
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