Overview

Cleaver-Brooks boiler feed systems help maintain peak efficiency and prolong the life of boilers where investment in a deaerator cannot be justified. Consisting of one or more feed pumps and a corrosion resistant receiver tank, the system automatically supplements condensate with makeup water to replace system losses. Cold water is heated by mixing with hot condensate and pumped to the boiler on demand.

Information in this section addresses tank size and typical offering of Boiler Feed Systems.

- Pump Run Options
  - Continuous
  - Intermittent

- Pumps are equipped with mechanical seals as standard.
  - Tungsten Carbide seals are available at additional cost - Contact PWS Sales.

- Pumps are 304 SS fitted construction with cast iron base and pump head.
  - 316 SS construction on special request - Contact PWS Sales.

- Pump dead head pressure must exceed the boiler safety valve setting by 3%.

- All units are factory assembled and include pump and receiver combinations suitable for feedwater temperatures up to 210°F at sea level and are F.O.B. Richfield, WI.

- When equipped with an automatic steam preheater, feedwater temperature can be maintained at 210°F. At this higher temperature, oxygen and carbon dioxide are released, reducing corrosion problems in the boiler. Pre-heating is recommended if return condensate constitutes 50% or less of the feedwater required.
FEATURES AND BENEFITS

The following features and benefits apply to Cleaver-Brooks Boiler Feed system products.

**All Pumps Deliver the Required Capacity at 210°F:**
- Guaranteed pump performance.

**All Pumps Have Mechanical Seals (Standard):**
- Reduces maintenance when compared to packing type seals.

**Specifically Designed for Compatibility With Cleaver-Brooks Boilers:**
- Quick, accurate equipment selection.
- Single source responsibility.
- Proven performance.

**Provides Additional Storage Time and Handles Volume-Swings in Condensate Return:**
- Feedwater tank collects intermittent condensate returns and supplies water at a relative constant volume.
- Minimizes problem from unpredictable condensate flow rates.

**Boosts Condensate Return Pressure:**
- Acts as a collecting point for low pressure and gravity returns
- Allows the introduction of returns to a high pressure vessel

**Accepts Gravity Returns:**
- Vessels are vented to atmosphere, providing no pressure resistance that would inhibit gravity return.

**Internal Pump Suction Vortex Breakers:**
- Eliminates the problems of loss in NPSHA and cavitations associated with the creation of vortices within pump suction piping.
Standard Signature Series

Receiver Tank

- Horizontal, ¼ inch thick, welded carbon steel receiver with heads, mounted on structural steel stand, with the following trim.
  - Float switch and solenoid operated make-up water valve.
  - Gauge glass set with shut-off valves.
  - Includes taps for sample and chemical feed.
  - Thermometer.
  - Piping between tank and pump including valve, strainer, and flexible coupling.
  - NOTE: High temperature diffuser tube not included

Feed Pumps

- Pump sets are Grundfos only complete with steel base, coupling, coupling guard and TEFC motors. Pumps are equipped with mechanical seals as standard. All motors are new NEMA rated, standard voltages are as follows:
  - Single Phase - Contact PWS Sales Department.
  - Three Phase - 230/460/3/60
  - Other voltages - If 208 or 550 volt motors are requested, 200/3/60 or 575/3/60 will be furnished. All motors 3450 or 3525 RPM.
  - The boiler load column for pump selections is calculated for a single pump.

Control Panel

- All systems using three phase motors are supplied with a NEMA Type 1 Control Panel enclosure which include magnetic starters, H-O-A selector switches, external resets, stand-by selector switches where required (dual units do not require a stand-by selector switch), 115 volt holding coils and starter overload heaters.
  - NOTE:
    - Duplex and Triplex units have transfer switches ONLY.
  - All control panels are UL listed and labeled as standard.
  - All wiring between control panel, pumps and other electrical devices provided with the will be factory completed. Simplex units panel provided unmounted. If the system must be broken down for shipment some field terminations might be required.
  - C-B nameplate attached showing model and unit number.

Packaging

- All systems up to and including 100 gallon are shipped whole. Systems larger than 100 Gallon will be shipped broken down and match marked.
- All systems are painted Cleaver Brooks blue except the control panel, wiring conduits electric motors, pumps and tanks that are either galvanized or of stainless steel construction.
Start – Up

- Individual pump throttling valves must be installed to insure the required GPM stated in the charts is not exceeded. This must be checked at start-up.
Guide

Tab 1: Model

Boiler Feed System Models

- Example: IDT - CR2-20U (460/3/60)
  - “I” – Intermittent Run Pump Operation
  - “D” – Number of Pumps:
    - S – Simplex
    - D – Duplex
    - D – Dual
    - T – Triplex
  - “T” – Tank Size
    - P – 45 Ga.
    - R – 75 Ga.
    - S – 100 Ga.
    - V – 270 Ga.
    - X – 500 Ga.
    - Y – 750 Ga.
    - Z – 1,000 Ga.
  - “CR2-20U” – Grundfos Pump/Motor Model
  - “(460/3/60)” – Current Characteristics

- Note:
  - All Systems 100 gallon and smaller with Maximum 2 Pumps are designated Signature Series.
  - All Systems 200 gallon through 340 gallon with 3 pumps or less are designated Signature Series.
  - All other Systems are considered Custom.
    - Custom Systems generally add an additional 2 weeks to the lead-time.
### Intermittent / Simplex

<table>
<thead>
<tr>
<th>Model</th>
<th>Tank Capacity (gal)</th>
<th>Tank Dimensions (inches)</th>
<th>Approx Shipping Weight. (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISP</td>
<td>45</td>
<td>18 x 43</td>
<td>625</td>
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<tr>
<td>ISR</td>
<td>75</td>
<td>24 x 40</td>
<td>675</td>
</tr>
<tr>
<td>ISS</td>
<td>100</td>
<td>24 x 55</td>
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<tr>
<td>IST</td>
<td>200</td>
<td>30 x 67</td>
<td>1125</td>
</tr>
<tr>
<td>ISV</td>
<td>270</td>
<td>36 x 63</td>
<td>1175</td>
</tr>
<tr>
<td>ISW</td>
<td>340</td>
<td>36 x 78</td>
<td>1350</td>
</tr>
<tr>
<td>ISX</td>
<td>500</td>
<td>42 x 84</td>
<td>1800</td>
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<tr>
<td>ISY</td>
<td>750</td>
<td>48 x 96</td>
<td>2050</td>
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Weights do not include pump weight.

### Intermittent / Duplex

<table>
<thead>
<tr>
<th>Model</th>
<th>Tank Capacity (gal)</th>
<th>Tank Dimensions (inches)</th>
<th>Approx Shipping Weight. (lbs.)</th>
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</thead>
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<tr>
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<td>775</td>
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<tr>
<td>IDT</td>
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<td>30 x 67</td>
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<tr>
<td>IDV</td>
<td>270</td>
<td>36 x 63</td>
<td>1325</td>
</tr>
<tr>
<td>IDW</td>
<td>340</td>
<td>36 x 78</td>
<td>1450</td>
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<tr>
<td>IDX</td>
<td>500</td>
<td>42 x 84</td>
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<tr>
<td>IDY</td>
<td>750</td>
<td>48 x 96</td>
<td>2125</td>
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</table>

Weights do not include pump weight.

### Intermittent / Dual

<table>
<thead>
<tr>
<th>Model</th>
<th>Tank Capacity (gal)</th>
<th>Tank Dimensions (inches)</th>
<th>Approx Shipping Weight. (lbs.)</th>
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</thead>
<tbody>
<tr>
<td>IUP</td>
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<tr>
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<td>IUY</td>
<td>750</td>
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<td>2125</td>
</tr>
<tr>
<td>IUZ</td>
<td>1000</td>
<td>48 x 125</td>
<td>2475</td>
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Weights do not include pump weight.
# Product Guide

## Boiler Feed System

### Intermittent / Triplex

<table>
<thead>
<tr>
<th>Model</th>
<th>Tank Capacity (gal)</th>
<th>Tank Dimensions (inches)</th>
<th>Approx Shipping Weight (lbs.)</th>
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<td>ITY</td>
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<tr>
<td>ITZ</td>
<td>1000</td>
<td>48 X 125</td>
<td>2625</td>
</tr>
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</table>

Weights do not include pump weight.

### Continuous / Simplex

<table>
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<th>Tank Dimensions (inches)</th>
<th>Approx Shipping Weight (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSP</td>
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<tr>
<td>CSR</td>
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Weights do not include pump weight.

### Continuous / Duplex

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<th>Approx Shipping Weight (lbs.)</th>
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</thead>
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<td>CDR</td>
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<td>36 X 63</td>
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Weights do not include pump weight.
## Continuous / Dual

<table>
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<td>CUR</td>
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<tr>
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<td>36 X 78</td>
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<td>CUX</td>
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<tr>
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Weights do not include pump weight.

## Continuous / Triplex

<table>
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<th>Tank Dimensions (inches)</th>
<th>Approx Shipping Weight (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTT</td>
<td>200</td>
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<td>1425</td>
</tr>
<tr>
<td>CTV</td>
<td>270</td>
<td>36 X 63</td>
<td>1550</td>
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<tr>
<td>CTW</td>
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<td>1675</td>
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<td>CTX</td>
<td>500</td>
<td>42 X 84</td>
<td>2000</td>
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<td>CTY</td>
<td>750</td>
<td>48 X 96</td>
<td>2325</td>
</tr>
<tr>
<td>CTZ</td>
<td>1000</td>
<td>48 X 125</td>
<td>2675</td>
</tr>
</tbody>
</table>

Weights do not include pump weight.

### Boiler Feed Components

- **Tank**
  - Required if select Pump and Stand
  - For Tank Only
    - Select Tank Only
    - De-Select Trim, Stand, and Pump
- **Trim (Controls)**
- **Stand**
  - Required if Tank and Pump selected
- **Pump**
  - For Pumpset Only
    - Select Pump Only
    - De-Select Tank, Trim, and Stand
Tank Design

- Required if Tank is selected
  - Options
    - Cleaver-Brooks
    - Aurora
  - Available for tank only applications

Replacement Tank

- Required for Tank Only Application
  - Specify whether or not a replacement tank application

Tank Unit Number

- Required for Replacement Tank Applications

Number of Boilers

- Standard: Maximum of 3

Boiler Horsepower

- Standard: Maximum of 800HP per pump

Boiler Operating Pressure

- Minimum: 6 psi
  - Maximum: 200 psi

Boiler Safety Valve Setting

- Minimum
  - Operating Pressure Less than or Equal to 12
    - Operating Pressure + 3
  - Operating Pressure equal to 13
    - 15
  - Operating Pressure Less than or Equal to 135 and greater than 13
    - Operating Pressure + 15
  - Operating Pressure Greater than 135
    - Operating Pressure x 1.11

Mode of Operation

- Options
  - Intermittent (On/Off)
  - Continuous
Additional Pressure Drop

- 15psi pressure allowance included within the pump selection for an economizer
- Only an option:
  - Continuous Mode of Operation
  - Operating Pressure is between 30 and 185

Pumpset Configuration

- Simplex
  - Available if
    - Number of Boilers = 1
  - For 1-boiler operation, consist of:
    - (1) packaged pump: (1) TEFC motor coupled to a vertical multistage pump on steel channel base with flexible coupling and coupling guard between pump and motor;
    - (1) steel receiver with extra suction and preheat tapping
    - Float switch and solenoid make-up valve
    - Gauge glass with shutoff valves and thermometer
    - Suction piping from receiver to pump is complete with isolation valve, Y-type strainer, flexible hose, gate valve, and expansion type flexible coupling.

- Duplex
  - Available if
    - Number of Boilers = 1
    - Number of Boilers = 2 and Backup Boiler = Yes
  - For 1- boiler operation with stand-by,
    - Similar to Simplex with (2) pumps;
    - (1) steel receiver
    - NEMA 1 control panel
    - Magnetic starters (where required) mounted in a NEMA I Enclosure
    - H-O-A switch and manual transfer switch for standby pump.

- Dual
  - Available if
    - Number of Boilers = 2
    - Number of Boilers = 3 and Backup Boiler = Yes
  - For 2-boiler operation,
    - Similar to duplex with large receiver size for two boiler operation - individually controlled.
    - Two H-O-A switched (one for each starter).
    - Transfer switch not required.
• Triplex
  • Available if
    • Number of Boilers = 2 or 3
  • For 2-boiler operation with stand-by,
    • Similar to dual units except 3 pumps are furnished (third pump is stand-by).
    • Two selector switches are furnished to allow pumps 1 & 2, 1 & 3, or 2 & 3 to operate.
    • (If 3-boiler operation is required, it must be specified and priced accordingly.)

Triplex Boiler Adder
• Line item included for 3 boiler / 3 pump applications

Increase Tank Size
• Substitute Larger Size Tank for Standard Tank Size
• Physical dimensions of the pump and motor prohibit substitutions of smaller receivers on packaged units in most cases

<table>
<thead>
<tr>
<th>Original Tank Capacity</th>
<th>Increase Tank Capacity ( Gal )</th>
<th>Add Additional Weight ( Lbs )</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 Gal. Tank 18 X 43</td>
<td>75, 100, 200</td>
<td>45, 195, 350</td>
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<tr>
<td>75 Gal. Tank 24 X 40</td>
<td>100, 200, 270</td>
<td>150, 305, 330</td>
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<tr>
<td>100 Gal. Tank 24 X 55</td>
<td>200, 270, 340</td>
<td>155, 180, 215</td>
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<td>200 Gal. Tank 30 X 67</td>
<td>270, 340, 500</td>
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<td>270 Gal. Tank 36 X 63</td>
<td>340, 500</td>
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<td>340 Gal. Tank 36 X 78</td>
<td>500, 750</td>
<td>255, 705</td>
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<tr>
<td>500 Gal. Tank 42 X 84</td>
<td>750, 1000</td>
<td>450, 1000</td>
</tr>
<tr>
<td>750 Gal. Tank 48 X 96</td>
<td>1000</td>
<td>550</td>
</tr>
</tbody>
</table>

Storage Time Display
• Displays Final Tank Size and Actual Storage Time
Storage Time Error Display

- If Storage Time is less than 10 Mins a message will display the following
  - Actual Storage Time is less than 10 mins. A larger storage tank is required, please contact MKE PWS Sales.

Voltage

- 460/3/60
- 230/3/60
- 208/3/60
- 575/3/60
- 380-415/3/50

Pump Dead Head Pressure Display

- If Pump dead head pressure does not exceed the boiler safety valve setting by 3% the following is displayed:
  - Warning - NBIC Section I requires that the boiler feedpump must be able to produce a pressure equal to or greater than 3% above the highest boiler safety valve setting. The selected pump does not meet this requirement. This issue usually arises when the boiler operating pressure is significantly below the safety valve setting. Consider selecting a lower safety valve setting or over sizing the pump by entering a higher operating pressure.

Tab 2: Signature Series Options

Make Up Valve

- Square D
  - Standard - Default
  - Tank mounted internal float switch and solenoid valve

<table>
<thead>
<tr>
<th>Tank Size (gal)</th>
<th>Solenoid Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 – 100</td>
<td>½ inch</td>
</tr>
<tr>
<td>200 – 270</td>
<td>¾ inch</td>
</tr>
<tr>
<td>340 – 500</td>
<td>1 inch</td>
</tr>
<tr>
<td>750 – 1000</td>
<td>1 ½ inch</td>
</tr>
</tbody>
</table>

- Warrick
- McD-M 25 External Tank Piped
- McD-M 21 Internal Tank Mounted

Alarm Package Type

- McD-M63
  - Not an option if the Warrick Make Up Valve is selected
  - Warrick
Alarm Packages
- Includes: Alarm switch, alarm horn, silence push button, alarm light and two relays
- High Water Alarm
- Low Water Alarm
- Low Water Cutoff with Alarm

Low Discharge Pump Pressure Package
- Available for Continuous Operation

Air Gap Fitting
- Option

Chemical Feed Quill
- Tapping Standard on Tank

Magnesium Anode
- Tapping Standard on Tank

Pump Discharge Pressure Gauge (4-1/2”)
- Siphon and Valve

Pump Suction Pressure Gauge (4-1/2”)
- Siphon and Valve

3 Valve By Pass
- Sized based on required Make Up Valve By Pass Pipe Area
- Sizes
  - ¾”
  - 1”
  - 1-1/2”

High Temperature Diffuser Tube
- (Perforated) Schedule 40 SS pipe (not to exceed receiver length)
  - Size 2-1/2” x 37” lg (Use with 45 - 270 gal tanks)
  - Size 2 1/2” x 60” lg. (Use with 340 - 1000 gal tanks)
Additional Tapings

• Up to 5 additional tapings
  • If additional tapings are required utilize the special engineering tab
  • Specify the Taping Size, Location, and function for each additional taping

Tab 3: Pressure Vessel
Tank Construction

• Carbon Steel
  • Standard – Default
• Galvanized
  • Hot dipped galvanized tank
• Stainless Steel (304SS)
  • Not an option if an Aurora Tank
  • Tank Constructed out of grade 304 stainless steel.
  • No manway required
  • Tank has an extended 5-year warranty at no additional cost.

Manhole

• 11" X 15" (limited to sizes 200 – 1000 gallon)

Insulation and Lagging

• Special Quotation is required
  • Enter the Quotation Number, Description, and Pricing in the appropriate fields

ASME Construction Tank

• Special Quotation is required
  • Enter the Quotation Number, Description, and Pricing in the appropriate fields
  • Receiver tanks constructed to various ASME pressure (50#, 100#, 150#)

Seismic Calculations

• Special Quotation is required
  • Enter the Quotation Number, Description, and Pricing in the appropriate fields
  • Calculations
  • Upgrade of Stand
Special Wiring and/or Motors

- Special Quotation is required
- Enter the Quotation Number, Description, and Pricing in the appropriate fields

Tab 4: Control Panel

Nema Enclosure

- Not Available if Trim or Pump is not selected
- Options
  - Nema 4
  - Nema 12

Main Power Disconnect

- Not available if
  - Main Circuit Breaker is selected
  - Pumps is not selected
- Options
  - Main Fused Disconnect (40 AMP)
    - Not available if
      - Voltage is 208/3/60 and Pump HP is greater than 11 HP
      - Voltage is 280/3/50 and Pump HP is greater than 20 HP
  - Main Unfused Disconnect (40 AMP)
    - Not available if
      - Voltage is 208/3/60 and Pump HP is greater than 11 HP
      - Voltage is 280/3/50 and Pump HP is greater than 20 HP
      - Pumpset Configuration is Simplex
  - Main Unfused Disconnect (80 AMP)
    - Not available if
      - Pumpset Configuration is Simplex

Pump Protection

- Not available if
  - Pumps or Trim is not selected
- Required if
  - Main Power Disconnect is Main Unfused Disconnect (40 AMP) or Main Unfused Disconnect (80 AMP) and Pumpset Configuration is Duplex
  - Main Power Disconnect is any selection and Pumpset Configuration is Dual or Triplex
• Options
  • Individual Pump Fused Disconnect (40 AMP)
    • Not available if
      • Voltage is 208/3/60 and Pump HP is greater than 11 HP
      • Voltage is 280/3/50 and Pump HP is greater than 20
  • Individual Pump Fused
    • Not available if
      • Main Power Disconnect if Main Fused Disconnect (40 AMP)
  • Pump Circuit Breaker (per Pump) with Interlock

Main Circuit Breaker with Interlock
• Not Available if
  • Pumps is not selected
  • Main Power Disconnect is selected
• Options
  • 3 Pole 380/460/575 V
  • 3 Pole 208/230 V

Fused Control Circuit Transformer including Pump Motor Fuses
• Always selected if Pump and Trim is selected

Single Point Connection
• Included if Main Power Disconnect or Main Circuit Breaker is selected

Fused Magnetic Starter
• Not available if
  • Pumps is not selected

Electric Alternator
• Available if
  • Pumps is selected
  • Pumpset Configuration is Duplex
  • Continuous operation is selected

Audible Alarm
• Options
  • Horn
  • Bell
Alarm Silence Pushbutton
- Available if Audible Alarm is selected

Additional Contacts
- Not available if
  - Trim is not selected
- Options
  - Remote Low Water Alarm
    - Available if Low Water Alarm Package is selected
  - Remote Low Water Cut-Off Alarm
    - Available if Low Water Cut-Off Alarm Package is selected
  - Remote High Water Alarm
    - Available if High Water Alarm Package is selected
  - Pump Running Status (Per Pump)

Additional Pilot Lights
- Not available if
  - Trim is not selected
- Options
  - Power On Light
  - Pump Run Light (Per Pump)

Push To Test Pilot Light
- Available if Additional Pilot Light Option is selected

Additional 3 Pole Relay
- Not available if
  - Trim is not selected
- Options
  - Chemical Feed
  - Pump (Per Pump)
  - Remote Alarm

Hour Meter
- Not available if
  - Pump is not selected
Tab 5: Preheating Equipment

Preheating Equipment

- All standard tanks are supplied with extra openings for preheating equipment.
- Preheating systems are provided with thermostatically controlled steam pressure regulators, Sarco or equal connected to a perforated tube installed in tank by means of special bushing.
- Feed systems with preheat also include a sentinel relief valve installed on the tank.

Internal Steam Heater

- Not Available
  - Tank is not selected
  - Evaporation Rate is greater than 192.8
- Options
  - Low Pressure (5-15 psig)
    - Available if Evaporation Rate is less than 102
    - For low pressure systems ( 5 – 15 psi steam)
    - Operation on steam supply pressures less than 5 psig – Consult Sales
    - Thermostatic Temperature Regulating Valve without pressure reducing attachment
  - Following equipment is furnished:
    1. Perforated heater tube with special bushing.
    2. Temperature regulating valve.
    3. Strainer for temperature regulating valve.
    4. Pressure gauge.
    5. Sentinel Relief valve in tank.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Heating Rate (GPM)</th>
<th>Size of Steam Control Valve &amp; Strainer (Inches)</th>
<th>Min Steam Supply Line (Inches)</th>
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</thead>
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<td></td>
<td>50 deg. Temp Rise</td>
<td>100 deg. Temp Rise</td>
<td>150 deg. Temp Rise</td>
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<td>E2T14 - 3&quot;</td>
<td>102</td>
<td>51</td>
<td>34</td>
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</table>
• High Pressure (30-250 psig)
• Not Applicable for Steam Pressures over 250 psi
• Thermostatic Temperature Regulating Valve without pressure reducing attachment
• Following equipment is furnished:
  1. Perforated heater tube with special bushing.
  2. Temperature regulating valve.
  3. Strainer for temperature regulating valve.
  4. Pressure gauge.
  5. Sentinel Relief valve in tank.

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</table>
Enter Steam Pressure

- Minimum
  - Low Pressure: 5 psi
  - High Pressure: 30 psi
- Maximum
  - Low Pressure: 15 psi
  - High Pressure: 250 psi

Requested Temperature Rise

- 50° F
- 100° F
- 150° F

Heating Rate

- Determined by Low or High Pressure, Entered Steam Pressure, and Requested Temperature Rise

Internal Steam Heater Model

- Selection based on Low or High Pressure, Entered Steam Pressure, Heating Rate, and Requested Temperature Rise

Tab 6: Special Engineering

Special Quotations

- PWS List
- PWS Net

Additional Startup

- Optional

Ship Inland Freight

- Canada
- Thomasville
BOILER FEED SYSTEMS
SAMPLE SPECIFICATIONS

PART 1 GENERAL

1.1 GENERAL

A. The following sample specifications are provided by Cleaver-Brooks to assist you in specifying your customer’s specific needs and application

B. Boiler Feed System shall be Cleaver-Brooks Model ____________ (Specify simplex, duplex, dual, or triplex) packaged boiler system suitable for _____gpm, at a discharge pressure of _____psig. (Refer to Table H6-2, Table H6-3, and Table H6-4.)

PART 2 PRODUCTS

SYSTEM COMPONENTS

A. The unit shall consist of the following components:

1. One (substitute two for duplex or dual; three for triplex) stainless steel cast iron fitted pump(s) certified by Cleaver-Brooks for a minimum of _____gpm or 212°F water at _____psig. The pump(s) shall be guaranteed for one year against defects in workmanship and material. The pump(s) shall be equipped with mechanical seals for temperatures up to 225°F.

2. One non-code welded receiver made of structural grade steel.

   The tank shall be furnished with integral supports and connections for inlet, outlet drain, makeup valve, thermometer, and gauge glass.

3. Tank size shall be _____ inches diameter with _____ gallon capacity.

4. One fresh water makeup valve consisting of a float switch and solenoid valve suitable for tight shutoff against 100 psig inlet pressure.

5. Piping between the receiver and the pump shall consist of one (substitute two for duplex or dual; three for triplex) section(s) containing a gate valve(s), one flexible hose(s) and Y-type strainer(s) to ensure minimum pressure drop between receiver and pump.