

# **SIoux® HYBRID WATER HEATER**

**Patent Pending**

**Maximizing the  
Benefits of Coil and  
Direct-Fired Heating  
Technologies**



- **Higher Discharge Temperature**
- **True High-Efficiency**
- **No Assembly Required**
- **#1 Brand of Water Heaters for the Concrete Industry**



# #1 Supplier of Water Heaters for Over 35 years

Sioux Corporation has been the number one supplier of water heaters to the concrete industry for over 35 years. Over the years Sioux has listened to the needs of concrete professionals and has continually improved our products to help improve the profitability of our customers' operations. Sioux is proud to introduce the high-efficiency Sioux Hybrid Water Heater, which maximizes the benefits of coil and direct-fired heating technologies.

## Benefits of the Sioux Hybrid Heater

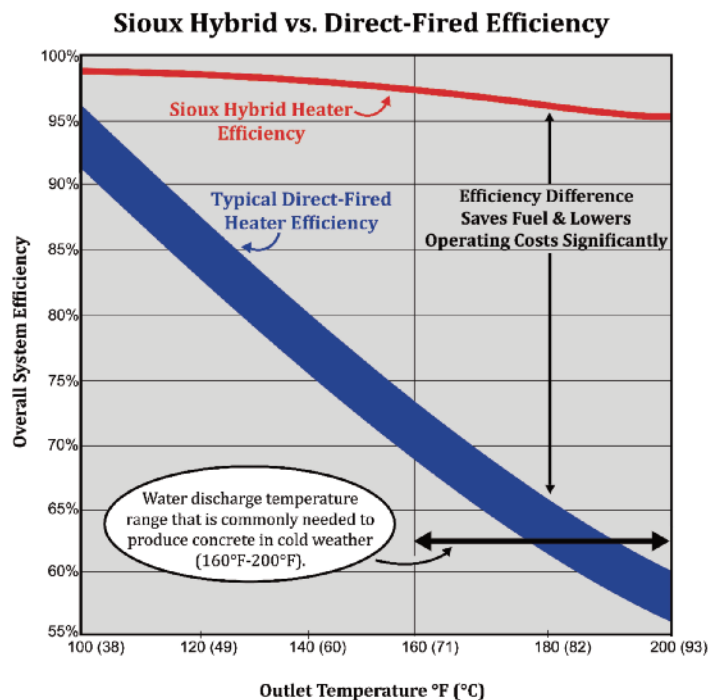
- Produces 205°F discharge water.
- Achieves 99% true efficiency.
- Provides recirculation mode, as required to maintain water storage tank temperature.
- Media section provides exceptionally high overall efficiency.
- Coil section allows the heater to reach high temperature without producing steam.
- Ships complete. No assembly required. Simply connect:
  - Electricity (460, 230 or 208 Volts, 3 Phase, 60 Hz) alternate electricals available
  - Water
  - Fuel (LP, NG or Diesel Fuel)

## Myths of Direct-Fired Water Heaters

- 99.9 % Efficiency.
- Can recirculate from a storage tank.
- Efficiency can be measured by exhaust gas temperature.
- Storage tanks are unnecessary because peak demands can be met with a larger heater.
- Do not require ASME Stamp.

## The Truth about Direct-Fired Water Heaters and Why the Sioux Hybrid Water Heater is Superior

- **Stack temperature does NOT provide an accurate measure of combustion efficiency. EFFICIENCY = Energy out / Energy in:** This data is difficult to measure: energy content of fuel used, fuel consumption, water temperature and flow, combustion air temperature and flow, electrical consumption, and other variables which are difficult to measure. Imagine this: If only 50% of the fuel was burned (for example from water drops contacting fuel prior to combustion), stack temperature would be low, but efficiency would be terrible... Therefore low stack temperature does not mean high efficiency.
  - **The SIOUX Hybrid Heater** has been designed as a high- efficiency system that achieves 99% true efficiency.
- **At what discharge temperature is efficiency measured?** Heater efficiency should be measured at the typical operating temperature for your plant, which for most ready mix customers, is 160°F (71°C) to 180°F (82°C). Direct-fired units measure efficiency well below that temperature. Typical direct-fired heater efficiency is much lower at the temperature required, due to heating water into steam, which escapes out the exhaust.
  - **The SIOUX Hybrid Heater's** coil section of the design eliminates this problem because high temperatures are reached within the coil section where the water cannot escape as steam, so you can heat water to much higher temperatures, and maintain exceptional efficiency.
- **What is efficiency during recirculation (needed to maintain your water storage tank temperature)?** With a typical direct- fired unit operating in recirculation mode (where tank water is pumped through the heater to maintain tank temperature), the heater water discharge temperature soars well above the design limit, thereby discharging excessive steam to the atmosphere, resulting in totally unacceptable efficiency, so direct-fired heaters are not used for recirculation.
  - **The SIOUX Hybrid Heater** has been designed specifically to recirculate to a water storage tank and maintain high efficiency. The ability to heat water to 208°F (93°C), and the use of a modulating burner make the Hybrid design ideal for maintaining tank water temperature.



# Standard Construction

**Skid:** Heavy-duty welded structural channel steel with incorporated forklift pockets, lifting points, and gussets with holes for bolting to a concrete pad.

**Heat Exchange System:** Includes three parts. The first part is a heavy-duty schedule 40 carbon steel pipe, horizontally-mounted, electrically-welded heating coil. Part two consists of a stainless steel exhaust pipe heat exchange system that transfers heat to the water in the process tank. Part three includes stainless steel heat exchange media and spray bar that utilizes the remaining exhaust heat. Each Sioux Water Heater coil is built to stringent ASME (American Society of Mechanical Engineers) standards, individually tested and inspected, and is permanently registered with the National Board of Boiler and Pressure Vessel Inspectors.

**Electrical System:** Features a smart relay control with touch screen information center for easy operation monitoring, variable frequency drive (VFD) control which automatically adjusts inlet water flow rate to

maximize performance, TEFC motors with magnetic starters, and low-flow indicator. Electrical components are mounted in NEMA-4 water tight, dust proof industrial electrical enclosures. Ergonomically designed control panel making operation simple and easy. Single point electrical connection with service rated disconnect breaker.

**Burner:** Available in oil, liquid propane, natural gas or a combination burner which can operate using all three. All burners include a flame monitoring safety ignition system to prevent burner operation if a flame is not present. Burner system provides an integral package with a forced air, adjustable pressure fuel system, and a UL-listed moisture-proof constant-duty transformer with spark ignition. Gas burner system is a UL-listed high efficiency power gas burner with an ASME-CSD-1 approved gas train. Combination burner system includes a remote, electrically powered fuel pump for operation with diesel fuel. Consult factory for more details.

## Specification Charts

### Sioux Hybrid Water Heater - 3M BTU

3M BTU	Input BTU/hr	Efficiency %	Output BTU/hr	Operating Current	Boiler HP	Maximum Flow Gal/min (L)	Inlet Pump	Minimum Flow Gal/min (L)	Circulation Pump
460/3/60	3,061,224	99%	3,000,000	16 Amps	90	100 (378)	5HP	40 (151)	5HP
230/3/60	3,061,224	99%	3,000,000	30 Amps	90	100 (378)	5HP	40 (151)	5HP

**ELECTRICALS**  
230 or 460V/3PH/60Hz (alternate electricals available)  
GAS CONNECTION & WATER CONNECTIONS  
A. Gas inlet connection is 2" (.05m) NPT; Inlet connection height is 54" (1.37m) above ground.  
B. Inlet water connection is 2" (.05m) NPT. Outlet water connection is 2" (.05m) NPT. Inlet connection height is 10" (.25m) above ground.

**FUEL SYSTEM REQUIREMENTS**  
Natural Gas-fired units:  
A. Approximate fuel consumption: 3,060 CFH  
B. Gas pressure requirements: 10" to 14" (.25m to .35m) water column pressure at burner (0.43 PSI (0.0296BAR)); 10" (.25m) minimum gas pressure must be maintained during heater operation.

LP Gas-fired units:  
A. Approximate fuel consumption: 33.34 GPH (126.19 LPH) or 142 lbs/hour (64.4 kg/hour).  
B. Gas pressure requirements: 10" to 14" (.25m to .35m) water column pressure at burner (0.43 PSI (0.0296BAR)); 10" (.25m) minimum gas pressure must be maintained during heater operation.  
Diesel-fired units:  
A. Approximate fuel consumption: 21.5 GPH (81.38 LPH).

**SHIPPING INFORMATION**  
A. Approximate shipping weight 4,500 lbs (2041.2 kg).  
B. Shipping dimensions- 46" W x 150" L x 78" H (1.17m W x 3.81m L x 1.98m H)

### Sioux Hybrid Water Heater - 6M BTU

6M BTU	Input BTU/hr	Efficiency %	Output BTU/hr	Operating Current	Boiler HP	Maximum Flow Gal/min (L)	Inlet Pump	Minimum Flow Gal/min (L)	Circulation Pump
460/3/60	6,122,449	99%	6,000,000	30 Amps	179	250 (946)	10HP	100 (378)	10HP
230/3/60	6,122,449	99%	6,000,000	60 Amps	179	250 (946)	10HP	100 (378)	10HP

**ELECTRICALS**  
230 or 460V/3PH/60Hz (alternate electricals available)  
GAS CONNECTION & WATER CONNECTIONS  
A. Gas inlet connection is 3" (.07m) NPT; Inlet connection height is 71.5" (1.8m) above ground.  
B. Inlet water connection is 4" (.1m) NPT. Outlet water connection is 3" (.07m) NPT. Inlet connection height is 17.5" (.44m) above ground.

**FUEL SYSTEM REQUIREMENTS**  
Natural Gas-fired units:  
A. Approximate fuel consumption: 6,100 CFH  
B. Gas pressure requirements: 10" to 14" (.25m to .35m) water column pressure at burner (0.43 PSI (0.0296BAR)); 10" (.25m) minimum gas pressure must be maintained during heater operation.

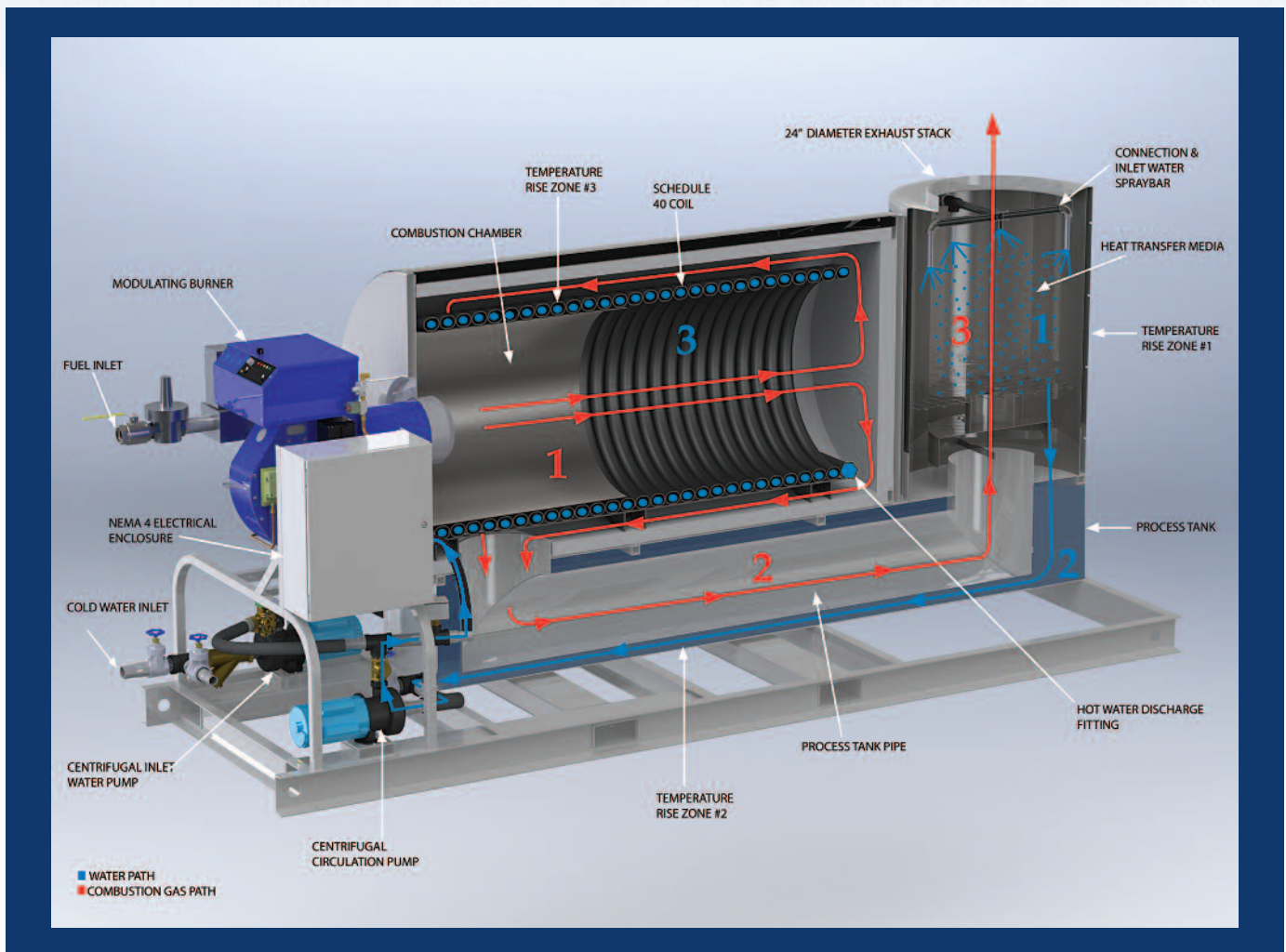
LP Gas-fired units:  
A. Approximate fuel consumption: 68 GPH (257 LPH) or 290 lbs/hour (132 kg/hour).  
B. Gas pressure requirements: 10" to 14" (.25m to .35m) water column pressure at burner (0.43 PSI (0.0296BAR)); 10" (.25m) minimum gas pressure must be maintained during heater operation.  
Diesel-fired units:  
A. Approximate fuel consumption: 44 GPH (167 LPH).

**SHIPPING INFORMATION**  
A. Approximate shipping weight 10,000 lbs (4,536 kg).  
B. Shipping dimensions- 90" W x 230" L x 87.5" H (2.3m W x 5.81m L x 2.2m H)

Efficiency figures are for normal operation. In water tank recirculation mode, efficiency may be slightly lower.



# Principles of the Sioux Hybrid Water



Operation of the Hybrid Heater is fairly simple: Please see the illustration above, and consider the flow of **combustion gas** (in red), and then the flow of **water** (in blue).

**COMBUSTION GAS FLOW:** In the illustration above, combustion gas as shown in red, flows from the burner on the left side, through the combustion gas pipe, to the media section on the right.

1. The **modulating power burner** and combustion chamber are engineered to provide maximum combustion of the fuel supplied to the heater. This heated gas passes through the center of the heating coil, and then along the exterior of the heating coil (red Section 1). This two-pass, high-efficiency design maximizes heat transfer into the water flowing in the coil. Three standard

burners are available: (1) gas fired (which can be changed between natural gas and LP gas in one minute by removing or inserting an orifice), (2) diesel fired, or (3) a combination gas/diesel burner which can burn NG, LP, or diesel. The burner is conveniently located for easy access and maintenance.

2. Next, combustion gas passes through the process tank pipe (red Section 2).
3. Lastly, combustion gas passes through the media section (red Section 3) and exits the heater at the exhaust stack.

# Heater

**WATER FLOW:** In the illustration, water as shown in blue, flows (in the opposite direction as combustion gas) from the media section on the right, through the process tank, to the coil/burner section on the left.

1. Water is fed into the media section (blue Section 1) by a **centrifugal inlet water pump** through the inlet water spray bar. The spray bar distributes water evenly across the media heating section where water flows by gravity around the stainless steel media material contained in an insulated, stainless steel tank. In the media section, water comes in contact with combustion gas and stainless steel media rings, capturing remaining combustion gas heat, providing the first water temperature rise.
2. Water then drops into the **stainless steel process tank** (blue Section 2), through which passes the combustion gas pipe, thereby

providing the second water temperature rise. The inlet water pump is controlled to maintain the water level in this tank, providing a constant supply of preheated water for the third and last heating section.

3. A **centrifugal circulation pump** feeds water from the process tank through the coil in the third heating section (blue Section 3), and out the heater discharge to the customer's storage tank. The heating coil consists of a **two-pass, high-efficiency, schedule 40 heating coil** built to ASME Code and is individually inspected by Hartford Boiler. The burner is controlled to heat water to the final discharge temperature setting, which is maintained regardless of incoming water temperature. Discharge water temperature can be set to a maximum of 208°F (98°C), adjustable in one degree increments.

## Additional Features

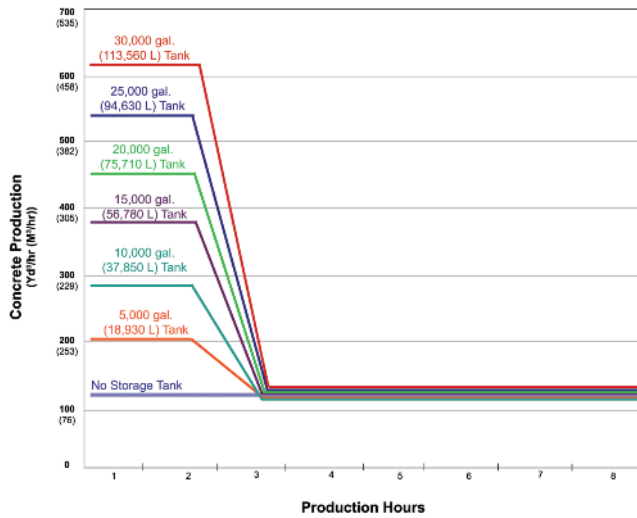
- Digital temperature control and the modulating burner system maintain discharge water temperature within 5°F (2.8°C) of setpoint.
- Dual high temperature limit switches provide redundant high temperature limit controls, added safety and meet ASME requirements.
- Flow switch shuts down burner operation if flow is too low, increasing safety and protecting components from damage.
- ASME rated pressure relief valve for safety.
- Inlet and outlet pressure gauges and thermometers to monitor performance and use in troubleshooting.
- Inlet water Y-Strainer prevents debris from entering the heater.
- Water shut-off valves for easy delimiting, draining and maintenance.

# Concrete Production $\{Yd^3/hr (M^3/hr)\}$

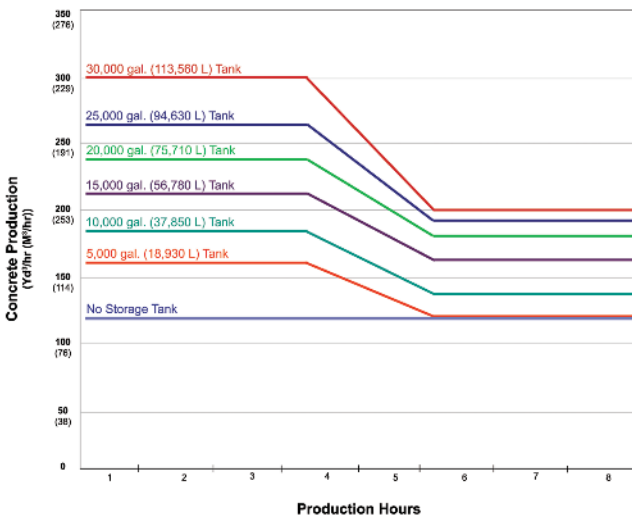
## 3M BTU Hybrid Heater

The illustrations show the concrete production capacity using a Sioux 3M BTU or 6M BTU Hybrid Water Heater with typical water storage tank sizes. Heating water in a storage tank during periods when the heater is not needed for production will provide additional capacity as shown in the charts. Larger storage tanks can provide a significant increase in production capacity for time period shown. A storage tank can ensure that peak demands are met without needing a larger heater, which costs more for the larger heater and the larger gas service. Note, for 24 hour production, a storage tank is beneficial to meet fluctuations in production.

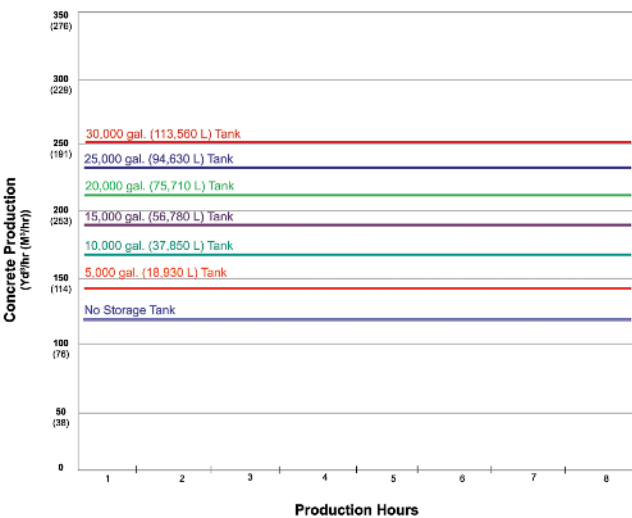
2 Hours of Peak Production



4 Hours of Peak Production



8 Hours of Peak Production





# Using Various Size Storage Tanks

6M BTU Hybrid Heater

## Steps To Sizing The System For Your Application:

1. Select either the 3M BTU/Hr unit or 6M BTU/Hr unit.
  2. Determine the number of hours of peak production (the number of hours/day that you want to be able to produce the maximum production rate).
- Use that corresponding chart.
3. Determine the concrete production you want to provide (cubic yards per hour) during peach production (i.e. 150 yd<sup>3</sup>/hr or 250 yd<sup>3</sup>/hr).
  4. Select the required hot water storage tank needed. If it falls between two sizes select the next larger size.

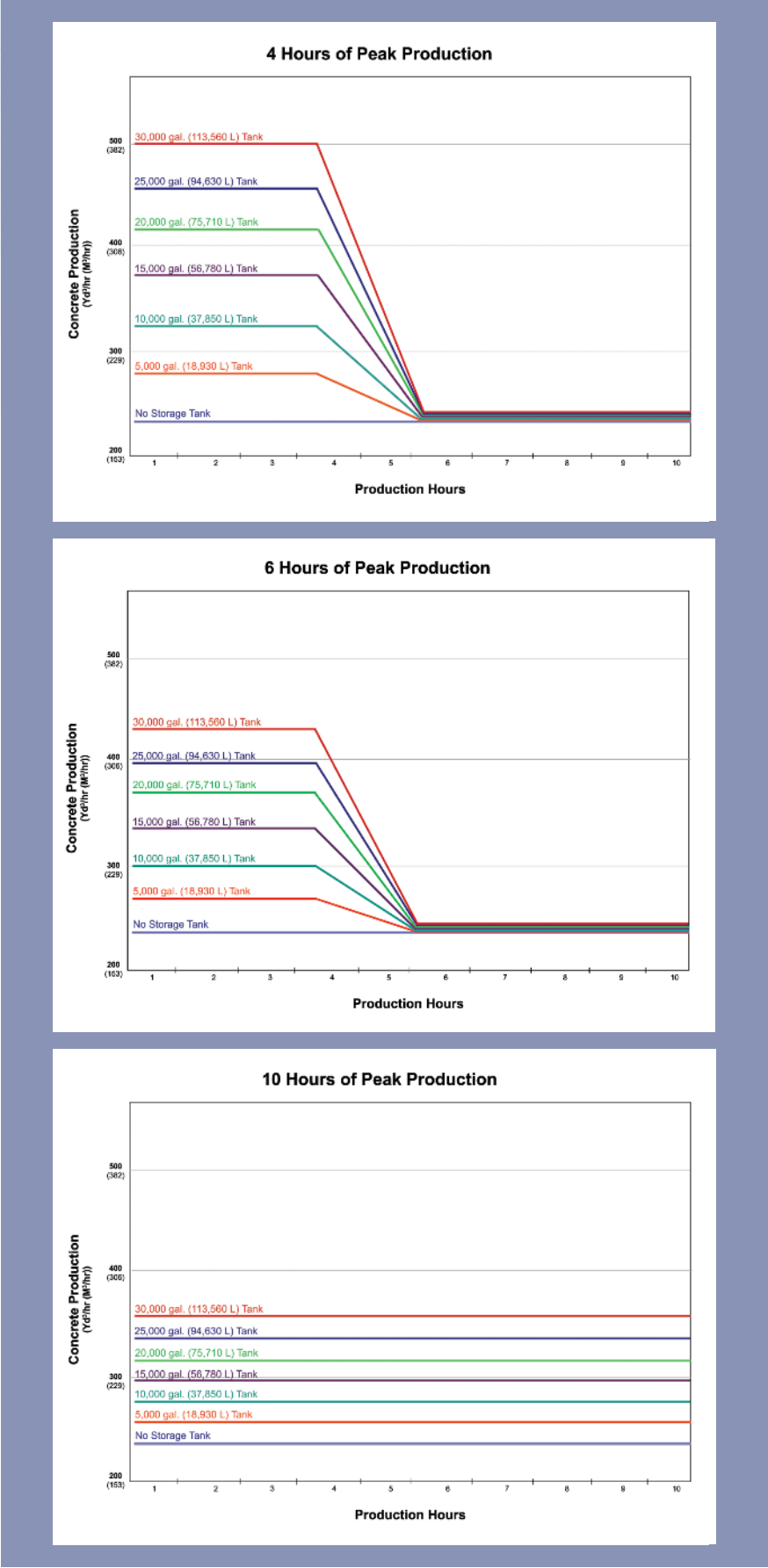
### EXAMPLE #1

Using a 3M BTU/Hr unit, 4 hours of peak production, and 200 yd<sup>3</sup>/hr, this requires a minimum of a 15,000 gallon tank.

### EXAMPLE #2

Using a 6M BTU/Hr unit, 6 hours of peak production, and 300 yd<sup>3</sup>/hr, this requires a minimum of a 10,000 gallon tank.

- Illustrations are based on the following assumptions:**
1. Use of 3M BTU or 6M BTU Hybrid Water Heater.
  2. Calculations are based on using 30 gallons (113 L) of water per cubic yard of concrete.
  3. Inlet water temperature of 60°F (16°C).
  4. Discharge water temperature of 160°F (71°C).
  5. Calculations do not include hot water for wash down or side tanks.
  6. Assumes typical operating conditions (such as BTU content of fuel, altitude, etc).



# Complete, Portable Systems from Sioux

Sioux has the engineering expertise and production flexibility to meet the needs for different operating conditions and other custom requirements such as temperature, altitude, electrical system (i.e. 50Hz, 380V, etc.) and complete engineering submittal packages. Sioux also offers:

- Containerized Systems (Sioux heater in an enclosed shipping container)
- Trailer Mounted Portable Systems (Sioux heater in an insulated van body)
- Complete Heating/Chilling Systems (Sioux heater, Carrier chiller, control system and optional water storage tanks)

## What Makes Sioux Different?

Since 1939, Sioux has been helping customers in a wide range of industries solve challenging problems by engineering and manufacturing innovative, application-specific equipment. Proven durability and reliability make Sioux the best value for demanding applications.

### Reliability Guarantee

Sioux offers the only twenty-year reliability guarantee in the industry which includes same day shipment of stock parts orders, and lifetime parts department support. See details in form 308 and form 847.

### Conservative Design

Sioux does not undersize components such as motors, pumps, burners, frames, or engines, which is common elsewhere.

### Proven Performance

Sioux machines are dependable in the field. Combining high quality components with 70 years of custom manufacturing experience and extensive engineering design capabilities allows Sioux to provide the industrial workplace with the best equipment for continuous operation.

### Simple Operation

Sioux machines are designed to be simple to install, operate, and maintain.

### Safety

In addition to dependability and simple operation, operator safety is a top design consideration for all Sioux products.

### Factory Testing

Every Sioux machine is thoroughly tested in our on-site testing facility before it leaves the factory.

### A Well-Deserved Reputation — The Best

Sioux water heaters are engineered specifically for application in the concrete industry to provide long life and trouble-free service, and include standard features that are often considered options on competitive models. These features may initially cost a little more, but provide equipment that runs better, lasts longer, is safer to operate, easier to maintain, repair, and troubleshoot, and over the life of the unit, provides a superior return on your investment.

**Call us toll-free at (888) 763-8833**  
or visit us at [www.sioux.com](http://www.sioux.com)



### SIoux CORPORATION

One Sioux Plaza • Beresford, South Dakota 57004-1500 USA  
Toll-free: (888) 763-8833 • Tel: (605) 763-3333 • Fax: (605) 763-3334  
E-mail: [email@sioux.com](mailto:email@sioux.com) • [www.sioux.com](http://www.sioux.com)

