

BOILER BLOWDOWN HEAT RECOVERY SYSTEMS



MADDEN ENGINEERED PRODUCTS

HOW TO SELECT AND SPECIFY A MADDEN HEAT RECOVERY SYSTEM

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SECTION 1 – Heat Recovery Overview

Larger industrial boilers utilize continuous surface blowdown to maintain proper conductivity and total dissolved solids in the steam drum. This process is often sent to a quenching tank system, wasting otherwise valuable BTU's (energy) from this process.

Madden surface blowdown heat recovery systems (HRS) are designed to recover the otherwise wasted BTU's from the continuous surface blowdown process. When the contaminated surface blowdown enters a heat recovery system, flash steam occurs due to the pressure drop. This clean flash steam can be sent directly back to the Deaerator (or other low pressure steam system). The remaining contaminated condensate then enters a heat exchanger which will utilize fresh makeup water (or condensate return if makeup is infrequent) as the cooling medium. The cooling medium will typically pick up 3-15°F from the heat exchanger without being contaminated by the contaminated surface blowdown process. It also reduces the dirty condensate to < 140°F, offering the ability to immediately drain the waste condensate without additional tempering.

NOTE – Can we integrate Bottom BD?: Intermittent bottom blowdown should not be integrated into a surface blowdown heat recovery system. Integrating this process into a heat recovery system would require much larger flash tanks, larger vent lines, and larger heat exchangers, while not capturing worthwhile BTU's. Keep these processes separate.

Madden can recommend a traditional blowdown tank or smaller blowdown separator for the intermittent bottom blowdown process. Specify the boiler operating pressure and the blowdown line size if required.

Section 1.1 - Sizing Principles

If not directly specified, Madden recommends selecting a heat recovery system with a continuous surface blowdown capacity equal to ~10% of the expected boiler room's realistic peak steam production.

Why?

On average, boiler rooms blow down ~3% of the ongoing steam production. Boiler rooms with well-treated, high quality makeup water may only blowdown at 1-2%. Boiler rooms without may rise to 5%+.

With an expected nominal continuous blowdown (CBD) range of 1-5%, a 10% CBD capacity ensures at least a 2:1 safety factor. If your client may see occasional bursts of CBD, or for any reason has an expected CBD rate above 5%, adjust your selection accordingly.

NOTE – Is oversizing important?: Oversizing heat recovery systems as a safety factor is not critical. If the operation blows down above the heat recovery system's rated capacity, it will not "hurt" anything within the system. But it may drain above 140 deg F, requiring additional tempering before draining to a city sewer line.

NOTE – Automated Conductivity-Based BD Control Considerations: More attention should be paid to the blowdown control system installed off the boiler steam drum connection. If the client will not use Madden's manual continuous blowdown Orifice Meter control valve (rendering this note moot), they are likely using automated conductivity-based blowdown controls.

These control systems are often set up to actuate more intermittently than continuously. For efficient surface blowdown BTU recovery, the goal is slower and steadier, rather than a timed "burst".

See our "APPLICATION-GUIDE_Using-HRS-with-Conductivity-BD-Control_V1.0" document for suggestions on how to modify these systems to gain the most out of a potential heat recovery system.

Section 1.2 – Available Pre-Designed HRS Models

Madden has (3) pre-designed heat recovery systems:

- **The HVX Series** – a single vertical unit, offering 1,500 PPH CBD capacity. Our most cost effective and compact heat recovery solution.
- **The HV Series** – (6) available models ranging from 3,000 to 12,000 PPH of CBD capacity. Ideal for both EPC projects and aftermarket sales as they only require 2.5 sq. ft. of floor space.
- **The HC Series** – (10) available models ranging from 4,000 to 50,000 PPH of CBD capacity. Ideal for projects requiring high-capacity surface blowdown heat recovery.



Below is a simple chart summarizing the basic properties of all pre-designed Madden heat recovery system models.

Model	CBD Capacity (PPH)	Allowable Makeup Water Rate (GPM)	Pre-Designed for Boiler Operating Pressure (PSIG)	Orientation	Full Spec's on Page	Short Cut – System is appropriate for peak boiler load (PPH):
HVX15-(TBD)	1,500	20	350	Vertical	8	≤ 15,000
HV30-(TBD)	3,000	90	600	Vertical	9	≤ 30,000
HV50-(TBD)	5,000	90	600	Vertical	10	≤ 50,000
HV70-(TBD)	7,000	160	600	Vertical	11	≤ 70,000
HV90-(TBD)	9,000	160	600	Vertical	12	≤ 90,000
HV120-(TBD)	12,000	160	600	Vertical	13	≤ 120,000
HC40-(TBD)	4,000	310	600	Horizontal	14	≤ 40,000
HC80-(TBD)	8,000	310	600	Horizontal	15	≤ 80,000
HC120-(TBD)	12,000	465	600	Horizontal	16	≤ 120,000
HC160-(TBD)	16,000	465	600	Horizontal	17	≤ 160,000
HC200-(TBD)	20,000	465	600	Horizontal	18	≤ 200,000
HC240-(TBD)	24,000	465	600	Horizontal	19	≤ 240,000
HC280-(TBD)	28,000	465	600	Horizontal	20	≤ 280,000
HC320-(TBD)	32,000	465	600	Horizontal	21	≤ 320,000
HC360-(TBD)	36,000	465	600	Horizontal	22	≤ 360,000
HC500-(TBD)	50,000	1,000	600	Horizontal	23	≤ 500,000

NOTE – Customization: Madden can customize any standard heat recovery system (mechanically actuated) to include:

- (1) Transmitters and level control valves.
- (2) Increases connection sizes and ancillary equipment for higher boiler operating pressure.
- (3) Increase the heat exchanger connections/size to increase allowable makeup water flow.
- (4) General arrangement changes to connections and/or ancillary equipment.

Contact the factory for support with custom specifications.

Section 2 – Examples on How to Size and Select a HRS

Let's walk through a few examples on how a Madden sales technician would select a heat recovery system given the boiler room parameters provided by the end user.

Example #1 (Typical/Standard):

- Number of Boilers: a client has (2) 1,000 HP Boilers, both potentially operating during peak season
- Peak Steam Load Calculation: $1,000 + 1,000 \text{ HP} * 34.5 = 69,000 \text{ PPH}$
- Boilers Operating Pressure: 250 PSIG
- Resulting CBD Capacity required at 10% CBD: 6,900 PPH
- Comment from end user: none

WALKTHROUGH: the first thing we check is the operating pressure, this is below all Madden models' pre-designed pressure rating, check, moving on. Next, we apply our discretion to the 10% CBD capacity general rule of thumb. Since this end user has not made any additional comments about the makeup water quality, this is straight forward, we want to select a system close to, but not significantly under, 6,900 PPH.

If floor space is tight, **our choice would be the vertical HV70 model.**

If the client had made a comment about wanting all external controls and transmitters, **our choice would be the horizontal HC80 model.** Horizontal units are more conducive to remote control and monitoring of the level and drain process.

Example #2 (“High” Operating Pressure & Standby Boiler):

- Number of Boilers: a client has (3) 1,500 HP Boilers and (1) 500 HP
- Peak Steam Load Calculation: all (4) could operate, so $(1,500 \text{ HP} * 3) + 500 \text{ HP} * 34.5 = 172,500 \text{ PPH}$
- Boilers Operating Pressure: **750 PSIG**
- Resulting CBD Capacity required at 10% CBD: 17,250 PPH
- Comment from end user: the 500 HP boiler is occasionally fired during winter season to supplement steam demand

WALKTHROUGH: the first thing we check is the operating pressure, at 750 PSIG, the pre-designed flash steam vent and PRV is likely too small. **Contact Madden to recommend vent & PRV size increases.**

Next, we apply our discretion to the 10% CBD capacity general rule of thumb. In this particular case, we would likely ask the client to advise their makeup water quality, as 17,250 PPH sits between (2) appropriate HC series models.

If the makeup water quality is high, **our choice would be the HC160 or HC120 model.** If details are provided to confirm nominal CBD is 3% or less, the HC120 is sufficient. If only a general comment is made or CBD rate could get up to 5-6%, we would stick with the HC160.

If the makeup water quality is normal or “poor”, **our choice would be the HC200 model.**

Example #3 (N+1 Operation, Quality Makeup Water, and 80% Condensate Return):

- Number of Boilers: a client has (2) 500 HP Boilers operating N+1
- Peak Steam Load Calculation: essentially ignoring one boiler, $500 * 34.5 = 17,250 \text{ PPH}$
- Boilers Operating Pressure: 150 PSIG
- Resulting CBD Capacity required at 10% CBD: 1,725 PPH
- Comment from end user: we have an RO system and maintain good chemical treatment for the makeup water, we also return ~80% condensate and do not require significant makeup water.

WALKTHROUGH: the first thing we check is the operating pressure, check, moving on.

Next, we apply our discretion to the 10% CBD capacity general rule of thumb. If this was a “typical” application, we would be looking at the HV30 due to the HVX15's limited allowable makeup water. However, since the makeup water quality is high, and the condensate return reduces the required makeup water rate:

Our choice would be the HVX15.

NOTE – High Condensate Return (minimal makeup flow): if you have client with a larger boiler room and 80-90%+ condensate return, the lack of makeup water may understandably be a concern for heat exchanger performance. Contact the factor when coming across a similar application – often times sending warm condensate through the heat exchanger is still an excellent solution, rather than makeup water. However, with these piping set ups, the client will then need to temper the waste CBD before hitting a city sewer drain.

For assistance and/or clarification, please do not hesitate to contact Madden.

Section 3 – Want Madden to Select and Spec’ the HRS? (Proposal Data Sheet)

Fill out the following page and email to sales@maddenep.com

Proposal Data Sheet

Boiler Blowdown Heat Recovery Systems

Instructions: Fill in the blanks with the operating data from your plant. Email the data sheet to the address listed above. We will run an analysis and send performance/fuel savings results to you along with a quotation for the equipment that we recommend for your installation.

Project Name:	
Address (City, State, Zip Code):	
Contact Phone Number:	
Contact Email:	

Boiler Capacity Information:

Number of Boilers Draining to HRS:	
Max Boilers Operating Simultaneously:	
Operating Pressure (PSI):	

Actual Operating Data (Fill in MAXIMUM TOTAL VALUES for the boiler room, not per/each boiler, if applicable):

	Maximum / Design	Average / Nominal	Minimum
Steam Production (PPH)			
Continuous Blowdown (PPH)			
Makeup Water Rate (GPM)			
Makeup Water Temperature (°F)			

Data for BTU Recovery Performance and Savings (ROI) Estimate:

Fuel Type Used:		Cost per Therm:	
Operating Pressure of Equipment Receiving Recovered Flash Steam (Typically D/A) (PSI):			

Ancillary Preferences:

Vertical / Horizontal Orientation?		Insulation Jacket (Y/N?)	
High Level Alarm (Yes / No?)		Transmitters (Yes / No?)	
Madden Manual Orifice Meter Blowdown Control Valves (Yes / No?) → (Not required if boilers have automated conductivity-based blowdown control system)			

Additional Comments (ancillary equipment preferences, level controls / transmitters, unusual set ups, concerns, etc.):

Submitted By:		Date:	
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Section 4 – All Madden HRS Standard Specification Pages

Every Madden heat recovery system model's standard specification page is included on the following pages. Once you have selected the best model for the project, these specifications can be copied for you or your clients internal use.

Reach out to the factory for any general questions, or questions about altering the standard designs.

SPEC' PAGE FOR MODEL NO. HVX15-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN VERTICAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, HVX Series, as manufactured by Madden Engineered Products, LLC., Elkhart, IN. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels Section VIII Div. 1 for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided. The system will be capable of handling 1,500 lbs. of blowdown water per hour at a boiler pressure of up to 350 p.s.i.g.

The heat recovery system shall consist of:

1. Vertical Flash Tank: 12" diameter X 48" seam to seam X 60" height, with 1" relief valve. Flash steam vent connection: 2" NPT, sch 40, SA106 pipe. Tank will be designed to collect sludge accumulation at the bottom with easy cleanout drain ball valve for flushing without disassembly.
 - a. Inlet: the flash tank vessel comes with a 1-1/2" NPT, sch 80 SA106 pipe inlet.
 - i. (Optional) Inlet Manifold: Madden to provide inlet manifold to provide (QTY) continuous blowdown connections, ___" FNPT. Made with Class 150 carbon steel fittings and pipe nipples.
 - b. Vessel Standard Ancillary Connections: Flash tank will include (2) 3/4" FNPT couplings for gauge glass connections, (2) 2" FNPT inspection openings, and 1/4" FNPT coupling for pressure gauge.
 - i. Valve set for sight glass are 3/4" MNPT, include vent and drain, brass material.
 - ii. Pressure gauge: 0-50 PSIG, SS, 4" dial, 1/4" MNPT.
 - c. Thermometer gauge panel showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type. Includes (3) 0-240 Deg F, 3-1/2" dial gauges with 8' capillaries.
2. Level Control: The boiler surface waste blowdown level within the HX heat recovery system will be controlled by an external Armstrong Model 3-LD free floating lever drain trap. Installed with 3/8" orifice which would provide up to 3,000 PPH capacity at a 5 PSI system pressure drop (assumed operating pressure is 5 PSI, based on D/A tank system flashes to, draining to atmospheric floor sewer drain. Provides 2:1 safety factor).
3. Bottom 12" Blind Flange Heat Exchanger Assembly: The vertical 12" flash tank will have a 12" Class 150 carbon steel blind flange installed on the bottom to seal the system. The following will be installed on the blind flange:
 - a. Boiler feedwater heat exchanger: 7/8" OD single **Copper** coil heat exchanger providing **9.8 SF** of heat exchanging capacity. Includes 5" SS inner tube baffle.
 - b. Overflow drain: 1-1/2" x 6" Sch 40 steel pipe to aid in accumulation of sludge at the bottom of the vessel to be flushed or cleaned intermittently throughout the year. Helps keep Armstrong float trap free of debris and increases service life.
 - c. Feedwater Inlet/Outlet connections: (2) 1" FNPT tapings will be made on the bottom of the blind flange. Madden to install nipples and 1" T fittings with temperature probes. T fittings will be where installing contractor connects boiler feedwater to act as cooling medium for continuous blowdown (feedwater typically picks up 3 to 10 deg F).
 - d. **FEED WATER FLOW RATE LIMITS**: The HVX15 is designed to be the most cost-effective solution for recovering up to 90% of BTU's in boiler surface blowdown for 'small' boiler rooms and/or boiler rooms with relatively substantial condensate return supplementing fresh makeup water. *The 1" feed water connections and heat exchanger coil should be limited to < 20 GPM as a maximum flow rate, with < 15 GPM offering ideal velocities through the coil for longer service life.*
4. (Optional) High level alarm system: part no. HC002B, with Mercoid 123 Series float switch and Federal Signal electronic alarm signal.
5. (Optional) Insulation Jacket: Custom, pre-cut fit over all heat recovery system connections. Interior and exterior cloth is high temp. extra durable silicone, with 1" "temp-mat" insulation, rated to 500 deg. Secured with Velcro straps and hog rings.
6. Heat Recovery System Support Stand: Unit will be assembled on a 28.5" X 28.5" X 48" height stand, made with 2" x 2" steel tube. Bottom of support uses 2" x 1/4" flat bar with (4) 17/32" bolt holes to secure to floor.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job site, as well as the high level alarm.

Specifications for:

By:

Date:

SPEC' PAGE FOR MODEL NO. HV30-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN VERTICAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, HV Series, as manufactured by Madden Engineered Products, LLC., Elkhart, IN. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels Section VIII Div. 1 for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided. The system will be capable of handling 3,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The heat recovery system shall consist of:

1. Vertical Flash Tank: 24" diameter X 40" height, 516 Gr 70 CS, with 1-1/2" relief valve, 3" inlet manifold, 6" x 8" hand hole, valve set and sight glass, pressure gauge, and SS ASME nameplate. Tank will be designed to prevent sludge accumulation. Connections and ancillary equipment details are as follows:
 - a. Inlet Manifold: Flash tank will have a 3" X ___" Sch 80 A-53 Pipe for flow control with (qty) 1" inlets. Inlets to be FNPT Class 150 carbon steel couplings.
 - b. Pressure Relief Valve: Kunkle part no. 6283FE, 1" inlet X 1-1/2" outlet, bronze body material, set at 40 PSI, capacity at 40 PSI is 861 PPH.
 - c. Vent: 3" Class 150 RF studed pad flange.
 - d. Sight Glass and Valve Set: 3/4" brass valve set with vent and drain, 21.5" gauge glass, connections are (2) 3/4" FNPT Class 150, CS, H. couplings.
 - e. Hand Hole: 6" x 8", bolt and yoke style with cover.
 - f. High Level Alarm (OPTIONAL): Part no. HC002B, Mercoid 123 Series float switch and Federal Signal electronic alarm signal. Connections to be (2) 1" FNPT Class 150, CS, H. couplings.
 - g. Pressure Gauge: 4" Dial, 0-50 PSI, SS, syphon pig tail, connection to be 1/4" FNPT Class 150, CS, H. coupling.
2. Level Control: Madden P/N FV100A, internal balanced pressure double seated drain valve actuated with integral SS ball float. Cast iron body with stainless steel trim.
3. Lower Vessel and Heat Exchanger: 12" diameter x 37.25" height, 516 SA Gr 70 CS, with make up water connections, temperature gauge panel, and 304SS vertical coil type heat exchanger. Details are as follows:
 - a. Vertical Coil Type Heat Exchanger: Welded steel construction. To be placed directly below the upper flash tank. The coil is constructed with 304 stainless steel tubing and headers, with a minimum surface area of 17 square feet. Coils are 7/8" OD, 304SS.
 - b. Feedwater Inlet and Outlet: to be 3" Class 150 RF flanged. Feedwater pressure drop will be less than 2 PSI through the shell side.
 - c. Thermometer Gauge Panel: showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type with 8' capillary cords, 1/2" NPT connections.
 - d. Drain: system terminates through a 1-1/2" FNPT 'T' fitting. One side is for waste water temperature probe connection, other is for remaining drain line to sewer or quench tank.
4. Blowdown Flow Control (OPTIONAL): Madden Orifice Meters, (qty), model no. OM ___-A. Used to control blowdown flow via orifice size selection and boiler operating pressure. Size ___A plate installed offers a blowdown flow control range of ___ to ___ PPH @ ___ PSI.
5. Insulation Jacket (OPTIONAL): Custom design, pre-cut to fit over all heat recovery system connections. Interior and exterior cloth is high temp. extra durable silicone, with 1" "temp-mat" insulation, rated to 500 deg. Secured with Velcro straps and hog rings. Comes in (6) pieces to cover upper and lower vessel.
6. Mounting Structure/Base: 28.5" x 28.5" x 49.75" "external" base support structure attached to upper ASME vessel for easier access to the lower vessel's vertical coil type heat exchanger. Structure is made with 2" x 2" steel tubing.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job site, as well as the orifice meters and high level alarm.

Specifications for:

By:

Date:

SPEC' PAGE FOR MODEL NO. HV50-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN VERTICAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, HV Series, as manufactured by Madden Engineered Products, LLC., Elkhart, IN. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels Section VIII Div. 1 for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided. The system will be capable of handling 5,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The heat recovery system shall consist of:

1. Vertical Flash Tank: 24" diameter X 40" height, 516 Gr 70 CS, with 2" relief valve, 3" inlet manifold, 6" x 8" hand hole, valve set and sight glass, pressure gauge, and SS ASME nameplate. Tank will be designed to prevent sludge accumulation. Connections and ancillary equipment details are as follows:
 - a. Inlet Manifold: Flash tank will have a 3" X " Sch 80 A-53 Pipe for flow control with (3) **TBD**" inlets. Inlets to be FNPT Class 150 carbon steel couplings.
 - b. Pressure Relief Valve: Kunkle part no. 6283GF, 1-1/4" inlet X 2" outlet, bronze body material, set at 40 PSI, capacity at 40 PSI is 1,420 PPH.
 - c. Vent: 3" Class 150 RF studed pad flange.
 - d. Sight Glass and Valve Set: 3/4" brass valve set with vent and drain, 21.5" gauge glass, connections are (2) 3/4" FNPT Class 150, CS, H. couplings.
 - e. Hand Hole: 6" x 8", bolt and yoke style with cover.
 - f. High Level Alarm (OPTIONAL): Part no. HC002B, Mercoid 123 Series float switch and Federal Signal electronic alarm signal. Connections to be (2) 1" FNPT Class 150, CS, H. couplings.
 - g. Pressure Gauge: 4" Dial, 0-50 PSI, SS, syphon pig tail, connection to be 1/4" FNPT Class 150, CS, H. coupling.
2. Level Control: Madden P/N FV100A, internal balanced pressure double seated drain valve actuated with integral SS ball float. Cast iron body with stainless steel trim.
3. Lower Vessel and Heat Exchanger: 12" diameter x 43" height, 516 SA Gr 70 CS, with makeup water connections, temperature gauge panel, and 304SS vertical coil type heat exchanger. Details are as follows:
 - a. Vertical Coil Type Heat Exchanger: Welded steel construction. To be placed directly below the upper flash tank. The coil is constructed with 304 stainless steel tubing and headers, with a minimum surface area of 21 square feet. Coils are 7/8" OD, 304SS.
 - b. Feedwater Inlet and Outlet: to be 3" Class 150 RF flanged. Feedwater pressure drop will be less than 2 PSI through the shell side.
 - c. Thermometer Gauge Panel: showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type with 8' capillary cords, 1/2" NPT connections.
 - d. Drain: system terminates through a 1-1/2" FNPT 'T' fitting. One side is for wastewater temperature probe connection, other is for remaining drain line to sewer or quench tank.
4. Blowdown Flow Control (OPTIONAL): Madden Orifice Meters, (qty), model no. OM -A. Used to control blowdown flow via orifice size selection and boiler operating pressure. Size A plate installed offers a blowdown flow control range of to PPH @ PSI.
5. Insulation Jacket (OPTIONAL): Custom design, pre-cut to fit over all heat recovery system connections. Interior and exterior cloth is high temp. extra durable silicone, with 1" "temp-mat" insulation, rated to 500 deg. Secured with Velcro straps and hog rings. Comes in (6) pieces to cover upper and lower vessel.
6. Mounting Structure/Base: 28.5" x 28.5" x 55.75" "external" base support structure attached to upper ASME vessel for easier access to the lower vessel's vertical coil type heat exchanger. Structure is made with 2" x 2" steel tubing.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job site, as well as the orifice meters and high-level alarm.

Specifications for:

By:

Date:

SPEC' PAGE FOR MODEL NO. HV70-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN VERTICAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, HV Series, as manufactured by Madden Engineered Products, LLC., Elkhart, IN. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels Section VIII Div. 1 for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided. The system will be capable of handling 7,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The heat recovery system shall consist of:

1. Vertical Flash Tank: 24" diameter X 40" height, 516 Gr 70 CS, with 2-1/2" relief valve, 3" inlet manifold, 6" x 8" hand hole, valve set and sight glass, pressure gauge, and SS ASME nameplate. Tank will be designed to prevent sludge accumulation. Connections and ancillary equipment details are as follows:
 - a. Inlet Manifold: Flash tank will have a 3" X " Sch 80 A-53 Pipe for flow control with (qty) 1" inlets. Inlets to be FNPT Class 150 carbon steel couplings.
 - b. Pressure Relief Valve: Kunkle part no. 6283HG, 1-1/2" inlet X 2-1/2" outlet, bronze body material, set at 40 PSI, capacity at 40 PSI is 2,213 PPH.
 - c. Vent: 4" Class 150 RF studded pad flange.
 - d. Sight Glass and Valve Set: 3/4" brass valve set with vent and drain, 21.5" gauge glass, connections are (2) 3/4" FNPT Class 150, CS, H. couplings.
 - e. Hand Hole: 6" x 8", bolt and yoke style with cover.
 - f. High Level Alarm (OPTIONAL): Part no. HC002B, Mercoid 123 Series float switch and Federal Signal electronic alarm signal. Connections to be (2) 1" FNPT Class 150, CS, H. couplings.
 - g. Pressure Gauge: 4" Dial, 0-50 PSI, SS, syphon pig tail, connection to be 1/4" FNPT Class 150, CS, H. coupling.
2. Level Control: Madden P/N FV100A, internal balanced pressure double seated drain valve actuated with integral SS ball float. Cast iron body with stainless steel trim.
3. Lower Vessel and Heat Exchanger: 12" diameter x 49.38" height, 516 SA Gr 70 CS, with make up water connections, temperature gauge panel, and 304SS vertical coil type heat exchanger. Details are as follows:
 - a. Vertical Coil Type Heat Exchanger: Welded steel construction. To be placed directly below the upper flash tank. The coil is constructed with 304 stainless steel tubing and headers, with a minimum surface area of 25 square feet. Coils are 7/8" OD, 304SS.
 - b. Feedwater Inlet and Outlet: to be 4" Class 150 RF flanged. Feedwater pressure drop will be less than 2 PSI through the shell side.
 - c. Thermometer Gauge Panel: showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type with 8' capillary cords, 1/2" NPT connections.
 - d. Drain: system terminates through a 1-1/2" FNPT 'T' fitting. One side is for waste water temperature probe connection, other is for remaining drain line to sewer or quench tank.
4. Blowdown Flow Control (OPTIONAL): Madden Orifice Meters, (qty), model no. OM -A. Used to control blowdown flow via orifice size selection and boiler operating pressure. Size A plate installed offers a blowdown flow control range of to PPH @ PSI.
5. Insulation Jacket (OPTIONAL): Custom design, pre-cut to fit over all heat recovery system connections. Interior and exterior cloth is high temp. extra durable silicone, with 1" "temp-mat" insulation, rated to 500 deg. Secured with Velcro straps and hog rings. Comes in (6) pieces to cover upper and lower vessel.
6. Mounting Structure/Base: 28.5" x 28.5" x 61.75" "external" base support structure attached to upper ASME vessel for easier access to the lower vessel's vertical coil type heat exchanger. Structure is made with 2" x 2" steel tubing.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job site, as well as the orifice meters and high level alarm.

Specifications for:

By:

Date:

SPEC' PAGE FOR MODEL NO. HV90-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN VERTICAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, HV Series, as manufactured by Madden Engineered Products, LLC., Elkhart, IN. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels Section VIII Div. 1 for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided. The system will be capable of handling 9,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The heat recovery system shall consist of:

1. Vertical Flash Tank: 24" diameter X 40" height, 516 Gr 70 CS, with 3" relief valve, 3" inlet manifold, 6" x 8" hand hole, valve set and sight glass, pressure gauge, and SS ASME nameplate. Tank will be designed to prevent sludge accumulation. Connections and ancillary equipment details are as follows:
 - a. Inlet Manifold: Flash tank will have a 3" X ___" Sch 80 A-53 Pipe for flow control with (qty) 1" inlets. Inlets to be FNPT Class 150 carbon steel couplings.
 - b. Pressure Relief Valve: Kunkle part no. 6283JH, 2" inlet X 3" outlet, bronze body material, set at 40 PSI, capacity at 40 PSI is 3,625 PPH.
 - c. Vent: 4" Class 150 RF studded pad flange.
 - d. Sight Glass and Valve Set: 3/4" brass valve set with vent and drain, 21.5" gauge glass, connections are (2) 3/4" FNPT Class 150, CS, H. couplings.
 - e. Hand Hole: 6" x 8", bolt and yoke style with cover.
 - f. High Level Alarm (OPTIONAL): Part no. HC002B, Mercoid 123 Series float switch and Federal Signal electronic alarm signal. Connections to be (2) 1" FNPT Class 150, CS, H. couplings.
 - g. Pressure Gauge: 4" Dial, 0-50 PSI, SS, syphon pig tail, connection to be 1/4" FNPT Class 150, CS, H. coupling.
2. Level Control: Madden P/N FV100B, internal balanced pressure double seated drain valve actuated with integral SS ball float. Cast iron body with stainless steel trim.
3. Lower Vessel and Heat Exchanger: 12" diameter x 55.25" height, 516 SA Gr 70 CS, with make up water connections, temperature gauge panel, and 304SS vertical coil type heat exchanger. Details are as follows:
 - a. Vertical Coil Type Heat Exchanger: Welded steel construction. To be placed directly below the upper flash tank. The coil is constructed with 304 stainless steel tubing and headers, with a minimum surface area of 29 square feet. Coils are 7/8" OD, 304SS.
 - b. Feedwater Inlet and Outlet: to be 4" Class 150 RF flanged. Feedwater pressure drop will be less than 2 PSI through the shell side.
 - c. Thermometer Gauge Panel: showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type with 8' capillary cords, 1/2" NPT connections.
 - d. Drain: system terminates through a 1-1/2" FNPT 'T' fitting. One side is for waste water temperature probe connection, other is for remaining drain line to sewer or quench tank.
4. Blowdown Flow Control (OPTIONAL): Madden Orifice Meters, (qty), model no. OM ___-A. Used to control blowdown flow via orifice size selection and boiler operating pressure. Size ___A plate installed offers a blowdown flow control range of ___ to ___ PPH @ ___ PSI.
5. Insulation Jacket (OPTIONAL): Custom design, pre-cut to fit over all heat recovery system connections. Interior and exterior cloth is high temp. extra durable silicone, with 1" "temp-mat" insulation, rated to 500 deg. Secured with Velcro straps and hog rings. Comes in (6) pieces to cover upper and lower vessel.
6. Mounting Structure/Base: 28.5" x 28.5" x 67.75" "external" base support structure attached to upper ASME vessel for easier access to the lower vessel's vertical coil type heat exchanger. Structure is made with 2" x 2" steel tubing.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job site, as well as the orifice meters and high level alarm.

Specifications for:

By:

Date:

SPEC' PAGE FOR MODEL NO. HV120-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN VERTICAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, HV Series, as manufactured by Madden Engineered Products, LLC., Elkhart, IN. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels Section VIII Div. 1 for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided. The system will be capable of handling 12,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The heat recovery system shall consist of:

1. A Vertical Flash Tank: 24" diameter X 40" height, 516 Gr 70 CS, with 3" relief valve, 3" inlet manifold, 6" x 8" hand hole, valve set and sight glass, pressure gauge, and SS ASME nameplate. Tank will be designed to prevent sludge accumulation. Connections and ancillary equipment details are as follows:
 - a. Inlet Manifold: Flash tank will have a 3" X ___" Sch 80 A-53 Pipe for flow control with (qty) 1" inlets. Inlets to be FNPT Class 150 carbon steel couplings.
 - b. Pressure Relief Valve: Kunkle part no. 6283JH, 2" inlet X 3" outlet, bronze body material, set at 40 PSI, capacity at 40 PSI is 3,625 PPH.
 - c. Vent: 4" Class 150 RF studded pad flange.
 - d. Sight Glass and Valve Set: 3/4" brass valve set with vent and drain, 21.5" gauge glass, connections are (2) 3/4" FNPT Class 150, CS, H. couplings.
 - e. Hand Hole: 6" x 8", bolt and yoke style with cover.
 - f. High Level Alarm (OPTIONAL): Part no. HC002B, Mercoid 123 Series float switch and Federal Signal electronic alarm signal. Connections to be (2) 1" FNPT Class 150, CS, H. couplings.
 - g. Pressure Gauge: 4" Dial, 0-50 PSI, SS, syphon pig tail, connection to be 1/4" FNPT Class 150, CS, H. coupling.
2. Level Control: Madden P/N FV100B, internal balanced pressure double seated drain valve actuated with integral SS ball float. Cast iron body with stainless steel trim.
3. Lower Vessel and Heat Exchanger: 12" diameter x 64.25" height, 516 SA Gr 70 CS, with make up water connections, temperature gauge panel, and 304SS vertical coil type heat exchanger. Details are as follows:
 - a. Vertical Coil Type Heat Exchanger: Welded steel construction. To be placed directly below the upper flash tank. The coil is constructed with 304 stainless steel tubing and headers, with a minimum surface area of 35 square feet. Coils are 7/8" OD, 304SS.
 - b. Feedwater Inlet and Outlet: to be 4" Class 150 RF flanged. Feedwater pressure drop will be less than 2 PSI through the shell side.
 - c. Thermometer Gauge Panel: showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type with 8' capillary cords, 1/2" NPT connections.
 - d. Drain: system terminates through a 1-1/2" FNPT 'T' fitting. One side is for waste water temperature probe connection, other is for remaining drain line to sewer or quench tank.
4. Blowdown Flow Control (OPTIONAL): Madden Orifice Meters, (qty), model no. OM ___-A. Used to control blowdown flow via orifice size selection and boiler operating pressure. Size ___A plate installed offers a blowdown flow control range of ___ to ___ PPH @ ___ PSI.
5. Insulation Jacket (OPTIONAL): Custom design, pre-cut to fit over all heat recovery system connections. Interior and exterior cloth is high temp. extra durable silicone, with 1" "temp-mat" insulation, rated to 500 deg. Secured with Velcro straps and hog rings. Comes in (6) pieces to cover upper and lower vessel.
6. Mounting Structure/Base: 28.5" x 28.5" x 76.75" "external" base support structure attached to upper ASME vessel for easier access to the lower vessel's vertical coil type heat exchanger. Structure is made with 2" x 2" steel tubing.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job site, as well as the orifice meters and high level alarm.

Specifications for:

By:

Date:

SPEC' PAGE FOR MODEL NO. HC40-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN HORIZONTAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, Type HC, as manufactured by Madden Engineered Products, LLC. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels, Section VIII Div.1, for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided. The system will be capable of handling 4,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The heat recovery system shall consist of:

1. ASME Vessel: 36" diameter X 64" overall length X 48" height (height does not include ancillary equipment installed on top). Made with SA 516 Gr 70 CS, ASME 150 PSI design @ 0-450 deg F.
2. Horizontal flash tank with 2" relief valve, gauge glass, hand hole, and pressure gauge. Tank will have a flow control manifold with (qty) 1" NPT inlets. Flash steam vent connection: 3" 150 psi RF flanged. Tank will be designed to prevent sludge accumulation.
 - a. Relief valve: Kunkle Model No. 6283GF, 1-1/4" MNPT inlet X 2" FNPT outlet, set at 40 PSI, capacity = 1,420 PPH. Bronze Body, ASME Sec I.
 - b. Pressure Gauge: SS, 4" dial, 0-50 PSI, 1/4" MNPT.
 - c. Sight Glass and Valve Set: 3/4" MNPT, Brass valves with vent and drain, 24" gauge glass.
3. Level Control: External balanced pressure drain valve, bronze body, size 1" NPT. Actuated with float controller via 6" x 8" stainless steel float.
4. Heat exchanger, U tube type, with tube bundle constructed with type 304 stainless steel, with a minimum surface area of 44 square feet, sized for a makeup water flow rate of up to 225 GPM with a pressure drop of less than 2 psi. Feed water inlet and outlet to be 3" 150 psi RF flanged.
5. Thermometer gauge panel showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type.
6. (optional) High level alarm system, part no. HC002B, with Mercoid 123 series float switch and Federal Signal electronic alarm signal.
7. (optional) (qty) Madden model no. OM250-_A orifice meter to control blowdown flow. Flow is controlled by heat treated stainless steel orifice plate, which will provide a blowdown flow control range of __ to __ PPH at __ PSI.
8. (optional) Custom fit insulation jacket. Exterior and interior cloth made of high temperature, extra durable silicone, rated to 500 deg F. Insulation material 1" thick. Will be pre-cut to fit around all connections, also comes with Velcro straps and hog ring ties for further security.
9. The unit will be assembled on a saddle type base ready for floor mounting.
10. The system will be capable of handling 4,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job sight as well as the orifice meters and the high level alarm.

Specifications for:

By:

Date:

SPEC' PAGE FOR MODEL NO. HC80-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN HORIZONTAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, Type HC, as manufactured by Madden Engineered Products, LLC. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels, Section VIII Div.1, for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided.

The heat recovery system shall consist of:

1. ASME Vessel: 36" diameter X 70" overall length X 48" height (height does not include ancillary equipment installed on top). Made with SA 516 Gr 70 CS, ASME 150 PSI design @ 0-450 deg F.
2. Horizontal flash tank with 1-1/2" MNPT x 2-1/2" FNPT relief valve, gauge glass, hand hole, and pressure gauge. Tank will have a flow control manifold with (qty) 1" NPT inlets. Flash steam vent connection: 4" 150 psi RF flanged. Tank will be designed to prevent sludge accumulation.
 - a. Relief valve: Kunkle Model No. 6283GF, 1-1/2" MNPT inlet X 2-1/2" FNPT outlet, set at 40 PSI, capacity = 2,213 PPH. Bronze Body, ASME Sec I.
 - b. Pressure Gauge: SS, 4" dial, 0-50 PSI, 1/4" MNPT.
 - c. Sight Glass and Valve Set: 3/4" MNPT, Brass valves with vent and drain, 24" gauge glass.
3. Level Control: External balanced pressure drain valve, bronze body, size 1" FNPT. Actuated by float controller via 6" x 8" stainless steel float.
4. Heat exchanger, U tube type, with tube bundle constructed with 30 3/4" OD type 304 stainless steel tubing, with a minimum surface area of 47 square feet. Feed water inlet and outlet to be 3" 150 psi RF flanged. The feedwater pressure drop in the tube bundle will be less than 7 psi with a velocity of less than 11 fps.
5. Thermometer gauge panel showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type.
6. (Optional) High level alarm system with Mercoid 123 series float switch and Federal Signal electronic alarm signal, item no. HC002B. Comes installed in a NEMA 4 PVC enclosure, 4" x 4".
7. (Optional) Orifice meter for blowdown flow control, (Qty) Model no. OM250-A, one unit for each boiler. The continuous blowdown flow rate will be controlled by a heat-treated stainless-steel orifice plate with 17 holes of increasing diameter, to permit flow ranging from ___ to ___ PPH at ___ PSI. The unit will be adjustable with a rotating disc to expose the desired orifice hole. The unit will be warranted for accurate flows for up to 10 years of service.
8. (optional) Custom fit insulation jacket. Exterior and interior cloth made of high temperature, extra durable silicone, rated to 500 deg F. Insulation material 1" thick. Will be pre-cut to fit around all connections, also comes with Velcro straps and hog ring ties for further security.
9. The unit will be assembled on a saddle type base ready for floor mounting.
10. The system will be capable of handling 8,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job sight as well as the orifice meters and the high-level alarm.

Specifications for:

By:

Date:

SPEC' PAGE FOR MODEL NO. HC120-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN HORIZONTAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, Type HC, as manufactured by Madden Engineered Products, LLC. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels, Section VIII Div.1, for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided.

The heat recovery system shall consist of:

1. ASME Vessel: 36" diameter X 75" overall length X 48" height (height does not include ancillary equipment installed on top). Made with SA 516 Gr 70 CS, ASME 150 PSI design @ 0-450 deg F.
2. Horizontal flash tank with 3" relief valve, gauge glass, hand hole, and pressure gauge. Tank will have a flow control manifold with (qty) 1" NPT inlets. Flash steam vent connection: 4" 150 psi RF flanged. Tank will be designed to prevent sludge accumulation.
 - a. Relief valve: Kunkle Model No. 6283GF, 2" MNPT inlet X 3" FNPT outlet, set at 40 PSI, capacity = 3,625 PPH. Bronze Body, ASME Sec I.
 - b. Pressure Gauge: SS, 4" dial, 0-50 PSI, 1/4" MNPT.
 - c. Sight Glass and Valve Set: 3/4" MNPT, Brass valves with vent and drain, 24" gauge glass.
3. Level Control: External balanced pressure drain valve, bronze body, size 1-1/4" NPT. Actuated by float controller via 6" x 8" stainless steel float.
4. Heat exchanger, U tube type, with tube bundle constructed with 45 3/4' OD type 304 stainless steel tubing, with a minimum surface area of 79 square feet. Feed water inlet and outlet to be 4" 150 psi RF flanged. The feedwater pressure drop in the tube bundle will be less than 7 psi with a velocity of less than 11 fps.
5. Thermometer gauge panel showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type.
6. (Optional) High level alarm system with Mercoid 123 series float switch and Federal Signal electronic alarm signal, item no. HC002B. Comes installed in a NEMA 4 PVC enclosure, 4" x 4".
7. (Optional) Orifice meter for blowdown flow control, (Qty) Model no. OM250-A, one unit for each boiler. The continuous blowdown flow rate will be controlled by a heat treated stainless steel orifice plate with 17 holes of increasing diameter, to permit flow ranging from ___ to ___ PPH at ___ PSI. The unit will be adjustable with a rotating disc to expose the desired orifice hole. The unit will be warranted for accurate flows for up to 10 years of service.
8. (optional) Custom fit insulation jacket. Exterior and interior cloth made of high temperature, extra durable silicone, rated to 500 deg F. Insulation material 1" thick. Will be pre-cut to fit around all connections, also comes with Velcro straps and hog ring ties for further security.
9. The unit will be assembled on a saddle type base ready for floor mounting.
10. The system will be capable of handling 12,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job sight as well as the orifice meters and the high level alarm.

Specifications for:

By:

Date:

SPEC' PAGE FOR MODEL NO. HC160-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN HORIZONTAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, Type HC, as manufactured by Madden Engineered Products, LLC. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels, Section VIII Div.1, for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided.

The heat recovery system shall consist of:

1. ASME Vessel: 36" diameter X 87" overall length X 48" height (height does not include ancillary equipment installed on top). Made with SA 516 Gr 70 CS, ASME 150 PSI design @ 0-450 deg F.
2. Horizontal flash tank with 3" relief valve, gauge glass, hand hole, and pressure gauge. Tank will have a flow control manifold with (qty) 1" NPT inlets. Flash steam vent connection: 4" 150 psi RF flanged. Tank will be designed to prevent sludge accumulation.
 - a. Relief valve: Kunkle Model No. 6252FKH, 2" FLG inlet X 3" FNPT outlet, set at 40 PSI, capacity = 5,184 PPH. Cast Iron Body, ASME Sec I.
 - b. Pressure Gauge: SS, 4" dial, 0-50 PSI, 1/4" MNPT.
 - c. Sight Glass and Valve Set: 3/4" MNPT, Brass valves with vent and drain, 24" gauge glass.
3. Level Control: External balanced pressure drain valve, bronze body, size 1-1/2" NPT. Actuated by float controller via 6" x 8" stainless steel float.
4. Heat exchanger, U tube type, with tube bundle constructed with 45 3/4' OD type 304 stainless steel tubing, with a minimum surface area of 97 square feet. Feed water inlet and outlet to be 4" 150 psi RF flanged. The feedwater pressure drop in the tube bundle will be less than 7 psi with a velocity of less than 11 fps.
5. Thermometer gauge panel showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type.
6. (Optional) High level alarm system with Mercoid 123 series float switch and Federal Signal electronic alarm signal, item no. HC002B. Comes installed in a NEMA 4 PVC enclosure, 4" x 4".
7. (Optional) Orifice meter for blowdown flow control, (Qty) Model no. OM250-A, one unit for each boiler. The continuous blowdown flow rate will be controlled by a heat treated stainless steel orifice plate with 17 holes of increasing diameter, to permit flow ranging from ___ to ___ PPH at ___ PSI. The unit will be adjustable with a rotating disc to expose the desired orifice hole. The unit will be warranted for accurate flows for up to 10 years of service.
8. (optional) Custom fit insulation jacket. Exterior and interior cloth made of high temperature, extra durable silicone, rated to 500 deg F. Insulation material 1" thick. Will be pre-cut to fit around all connections, also comes with Velcro straps and hog ring ties for further security.
9. The unit will be assembled on a saddle type base ready for floor mounting.
10. The system will be capable of handling 16,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job sight as well as the orifice meters and the high level alarm.

Specifications for:

By:

Date:

SPEC' PAGE FOR MODEL NO. HC200-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN HORIZONTAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, Type HC, as manufactured by Madden Engineered Products, LLC. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels, Section VIII Div.1, for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided. The system will be capable of handling 20,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The heat recovery system shall consist of:

1. ASME Vessel: 36" diameter X 100" overall length X 48" height (height does not include ancillary equipment installed on top). Made with SA 516 Gr 70 CS, ASME 150 PSI design @ 0-450 deg F.
2. Horizontal flash tank with 4" relief valve, gauge glass, hand hole, and pressure gauge. Tank will have a flow control manifold with (qty) 1" NPT inlets. Flash steam vent connection: 6" 150 psi RF flanged. Tank will be designed to prevent sludge accumulation.
 - a. Relief valve: Kunkle Model No. 6252FLJ, 2-1/2" FLG inlet X 4" FNPT outlet, set at 40 PSI, capacity = 8,045 PPH. Cast Iron Body, ASME Sec I.
 - b. Pressure Gauge: SS, 4" dial, 0-50 PSI, 1/4" MNPT.
 - c. Sight Glass and Valve Set: 3/4" MNPT, Brass valves with vent and drain, 24" gauge glass.
3. Level Control: External balanced pressure drain valve, bronze body, size 1-1/2" NPT. Actuated by float controller via 6" x 8" stainless steel float.
4. Heat exchanger, U tube type, with tube bundle constructed with type 304 stainless steel, with a minimum surface area of 115 square feet, sized for a makeup water flow rate of up to 337 GPM with a pressure drop of less than 2 psi. Feed water inlet and outlet to be 4" 150 psi RF flanged.
5. Thermometer gauge panel showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type.
6. (optional) High level alarm system, part no. HC002B, with Mercoid 123 series float switch and Federal Signal electronic alarm signal.
7. (optional) Orifice meter for blowdown flow control, (Qty) Model no. QM250-A, one unit for each boiler. The continuous blowdown flow rate will be controlled by a heat treated stainless steel orifice plate with 17 holes of increasing diameter, to permit flow ranging from to PPH at PSI. The unit will be adjustable with a rotating disc to expose the desired orifice hole. The unit will be warranted for accurate flows for up to 10 years of service.
8. (optional) Custom fit insulation jacket. Exterior and interior cloth made of high temperature, extra durable silicone, rated to 500 deg F. Insulation material 1" thick. Will be pre-cut to fit around all connections, also comes with Velcro straps and hog ring ties for further security.
9. The unit will be assembled on a saddle type base ready for floor mounting.
10. The system will be capable of handling 20,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job sight as well as the orifice meters and the high level alarm.

Specifications for:

By:

Date:

SPEC' PAGE FOR MODEL NO. HC240-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN HORIZONTAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, Type HC, as manufactured by Madden Engineered Products, LLC. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels, Section VIII Div.1, for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided. The system will be capable of handling 24,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The heat recovery system shall consist of:

1. ASME Vessel: 36" diameter X 112" overall length X 48" height (height does not include ancillary equipment installed on top). Made with SA 516 Gr 70 CS, ASME 150 PSI design @ 0-450 deg F.
2. Horizontal flash tank with 4" relief valve, gauge glass, hand hole, and pressure gauge. Tank will have a flow control manifold with (qty) 1" NPT inlets. Flash steam vent connection: 6" 150 psi RF flanged. Tank will be designed to prevent sludge accumulation.
 - a. Relief valve: Kunkle Model No. 6252FLJ, 2-1/2" FLG inlet X 4" FNPT outlet, set at 40 PSI, capacity = 8,045 PPH. Cast Iron Body, ASME Sec I.
 - b. Pressure Gauge: SS, 4" dial, 0-50 PSI, 1/4" MNPT.
 - c. Sight Glass and Valve Set: 3/4" MNPT, Brass valves with vent and drain, 24" gauge glass.
3. Level Control: External balanced pressure drain valve, bronze body, size 2" NPT. Actuated by float controller via 6" x 8" stainless steel float.
4. Heat exchanger, U tube type, with tube bundle constructed with type 304 stainless steel, with a minimum surface area of 132 square feet, sized for a makeup water flow rate of up to 337 GPM with a pressure drop of less than 2 psi. Feed water inlet and outlet to be 4" 150 psi RF flanged.
5. Thermometer gauge panel showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type.
6. (optional) High level alarm system, part no. HC002B, with Mercoid 123 series float switch and Federal Signal electronic alarm signal.
7. (optional) Orifice meter for blowdown flow control, (Qty) Model no. QM250-A, one unit for each boiler. The continuous blowdown flow rate will be controlled by a heat treated stainless steel orifice plate with 17 holes of increasing diameter, to permit flow ranging from to PPH at PSI. The unit will be adjustable with a rotating disc to expose the desired orifice hole. The unit will be warranted for accurate flows for up to 10 years of service.
8. (optional) Custom fit insulation jacket. Exterior and interior cloth made of high temperature, extra durable silicone, rated to 500 deg F. Insulation material 1" thick. Will be pre-cut to fit around all connections, also comes with Velcro straps and hog ring ties for further security.
9. The unit will be assembled on a saddle type base ready for floor mounting.
10. The system will be capable of handling 24,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job sight as well as the orifice meters and the high level alarm.

Specifications for:

By:

Date:

SPEC' PAGE FOR MODEL NO. HC280-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN HORIZONTAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, Type HC, as manufactured by Madden Engineered Products, LLC. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels, Section VIII Div.1, for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided. The system will be capable of handling 28,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The heat recovery system shall consist of:

1. ASME Vessel: 36" diameter X 130" overall length X 48" height (height does not include ancillary equipment installed on top). Made with SA 516 Gr 70 CS, ASME 150 PSI design @ 0-450 deg F.
2. Horizontal flash tank with 4" relief valve, gauge glass, hand hole, and pressure gauge. Tank will have a flow control manifold with (qty) 1" NPT inlets. Flash steam vent connection: 8" 150 psi RF flanged. Tank will be designed to prevent sludge accumulation.
 - a. Relief valve: Kunkle Model No. 6252FLJ, 2-1/2" MNPT inlet X 4" FNPT outlet, set at 40 PSI, capacity = 8,045 PPH. Cast Iron Body, ASME Sec I.
 - b. Pressure Gauge: SS, 4" dial, 0-50 PSI, 1/4" MNPT.
 - c. Sight Glass and Valve Set: 3/4" MNPT, Brass valves with vent and drain, 24" gauge glass.
3. Level Control: External balanced pressure drain valve, bronze body, size 2" NPT. Actuated by float controller via 6" x 8" stainless steel float.
4. Heat exchanger, U tube type, with tube bundle constructed with type 304 stainless steel, with a minimum surface area of 150 square feet, sized for a makeup water flow rate of up to 337 GPM with a pressure drop of less than 2 psi. Feed water inlet and outlet to be 6" 150 psi RF flanged.
5. Thermometer gauge panel showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type.
6. (optional) High level alarm system, part no. HC002B, with Mercoid 123 series float switch and Federal Signal electronic alarm signal.
7. (optional) Orifice meter for blowdown flow control, (Qty) Model no. QM250-A, one unit for each boiler. The continuous blowdown flow rate will be controlled by a heat treated stainless steel orifice plate with 17 holes of increasing diameter, to permit flow ranging from to PPH at PSI. The unit will be adjustable with a rotating disc to expose the desired orifice hole. The unit will be warranted for accurate flows for up to 10 years of service.
8. (optional) Custom fit insulation jacket. Exterior and interior cloth made of high temperature, extra durable silicone, rated to 500 deg F. Insulation material 1" thick. Will be pre-cut to fit around all connections, also comes with Velcro straps and hog ring ties for further security.
9. The unit will be assembled on a saddle type base ready for floor mounting.
10. The system will be capable of handling 28,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job sight as well as the orifice meters and the high level alarm.

Specifications for:

By:

Date:

SPEC' PAGE FOR MODEL NO. HC320-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN HORIZONTAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, Type HC, as manufactured by Madden Engineered Products, LLC. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels, Section VIII Div.1, for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided. The system will be capable of handling 32,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The heat recovery system shall consist of:

1. ASME Vessel: 36" ID X 142" OAL X 48" height (height does not include ancillary equipment installed on top of unit). Made with SA516 Gr 70 CS, ASME 150 PSI design, 0-450 Deg F.
2. Horizontal flash tank with relief valve, gauge glass, hand hole, and pressure gauge. Tank will have a flow control manifold with (qty) 1" NPT inlets. Flash steam vent connection: 8" 150 psi RF flanged. Tank will be designed to prevent sludge accumulation.
 - a. Relief valve: Kunkle Model No. 6252FMK, 3" RF Flanged inlet X 4" FNPT outlet, set at 40 PSI, capacity = 10,153 PPH. Cast Iron Body, ASME Sec I.
 - b. Pressure Gauge: SS, 4" dial, 0-50 PSI, 1/4" MNPT.
 - c. Sight Glass and Valve Set: 3/4" MNPT, Brass valves with vent and drain, 24" gauge glass.
3. Level Control: External balanced pressure drain valve, bronze body, size 2" FNPT. Actuated by float controller via 6" x 8" stainless steel float.
4. Heat exchanger, U tube type, with tube bundle constructed with type 304 stainless steel, with a minimum surface area of 168 square feet, sized for a makeup water flow rate of up to 337 GPM with a pressure drop of less than 2 psi. Feed water inlet and outlet to be 6" 150 psi RF flanged.
5. Thermometer gauge panel showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type.
6. (optional) High level alarm system, part no. HC002B, with Mercoid 123 series float switch and Federal Signal electronic alarm signal.
7. (optional) Orifice meter for blowdown flow control, (Qty) Model no. QM250-_A, one unit for each boiler. The continuous blowdown flow rate will be controlled by a heat treated stainless steel orifice plate with 17 holes of increasing diameter, to permit flow ranging from ___ to ___ PPH at ___ PSI. The unit will be adjustable with a rotating disc to expose the desired orifice hole. The unit will be warranted for accurate flows for up to 10 years of service.
8. (optional) Custom fit insulation jacket. Exterior and interior cloth made of high temperature, extra durable silicone, rated to 500 deg F. Insulation material 1" thick. Will be pre-cut to fit around all connections, also comes with Velcro straps and hog ring ties for further security.
9. The unit will be assembled on a saddle type base ready for floor mounting.
10. The system will be capable of handling 32,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job sight as well as the orifice meters and the high level alarm.

Specifications for:

By:

Date:

SPEC' PAGE FOR MODEL NO. HC360-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN HORIZONTAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, Type HC, as manufactured by Madden Engineered Products, LLC. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels, Section VIII Div.1, for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided. The system will be capable of handling 36,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The heat recovery system shall consist of:

1. ASME Vessel: 36" ID X 142" OAL X 48" height (height does not include ancillary equipment installed on top of unit). Made with SA516 Gr 70 CS, ASME 150 PSI design, 0-450 Deg F.
2. Horizontal flash tank with relief valve, gauge glass, hand hole, and pressure gauge. Tank will have a flow control manifold with (qty) 1" NPT inlets. Flash steam vent connection: 8" 150 psi RF flanged. Tank will be designed to prevent sludge accumulation.
 - a. Relief valve: Kunkle Model No. 6252FMK, 3" RF Flanged inlet X 4" FNPT outlet, set at 40 PSI, capacity = 10,153 PPH. Cast Iron Body, ASME Sec I.
 - b. Pressure Gauge: SS, 4" dial, 0-50 PSI, 1/4" MNPT.
 - c. Sight Glass and Valve Set: 3/4" MNPT, Brass valves with vent and drain, 24" gauge glass.
3. Level Control: External balanced pressure drain valve, bronze body, size 2" NPT. Actuated by float controller via 6" x 8" stainless steel float.
4. Heat exchanger, U tube type, with tube bundle constructed with type 304 stainless steel, with a minimum surface area of 186 square feet, sized for a makeup water flow rate of up to 337 GPM with a pressure drop of less than 2 psi. Feed water inlet and outlet to be 6" 150 psi RF flanged.
5. Thermometer gauge panel showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type.
6. (optional) High level alarm system, part no. HC002B, with Mercoid 123 series float switch and Federal Signal electronic alarm signal.
7. (optional) Orifice meter for blowdown flow control, (Qty) Model no. QM250-_A, one unit for each boiler. The continuous blowdown flow rate will be controlled by a heat treated stainless steel orifice plate with 17 holes of increasing diameter, to permit flow ranging from ___ to ___ PPH at ___ PSI. The unit will be adjustable with a rotating disc to expose the desired orifice hole. The unit will be warranted for accurate flows for up to 10 years of service.
8. (optional) Custom fit insulation jacket. Exterior and interior cloth made of high temperature, extra durable silicone, rated to 500 deg F. Insulation material 1" thick. Will be pre-cut to fit around all connections, also comes with Velcro straps and hog ring ties for further security.
9. The unit will be assembled on a saddle type base ready for floor mounting.
10. The system will be capable of handling 36,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job sight as well as the orifice meters and the high level alarm.

Specifications for:

By:

Date:

SPEC' PAGE FOR MODEL NO. HC500-(TBD)

PROPOSAL SPECIFICATION No.:

MADDEN HORIZONTAL CONTINUOUS BOILER BLOWDOWN HEAT RECOVERY SYSTEM

The contractor shall furnish and install a Heat Recovery System, Type HC, as manufactured by Madden Engineered Products, LLC. This equipment will be constructed in accordance with standards of the A.S.M.E. Code for Unfired Pressure Vessels, Section VIII Div.1, for 150 p.s.i.g. pressure. National Board serial number and "U" stamp will be provided. The system will be capable of handling 50,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The heat recovery system shall consist of:

1. ASME Vessel: 48" ID X 138" OAL X 66" height (height does not include ancillary equipment installed on top of unit). Made with SA516 Gr 70 CS, ASME 150 PSI design, 0-450 Deg F.
2. Horizontal flash tank with relief valve, gauge glass, hand hole, and pressure gauge. Tank will have a flow control manifold with (qty) 1" NPT inlets. Flash steam vent connection: 8" 150 psi RF flanged. Tank will be designed to prevent sludge accumulation.
 - a. Relief valve: Kunkle Model No. 6252KPM, 4" RF Flanged inlet X 6" FNPT outlet, set at 40 PSI, capacity = 17,993 PPH. Cast Iron Body, ASME Sec I.
 - b. Pressure Gauge: SS, 4" dial, 0-50 PSI, ¼" MNPT.
 - c. Sight Glass and Valve Set: ¾" MNPT, Brass valves with vent and drain, 24" gauge glass.
3. Level Control: External balanced pressure drain valve, bronze body, size 2" NPT. Actuated by float controller via 6" x 8" stainless steel float.
4. Heat exchanger, U tube type, with tube bundle constructed with type 304 stainless steel, with a minimum surface area of 250 square feet, sized for a makeup water flow rate of up to 630 GPM with a pressure drop of less than 2 psi. Feed water inlet and outlet to be 6" 150 psi RF flanged.
5. Thermometer gauge panel showing temperatures of feed water inlet, feed water outlet, and blowdown water to drain. Gauges to be liquid filled type.
6. (optional) High level alarm system, part no. HC002B, with Mercoid 123 series float switch and Federal Signal electronic alarm signal.
7. (optional) Orifice meter for blowdown flow control, (Qty) Model no. QM250-A, one unit for each boiler. The continuous blowdown flow rate will be controlled by a heat treated stainless steel orifice plate with 17 holes of increasing diameter, to permit flow ranging from to PPH at PSI. The unit will be adjustable with a rotating disc to expose the desired orifice hole. The unit will be warranted for accurate flows for up to 10 years of service.
8. (optional) Custom fit insulation jacket. Exterior and interior cloth made of high temperature, extra durable silicone, rated to 500 deg F. Insulation material 1" thick. Will be pre-cut to fit around all connections, also comes with Velcro straps and hog ring ties for further security.
9. The unit will be assembled on a saddle type base ready for floor mounting.
10. The system will be capable of handling 50,000 lbs. of blowdown water per hour at a boiler pressure of up to 600 p.s.i.g.

The Contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from feed water source to heat exchanger, piping from the heat exchanger to the feed water heater, piping to drain for blowdown water, and piping of the flash steam from the system. The Contractor will be responsible for installing the gauge glass, relief valve, and gauges at the job sight as well as the orifice meters and the high level alarm.

Specifications for:

By:

Date:

Section 5 – Additional Information

The following is a list of additional literature we want to be sure sales engineers are aware of. Find them on the literature page on our website:

1. Typical Piping and Installation Diagrams for the HVX, HV, and HC series.
2. An Application Guide for Boiler Blowdown Flow Control (Orifice Meters vs. Automated Conductivity-Based Blowdown Systems).
3. Installation, Maintenance, and Operator's Guide for Heat Recovery Systems
4. Heat Recovery System Brochure
5. Informative Diagrams:
 - a. Visualizing BTU Recovery (Boiler rooms with and without an HRS)
 - b. Surface vs Bottom BD, Can and Cannot
 - c. Madden "Systems" vs. Competitor "Assemblies"
6. Fillable proposal data sheet (also included in this document)
7. Repair parts lists

We also have a YouTube page with helpful videos: https://www.youtube.com/channel/UCB2XnV1XQDJ_4Inn5ryjuFA

General FYI's:

1. Madden is always happy to select, spec' and quote a system for engineers and sales reps. We are a smaller, responsive manufacturer. We strive to be as supportive and responsive as possible. Please never hesitate to contact us.
2. **Madden can put together a BTU recovery estimate to show the performance and savings benefit of installing a heat recovery system in the boiler room.**
3. We can customize any system. If your client wants all instrumentation to include transmitters for remote view and control, advise preferences and Madden will appropriately remove redundant equipment and provide you customized specification pages.
4. Madden keeps our HVX15, HV30, and HV50 vessels in stock for the option to pay an expedite fee to receive a system in 2-4 weeks.
 - a. Typical lead times are otherwise 16-20 weeks after submittal approval.
5. Madden can support submittal procedures after order, including but not limited to:
 - a. 3D models and GA prints
 - b. Marked data sheets on ancillary equipment
 - c. Manuals
 - d. Inspection and test plans
 - e. Hydro reports
 - f. Positive Material Identification and Material Traceability Reports
 - g. ASME Calcs and Welding Procedures

If you or a client are interested in recovering heat from your boiler room, please reach out!