

MADDEN

ENGINEERED PRODUCTS

Boiler Blowdown Heat Recovery Systems

Reduces Boiler Fuel Consumption & Carbon Footprint.

- Most Cost Effective H.R.S. design
- Lower up-front costs.
- Fast return on investment.



HX Series:
*Shell and
coil only heat
exchanger.*



HVX Series:
*Includes coil heat
exchanger &
recovers flash steam.*

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- Pg 3** HVX Model Overview
- Pg 4** Product Selection & Dimensions
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Part Numbering Format

Format: 1st - start with HX, or HVX. 2nd - add capacity number. 3rd - add ancillary equipment adders and upgrades as necessary.

1.) "HX" SERIES

SMALL, EFFICIENT, COST EFFECTIVE

BLOWDOWN CAPACITIES

"20" - 2,000 PPH

"25" - 2,500 PPH

"30" - 3,000 PPH

2.) "HVX" SERIES

"HYBRID" DESIGN, SEE NOTES

BLOWDOWN CAPACITIES

"15" - 1,500 PPH

NOTE #1: The HX series heat exchangers do not offer flash steam recovery. The HVX15 systems recovers both flash steam and preheats makeup water via the heat exchanger coil; however, the HVX15 has potential flow rate limits for the makeup water (cooling water) source. See below.

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OPTIONAL ANCILLARY EQUIPMENT 'ADDITIONS'

"H" - HIGH LEVEL ALARM SYSTEM, P/N HC002B

"I" - CUSTOM FIT ISULATION JACKET, P/N = HV50(CAPACITY)IJ

"A" - COPPER COIL HEAT EXCHANGER - shorter service life, but more efficient BTU recovery

"O" - MADDEN ORIFICE METER(S), P/N OM250_A OR OM650_A, - for blowdown flow rate control.

"M" - INLET MANIFOLD, P/N HV310, 3" X 36", Sch 80, SA106 or A53, CS, up to (3) 1" FNPT connections.

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Full P/N Example:

HVX15	-	HIA	-	2
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NOTE #2, FEEDWATER 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 1-1/2" feed water connections and 7/8" heat exchanger coil should be limited to < 30 GPM as a max flow rate, with < 16 GPM being a more ideal nominal flow rate.

If your boiler room's makeup water requirements will consistently exceed 16 GPM, Madden recommends diverting only some of the main makeup water flow to our HVX15 recovery system. After passing through, the preheated makeup water should then be piped to the D/A tank or atmospheric preheating tank into its own inlet connection, not back into the pressurized makeup water line.

If this piping arrangement or other cooling water sources cannot be accommodated, consider Madden's HV30 series heat recovery system, where makeup water flow rate restrictions are rarely a concern.

Heat Recovery Systems' Performance Data

BTU Recovery Example

1. Boiler surface water blowdown rate:	1,000 PPH
2. Boiler Pressure in P.S.I.G.:	150 PSIG
3. Lbs. of water flashed @ 5 p.s.i.g (14.6%):	146 PPH
4. B.T.U. Recovery per hour from Flash Steam @ 1155 B.T.U. per hour:	168,630
5. Specific volume of flash in Cubic Feet per Hour (146 PPH * 21):	3,066 Ft ³ /HR
6. Water remaining after flash in lbs. per Hour:	854 PPH
7. Heat in remaining condensate (unflashed) water @ 225 deg F. temperature:	192,150 BTU's
8. Recoverable heat in water with 60 deg F. cooling medium plus 10 deg F. transfer loss:	132,370
9. Total Heat Recovery from Boiler Blowdown B.T.U. per Hour (Item 4 + 8):	<u>301,000 BTU's</u>

- Big BTU savings can result in fast investment payback and lower operating costs.
- Contact the factory or your sales representative for a computer analysis of your operating system today.

Fuel Savings Example

Blowdown Rate.	3,000 lbs. per hour
Boiler Pressure.	150 p.s.i.g
BTU Savings.	903,000 per hour
Fuel Savings per Hour.	113 lbs. of coal
	6 gallons of oil
	9 therms of gas

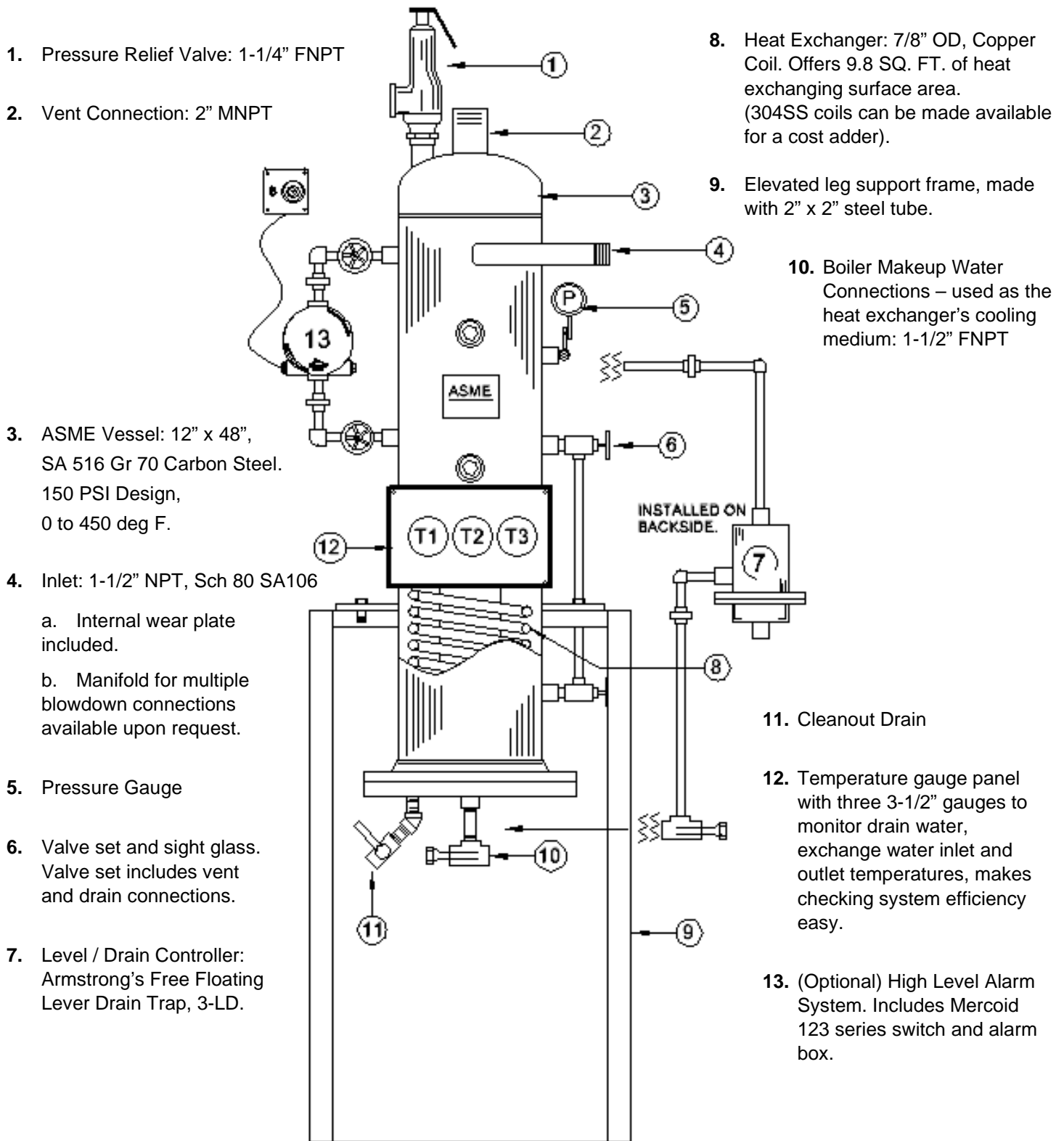
Fuel Savings per Year

- 678,000 lbs. of Coal, or
 - 36,000 gallons of Oil, or
 - 54,000 therms of Gas.
- = \$**

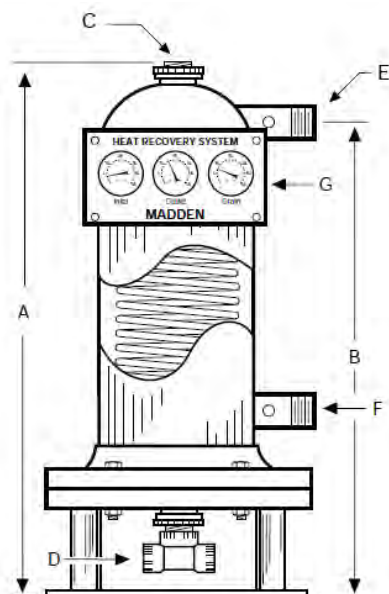
Initial Pressure P.S.I.G.	Temp. of Liquid (F)	ATM Pressure 0 P.S.I.	Percent of Flash at Reduced Pressures							
			5 #	10 #	15 #	20 #	25 #	30 #	35 #	40 #
50	298	9	7.5	6.3	5.2	4.2	3.4	2.6	1.9	1.2
75	320	11.5	9.9	8.7	7.6	6.7	5.9	5.1	4.4	3.8
100	338	13	11.5	10.3	9.3	8.4	7.3	6.9	6.3	5.5
125	353	14.5	13.3	11.8	10.9	10	9.2	8.5	7.9	7.2
150	366	16	14.6	13.2	12.3	11.4	10.6	9.9	9.3	8.5
175	377	17	15.8	14.4	13.4	12.5	11.6	11.1	10.4	9.7
200	388	18	16.9	15.5	14.6	13.7	12.9	12.2	11.6	10.9
225	397	19	17.8	16.5	15.5	14.7	13.9	13.2	12.6	11.9
250	406	20	18.8	17.4	16.5	15.6	14.9	14.2	13.6	12.9
300	421	21.5	20.3	19	18	17.2	16.5	15.8	15.2	14.5
350	435	23	21.8	20.5	19.5	18.7	18	17.3	16.7	16
400	448	24	23	21.8	21	20	19.3	18.7	18.1	17.2
450	459	25	24.3	23	22	21.3	20	19.9	19.3	18.7
500	470	26.5	25.4	24.1	23.2	22.4	21.7	21.1	20.5	19.9
550	480	27.5	26.5	25.2	24.3	23.5	22.8	22.2	21.6	20.9
600	488	28	27.3	26	25	24.3	23.6	23	22.4	21.8
650	495	31.5	30.2	29.1	28.2	27.5	26.75	26.1	25.5	24.9
B.T.U. in Flash per lbs.			1150	1155	1160	1164	1167	1169	1172	1174
Temperature of Liquid (F)			212	225	240	250	259	267	274	280
Steam Volume Cu. Ft. Lb.			26.8	21	16.3	13.7	11.9	10.5	9.4	8.5

Madden Features – Model No. HVX15

Compact like the original HX to keep cost low as possible but now has room to recover flash steam like the HV.

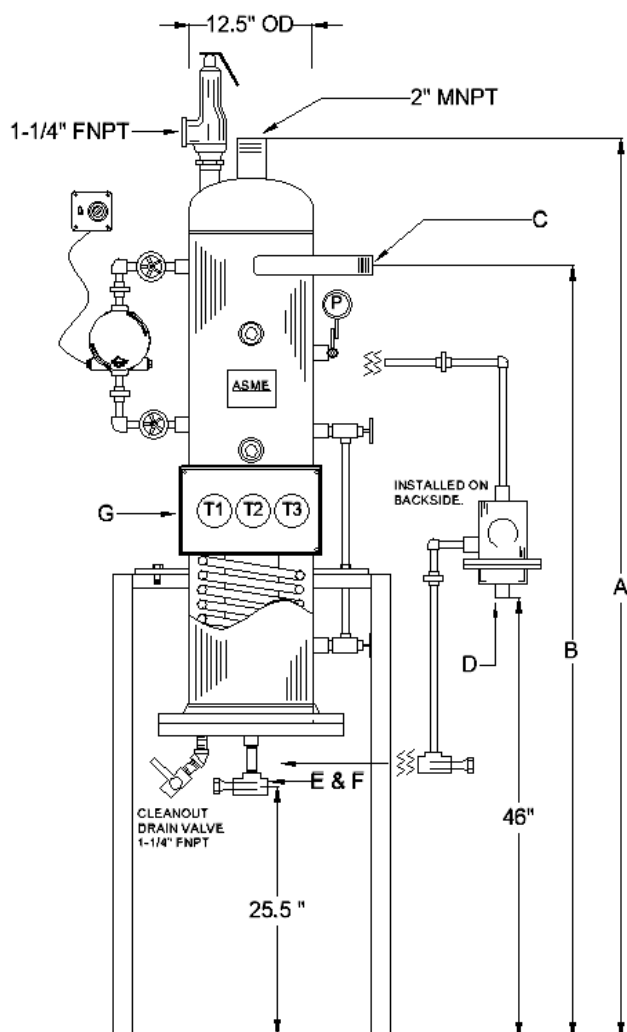


Dimensions - Type HX Heat Recovery Systems

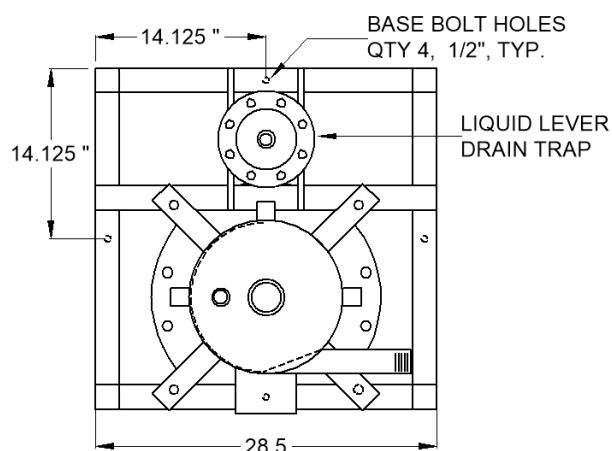


Model Number	HX20	HX25	HX30	HVX15
Capacity (PPH)	2,000	2,500	3,000	1,500
Flash Steam ?	N	N	N	Y
Coil Area (Sq. Ft.)	17	21	25	9.8
Coil Material	Copper / SS	Copper / SS	Copper / SS	Copper
A (OAH)	42"	48"	54"	92.5"
B	22"	28"	34"	79"
C - BD Inlet	1-1/2"	1-1/2"	1-1/2"	1-1/2"
D - Blowdown Drain	1-1/2"	1-1/2"	1-1/2"	1"
E - Makeup Water Inlet	2-1/2"	2-1/2"	2-1/2"	1-1/2"
F - Makeup Water Out	2-1/2"	2-1/2"	2-1/2"	1-1/2"
G - Temperature Gauges and Nameplate. Includes 3 digit Serial Number.				
Ship Weight (Lbs.)	500	525	575	595

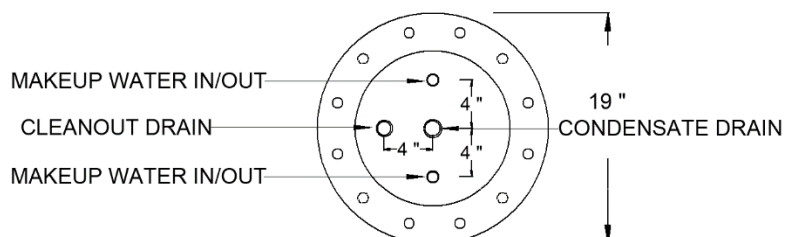
Dimensions - Type HVX15 Heat Recovery System



TOP DOWN VIEW



BOTTOM UP VIEW



Madden Ancillary Equipment



Orifice Meter - Flow Control Option

The adjustable Madden Orifice Meter has 17 different orifices to select for accurate blowdown flow control. Durable, guaranteed for 10 years against cutting, wire drawing, or other distortion. One unit required for each boiler.

The Madden Orifice Meter enables the boiler operator to maintain accurate, repeatable flow control for continuous top blowdown.

Two models:

- OM250 – for boilers up to 250 psi.
- OM650 – for boilers up to 650 psi.

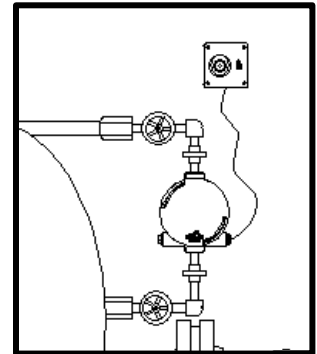
Features include:

- Sediment chamber w/stainless steel filter screen.
- Removable adjustment key.
- Stainless steel, heat-treated orifice plate.
- Drain valve and flush filter screen.

High Level Switch and Alarm System

All heat recovery systems, less the 'original' HX series, have an optional high-level switch and alarm system (P/N HC002B). Madden typically uses a Mercoird 123 series SPDT switch with our alarm box. The switch enclosure is "general purpose". Other switches can be sourced upon request.

The alarm box is a 4" x 4" x 4" PVC wall mount box (NEMA 4X) with manual silencing toggle switch. It is wired to blink the light and sound the alarm. Contractors can connect to the same alarm contact to then wire an external output signal elsewhere at the job site.



Custom Insulation Jackets – Cost efficient and easy to install.

Madden offers M.I.T. International insulation jackets to further boost the energy efficiency of our heat recovery systems. The jackets are built to order to fit your particular HV, HC, or HX system. They fit around all connections and come with Velcro straps and hog ring ties to further secure the jacket to the system.

This material has a durable silicone interior and exterior cloth with 1" thick insulation. Rated to 500 deg F.

Not only will this material increase your system's efficiency, it also protects local personnel from accidentally touching the units when operating.



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