

Centrifugal Blowdown Separators & Traditional Blowdown Tanks



Table of Contents

Overview: Function, Purpose, and Selection Guide for Blowdown Separators & Tanks	Pg. 1
Features of Blowdown Separators & Tanks	Pg. 2
Boiler Blowdown Flow Rates and Required Cooling Water Chart.....	Pg. 2
Blowdown Separator Dimensions & Connections Chart.....	Pg. 3
Blowdown Separator Specification Sheet	Pg. 4
Automatic Aftercooler Information	Pg. 5
Typical P&ID for Intermittent Bottom Blowdown Vessels	Pg. 6
Information on Traditional Bottom Blowdown Tanks	Pg. 7

Centrifugal Blowdown Separators

Function: Madden Blowdown separators are designed to immediately dispose of hot, high pressure boiler blowdown. When the hot, high pressure bottom blowdown from the boiler enters the separator's low pressure vessel, flash steam is created and vented to the atmosphere. The remaining hot bottom blowdown drains out the vessel to the aftercooler. A temperature regulating valve on the aftercooler opens a cooling water valve. This results in the immediate mixing of cold water and the hot bottom blowdown to a temperature $\leq 140^{\circ}$ Fahrenheit.

Selection Guide: To select the proper blowdown separator for your application, you need to know both the boiler operating pressure and the size of the bottom blowdown connection. Using those two figures, you can match the bottom blowdown inlet on the blowdown separator to the boiler blowdown connection size from the table on page 2. For example, the proper blowdown separator connection for a 125 psi boiler with a 1-1/2" bottom blowdown connection, you'll need model number BD230D45. The aftercooler size is determined by the size of the drain in the blowdown separator. The temperature regulating valve sizing is dependent on the cold water inlet on the aftercooler selected. For sizing on blowdown tanks, or for blowdown separators for boilers over 300 psi, contact the factory. All connections 2-1/2" and smaller are NPT, 3" and larger are 150 psi RF flanged. These are the standards, customized connections available upon request. *See page 3 for system drawing and dimensions.*

Data Required: Blowdown Pipe Size _____ Boiler Pressure _____ psig

Traditional Blowdown Tanks

Function: Blowdown Tanks are used as an alternative system for cooling the bottom boiler blowdown. These large tanks retain the blowdown water volume from one blow after the flash steam has been vented to the atmosphere and allow the water to cool down by natural convection over a 6-12 hour period. This retained water that did not reach the tank's overflow drain will be close to room temperature when it is displaced by the next blowdown. The resulting mixture of retained water and new blowdown entering the tank will be $\leq 140^{\circ}$ Fahrenheit as it is displaced out of the overflow drain. *See page 5 for details of construction.*

Selection Guide: To select the proper blowdown tank for your application you need to know the following:

1. Boiler operating pressure.
2. Size and type of the bottom blowdown connection.
3. Equivalent pipe length to the tank.
4. And the boiler's steam drum diameter and length.

Contact the factory for assistance.

Features of Blowdown Separators & Tanks

Blowdown separators and tanks are made to ASME Div 1, Sec VIII code. Separators are designed to 150 PSI – 0-500 deg F. Tanks are designed 50 PSI – 0 to 450 deg F. These vessels will come with a U-1 form and are assigned a National Board serial number.

Blowdown Separators

- Fast, safe, low-cost way to separate steam and water to remove harmful dissolved solids from the boiler(s).
- Protects the boiler(s) surfaces from severe scaling and/or corrosion problems as a result.
- Quiet design keeps noise levels below 90 dBA. No exhaust head required.
- Cools bottom boiler blowdown to safe temperatures to meet state and local requirements.
- Vortex breaker and SS triangular baffle reduce momentum of water before drain and ensures flash steam separation from condensate. Drain is completely filled - no center void
- Compact design saves floor space. Design also gravity drains for added service life.
- *AVAILABLE IN 304SS UPON REQUEST.*

Blowdown Tanks

- Designed around the latest NB-27 standards.
- Other design standards and codes can be met upon request.
- Cools bottom boiler blowdown to safe temperatures to meet state and local requirements.
- Best design choice for boilers operating above 300 psig.
- Uses natural convection to cool intermittent bottom boiler blowdown, installation of other cooling accessories not needed.
- Saves on plant water usage.
- Tangential inlets help separate steam from condensate.
- Wear plates available in CS and SS.
- *AVAILABLE IN 304SS UPON REQUEST.*

Blowdown Flow Rates and Required Cooling Water

Madden offers two sets of pre-designed centrifugal blowdown separators. The BD130 and BD230 models are pre-sized for boilers operating up to 150 PSIG. The BD242 models are sized for boilers operating between 151 and 300 PSIG. Reference the below Table 1. The maximum blowdown flow rate assumes ~30 ft. of equivalent straight length of Sch 80 pipe from boiler to separator.

Table 1 - Blowdown Separator Design Parameters

Blowdown Separator Model #	Vessel Blowdown Inlet	Maximum Blowdown Flow (PPH)	Resulting Flash Steam (PPH)	Resulting Condensate (GPM)	Required Quenching Flow (65 deg F.) (GPM)	Required C.W. Regulating Valve Size
<i>Designed for Boilers Operating Up To 150 psig.</i>						
BD130A22	3/4"	15,000	2,460	25.04	23.92	3/4"
BD130B23	1"	18,000	2,952	30.05	28.86	3/4"
BD230C44	1-1/4"	35,000	5,740	58.44	56.32	1-1/4"
BD230D45	1-1/2"	57,500	9,430	96.00	92.37	2"
BD230E56	2"	100,000	16,400	166.96	160.77	1-1/2" (D)
<i>Designed for Boilers Operating Up To 300 psig.</i>						
BD242B44	1"	29,500	6,667	45.60	43.84	1"
BD242C45	1-1/4"	58,000	13,108	89.65	86.38	2"
BD242D56	1-1/2"	83,000	18,758	128.30	123.32	1-1/2" (D)
BD242E68	2"	152,000	34,352	234.96	228.67	2" (D)

Note: Madden's standard valves are single seated. For larger applications it is more cost effective to switch to a double seated valve (D).

Blowdown Separator: Dimensions & Connections

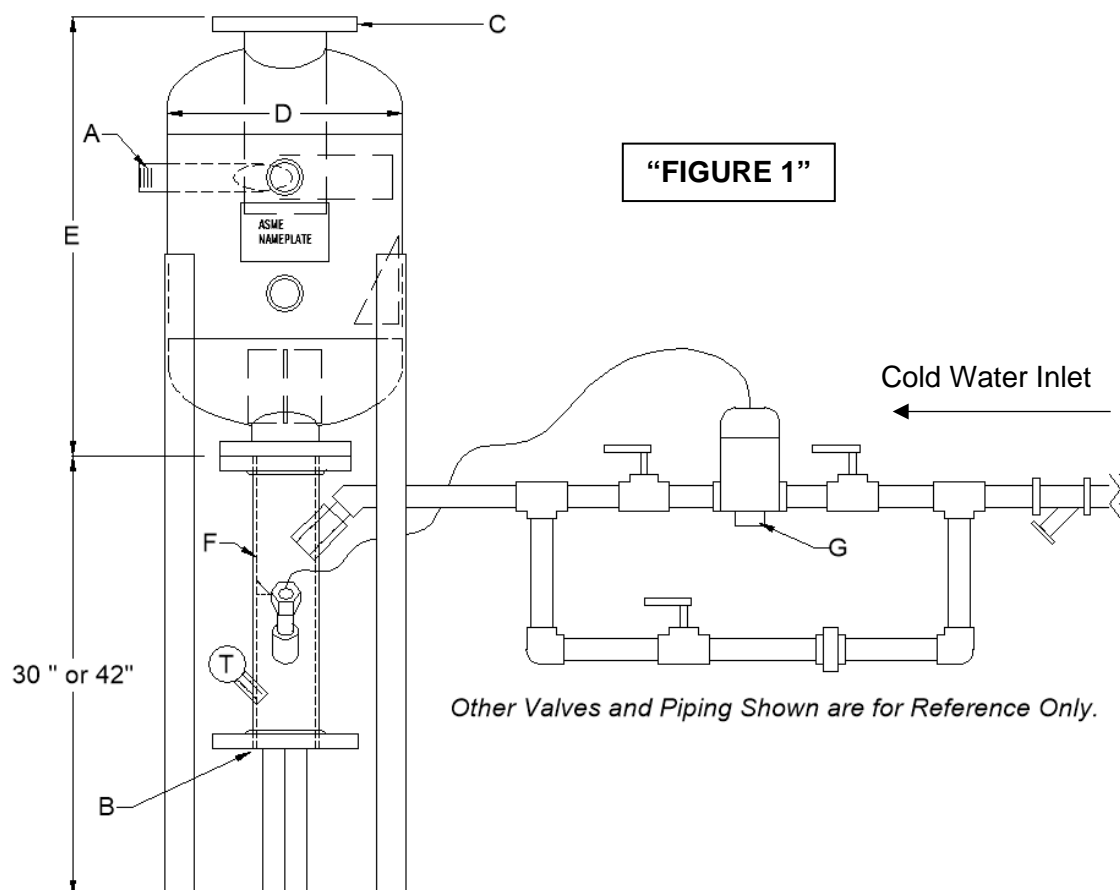


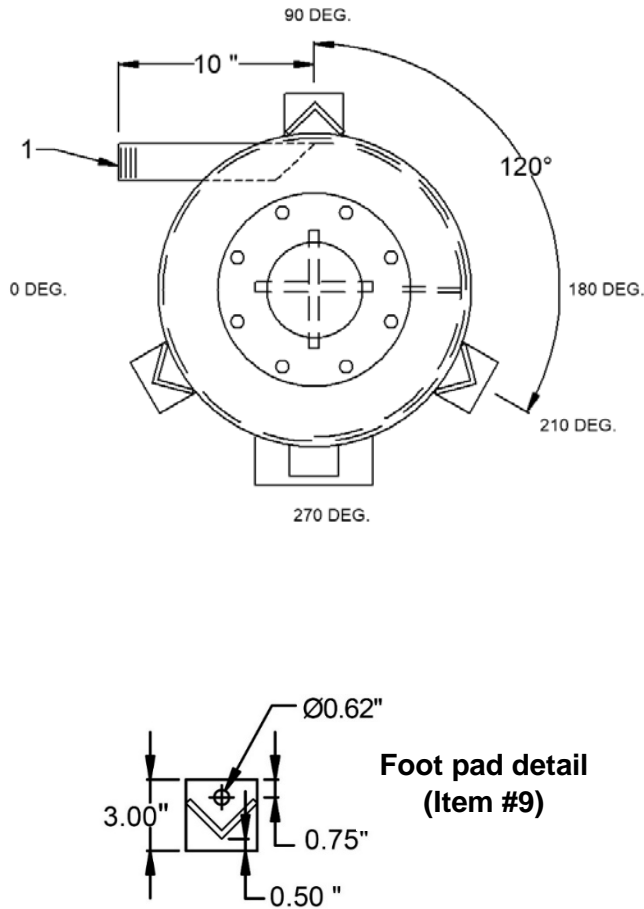
Table 2 - Blowdown Separator Sizing Selection Chart

Blowdown Separator Model #	Blowdown Inlet -A-	Drain -B-	Vent -C-	Vessel Dia. x H (-D x E-)	Aftercooler Part No. -F-	Cold Water Inlet	After Cooler Size	C.W. Valve Number	Valve Size -G-
Designed for Boilers Operating Up To 150 psig.									
BD130A22	3/4"	2-1/2"	2-1/2"	10" x 30"	AC200	3/4"	2-1/2"	AC102	3/4"
BD130B23	1"	2-1/2"	3"	10" x 30"	AC200	3/4"	2-1/2"	AC102	3/4"
BD230C44	1-1/4"	4"	4"	16" x 30"	AC400	1-1/4"	4"	AC104	1-1/4"
BD230D45	1-1/2"	4"	5"	16" x 30"	AC400	2"	4"	AC106	2"
BD230E56	2"	5"	6"	16" x 30"	AC500	1-1/2"	5"	AC105D	1-1/2" (D)
Designed for Boilers Operating Up To 300 psig.									
BD242B34	1"	3"	4"	16" x 42"	AC300	1"	3"	AC103	1"
BD242C46	1-1/4"	4"	6"	16" x 42"	AC400	2"	4"	AC106	2"
BD242D58	1-1/2"	5"	8"	16" x 42"	AC500	1-1/2"	5"	AC105D	1-1/2" (D)
BD242E68	2"	6"	8"	16" x 42"	AC600	2"	6"	AC106D	2" (D)
Standard Connection Sizes: Connections ≤ 3" are NPT. Larger connections are Class 150 RFSO Flanges.									

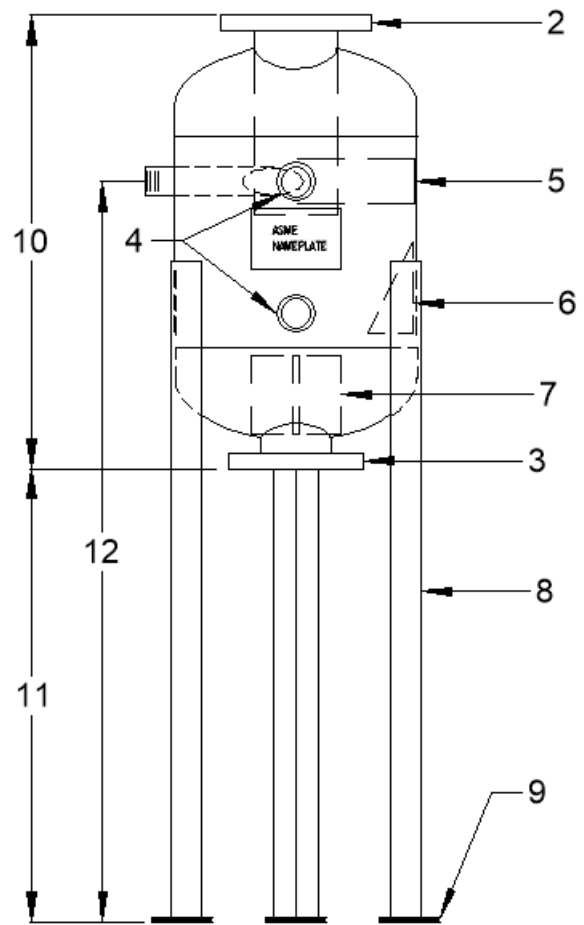
NOTE: Blowdown separators come with legs. Mounting brackets for attaching the blowdown separator to supporting structures (latter provided by the owner) are also available as an option. **Custom sizing is available upon request.**

Blowdown Separator: Specification Sheet

Overhead view



"FIGURE 2"



Item	Description	Item	Description
#1	_____ " NPT Blowdown Inlet Connection	#7	Vortex Breaker, Stainless Steel
#2	_____ " Vent Connection, 150 psi R.F. Flange	#8	Legs with Foot Pad
#3	_____ " Drain Connection, 150 psi R. F. Flange	#9	Foot Pad (see details above)
#4	2" NPTF Inspection Opening	#10	Vessel Height: _____ 30" or _____ 42"
#5	Impingement Plate, Stainless Steel	#11	Leg Height: _____ 30" or _____ 42"
#6	Wall Baffle, Stainless Steel	#12	Inlet Height: _____ 37" or _____ 49"

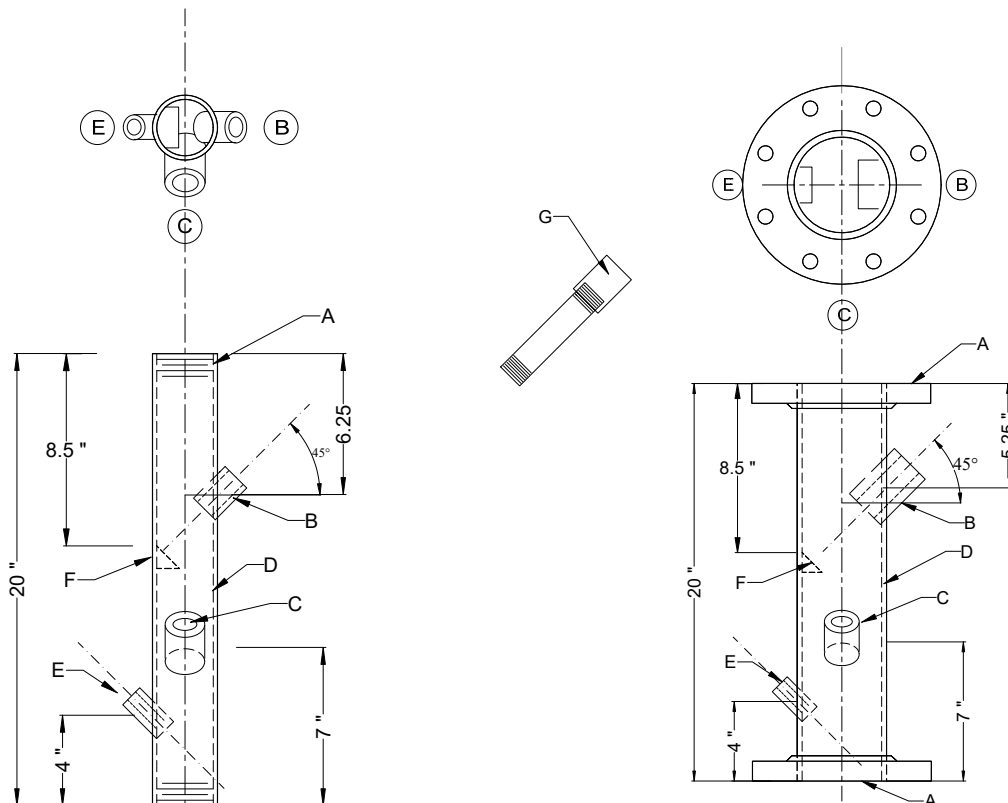
Automatic Aftercooler Information

Function: The automatic aftercooler is used to quench the remaining condensate to a safe temperature for sewer disposal after flashing off steam. The design temperature to be reached after quenching is 140 deg F or less. Aftercoolers utilize three main components to achieve adequate quenching:

1. Aftercooler: A-53 SCH 40 Pipe installed on drain of blowdown separator with a stainless steel baffle inside to help mix cold water with hot condensate.
2. Temperature Regulating Valve: A self-operating temperature regulating valve is provided with the aftercooler to complete the service of quenching hot condensate. The valves are sized with the assumption 65 deg cooling water is available.
3. Temperature Sensing Bulb: These valves include a temperature sensing bulb that actuates the spring-loaded valve. The standard temperature set range is 60 - 140 deg F. Bulb thermowells are available as an option for added service life.

Additional (optional) Equipment: Madden also supplies the necessary components to complete the cooling water supply line or spool. These options often come as follows:

1. "Line": A cold water supply "line" will include a Y-strainer, aforementioned temperature regulating valve, and check valve. Madden will provide the remaining piping to complete the line and install on the aftercooler at our factory.
2. "Spool": A complete cold water supply "spool" includes a bypass line should maintenance of the regulating valve ever be required. Reference "Figure 1" on page 3 for layout. These include a Y-strainer, aforementioned temperature regulating valve, 2 gate valves to isolate regulating valve, a globe valve on the bypass line to control cold water supply manually, and a check valve.



"A" – Inlet and outlet connection. MNPT for 2" and 3", Class 150 RFSO for 4" and up.

"B" – Cooling water inlet connection, Class 150 C/S coupling, sized the same as selected regulating valve.

"C" – Regulating valve sensing probe connection. 1" FNPT Class 150 C/S coupling.

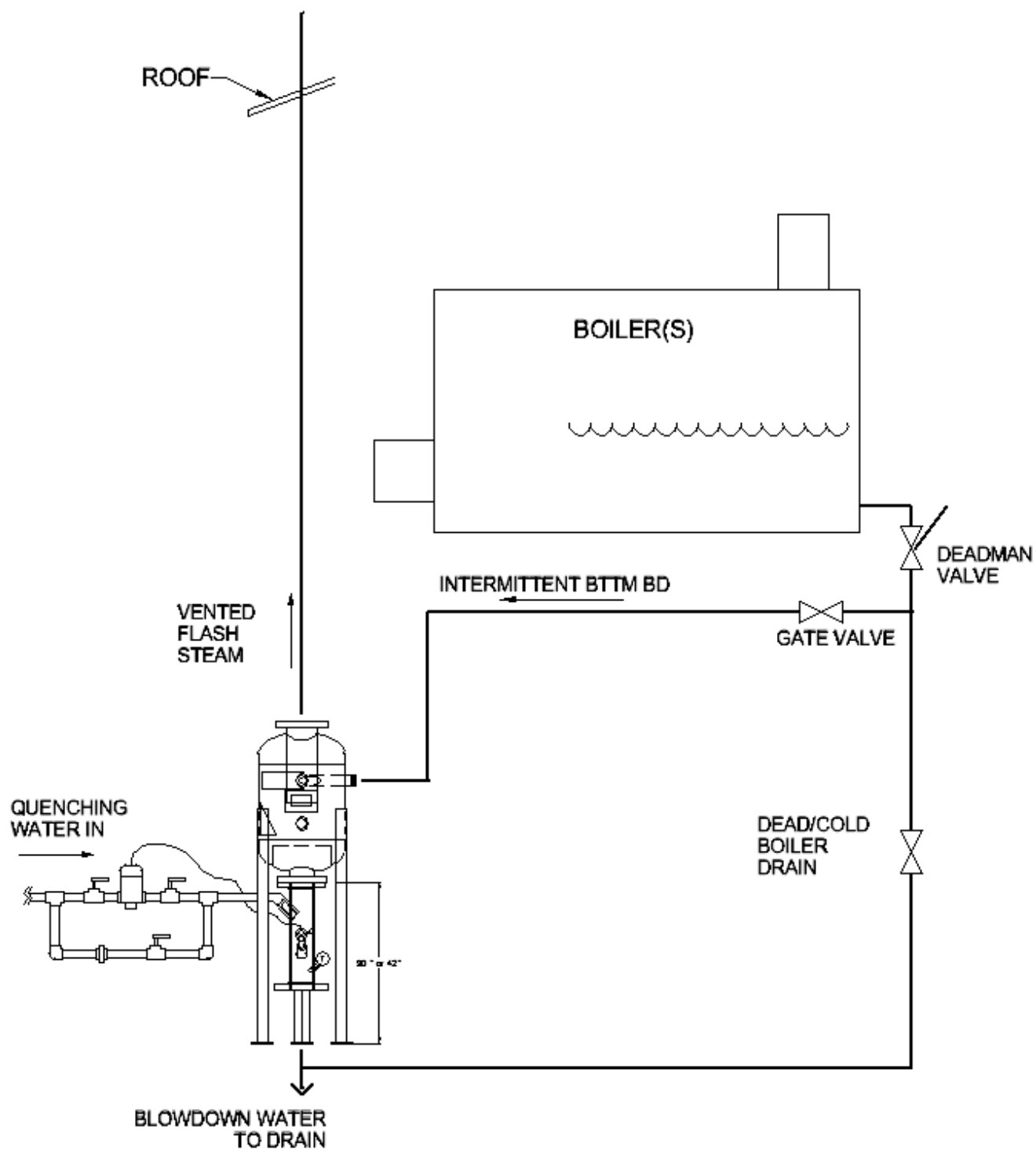
"D" – Aftercooler pipe, A53, seamless. 304SS available as requested option.

"E" – Temperature gauge connection, 1/2" FNPT, Class 150 C/S.

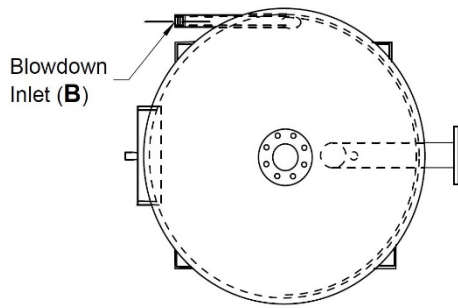
"F" – SS water deflector. Helps ensure cooling water will mix efficiently with hot condensate.

"G" – Pipe nipple and coupling used when needed for Terice sensing probes.

Typical P&ID for Intermittent Bottom Blowdown Vessels



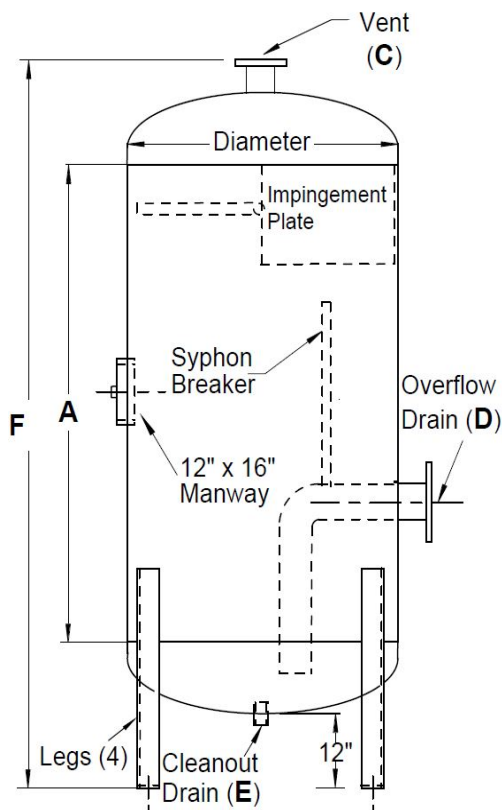
Traditional Boiler Blowdown Tanks



These heavy steel tanks receive the bottom blowdown water from a boiler and cool it down using the flash steam principle, along with convection cooling over several hours for the retained hot water. The tank is designed to breakup the blowdown flow by impacting the high pressure hot water on the steel centrifugal impact plate. The water droplets give up heat as flash steam is formed. The flash steam is vented from the top of the tank to the atmosphere. Retained water displaces cooled water from the previous blowdown, and is retained in the tank until it cools to the statute limits.

Data required for sizing calculations:

- Blowdown pipe size, type and equivalent length to tank.
- Boiler steam drum diameter & length.



Model Number	Dia.	Shell A	NPT B	150#RF C	Flange D	NPT E	OAH F
BD1600	16"	35.5"	Up to 2"	*2-1/2"	*2"	2"	66"
BD2400	24"	32"	Up to 2"	*3"	*2"	2"	66"
BD3000	30"	29"	Up to 2"	4"	*2"	2"	66"
BD3600	36"	30"	Up to 2"	4"	3"	2"	70"
BD4200	42"	42"	Up to 2"	5"	3"	2"	85"
BD4800	48"	48"	Up to 2"	6"	4"	2"	94"
BD5400	54"	66"	Up to 2"	6"	4"	2"	116"
BD6000	60"	72"	Up to 2"	6"	4"	2"	125"
BD7200	72"	96"	Up to 2"	10"	4"	2"	155"

*These connections are NPT

- Shell length (Dimension A) and connections size dimensions can be changed to meet the application requirements for the specific boiler as determined by design rule calculations.
- Sizing of tank and connections should be determined using National Board design rules for blowoff tanks.
Contact the factory for assistance.
- Construction: ASME Section VIII, Div. 1, 50 psi DWP, with National Board serial number

NOTE: The above chart is for reference. **Madden builds all tanks to order.** Traditional overflow type blowdown tanks are NOT a stock item.

MADDEN

ENGINEERED PRODUCTS, LLC

P.O. Box 387
1317 Princeton Blvd.
Elkhart, Indiana 46516

Phone: (574) 295-4292
Fax: (574) 295-7562
Email: info@maddenep.com

SOLD BY:

Version 2.2

Page | 7