MADDEN
ENGINEERED PRODUCTS

BOILER BLOWDOWN TANKS
ENGINEERING DATA SHEET

OVERVIEW

Madden Boiler Blowdown Tanks provide a safe and reliable method for cooling and discharging intermittent boiler blowdown. When designed properly, compared to blowdown separators (flash separators with aftercoolers), these traditional overflow style designs reduce flash steam expansion rates which greatly extend service life and reduce blowoff noise. These designs also reduce, if not eliminate, the need for cold quenching water lines.

Flash Separation: Blowdown vessels provide atmospheric conditions which immediately relieve most of the energy from high pressure boiler blowdown in the form of flash steam. Proper vessel diameter and vent sizing ensure (1) hot condensate will not be carried out of the vent with the flash steam, and (2) operating noise levels will be below 85 dBa.

Cooling by Retention: The remaining hot condensate is retained for 6–12 hours, cooling naturally before being displaced through the overflow outlet.

Discharge: The next blowdown mixes with cooled retained water, ensuring the effluent leaving the overflow drain is ≤ 140 °F, compliant with sewer and safety codes.

DATA SHEET CONTENTS:

Why Madden?

Madden is the industry leader in designing blowoff vessels for multiple blowdown processes (including but not limited to D/A overflow, surface blowdown, and heat exchanger drain lines).

- ✓ **RESPONSIVE:** We design and quote quickly. Sizes and prices often returned on the same day as the request.
- ✓ **INDUSTRY EXPERTS:** Extensive knowledge and experience with the NB-27 guide for designing blowoff vessels as well as ASME standards. At Madden we commonly provide custom designs for multiple blowdown processes which include custom-sized cold water tempering solutions on the drain line. *Madden's goal is to offer clients full blowdown system solutions, not just a vessel.*
- ✓ **COMPLETE BLOWDOWN SOLUTIONS**: Madden offers a wide variety of boiler blowdown equipment. If you have other requirements or interests such as surface blowdown heat recovery, sample cooling and analysis, or chemical injection systems, we have you covered.

Madden Blowdown Tank Model Numbering System

Reference for pages 2 - 4

(1) Series Name:	**(4) Vent Size**	**(7) If required**
"BD" – Traditional Blowdown Tank	"___" Enter inch value	*For internal use to*
(2) Diameter:	**(5) Overflow Drain Size**	*distinguish similar tank*
"___" Enter inch value	"___" Enter inch value	*designs. Contact the factory*
(3) Seam to Seam Height	**(6) Centrifugal Inlet Size**	*with any questions.*
"___" Enter inch value	"___" Enter inch (cont. adding)	

NOTE: for fractional pipe/connections sizes, Q = ¼, H = ½, and T = ¾. A 1-1/2" inlet would be noted as "1H"

BD Tank Model Number Example: BD4872-12421H-(tbd) (48" dia X 72" sm-sm, 12" vent, 4" O.F. drain, 2" and 1-1/2" inlet)

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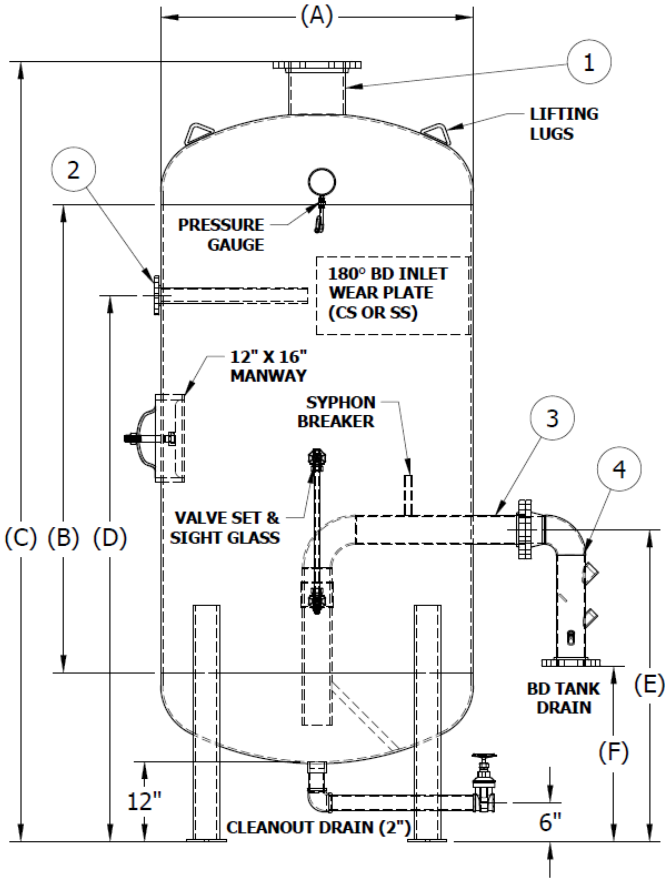
BOILER BLOWDOWN TANKS
SIZING/SELECTION



DATA REQUIRED FOR PROPER SIZING:

- Boiler operating pressure.
- Boiler blowdown line/connection size.
- Approximate boiler steam drum dimensions, in order to calculate BD volume by a level drop (NB-27 = 4"), OR,
- Average BD time and requested safety factor (typical BD time is 10-20 seconds, typical sizing is for 45-60 seconds)

TYPICAL CONSTRUCTION & FEATURES:

- **MATERIAL:** SA516 GR 70 CS (SS options available)
- **CONSTRUCTION:** ASME Div. 1, Sec. VIII, BPVC 50 PSI.
- Includes National Board Serial Number & U-1A Form.
- **FINISH:** Red oxide primer on exterior. (Internal coatings, epoxy, and zinc options available)
- **ANCILLARY EQUIPMENT:** Valve set and sight glass, pressure gauge, and cleanout drain. On request, Madden can also provide level, pressure, & temperature transmitters.
- **ENGINEERING:** Madden can provide capacity sizing calculations/justification, ASME calculations, and allowable nozzle loads. Seismic calculations can also be outsourced upon request.
- **TESTING:** Standard ASME inspection and hydro testing procedures are followed. Other Non-destructive examinations can be provided for a cost adder upon request.

ITEM	DESCRIPTION	VALUE (unit)
1	Flash Steam Vent – SA106 pipe or rolled steel nozzle, class 150 flange	
2	Centrifugal/Tangential Blowdown Inlet – SA106 pipe, sch 80 or 160, NPT or Flange	
3	Overflow Drain – SA106 pipe, sch 40, Flange (typically installed halfway up straight wall length)	
4	Aftercooler (quenching pipe) – Sch 40 Steel Pipe, NPT or Flange, same size as item 3. The value listed here is the cold water tempering inlet connection:	
A	Vessel Diameter:	
B	Vessel Height: (straight wall, seam to seam)	
C	Overall Height:	
D	Inlet Height – From grade level (Typically set 12" below upper seam, exact height is not critical, needs to be above water level)	
E	Overflow Drain Height: (Typically set half way up the seam to seam dimension, this is the operating capacity)	
F	Height from grade level to aftercooler drain connection	
-	Estimated Shipping Weight:	
-	Overall Capacity: (nominal/operating capacity is typically half of this value)	

YOUR MADDEN BD TANK MODEL No.: _____

Provide required sizing data for the Madden team to fill in this table. A separate detailed sizing justification sheet can also be provided upon request.

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BOILER BLOWDOWN TANKS
PRE-DESIGNED MODELS

"PRE-DESIGNED" MODELS - PURPOSE:

- Blowoff vessel configurations included within this data sheet are intended for (1) conceptual guidance to streamline design conversations and/or (2) for engineering firms to plan and budget floor space and costs during the design phase of a public bid project.
- The tank capacities, vent sizes, and drain sizes listed below have **not** been pre-sized per any boiler room parameters or assumptions. Use these details as a baseline for sizing a future blow off vessel.
- For boiler blowdown tank performance and compliance confirmations, provide Madden with project specific details. Madden engineers can design custom, project specific blowdown tanks in minutes.

NOTE: Cold water supply spool shown for visual reference only. Details are not included in pre-designed configurations. See note below table.

MADDEN'S BASELINE BOILER BLOWDOWN TANK MODEL NUMBERS

Model Number	**Flooded Capacity** (Gallons)	**Operating Capacity** (Gallons)	**Shipping Weight** (Apprx) (Lbs)	**Operating Weight** (Apprx) (Lbs)	**Diameter** (Inch)	**Straight Wall Height** (In.)	**Vent** (In.)	**Overflow Drain** (In.)	**Inlet** (In.)	**Overall Height** (In.)
BD3648-642	264	132	1,600	2,701	36"	48"	6"	4"	2"	88"
BD4248-642	372	186	1,835	3,387	42"	48"	6"	4"	2"	91"
BD4848-842	501	250	2,075	4,161	48"	48"	8"	4"	2"	94"
BD4860-842	595	297	2,270	4,748	48"	60"	8"	4"	2"	106"
BD4872-1242	689	345	2,460	5,339	48"	72"	12"	4"	2"	118"
BD5460-842	773	386	2,575	5,796	54"	60"	8"	4"	2"	109"
BD5472-1242	892	446	2,850	6,572	54"	72"	12"	4"	2"	121"
BD6060-1242	979	489	2,950	7,030	60"	60"	12"	4"	2"	112"
BD6072-1842	1,126	563	3,200	7,898	60"	72"	18"	4"	2"	124"
BD7272-1242	1,692	846	3,925	10,985	72"	72"	12"	4"	2"	130"
BD7284-1842	1,903	951	4,215	12,151	72"	84"	18"	4"	2"	142"

ENGINEERS, LET MADDEN DO THE WORK FOR YOU.

Need a common tank for multiple boilers, surface and bottom blowdown, D/A overflow, and more? Specify all desired processes, incoming pressures, and maximum flow rates, and we'll take it from there.

Madden personnel will not only size a blowdown tank, we'll also calculate the necessary cold water quenching line size (pictured above) to ensure your blowdown system never discharges above 120 deg F.

We'll provide a full specification page (next page), all equipment sizing justifications, as well as a complete system model number. For example your **complete blowdown system solution** model number could be:

BD4860-1242_ACBT405D-13F_CWS105-1T

PROPOSAL SPECIFICATION No. _____
INTERMITTENT BOILER BLOWDOWN TANK
MADDEN MODEL BD_____

1.1 **SUMMARY OF WORK BY OTHERS**

1.1.1 The installing contractor shall furnish and install a Blowoff Tank as manufactured by Madden Engineered Products, LLC. in Elkhart, IN. This equipment will be constructed in accordance with National Board Rules, standards of the A.S.M.E. Code for Unfired Pressure Vessels for *50 p.s.i.g.* pressure, and it will have the "U" stamp and National Board serial number.

1.1.2 The installing contractor will furnish and install all related piping, fittings and valves to provide a complete system. This includes piping from the boiler blowdown valves, vent piping from the tank for the flash steam, and piping from the overflow drain and cleanout drain. The Contractor will be responsible for installing the sight glass at the job site.

1.2 **EQUIPMENT BY MADDEN**

1.2.1 **Vertical flash tank**, Madden Model No. BD____, ___" diameter X ___" sm-sm X ___" OAH with the following features:

A. Centrifugal blowdown inlet(s): ___" MNPT Sch 80 SA106 Pipe *(Sch 80 is standard, other available by request)*
B. Inlet Wear Plate: 1/4" X 12" X 180 deg, Carbon Steel *(other materials and thicknesses available upon request)*
C. Vent: ___" Class 150 RFSO flange (__ fps flash steam velocity) with Sch 40 __" SA106 pipe
D. Overflow Drain:___" Class 150 RFSO flange with Sch 40 __" SA106 pipe
E. Manhole: 12" X 16" *(other sizes, or hinged davit arm style, available upon request)*
F. Lifting Lugs (2)
G. Tank legs (4) with foot pads: elevate tank bottom 12" from floor
H. Construction: SA516 (or SA455) Gr 70 Carbon Steel, standard thickness will meet minimum ASME requirement for BPVC of 50 PSI design + 1/8" corrosion allowance. *(Thickness above code available upon request)*
I. Finish: exterior red/brown oxide primer *(other paint finishes available upon request)*
J. Sight glass and brass valve set connections (2): 3/4" FNPT, CS, 3,000# couplings.
K. Pressure gauge connection: ¼" FNPT, CS, 3,000# couplings.
L. Ancillary Equipment Offered by Madden to include:
   1. Madden Pressure Gauge, P/N GA-P-EBB: 1/4" NPT, 4" dial, 0-50 PSI, SS material, includes pig tail.
   2. Madden Valve Set and Sight Glass, P/N HV089A: ¾" MNPT brass valves, glass gauge is 21.5" long, valve set includes vent and drain.
   3. Madden Cleanout Drain Pipe and Gate Valve, P/N "BD-Drain": Bronze Gate Valve, 2" FNPT x FNPT, will include pipe and fitting to extend valve out from under tank cleanout drain, pipe painted with red oxide primer.
   4. For additional ancillary equipment, such as level, pressure, or temperature transmitters, please send specifications to Madden.

1.2.2 (Optional) **Aftercooler Package:**

A. Used when additional processes, other than intermittent bottom blowdown, are also sent to this common tank.
B. Madden P/N ACBT___D-___ (ask factory for assistance)
C. Inlet & Outlet: __" Class 150 RFWN (inlet) & RFSO (outlet) flange connection with 4" sch 40 elbow
D. After cooler pipe: __" diameter X 19" length, A-53 pipe, sch 40, with following connections:
   a. Cold water supply: ___" FNPT, 45 deg angle, class 300 coupling
   b. Temperature Gauge: 1/2" FNPT, class 300 cplg, includes 3" dial analog gauge, 1/2" NPT connection, 0-240 deg F, SS, Weiss brand
   c. Temperature Sensing Probe Connection: 1" FNPT, 45 deg angle, class 300 cplg
E. Temperature Regulating Valve, self-operating, ___" FNPT x FNPT, ___ Cv, (single or double seated design), bronze body and copper temperature sensing probe. Madden P/N AC10__.

1.2.3 (Optional) **Cold Water Supply Spool**:

A. Surrounds aftercooler's self operating cold water valve. Provides a bypass line around the self operating valve with a manual globe valve. Recommended for blowdown tanks handling multiple continuous processes.
B. Madden P/N CWS1___ (ask factory for assistance)
C. Supply spool piping to be __" Class 150/Sch 40 piping and fittings.
D. Valves included: (2) __" Bronze Class 125 FNPT isolating gate valves, (1) __" Bronze Class 125 FNPT globe valve, (1) __" Bronze Class 125 FNPT Y-strainer and (1) __" Swing type Bronze Class 125 FNPT check valve
E. (2) Adjustable steel support legs with footpads will be provided
F. NOTE: Assembly as quoted to be performed by Madden.
G. NOTE: Cold water supply spool pressure drop estimated to be ___ PSI.

Project: (name) – (location)
Spec's By:
Date: