BLOWDOWN SEPARATORS

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ILLUSTRATIONS

TABLES

This section contains information on blowdown separators, which are used to provide safe and economical flash purification to enhance blowdown effectiveness.

FEATURES AND BENEFITS

- Fast, safe, low-cost way to separate steam and water and remove harmful dissolved solids
- Protects boiler surfaces from severe scaling or corrosion problems.
- Economical flash purification process for enhancing blowdown effectiveness
- Reduce drain water temperature to meet state and local requirements.
- Quiet design, with noise levels below 90 dBA, so no exhaust head is required
- CB blowdown separators are compact, and can be quickly installed with few connections
- Stainles steel striking plate greatly extends separator life.
- Momentum of water is speeded by spiral baffle centerwise to drain. Drain is completely filled - no center void.
- Tangential inlet and small diameter prompt high velocity spinning for release of steam.
- All interior surfaces slant toward drain, making unit self-draining, self-drying for longer life.
- Proven performance
- Demonstrated durability
- Universal adaptability

PRODUCT OFFERING

Boilers that supply steam for power, process or heating applications require periodic and more often, frequent, blowdowns to prevent buildup of harmful solids. Blowdown protects boiler surfaces from severe scaling or corrosion problems that would otherwise result.

Cleaver-Brooks blowdown separators use a safe, economical flash purification process for enhancing blowdown effectiveness. Steam is rapidly separated from blowdown water and vented out the top of the blowdown separator in a cyclonic spinning action. Water and dissolved solids are flushed out the bottom drain.

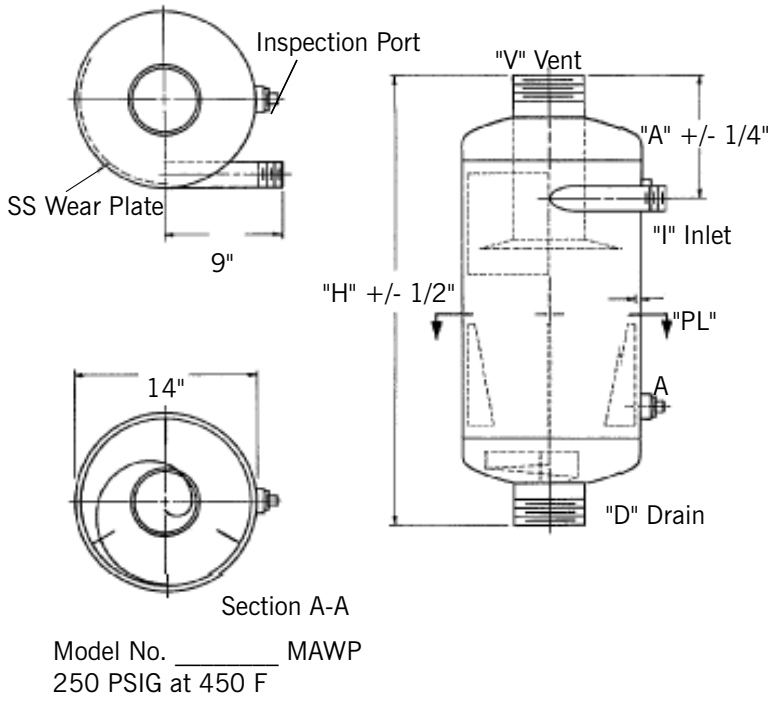
The design is quiet, with noise levels held below 90 dBA, so no exhaust head is required. Internal pressures do not exceed 5 psig. Blowdown water is cooled to 120 °F by a drain tempering device, designed to meet state and local codes.

Cleaver-Brooks blowdown separators are compact, and can be quickly installed with few connections. Accessories include leg or wall brackets, drain tempering fitting, strainer, temperature regulating valve, thermometer, pressure gauge and flanges.

- Pressure ranges:

  0 to 300 psig, standard.

  301 to 1600 psig, special.
- Available with ASME “U” stamp.



MODEL NO.	A20B	A34B	A56B
"H" Dimension	22"	34"	56"
"A" Dimension	10"	10-1/4"	11"

"I" Inlet size – Determined by blowdown valve size.
:V" Vent size – Select from Table 1.
"D" Drain size – Select from Table 1.
"PL" Plate size – 5/16" or 3/8". May be determined by codes.

HEADS	SA 516-70
SHELL	SA 53B
COUPLINGS	SA 105
WEAR PLATE	SA 240-304
BAFFLES	SA 240-304
NOZZLES	SA 53B, SA 106-B
FINISH	RED OXIDE PRIMER

Figure 1. Blowdown Separator Dimensions

Table 1. Boiler Blowdown Separator Sizing

BDV	PRESS.	TANK SIZE	INLET	DRAIN	VENT	CWI	BDV FLOW	COND GPM	COLD WATER	TOTAL DRAIN	FLASH
1"	50	14"X 20"	1"	2"	2 1/2"	1/2"	6444	12.17	12.52	24.69	360
1"	100	14"X 20"	1"	3"	2 1/2"	1/2"	11844	21.18	21.80	42.98	1252
1"	125	14"X 34"	1"	3"	3"	1/2"	13,604	23.56	24.25	47.81	1823
1"	150	14"X 34"	1"	3"	3"	1/2"	15394	26.48	27.25	53.72	2155
1"	200	14"X 34"	1"	3"	4"	3/4"	19690	32.84	33.80	66.64	3268
1"	250	14"X 34"	1"	4"	4"	1"	21838	35.25	36.27	71.52	4214
1"	300	14"X 56"	1"	4"	4"	1"	25060	39.70	40.85	80.54	5212
1 1/4"	50	14"X 20"	1 1/4"	3"	4"	1/2"	13472	25.44	26.17	51.61	754
1 1/4"	100	14"X 34"	1 1/4"	4"	4"	3/4"	22284	39.67	40.82	80.49	2448
1 1/4"	125	14"X34"	1 1/4"	4"	4"	1"	25379	43.96	45.23	89.19	3400
1 1/4"	150	14"X 34"	1 1/4"	4"	4"	1"	30792	52.96	54.50	107.46	4310
1 1/4"	200	14"X 34"	1 1/4"	4"	5"	1 1/4"	37848	63.13	64.96	128.09	6282
1 1/4"	250	14"X 56"	1 1/4"	4"	5"	1 1/2"	42339	68.34	70.32	138.65	8171
1 1/4"	300	14"X 56"	1 1/4"	4"	5"	1 1/2"	48754	77.23	79.47	156.70	10140
1 1/2"	50	14"X 34"	1 1/2"	3"	4"	3/4"	19437	36.70	37.76	74.46	1088
1 1/2"	100	14"X 34"	1 1/2"	4"	4"	1"	33573	60.03	61.77	121.80	3558
1 1/2"	125	14"x34"	1 1/2"	4"	4"	1 1/4"	38874	67.33	69.28	136.61	5209
1 1/2"	150	14"X 34"	1 1/2"	4"	5"	1 1/4"	44625	76.88	79.11	155.99	6184
1 1/2"	200	14"X 56"	1 1/2"	5"	5"	1 1/2"	53893	89.89	92.50	182.39	8946
1 1/2"	250	14"X 56"	1 1/2"	5"	6"	2"	60962	98.39	101.25	199.64	11765
1 1/2"	300	14"X 56"	1 1/2"	5"	6"	2"	69796	110.56	113.76	224.32	14517
2"	50	14"X 34"	2"	4"	5"	1 1/4"	37454	70.69	72.74	143.43	2108
2"	100	14"X 34"	2"	5"	5"	2"	60,536	108.24	111.38	219.62	6416
2"	125	14"x34"	2"	5"	5"	2"	70,893	122.79	126.36	249.15	9496
2"	150	14"X 56"	2"	5"	6"	2"	79721	137.12	141.09	278.21	11162
2"	200	14"X 56"	2"	6"	6"	2"	94496	157.62	162.19	319.81	15686
2"	250	14"X 56"	2"	6"	8"	2 1/2"	109261	176.35	181.46	357.81	21087
2"	300	14"X 56"	2"	6"	8"	2 1/2"	122550	194.12	199.75	393.87	25490

251-300 psig U. Symbol Construction and Stamping is required.

To use this chart:
1.Select separator size from this table by matching operating pressure and blow-down valve size.
2.Select Plate Thickness (PL) as local regulations require or as desired for maximum pressure stamped on Separator 3/16", 150 psig, 5/16", 225 psig, 3/8", 250 psig.
3.If local regulations require, indicate ASME or Standard. Separator size is now determined and discharge piping may follow these sizes with no calculation necessary. Separators are designed to exhaust at less than 5 psig.

Standard and Optional Equipment Selection

For dimensions and sizing of blowdown separators, refer to Figure 1 and Table 1.

For manual drain water tempering, use Aftercooler model 5D and specify drain diameter.

For automatic control of drain water temperature, use 18DF___ or 20AO___ Aftercooler. 20AO Aftercooler is required in some areas to automatically regulate the temperature of the water to the drain. Check local codes to ascertain if it is required in your area.

A temperature regulating valve should be used when the blowdown temperature going to the drain needs to be less than 212 °F. (See Table 2 to select cooling water line and valve size.)

Use a solenoid valve and thermostat when the cooling water pressure exceeds 80 psig.

1. Model 18DF Aftercooler (Figure 1) or Model 16DS (Figure 3). Nonclogging automatic drain tempering fitting with stainless steel mixing tongue (on 4" and larger) to provide thorough mixing of influent cold water with drain water. The middle flange (Model 18DF) permits rotation for various pipe fitting requirements and also serves as a dismantling flange. Two bulb-wells for mounting control valve and thermometer are furnished. When ordering, state cold water inlet size.

2. Model 20AO Jacket Type After Cooler (Figure 4). Required in some areas. Has mixing holes corresponding to the cold water inlet size. The lower portion is designed with wells to accommodate automatic control bulb and thermometer. When ordering state cold water inlet size.

3. Temperature Regulator Valves. Automatically control the flow of cold water by responding to temperature changes at the thermostatic bulb. The 6" capillary tube allows installation in the cold water line while the 11" bulb is mounted in the lower portion of the aftercooler. The valve size should correspond to the cold water inlet.

4. Thermometer. Bi-metal, drawn steel case, rust resistant and finished in oven baked enamel. Six inch brass stem with 1/4" NPT bushing provided for use with Model 18DF and Model 20AO Aftercoolers.

5. Solenoid Valve. Automatically controls cooling water to aftercooler. Non-magnetic stainless steel body; micro-finished, hardened pilot valve ball. Has two-wire control circuit (120/60). Well immersion hot water control provided for actuating solenoid valve.

6. The Model 5D Drain Tempering Fitting (Figure 5). Simple type of aftercooler for adding cooling water with manual control. It has cold water inlet for adding cooling water to drain for tempering to 120 °F. Inlet is sized for minimum influent water conditions of 60 °F water at 40 psig pressure with 100 sq-ft of supply. When ordering, state Model 5D (Drain Diameter); i.e. for 4" drain use Model 5D 4.

7. Armstrong Strainer. Cast iron with .045 stainless steel screen. Install in cold water line to protect temperature regulator valve or solenoid valve shown in adjacent column.

8. Separator Floor Stand (Figure 6). Provides and excellent means for supporting separators. Constructed of sturdy angle iron. They come attached to the separator to provide an easy and expedient means of installation. Standard height raises separator 18 inches from floor, or when aftercoolers are provided, additional height

is provided.

9.Separator Wall Brackets (Figure 7). For wall mounting where floor space is limited, or where desired installation is at a level higher than leg height of 18 inches.

A	B	C	CWI
2	20	3	1/2
2	20	3	3/4
2-1/2	20	3	3/4
3	20	3-1/2	3/4
3	20	3-1/2	1
4	20	3-1/2	1
4	20	3-1/2	1-1/4
5	20	3-1/2	1-1/4
5	20	3-1/2	1-1/2
6	20	4	1-1/2
6	20	4	2

NOTES:
1. Temperature regulator valve bulb is installed in lower section of the aftercooler so that the bulb senses mixed water temperature. Valve is modulating so that the right amount of cold water is added to cool the drain water to the desired temperature set on the valve. Valve range is 115 to 180 °F.

2. Regulator Valve has composition seat to ensure tight shut-off when not blowing down. Valve should be protected with C.1. Strainer with .045 mesh.

3. CWI = cold water inlet size.

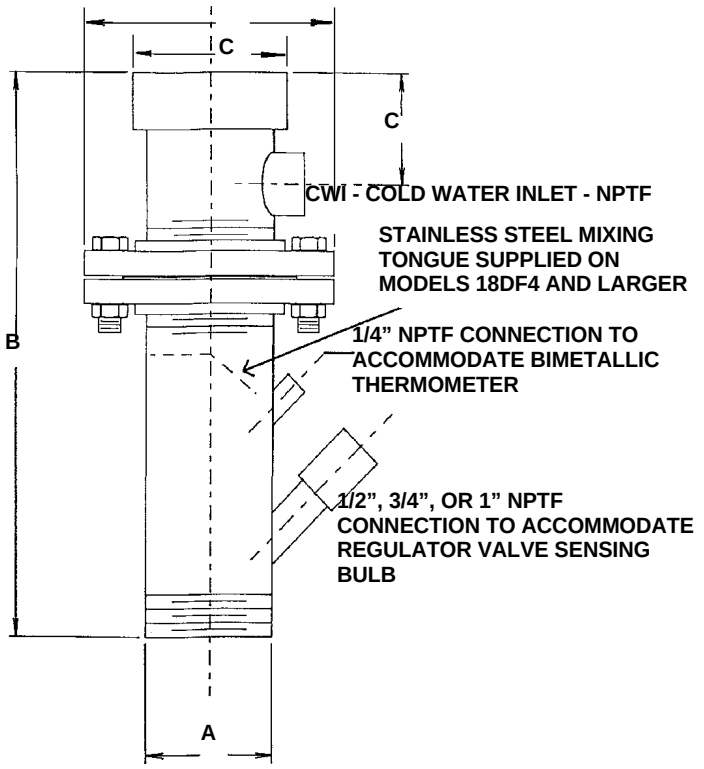


Figure 2. Automatic Drain Water Aftercooler (18DF) Dimensions

A	CWI	B
2	1/2	3
2	3/4	3
2-1/2	3/4	3
3	3/4	4-1/2
3	1	4-1/2
4	1	4-1/2
4	1-1/4	4-1/2
5	1-1/4	5
5	1-1/2	5
6	1-1/2	5
6	2	5

Temperature regulator valve sensing bulb is installed in lower section so that mixed water temperature is sensed by bulb. Valve modulates to add sufficient cold water to lower drain water temperature.

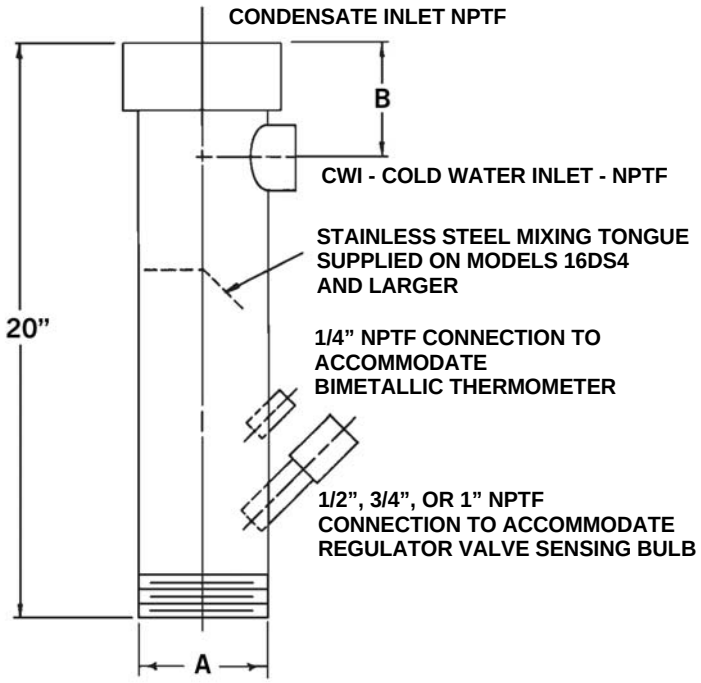


Figure 3. Automatic Drain Water Aftercooler (16DS) Dimensions

D_1	D_2	CWI
2	3	1/2
2	3	3/4
2-1/2	4	3/4
3	4	3/4
3	4	1
4	5	1
4	5	1-1/4
5	6	1-1/4
5	6	1-1/2
6	8	1-1/2
6	8	2

NOTES:
1. Temperature regulator valve bulb is installed in lower section of the aftercooler so that the bulb senses mixed water temperature. Valve is modulating so that the right amount of cold water is added to cool the drain water to the desired temperature set on the valve. Valve range is 115 to 180 °F.

2. Regulator Valve has composition seat to ensure tight shut-off when not blowing down. Valve should be protected with C.1. Strainer with .045 mesh.

3. CWI = cold water inlet size.

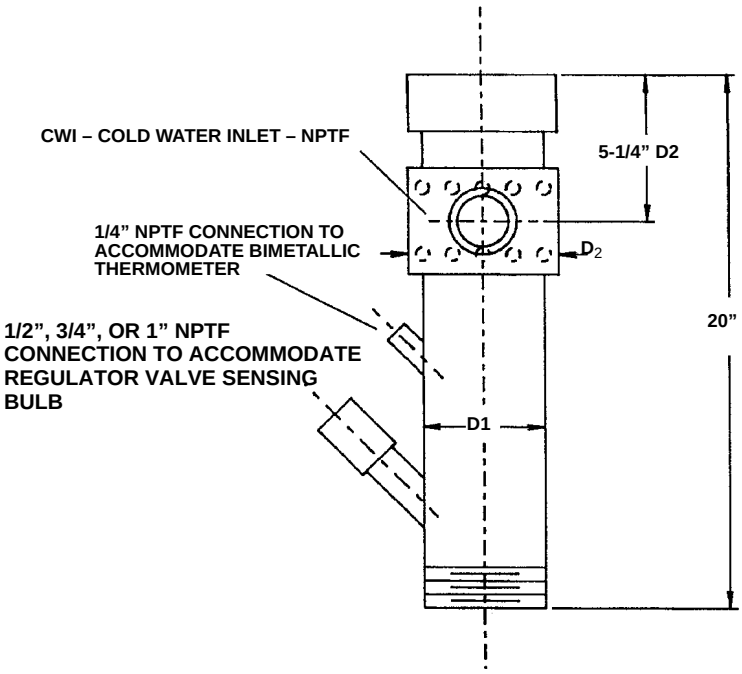


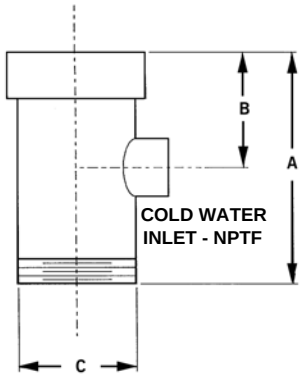
Figure 4. Automatic Drain Water Aftercooler (20AO) Dimensions

Table 2. Cooling Water Line and Valve Sizing

SEPARATOR INLET SIZE	1"			1-1/4"			1-1/2"			2"			2-1/2"		
COOLING WATER PRESS. (PSIG)	40	50	60	40	50	60	40	50	60	40	50	60	40	50	60
GENERATOR OPERATING PRESSURE (50 TO 70 °F COOLING WATER TEMPERATURE)															
0-50	1/2	1/2	1/2	1	1	1	1-1/4	1	1	1-1/4	1-1/4	1-1/4	1-1/2	1-1/2	1-1/2
51-100	1	3/4	3/4	1	1	1	1-1/4	1-1/4	1-1/4	1-1/2	1-1/2	1-1/4	2	2	2
101-125	1	3/4	3/4	1-1/4	1	1	1-1/4	1-1/4	1-1/4	2	2	1-1/2	2	2	2
126-175	1	1	1	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	2	2	2	2-1/2	2-1/2	2
176-225	1	1	1	1-1/4	1-1/4	1-1/4	1-1/2	1-1/2	1-1/4	2	2	2	2-1/2	2-1/2	2
226-250	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/2	1-1/2	1-1/4	2	2	2	2-1/2	2-1/2	2
251-300	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/2	1-1/2	1-1/4	2	2	2	2-1/2	2-1/2	2-1/2
GENERATOR OPERATING PRESSURE (71 TO 80 °F COOLING WATER TEMPERATURE)															
0-50	3/4	1/2	1/2	1	1	1	1-1/4	1	1	1-1/4	1-1/4	1-1/4	2	2	1-1/2
51-100	1	3/4	3/4	1-1/4	1	1	1-1/4	1-1/4	1-1/4	2	2	1-1/2	2	2	2
101-125	1	1	3/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	2	2	2	2-1/2	2-1/2	2
126-175	1	1	1	1-1/4	1-1/4	1-1/4	1-1/2	1-1/2	1-1/4	2	2	2	2-1/2	2-1/2	2
176-225	1	1	1	1-1/4	1-1/4	1-1/4	1-1/2	1-1/2	1-1/4	2	2	2	2-1/2	2-1/2	2-1/2
226-250	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/2	1-1/2	1-1/4	2-1/2	2-1/2	2	2-1/2	2-1/2	2-1/2
251-300	1-1/4	1-1/4	1-1/4	1-1/2	1-1/4	1-1/4	2	2	1-1/2	2-1/2	2-1/2	2	2-1/2	2-1/2	2-1/2

Use the chart as follows:
1. Depending upon the temperature of the cooling water used, locate the section of the chart which applies, 50-70 °F or 71 - 80 °F.
2. At the top of chart locate Separator inlet size and in left column under the section selected in step one, locate Boiler Operating pressure. You now have a selection of three valve sizes.
3. From the top of chart select the cooling water line pressure either 40, 50 or 60 and read the desired valve and line size.

A	B	C	CWI
6	3	2	3/4
6	3	2-1/2	3/4
7	3-1/2	3	1
7	3-1/2	4	1-1/4
7	3-1/2	5	1-1/2
8	4	6	2



NOTE:
1. Temperature regulator valve bulb is installed in lower section of the aftercooler so that the bulb senses mixed water temperature. Valve is modulating so that the right amount of cold water is added to cool the drain water to the desired temperature set on the valve. Valve range is 115 to 180 °F.

2. Regulator Valve has composition seat to ensure tight shut-off when not blowing down. Valve should be protected with C.1. Strainer with .045 mesh.

3. CWI = cold water inlet size.

4. 16DS Same as 18DF Without Flanges.

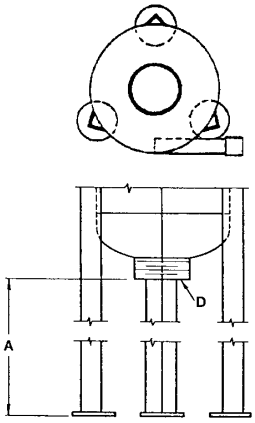
Figure 5. Model 5D Dimensions

For Screwed or Beveled Connections, Factory Fabricated 2" x 2" x 1/4" Angle Permissible Load 6000 lbs

If 18DF, 16DS, or 20AO Aftercooler is furnished with separator, see dimension chart for separator height “A”. “A” dimension is determined by separator drain size “D”. This provides adequate height for the aftercooler and elbow when required.

“A” dimension will always be 18" when separator is furnished without an aftercooler.

D	A
2	22
2-1/2	23
3	24
4	25
5	30
6	34



For Flanged Connections Factory Fabricated 2" x 2" x 1/4" Angle Permissible Load 6000 lbs.

If 18DF, 16DS, or 20AO Aftercooler is furnished with flanged connections on both ends, use dimension chart to determine separator height "A".

"A" dimension will always be 18" when separator is furnished without an aftercooler.

D	A
2	28
2-1/2	30
3	31
4	32
5	33
6	35

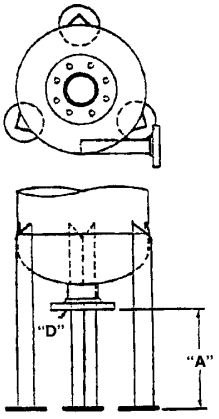
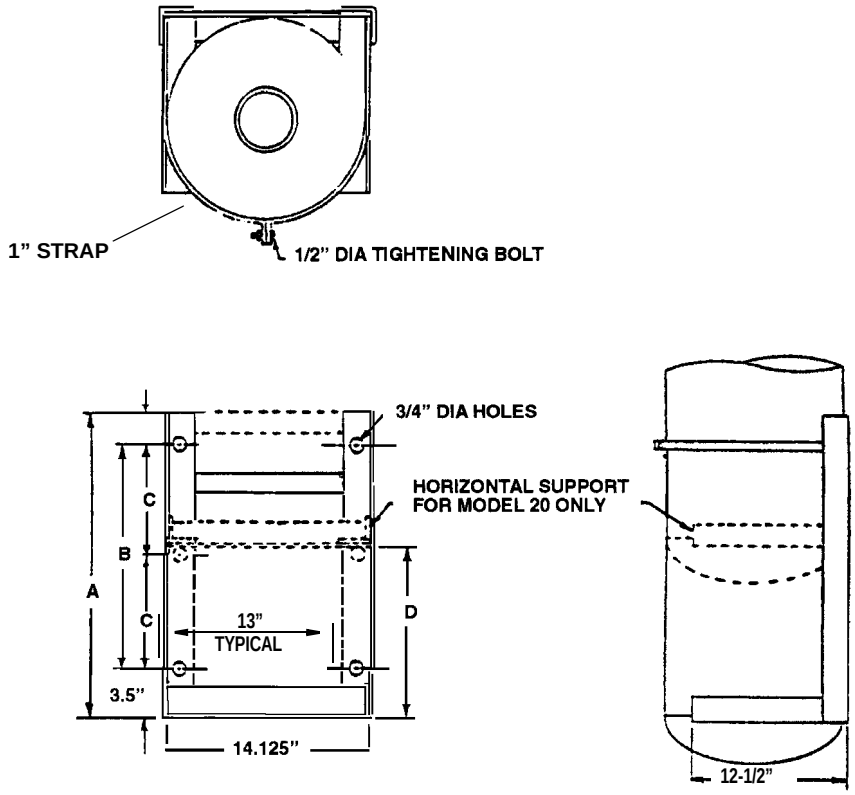


Figure 6. Separator Floor Stand



SEPARATOR WALL BRACKET 2 X 2 X 1/4" ANGLE

USE MODEL 20 W/20" SEPARATOR
USE MODEL 34 W/34" SEPARATOR
USE MODEL 56 W/56" SEPARATOR

MODEL	A	B	C	D
20	20	14	-	13
34	20	14	-	-
56	35	28	14	-

NOTE:
1. DIMENSION C IS FOR MODEL 56 ONLY.
2. DIMENSION D IS FOR MODEL 20 ONLY.

Figure 7. Separator Wall Bracket

Blowdown Separators
Sample Specifications

PART 1 GENERAL 1.1 GENERAL

The following sample specification is provided by Cleaver-Brooks to assist you in meeting your customer's requirements.

PART 2 PRODUCTS 2.1 EQUIPMENT

A. Blowdown Separaator

1. Furnish and install Cleaver-Brooks Model _____ blowdown separator with I=_____, D=_____, V=_____, and _____ plate thickness.
2. The separator shall be manufactured in accordance with ASME Code for 250 psig design and tested to 375 psig.
3. Provide separator with National Board stamping and "U" symbol. (Necessary in Michigan and Utah, optional elsewhere.)
4. The separator shall be furnished with _____ (screwed, weld bevel, 150# flanged or 300# flanged) connections.
5. The separator shall include a stainless steel striking plate at the point of inlet impingement and shall be furnished by Cleaver-Brooks.

B. Accessories

1. Provide a _____ solenoid valve to automatically control the flow of cold water by responding to temperature changes sensed at the thermostatic bulb in the aftercooler fitting.
2. Furnish a bi-metal thermometer with necessary adaptor bushing for use with _____ (18DF, 16DS, or 20AO) aftercooler.
3. Furnish a _____ cast iron strainer with .045 stainless steel screen ahead of the _____ (TRV or solenoid valve) to protect said valve against foreign matter.
4. Furnish and install an automatic drain water aftercooler, Model _____ (18DF, 16DS, or 20AO) with a _____ cold water connection for a _____ (TRV or solenoid valve and thermostat).
5. Provide a _____ temperature regulator valve to automatically control the flow of cold water by responding to temperature changes sensed at the thermostatic bulb in the aftercooler fitting.
6. Provide accessory separator floor stand or wall mounting bracket.

NOTES