

## FLASH SEPARATORS

### CONDENSATE HANDLING AND FLASH STEAM RECOVERY

- **Saves Money**

Recover Valuable BTU's in Flash Steam

- **Pre-engineered Design**

Convenient Charts for Easy Selection

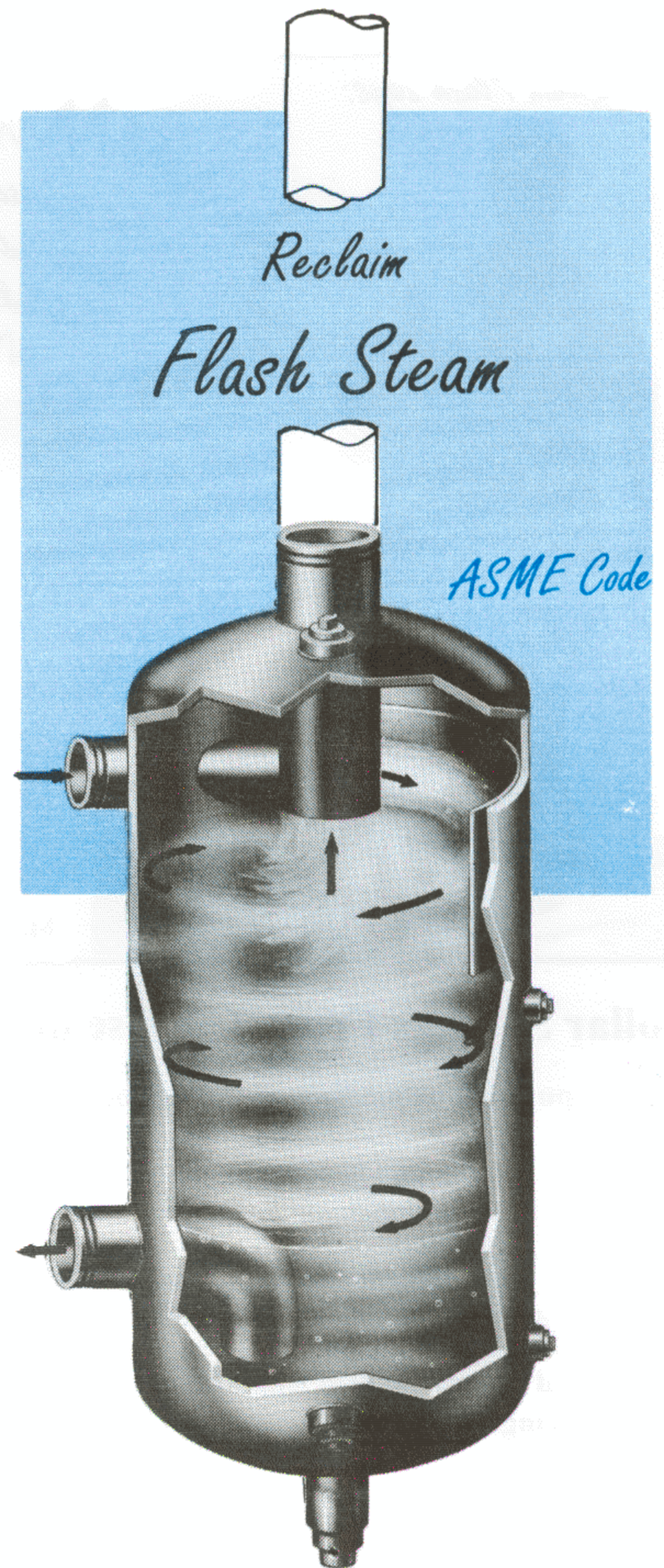
- **Smaller Size**

Replaces Larger Flash Tanks

- **Quality Construction**

Built to the ASME Code Sec. VIII, Div. 1

Penn Flash Separator uses a tangential inlet and cyclonic action to instantly separate steam and condensate. Our Flash separators are smaller in size and more efficient than traditional flash tanks. Because of our unique size they are usually less expensive than traditional flash tanks. The clean steam can be returned to a lower pressure saving valuable BTU's and make-up water. Return on investment can be in a matter of weeks. Easy Selection using our flash steam and selector charts assures proper sizing of a Flash Separator for your condensate requirements. Penn Separator has experience building pressure vessels to ASME Code since 1956. Each Flash Separator comes standard with ASME Code Sec. VIII, Div. I stamp.



**Penn Separator Corp.** - P.O. Box 340 • Brookville, PA 15825

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*Captain Flash says:*



## Why Penn Flash Separators are Rapidly Replacing Flash Tanks

Flash tanks are designed to have an internal velocity slow enough so that the venting steam will not pick up any water. To accomplish this a large diameter tank is required.

The Penn Flash Separator uses a smaller diameter tank and a tangential inlet that spins the condensate around creating a low pressure area in the center of the separator. This allows the condensate to flash into the center and follow it upwards to the centrally located vent providing clean dry steam.

The smaller size and clean dry steam are the reason why Penn Flash Separators are replacing traditional flash tanks.

MIKE O'HEARN, *Mr. Universe*

## Dollar Savings From The Use of a Penn Flash Separator:

You can put high or medium pressure condensate to work for you in the following way

10,000 #/hr. condensate at 100 psig taken to a Flash Separator and venting to a 5 psig deaerator or any low pressure steam use.

10,000 #/hr. from 100 psig to 5 psig gives 11.8% flash steam or 1180 #/hr. steam X 1156 btu's/lbs. gives 1,364,080 btu's/hrs. recovered / 1,000,000 btu's / .80 boiler efficiency x \$ 5.00 fuel cost/million BTU's

**Anticipated hourly savings from flash steam = \$ 8.52 / hour**

**Yearly Savings at \$ 8.52 x \* 2080 = \$ 17,721.80 / year** (\* Based on 8 hour day 5 days a week)

**Equipment cost using a FS 14-34 flash separator, trap, level gauge, safety relief valve, and legs \$ 2,135.00**

## Suggested Specifications:

Furnish and install as shown on plans a Vertical Cyclone Flash Separator Model No. FS \_\_\_\_\_" Dia. - \_\_\_\_\_" Height, as selected for a condensate flow rate of \_\_\_\_\_ #/hr. at \_\_\_\_\_ psig flashing to a pressure of \_\_\_\_\_ psi. The nozzles also selected for the flow rate shall include a \_\_\_\_\_" tangential inlet with stainless steel wear plate to match the condensate line size, a \_\_\_\_\_" water leg overflow type condensate drain, and a \_\_\_\_\_" centrally located steam vent to produce 97% quality flash steam. The tank shall include coupling connections for a level gauge, inspection openings and tank cleanout. Materials and locations per our spec print C-4B.

Optional accessories that can be provided include a (External Float Level Controller with a Pneumatic or Mechanical Control Valve or Armstrong Trap Model No. \_\_\_\_\_) properly sized for the condensate drain flow rate, inlet Check Valves (list sizes) as required for multiple inlets at various pressures, tank Clean-Out Ball Valve, Safety Relief Valve to protect the tank from over-pressurizing or to maintain a maximum venting pressure, a Pressure Gauge with Iron Siphon, and Industrial Type Thermometer.

Optional Supports include Angle Legs with Floor pads. Three legs are provided on 24" diameter separators and smaller and four legs are provided on larger separators. Your special mounting bracket designs are also available.



## Selecting a Flash Separator:

Flash Separators are sized for the condensate flow entering the tank and the amount of flash steam that is produced when venting to a lower pressure. To select a flash separator use Chart "A" to determine the flash steam amount and Chart "B" that gives the size of tank and nozzle connection sizes required.

From **Chart "A"** follow the "PRESSURE FROM" (horizontal at the top) down vertically to the "FLASH TO" pressure. All pressures are in psig. **Example:** 100 psig condensate "pressure from" flash to a low pressure application at 5 psig gives 11.8% condensate flashed into steam.

### CHART "A" - PERCENTAGE OF FLASH STEAM

#### PRESSURE FROM

	600	500	450	400	350	300	250	200	150	100	75	50	25
<b>500</b>	2.8												
<b>400</b>	5.8	3.1	1.3										
<b>350</b>	7.5	4.8	3.0	1.8									
<b>300</b>	9.2	6.6	4.8	3.6	1.9								
<b>250</b>	11.1	8.5	6.8	5.6	3.9	2.1							
<b>225</b>	12.2	9.7	8.0	6.8	5.1	3.3	1.2						
<b>200</b>	13.3	10.8	9.1	7.9	6.2	4.4	2.4						
<b>175</b>	14.4	11.9	10.3	9.1	7.4	5.7	3.7	1.3					
<b>150</b>	15.7	13.2	11.6	10.4	8.8	7.0	5.0	2.7					
<b>125</b>	17.1	14.6	13.0	11.9	10.3	8.5	6.6	4.3	1.6				
<b>100</b>	18.6	16.2	14.6	13.5	11.9	10.2	8.3	6.0	3.4				
<b>75</b>	20.3	18.0	16.4	15.3	13.7	12.1	10.2	7.9	5.4	2.0			
<b>50</b>	22.6	20.3	18.8	17.7	16.1	14.5	12.6	10.4	7.9	4.6	2.6		
<b>25</b>	25.4	23.1	21.6	20.6	19.1	17.5	15.6	13.5	11.0	7.8	5.9	3.3	
<b>15</b>	26.9	24.7	23.2	22.1	20.6	19.0	17.2	15.1	12.7	9.5	7.6	5.1	1.8
<b>10</b>	27.8	25.6	24.2	23.1	21.6	20.1	18.3	16.2	13.8	10.6	8.7	6.2	2.9
<b>5</b>	28.9	26.7	25.2	24.2	22.7	21.1	19.4	17.3	14.9	11.8	9.9	7.4	4.2
<b>0</b>	30.2	28.0	26.6	25.6	24.1	22.6	20.8	18.8	16.4	13.3	11.4	9.0	5.8

Knowing the flash steam percentage use **Chart "B"** "next page" to select the Flash Separator by finding the flash amount across the top and going down to the total condensate flow rate entering the separator shown on the left side of the chart. **Example:** Referring back to "Chart A" we had 11.8% flash steam. If you have a condensate flow rate of 10,000 #/hr. entering the separator you will have (10,000 X 11.8 %) or 1,180 #/hr. flashing to steam. Find the flash amount across the top of the chart for 1,180 #/hr. Use a amount not less then the actual steam amount or column 2,000 #/hr. and follow this down to the condensate amount of 10,000 #/hr. This example would use a 14" Dia. X 34" High Flash Separator with a 2" condensate drain and 4" steam vent.

#### SIZING NOTES:

1. Drain and vent sizes listed in Chart B are for atmospheric operating pressures. When the flash pressure is above atmospheric pressure a smaller drain and vent size may be used. The drain can be selected not to exceed the available flash to pressure in the vessel. The drain can also be selected to match the size of the trap or control valve. To select a vent for application above atmospheric pressure use the following formula:

$$\text{Minimum vent size formula: } \text{Dia.} = .0184 \times \sqrt{F \times SV}$$

Where: **Dia.** Equals the minimum diameter of vent (inches), **F** is the amount of flash steam in lbs./hour, the and **SV** is specific volume of steam (cu.ft/lbs.) at the lower pressure.

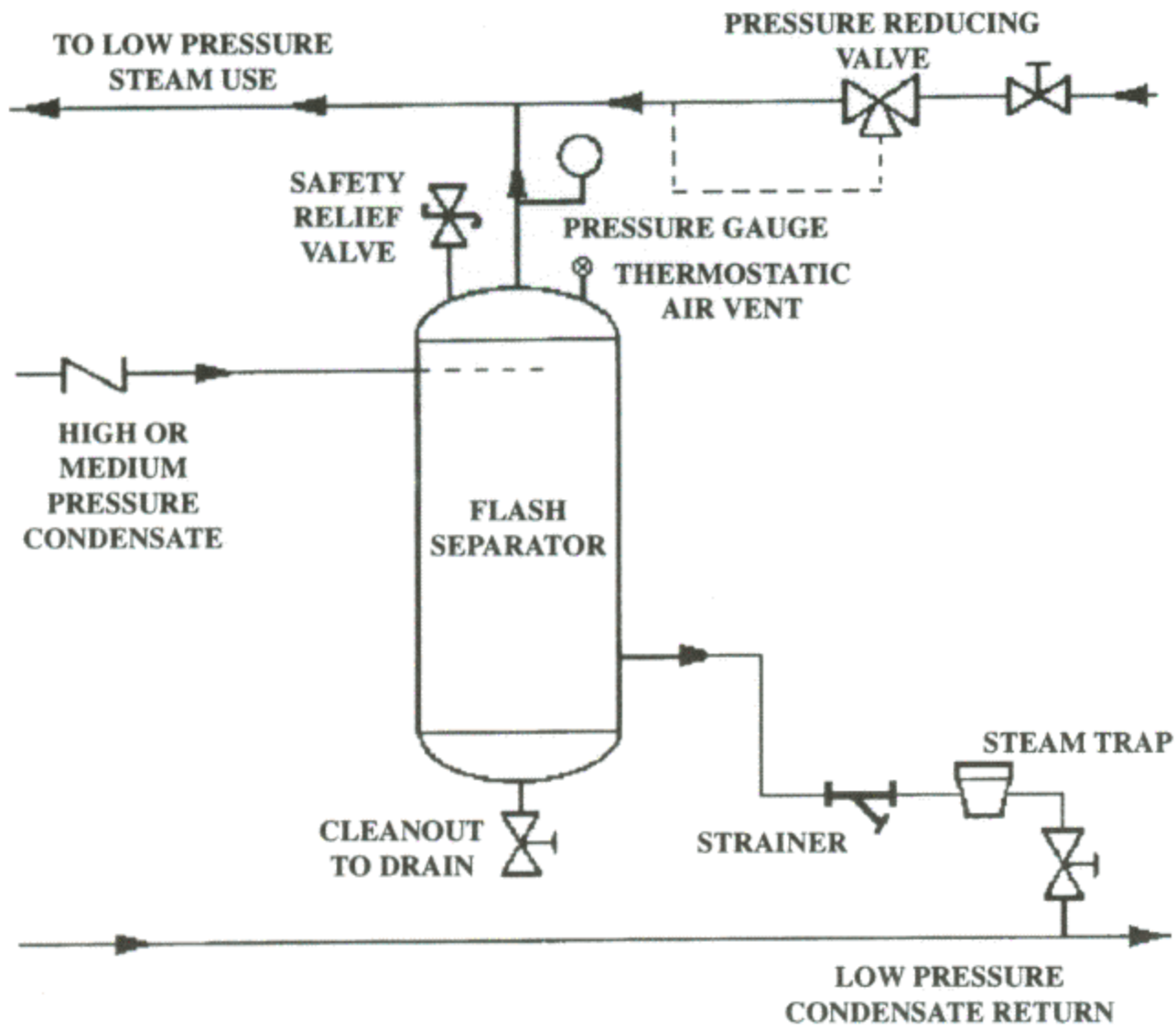
2. The condensate from the Flash Separator operating at atmospheric conditions can be directed to a floor drain. This type of separator can use a optional Penn Aftercooler Package to automatically cool the temperature of the condensate leaving the separator drain to an acceptable temperature. Refer to page C-3 "Cooling Chart - Flash Separator Discharge for recommended drain and cooling valve sizes.





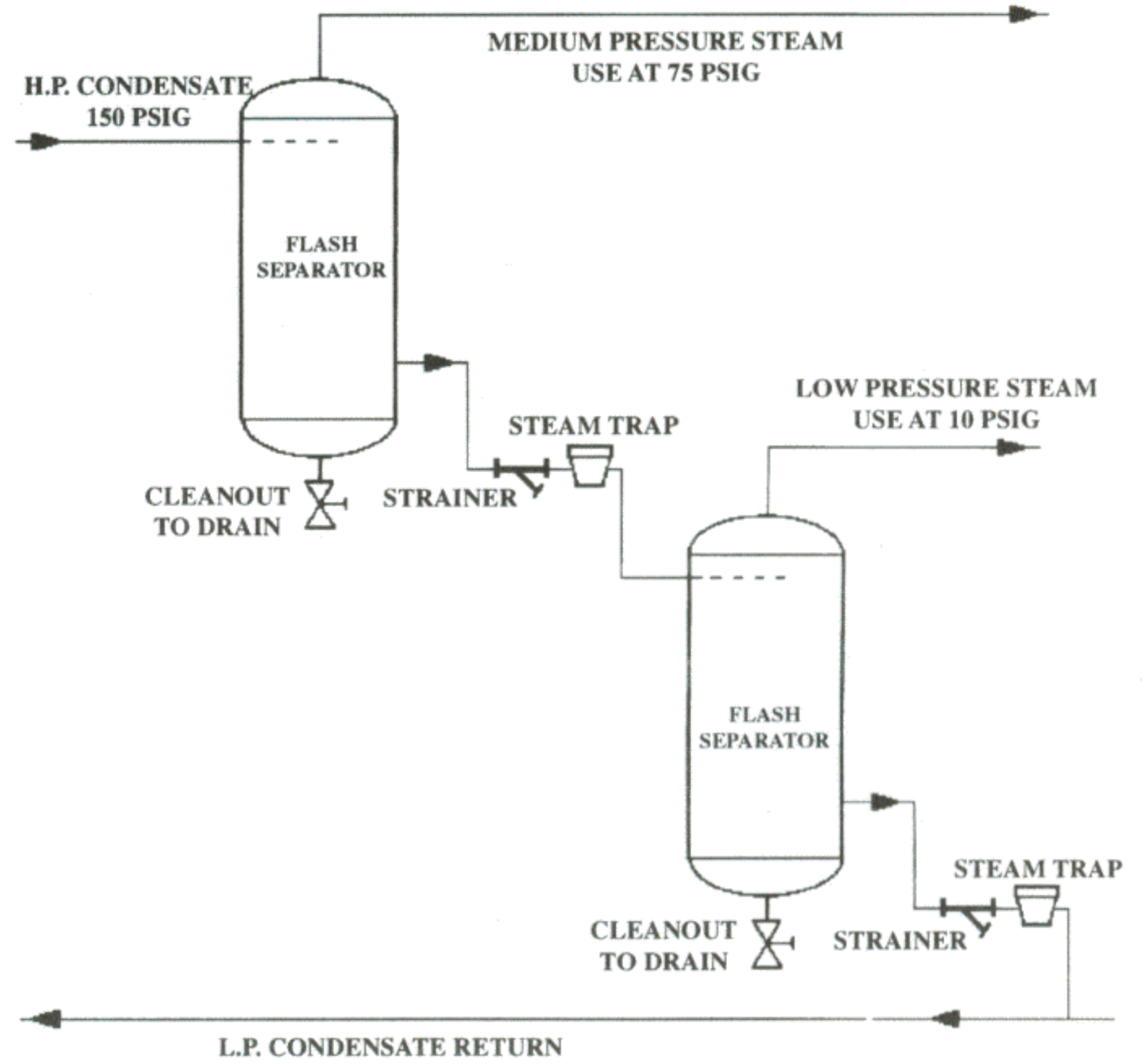


# USES OF FLASH SEPARATORS



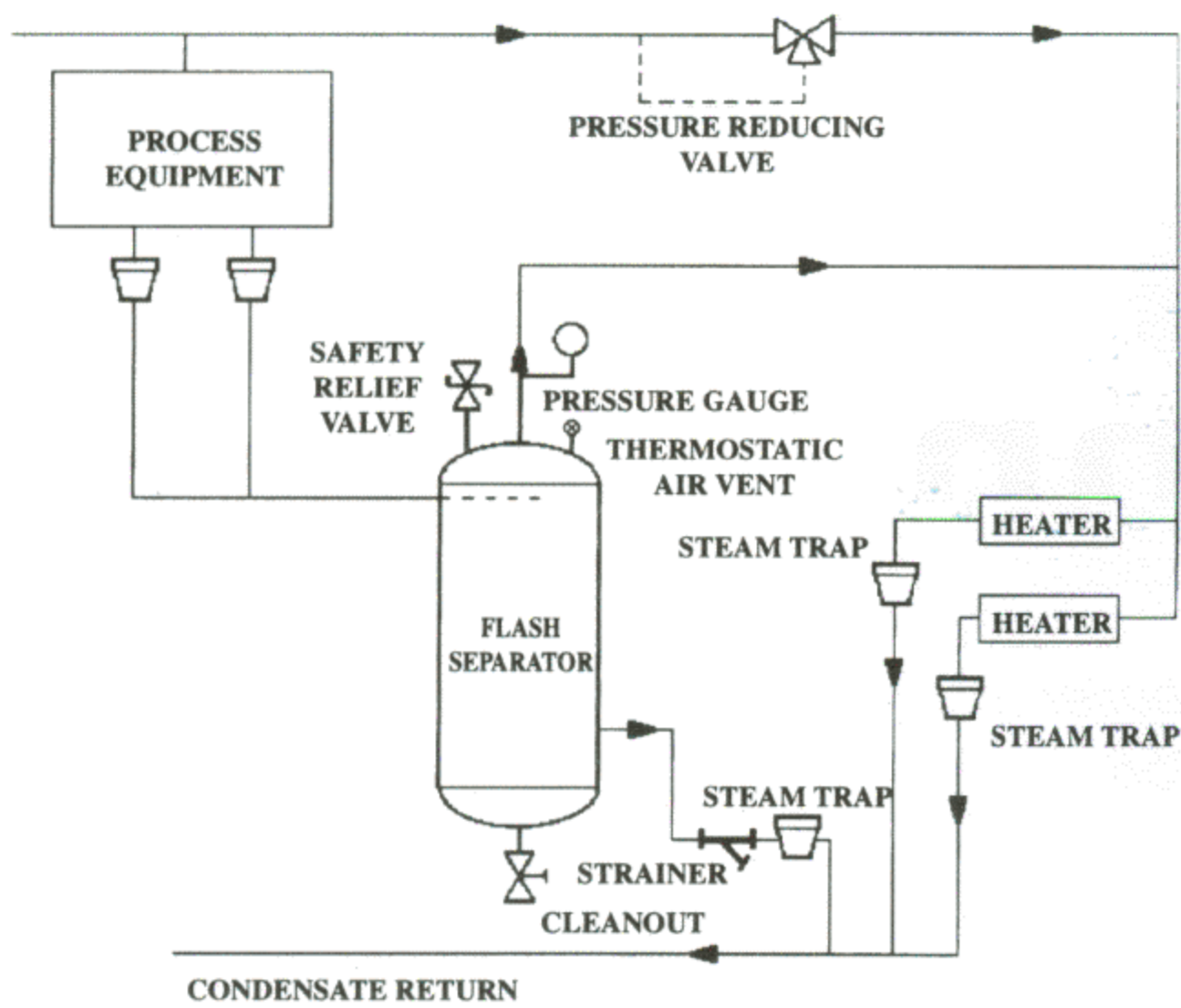
Sketch #1

Typical Flash Separator application flashes high or medium pressure condensate to supplement a low pressure steam use.



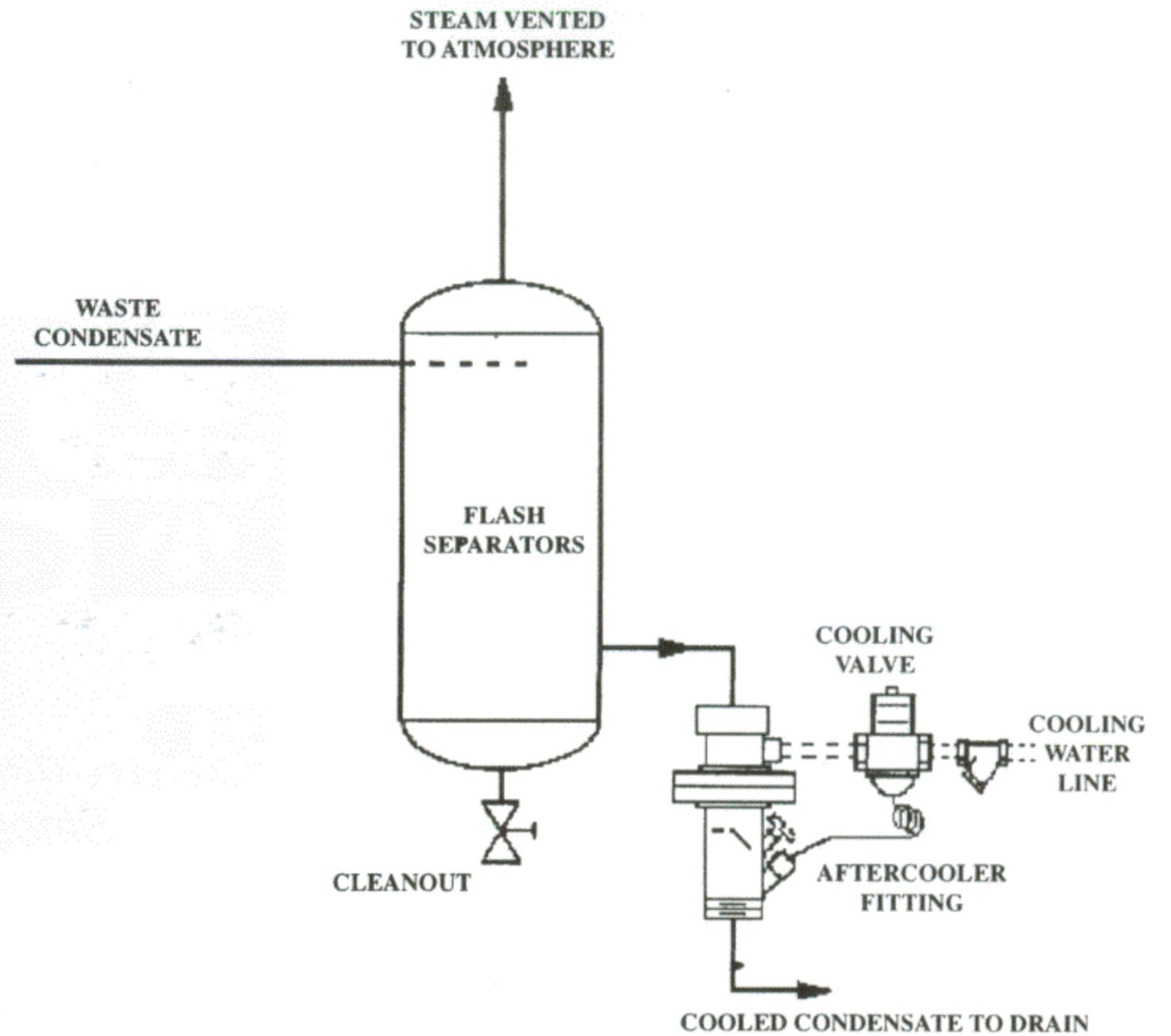
Sketch #3

Staged Flash Separators use two separators to supply medium and low pressure steam from high pressure condensate.



Sketch #2

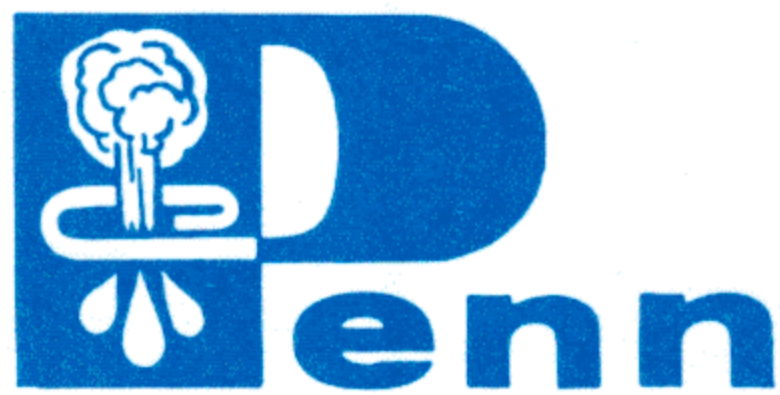
Flash Steam from a high pressure process to supply medium pressure steam to heaters.




Sketch #4

Waste condensate that needs cooled to drain can use a Flash Separator with our automatic aftercooler fitting and accessories.

# TABLES INDEX



Your de  *dable boiler accessories*  
Since 1956

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