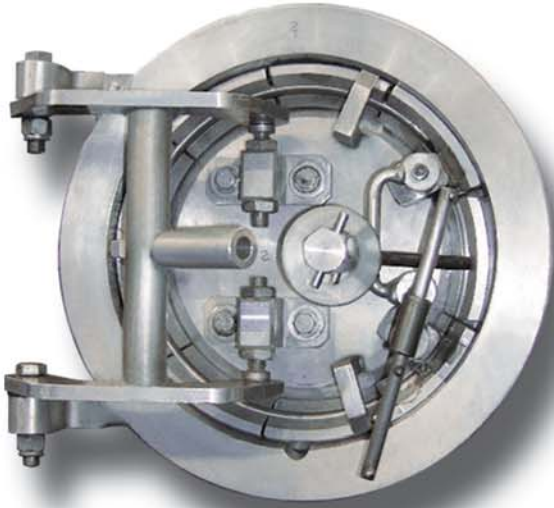


Yale® and SENTRY® Closures





Yale® Quick Opening Closures

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For fast, easy and economical accessibility to pipelines and other vessel applications, think first of the broad family of Yale® closures. Yale closures feature a quick-opening threaded design. The Yale product line includes a series of high pressure Figure 500™, 500R™ and 515™ threaded closures.

Yale® Figure 500™ The Original Threaded Closure

Over 60 years of reliable field service has made Yale the leader in the industry. With the original Figure 500™ closure, Yale was first to develop the inherent safety and operating ease of a threaded closure. The Figure 500 closure design combines simplicity and reliability through the use of a rugged, modified ACME thread to fasten the cap to the hub. The pressure seal is achieved by an O-ring set in the face of the hub. Figure 500 closures are manufactured in sizes 2"–14".



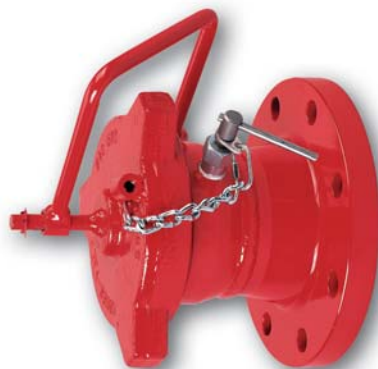
Yale® Figure 500R™ Closures

The Figure 500R™ was designed for larger diameter closure applications. Figure 500R closures are machined with a bevel seat. The bevel seat on the hub provides the operator an accurate stabbing section and reduces the risk for thread and seal damage. All Figure 500R closures also have a minimum of 3" thread length for greater safety and mechanical sealing integrity. The Figure 500R design is available in sizes 16" or larger. Closure horizontal hinges swing left or right for sizes 16" and above.



Yale® Figure 515™ Closures

The Figure 515™ flanged closure offers a bolted flange-to-flange configuration. A rugged ACME thread fastens the cap to the hub, making the Figure 515 the safest in the industry. The pressure seal is achieved by an O-ring set in the face of the hub. Figure 515 closures are available in diameter from 2"–72" and ANSI class 150 through 2500.





Field Weldable Hubs

The closure hub is field weldable using welding instructions furnished with each closure order. When attaching the closure hub to high-strength, thin-wall pipe, the O.D. of the hub weld bevel can be increased to compensate for the different Specified Minimum Yield Strengths (SMYS) as recommended in ASME B16.5, B31.4 and other pipeline codes. Thus, the standard closure hub of SA 350 LF2-CL1 forged steel can be jointed to pipe having a SMYS of up to 1.5 times the SMYS of SA 350 LF2-CL1. Materials to match higher strength pipe are available on request.

Double Safety Protection

The most important feature of the Yale® closures is safety. Preventing serious injuries, or even deaths, is of primary concern to R&M Energy Systems. Pressure Alert Valves (PAV™), standard on 6" and larger closures, provide warning of internal pressure. Furthermore, the threaded design makes Yale closures among the safest in the industry. For example, if pressure was trapped behind the cap of the closure, it would be extremely difficult to unscrew the cap because of the thread friction. However, if the cap was rotated less than 1/4 turn, the pressure energized O-ring would relax and the trapped pressure would bleed around the threads. At this point, there would still be over 90% of thread engagement holding the cap onto the hub.



The threaded design makes Yale closures among the safest in the industry

Pressure Alert Valve (PAV™)

A Pressure Alert Valve (PAV™) is furnished as standard equipment on all 6" and larger closures (may be purchased as an option on smaller sizes). The PAV is installed on the closure hub. A chain attaches the PAV stem to the closure cap (see photo bottom left). Before the cap can be rotated, the valve stem must be removed from the PAV body. This action is designed to warn the operator of any residual pressure in the vessel before the closure cap is loosened. **The PAV is NOT designed to function as a bleed down or blowdown valve.**



Pressure Alert Valve



A Yale® Figure 500R™ Closure installed on pig launcher

Closure Design Options

To accommodate most applications Yale® closures are available for HORIZONTAL, VERTICAL or ANGLE installations.

Horizontal closures are equipped with side arm hinges or jib arm hinges depending on closure size and pressure rating.

Side arm hinges are hinged on the left side (facing the closure) unless ordered otherwise.

Jib arm hinges will permit the cap to swing to either side after opening, thus providing greater installation and operational flexibility.

Six inch and larger **closure caps for vertical installations** are suspended from a davit hinge by a threaded center pin having the same thread pitch as the closure.

Angled closure hinges are custom designed to match the specified incline or decline angle.

All closure hinges are adjusted at the factory to support the entire weight of the closure cap. This prevents the cap from resting on the threads of the mating hub and allows even the heaviest of caps to be easily rotated off and on the threaded hub. If field adjustment is necessary, the horizontal jib and the 26" and larger vertical davit have adjustment in two planes permitting fast, positive positioning of the cap relative to the hub. Twenty-four inch and smaller vertical davits have adjustments in the vertical plane only.

Twelve inch and smaller closures can be ordered with any of the following options or combinations:

- Cap and hub only
- Cap and hub with chain and swivel
- Cap and hub with Figure 500 bleeder plug
- Cap and hub with PAV
- Cap and hub with hinge (excluding 2")
- Closure caps can be center drilled and tapped for no hinge closures, or drilled and tapped off center for hinged closures.
- Cap pins on vertically hinged closures can be drilled and tapped as follows: Sizes 8" to 14" drilled $\frac{1}{4}$ " thru and tapped $\frac{3}{8}$ " NPT; sizes 16" and larger, drilled $\frac{1}{2}$ " thru and tapped $\frac{1}{2}$ " NPT. Larger NPT couplings available upon request.



Horizontal Closure
(Side arm hinge shown)



Vertical Closure



Angled Closure
(Inclined shown, declined available)



No Hinge Closure

NOTE: From pipeline horizontal centerline, incline angles up, decline angles down.

Materials

Standard materials used in closures are made to ASTM specifications and are types permitted under ASME Section VIII, Division 1, Boiler and Pressure Vessel Code. Closure hubs and most 14" and smaller caps use SA 350 LF2-CL1. The standard material for 16" and larger caps is SA 516 Grade 70 normalized. Standard material for flanges for Figure 515™ closures is SA105N. Materials for special applications, including hinges for offshore service, can be furnished upon request.

O-Ring Material

Pressure, temperature and chemical environments need to be considered when selecting O-ring material.

The standard O-ring material for Yale® closures is **Nitrile (NBR)** which has both excellent resistance to the effects of most hydrocarbons and very good flexibility at low temperature. The maximum operating temperature is 250° F.

FKM (Viton®) O-rings are recommended for higher temperature applications to 400° F.

Ethylene Propylene (EP) Rubber compounds are available for glycol and steam service up to 300° F.

Other elastomers are available for specific service conditions.

Code Compliance

Yale® closures are designed and proof tested in accordance with the requirements of ASME Section VIII, Division 1 Boiler and Pressure Vessel Code. The table on page 7 lists suggested allowable working pressures based on ANSI B16.5 class designations.

It is important to provide R&M Energy Systems with system design pressure, line size, operating temperature, and application code to ensure the most economical closure selection.

ASME Code Stamped Closures

Yale® closures can be code stamped and U-2A Partial Data Reports furnished. Code stamping verifies shop inspection of the closure and materials by an ASME Authorized Inspector.

Manufacturer's Statement of Code Compliance

A manufacturer's statement of code compliance can be furnished affirming that the closure is manufactured in accordance with the requirements of an applicable code including ASME, API 6-H, ANSI, DOT and customer specifications.





Yale® Figure 500™ with PAV™

How to Order Yale® Closures

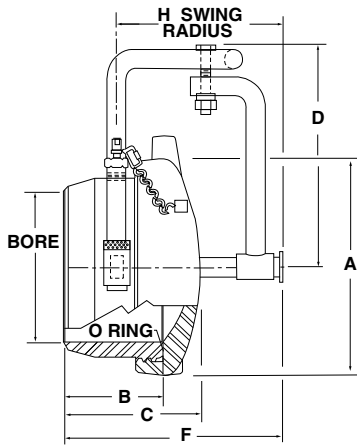
To assure proper handling of your order, the following information must be provided:

1. Maximum design pressure or ANSI rating and minimum and maximum design temperature.
2. Design factor.
3. Maximum field test pressure.
4. I.D., wall thickness, nominal pipe diameter and grade of material of the matching pipe.
5. Type of hinge as determined by position of the installation:
 - (a) Horizontal — Horizontal hinges — Sizes 3"-14" are hinged on the left side (facing the closure) unless ordered otherwise. Larger sizes are hinged in the center and will swing to either side.
 - (b) Vertical — Vertical hinge.
 - (c) Angle — Angle hinge (specify inclined or declined and degree of angle) refer to photo on page 5.
 - (d) Flanged — for bolt up applications (provide desired material).
6. Mating flange type and rating.
7. Service to determine proper O-ring material. Use only factory replacement O-rings.
8. Specific codes or special material requirements applicable to the closure design.

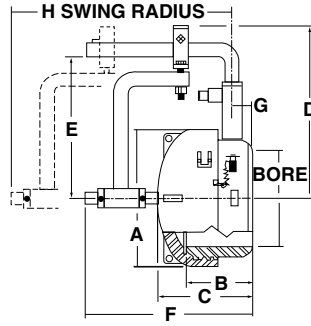
Class Designations and Pressures

Closure	ANSI Working Pressure -50° to 400° F			Hydrostatic Test Pressure		
	PSI	bar	kPa	PSI	bar	kPa
Series						
150	285	19.6	1960	450	30	3000
300	740	51.1	5110	1125	77	7700
400	990	68.3	6828	1500	103	10300
600	1480	102.1	10210	2225	154	15400
900	2220	153.2	15320	3350	230	23000
1500	3705	255.3	25530	5575	383	38300
2500	6170	425.5	42550	9275	639	63900

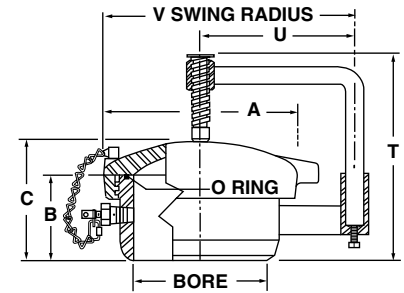
Yale® Quick Opening Closures | Figure 500™ and 500R™ Dimensional Data



Horizontal 3" - 14"



Horizontal 16" and Larger



Vertical

Yale® Figure 500™ and 500R™ Dimensions

Closure Size & Series (Note 1)	A Cap O.D.	B Hub Length	C Cap/Hub Makeup	Horizontal					Vertical			
				D	E	F	G Min.	H Swing Radius	T Height	U	V Swing Radius	
2 150/900	4 ³ / ₈	2 ⁵ / ₈	3 ¹ / ₄	NO HINGE								
3 150/900	5 ¹ / ₂	2 ⁵ / ₈	3 ¹ / ₄	6	N/A	7	N/A	8 ³ / ₄	7	7	8 ³ / ₄	
4 150/900	6 ³ / ₄	3 ¹ / ₂	5	7	N/A	8	N/A	9 ¹ / ₄	7	8	9 ¹ / ₄	
6 150/600	9 ³ / ₄	4 ¹ / ₂	5 ³ / ₄	9	N/A	10 ¹ / ₂	N/A	13	11	8	13	
8 150/600	11 ¹ / ₄	5	6 ³ / ₄	9 ¹ / ₂	N/A	11	N/A	15	12	8 ¹ / ₂	14 ¹ / ₄	
8 900	12 ¹ / ₄	5 ¹ / ₂	7 ³ / ₄	13 ¹ / ₂	N/A	13 ¹ / ₂	N/A	16	14 ¹ / ₄	9	15 ¹ / ₄	
10 150/600	13 ⁷ / ₈	5 ¹ / ₂	8	14 ³ / ₄	N/A	13 ¹ / ₂	N/A	18	14 ¹ / ₄	11 ¹ / ₂	18 ¹ / ₂	
10 900	15 ⁷ / ₈	5 ¹ / ₂	10 ¹ / ₂	15 ¹ / ₂	N/A	13 ³ / ₄	N/A	18	14	12 ³ / ₄	20	
12 150/600	15 ³ / ₈	5 ¹ / ₂	8	15 ¹ / ₂	N/A	13 ¹ / ₂	N/A	20	14 ¹ / ₄	12 ¹ / ₄	20	
12 900	16 ³ / ₄	5 ¹ / ₂	11 ¹ / ₄	15 ¹ / ₂	N/A	13 ³ / ₄	N/A	20	13 ³ / ₂	12 ¹ / ₂	21	
14 150/600	18	5 ¹ / ₂	8	17 ¹ / ₄	N/A	13 ¹ / ₂	N/A	22	14 ¹ / ₄	13	22	
14 900	18 ³ / ₄	8 ¹ / ₂	14 ¹ / ₄	24	20	24 ³ / ₄	22	32	24	18 ³ / ₄	28	
16 150/600	19 ⁷ / ₈	9 ¹ / ₄	14 ¹ / ₂	24 ³ / ₄	20 ³ / ₈	25 ³ / ₄	2 ¹ / ₄	33	25	20	30	
16 900	20 ⁷ / ₈	10	15 ³ / ₄	24 ³ / ₄	20 ³ / ₈	26 ¹ / ₄	3	33	26 ¹ / ₄	20	30 ¹ / ₂	
18 150/600	22 ⁷ / ₈	9 ¹ / ₄	15 ¹ / ₄	25 ³ / ₄	21 ³ / ₈	26 ¹ / ₄	2 ¹ / ₄	33	25 ³ / ₄	21	32 ¹ / ₄	
18 900	23 ¹ / ₈	10	16	25 ³ / ₄	21 ³ / ₈	26 ³ / ₄	3	33	27	21	32 ³ / ₄	
20 150/600	24 ³ / ₈	11	16 ³ / ₄	27 ¹ / ₂	27 ³ / ₈	27 ¹ / ₂	3 ¹ / ₄	47	27 ¹ / ₂	22	34 ¹ / ₄	
20 900	25 ¹ / ₂	13	19 ¹ / ₂	29 ¹ / ₂	27 ³ / ₈	29 ¹ / ₂	4 ¹ / ₄	47	28 ³ / ₄	23	35 ¹ / ₈	
22 150/600	26 ¹ / ₈	11	17 ³ / ₄	28 ¹ / ₂	28 ⁷ / ₈	28 ¹ / ₂	4 ¹ / ₄	47	28 ³ / ₄	23 ³ / ₄	36 ³ / ₄	
22 900	28 ¹ / ₄	13	19 ¹ / ₄	29 ¹ / ₄	28 ⁷ / ₈	30	3 ¹ / ₄	47	29 ¹ / ₂	23 ³ / ₄	37 ¹ / ₂	
24 150/600	29	11	19	35 ³ / ₄	30 ³ / ₈	29 ¹ / ₄	3 ¹ / ₄	48	29 ¹ / ₂	25 ¹ / ₄	39	
24 900	30 ³ / ₈	13	20 ¹ / ₂	35 ³ / ₄	30 ³ / ₈	33 ¹ / ₂	3 ¹ / ₄	48	30	25 ¹ / ₄	40	
26 150/600	31 ¹ / ₄	11	18 ¹ / ₂	35 ³ / ₄	31 ³ / ₈	32 ¹ / ₂	3 ¹ / ₄	48	34 ¹ / ₂	27 ³ / ₄	43 ¹ / ₂	
26 900	32 ⁷ / ₈	13	21 ¹ / ₄	39 ³ / ₄	29 ¹ / ₄	34 ¹ / ₄	4 ¹ / ₄	48				
28 150/600	33 ¹ / ₂	11	19	40 ³ / ₄	30 ¹ / ₄	33 ¹ / ₄	3 ¹ / ₄	48	34 ¹ / ₂	28 ³ / ₄	45 ³ / ₄	
28 900	35 ¹ / ₈	13	21 ³ / ₄	40 ³ / ₄	30 ¹ / ₄	34 ¹ / ₄	4 ¹ / ₄	48				
30 150/600	35 ⁷ / ₈	12	20 ¹ / ₂	41 ³ / ₄	31 ¹ / ₄	33 ³ / ₄	3 ¹ / ₄	48	36 ¹ / ₄	29	47	
30 900	37 ¹ / ₂	16	22 ¹ / ₄	50 ¹ / ₄	33 ¹ / ₄	35 ¹ / ₄	5	59				
32 150/600	38 ¹ / ₈	12	21	42 ³ / ₄	32 ³ / ₄	34	3 ¹ / ₄	48	36 ¹ / ₂	30	49 ¹ / ₄	
32 900	39 ⁷ / ₈	16	26 ¹ / ₄	51 ¹ / ₄	34 ¹ / ₄	38 ¹ / ₄	5	59				
34 150/600	40 ¹ / ₄	12	21 ¹ / ₂	43 ³ / ₄	33 ³ / ₄	34 ¹ / ₂	3 ¹ / ₄	48	36 ³ / ₄	31	51 ¹ / ₄	
34 900	42 ³ / ₈	16	27	51 ¹ / ₄	34 ¹ / ₄	39	5	59				
36 150/300	40 ³ / ₈	13	22 ¹ / ₄	53 ³ / ₄	36 ¹ / ₄	36	4	59	38 ¹ / ₂	36	56 ¹ / ₄	
36 400/600	42 ³ / ₈	15	25 ¹ / ₄	53 ³ / ₄	36 ¹ / ₄	38 ¹ / ₄	5	59	40 ¹ / ₂	36	57 ¹ / ₄	
36 900	44 ¹ / ₂	16	27 ¹ / ₄	53 ³ / ₄	36 ¹ / ₄	40 ¹ / ₄	5	59	52 ¹ / ₄	37 ³ / ₄	59 ³ / ₄	
38 150/300	42 ³ / ₄	14	23 ³ / ₄	54 ¹ / ₂	37 ¹ / ₂	37	4	60				
38 400/600	44 ⁷ / ₈	15	25 ³ / ₄	55 ¹ / ₂	38 ¹ / ₄	38 ³ / ₄	5	59				
38 900	47	17	28 ³ / ₄	54 ¹ / ₂	37 ¹ / ₂	43 ¹ / ₄	5	59				
40 150/300	44 ⁷ / ₈	13	23 ¹ / ₂	55 ¹ / ₄	39 ¹ / ₂	37 ¹ / ₂	5	59				
40 400/600	47	15	26 ¹ / ₄	55 ¹ / ₂	38 ¹ / ₄	39	5	59	41 ¹ / ₄	38	61 ¹ / ₂	
42 150/300	46 ⁷ / ₈	13	23 ³ / ₄	56 ¹ / ₂	39 ¹ / ₄	37 ³ / ₄	4	60				
42 400/600	49 ¹ / ₄	15	26 ³ / ₄	56 ¹ / ₂	39 ¹ / ₄	39 ¹ / ₂	5	60	41 ³ / ₄	39	63 ³ / ₄	

Sizes 44" and larger available upon request.

Note 1: All Dimensions Nominal and for reference only. Dimension drawings can be provided upon request at time of order.

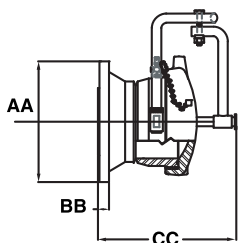
N/A - not applicable

Yale® Figure 515™ Dimensions

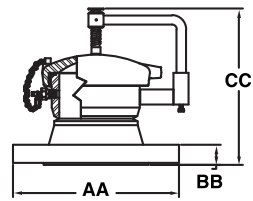
Size	ANSI	AA	BB	CC		Size	ANSI	AA	BB	CC		Size	ANSI	AA	BB	CC	
				Vert	Horz					Vert	Horz					Vert	Horz
2"	150	6.000	0.750	5.750	5.750	26"	150	34.250	2.690	39.250	37.250	36"	150	46.000	2.375	43.875	41.375
	300	6.500	0.875	6.000	6.000		300	38.250	3.125	41.750	39.750		300	50.000	4.125	48.000	45.500
	600	6.500	1.000	6.125	6.125		600	40.000	4.250	43.250	41.250		400	50.000	4.500	50.375	48.125
	900	8.500	1.500	7.250	7.250		900	42.750	5.500		45.500		600	51.750	4.875	51.625	49.375
3"	150	7.500	0.938	9.750	9.750	28"	150	36.500	2.810	39.440	38.190	38"	150	48.750	3.440		43.190
	300	8.250	1.125	10.125	10.125		300	40.750	3.380	42.250	41.000		300	46.000	4.250		44.120
	600	8.250	1.250	10.250	10.250		600	42.250	4.380	43.750	42.500		400	47.500	4.880		46.870
	900	9.500	1.500	11.000	11.000		900	46.000	5.620		46.000		600	50.000	6.000		48.750
4"	150	9.000	0.938	10.000	11.000	30"	150	38.750	2.125	41.375	38.875	40"	150	50.750	3.560		43.940
	300	10.000	1.250	10.375	11.375		300	43.000	3.625	44.500	42.000		300	48.750	4.500		45.120
	600	10.750	1.500	11.000	12.000		600	44.500	4.500	46.000	43.500		400	50.000	5.120	49.750	47.500
	900	11.500	1.750	11.500	12.500		900	48.500	5.875		47.500		600	52.500	6.250	51.630	49.380
6"	150	11.000	1.000	14.500	14.000	32"	150	41.750	3.190	42.190	39.690	42"	150	53.000	3.810		44.500
	300	12.500	1.438	14.875	14.375		300	45.250	3.880	45.250	42.750		300	50.750	4.690		45.630
	600	14.000	1.875	15.625	15.125		600	47.000	4.620	46.750	44.250		400	52.000	5.250	50.560	48.310
8"	150	13.500	1.125	16.000	15.000		900	51.750	6.250		51.250		600	55.250	6.620	52.750	50.500
	300	15.000	1.625	16.375	15.375	34"	150	43.750	3.250	42.630	40.380	44"	150	57.500	7.500		57.130
	600	16.500	2.188	17.250	16.250		300	47.500	4.000	45.870	43.620		300	50.750	4.690		45.630
	900	18.500	2.500	20.625	19.875		600	49.000	4.750	47.370	45.120		400	52.000	5.250	50.560	48.310
10"	150	16.000	1.188	18.250	17.500		900	55.000	6.500		52.750		600	55.250	6.620	52.750	50.500
	300	17.500	1.875	18.875	18.125	36"	150	41.750	3.190	42.190	39.690	46"	150	57.500	7.500		57.130
	600	20.000	2.500	20.250	19.500		300	45.250	3.880	45.250	42.750		300	50.750	4.690		45.630
	900	21.500	2.750	21.250	20.500		600	47.000	4.620	46.750	44.250		400	52.000	5.250	50.560	48.310
12"	150	19.000	1.250	18.750	18.000		900	51.750	6.250		51.250		600	55.250	6.620	52.750	50.500
	300	20.500	2.000	19.375	18.625	38"	150	43.750	3.250	42.630	40.380	48"	150	57.500	7.500		57.130
	600	22.000	2.625	20.375	19.625		300	47.500	4.000	45.870	43.620		300	50.750	4.690		45.630
	900	24.000	3.125	21.375	21.125		600	49.000	4.750	47.370	45.120		400	52.000	5.250	50.560	48.310
14"	150	21.000	1.375	19.250	18.500		900	55.000	6.500		52.750		600	55.250	6.620	52.750	50.500
	300	23.000	2.125	19.875	19.125	40"	150	43.750	3.250	42.630	40.380	50"	150	57.500	7.500		57.130
	600	23.750	2.750	20.750	20.000		300	47.500	4.000	45.870	43.620		300	50.750	4.690		45.630
	900	25.250	3.375	32.375	33.125		600	49.000	4.750	47.370	45.120		400	52.000	5.250	50.560	48.310
16"	150	23.500	1.438	30.000	30.750		900	55.000	6.500		52.750		600	55.250	6.620	52.750	50.500
	300	25.500	2.250	30.750	31.500	42"	150	43.750	3.250	42.630	40.380	52"	150	57.500	7.500		57.130
	600	27.000	3.000	32.000	32.750		300	47.500	4.000	45.870	43.620		300	50.750	4.690		45.630
	900	27.750	3.500	34.750	34.750		600	49.000	4.750	47.370	45.120		400	52.000	5.250	50.560	48.310
18"	150	25.000	1.563	31.125	31.750		900	55.000	6.500		52.750		600	55.250	6.620	52.750	50.500
	300	28.000	2.375	32.000	32.500	44"	150	43.750	3.250	42.630	40.380	54"	150	57.500	7.500		57.130
	600	29.250	3.250	33.000	33.500		300	47.500	4.000	45.870	43.620		300	50.750	4.690		45.630
	900	31.000	4.000	36.000	35.750		600	49.000	4.750	47.370	45.120		400	52.000	5.250	50.560	48.310
20"	150	27.500	1.688	33.188	33.188		900	55.000	6.500		52.750		600	55.250	6.620	52.750	50.500
	300	30.500	2.500	33.875	33.875	46"	150	43.750	3.250	42.630	40.380	56"	150	57.500	7.500		57.130
	600	32.000	3.500	35.000	35.000		300	47.500	4.000	45.870	43.620		300	50.750	4.690		45.630
	900	33.750	4.250	38.500	39.250		600	49.000	4.750	47.370	45.120		400	52.000	5.250	50.560	48.310
24"	150	32.000	1.880	35.500	35.250		900	55.000	6.500		52.750		600	55.250	6.620	52.750	50.500
	300	36.000	2.750	36.125	35.875	48"	150	43.750	3.250	42.630	40.380	58"	150	57.500	7.500		57.130
	600	37.000	4.000	37.500	37.250		300	47.500	4.000	45.870	43.620		300	50.750	4.690		45.630
	900	41.000	5.500	41.500	45.000		600	49.000	4.750	47.370	45.120		400	52.000	5.250	50.560	48.310

Size not available.

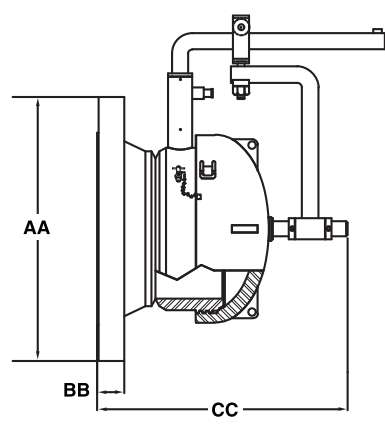
Note 1: All Dimensions Nominal (inches). Dimension drawings available upon request at time of order.
 Note 2: For sizes of 24" and less, the flanges are in accordance with ASME B16.5, *Pipe Flanges and Flanged Fittings, NPS 1/2 Through NPS 24*.
 Note 3: For sizes of 26" and larger, the flanges are in accordance with ASME B16.47, *Large Diameter Steel Flanges, NPS 26 Through NPS 60*.
 This specification gives dimensions for type A and type B flange. Dimensions shown here are in accordance with type A, which is larger.
 With both sizes available, please state which type is desired. Dimension drawings can be produced accordingly.



Horizontal 3" - 14"



Vertical



Horizontal 16" and Larger



Closure Caps

Pipeline Union

Conversion: Closure to Figure 505™ Pipeline Union

Twelve inch and smaller ANSI Series 150–600 closures can be converted to Yale Figure 505 unions. This is a convenient method to extend the pipeline without welding.

Pressure Alert Valve (PAV™)

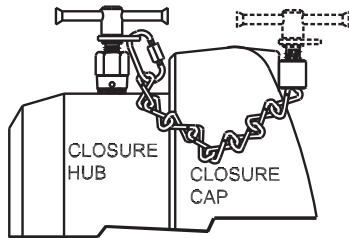
An additional safety feature—a PAV™ is furnished as standard equipment on all 6" and larger closures and may be purchased as an option on smaller sizes. Before the cap can be rotated, the seating screw must be removed from the PAV body. This action will warn the operator of any residual pressure in the vessel before the closure cap is loosened. The PAV is NOT designed to release internal pressure.

Closure Actuator Tool

For easy operation, 16" and larger closures are furnished with a Closure Actuator Tool (CAT). The CAT tool is designed to assist in both opening and closing the closure.

Thread Inspection Gauge/Training

Corroded, severely worn or damaged threads can be a safety hazard. Thread gauges and seminars are available for training field personnel in proper maintenance and thread inspection procedures.



Pressure Alert Valve

Yale® Lug Wrench

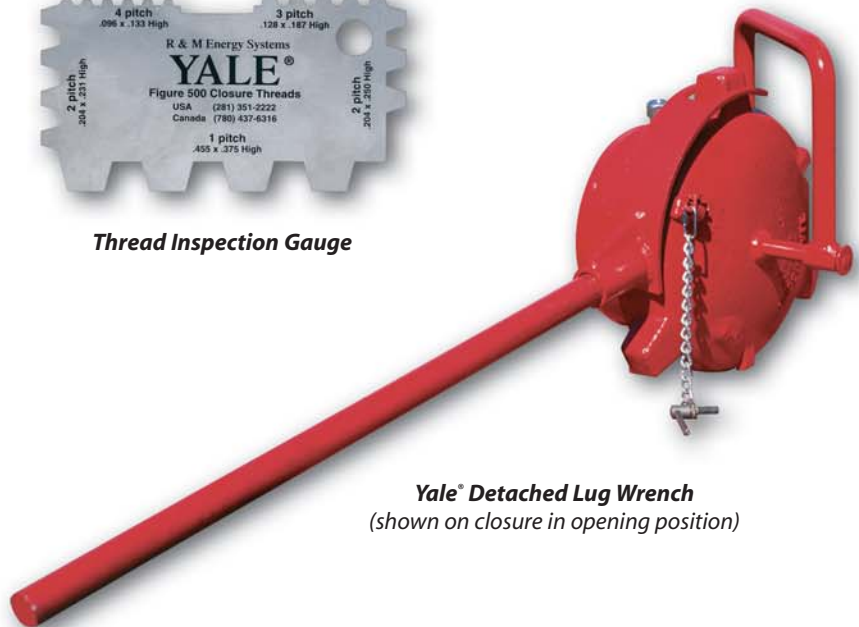
Closure caps, 4" – 14", are formed with the characteristic "Yale" lugs. A specially designed detached wrench slips over the lugs for quick closure closing and opening.



Closure Actuator Tool
(shown in closing position)



Thread Inspection Gauge



Yale® Detached Lug Wrench
(shown on closure in opening position)

Designed for simplicity and reliability, the Yale® SafeGuard™ Lugless Closure is part of the extensive line of Yale Figure 500 closures. It provides secure sealing and easy operation utilizing the field-proven threaded closure cap with O-ring pressure seal design, with the additional safety aspect of the lugless design for effective pipeline and vessel accessibility.

Yale® Figure 500™ SafeGuard™ Lugless Closure

The lugless feature of the SafeGuard closure prevents in-field safety risks associated with hammering on the closure cap lugs as well as the potential for damage to the closure that could hinder its sealing capability and shorten the service life of the closure. The Yale SafeGuard closure can be easily operated with a standard 24" or 36" pipe wrench.

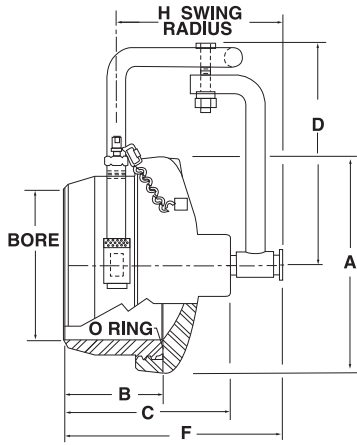
The unique, lugless feature of the Yale SafeGuard closure provides significant benefits to end users that include an overall low total cost of ownership. Specific benefits include:

- Safety for the operators
- Secure sealing without leakage
- Quick and easy operation that saves time and effort on the part of the operators
- Long service life to optimize the return on your investment

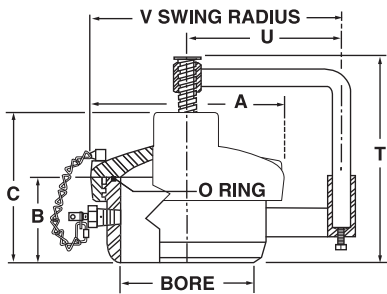


Features and Benefits of the SafeGuard Lugless Closure

- The lugless design eliminates risk of hammering on closure cap for added safety and prevention of damage to the closure
- Rugged, ACME-threaded design with secure O-ring pressure seal ensures positive sealing
- Available in sizes from 2" through 10" for application versatility
- A variety of O-ring materials such as Nitrile, Viton®, Ethylene Propylene compounds and others are available to meet a broad range of pressure, temperature and chemical requirements for effective sealing in the most critical applications
- All standard materials used in the manufacture of Yale closures are to ASTM specifications as permitted under ASME Section VIII, Division 1, Boiler and Pressure Vessel Code to ensure performance and safety
- The closure hub is field weldable for easy and secure installation
- The Yale closure is among the safest in the industry due to its threaded design that makes it extremely difficult to unscrew the cap of a pressurized pipeline or vessel
- A Pressure Alert Valve (standard on 6" and larger closures and optional on all others) ensures that all residual pressure in the pipeline or vessel is eliminated before the pressure cap is loosened to ensure operator safety
- Ideal for applications such as pipelines, pressure vessels, pig traps, filter and filtration systems and manway access along with many others
- Yale Figure 500 SafeGuard Lugless Closures provide productivity, durability and safety for the most critical installations.



Horizontal



Vertical

Dimensions

Closure Size & Series	A Cap O.D.	B Hub Length	C Cap/Hub Makeup	Horizontal					Vertical			
				D	E	F	G Min.	H Swing Radius	T Height	U	V Swing Radius	
2 150/900	4 ³ / ₈	2 ⁵ / ₈	4 ³ / ₈	NO HINGE								
3 150/900	5 ¹ / ₂	2 ⁵ / ₈	3 ³ / ₄	6	N/A	7 ¹ / ₂	N/A	9 ¹ / ₄	7 ¹ / ₂	7	9 ⁷ / ₈	
4 150/900	6 ³ / ₄	3 ¹ / ₂	6 ¹ / ₈	7	N/A	9 ¹ / ₈	N/A	10 ³ / ₈	8 ¹ / ₈	8	11 ⁵ / ₈	
6 150/600	9 ³ / ₄	4 ¹ / ₂	7 ¹ / ₄	9	N/A	12	N/A	14 ¹ / ₂	12 ¹ / ₂	8	13 ³ / ₈	
8 150/600	11 ¹ / ₄	5	8 ¹ / ₂	9 ¹ / ₂	N/A	12 ³ / ₄	N/A	16 ³ / ₄	13 ³ / ₄	8 ¹ / ₂	14 ¹ / ₄	
10 150/600	13 ⁷ / ₈	5 ¹ / ₂	9 ⁷ / ₈	14 ³ / ₄	N/A	15 ³ / ₈	N/A	19 ⁷ / ₈	16 ¹ / ₈	11 ¹ / ₂	18 ⁵ / ₈	

General Design

The SENTRY concept relies on a simple locking ring that slides within a groove machined into the outer flange or hub. When expanded to the closed position, the locking ring securely locks the door into position.

This design methodology is well proven within the oil and gas industry and provides distinct advantages of integral safety and avoids the reliance on external clamps with combined screw thread expanders.

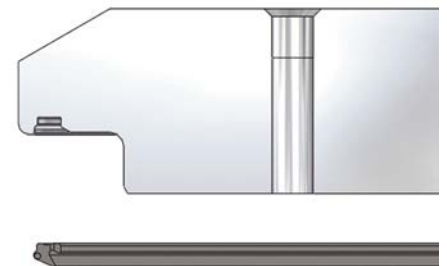
Heavy-duty components are used to actuate the locking ring and are designed to withstand the rigors of long term operation. Components are designed and arranged to ensure secure retention of all hinge hardware and simplified handling by fabricators.

SENTRY closures are available with the ASME 'U' stamp Cloverleaf and can be supplied in compliance with most international design codes.



Closure Operation

The SENTRY closure operating cycle consists of removing the Pressure Alert Valve/Safety Segment assembly and then rotation of the actuator lever through 180°. This simple operation contracts the locking ring sufficiently to clear the outer hub, allowing the door to be pulled open. Closing is simply a reversal of this operation.



A key feature of the SENTRY closure is the pressure energized lip seal

Closure Sealing

A key feature of the SENTRY closure is the pressure energized lip seal. Located within the face of the door (horizontal) or the hub (vertical) for protection, the seal is available in several materials to meet the demands of today's pipeline industry. The increased contact of the sealing surface reduces stress loads and extends the closure operating life. Designed to provide extended service life, the SENTRY seal is a one-piece design consisting of an integral elastomeric seal and a coiled spring anti-extrusion device.

Closure Safety

Safety is paramount in today's industry and the SENTRY closure not only provides speed of operation but also the benefit of integral safety features that prevent unsafe operation. With the locking ring in the locked, closed position, internal pressure creates a seating force that physically traps the locking element between the door and outer hub, making it impossible for the door to open. This design characteristic is further enhanced by the integral Pressure Alert Valve (PAV™) that threads into a pressure sensing port. A small removable segment of the locking ring is attached to the PAV forming a double safety feature and preventing accidental opening. Operation of the PAV provides positive indication as to the pressurized state of the pressure vessel.

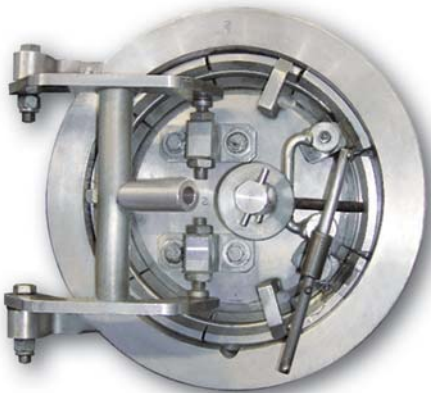




Horizontal



Vertical



Configurations

The SENTRY closure is available in both:

Horizontal

For horizontal applications, the SENTRY closure is supplied with a heavy duty, double pivot hinge arrangement that fully supports the weight of the closure door, minimizes the swing radius and insures repetitive operation. *Note: Horizontal are hinged on the left side (facing the closure) unless ordered differently.*

Vertical

For vertical operation, the SENTRY closure can be supplied in several designs to suit the requirements of the customer and to suit their site needs.

Vertical closures can be supplied with lifting eyes only to permit removal with client supplied equipment. Options for davit arms using simple screw jack, chain hoist or hydraulic are available. The heavy duty davit arm is designed to fully support the weight of the door and provide long term reliable operation

A 'low height' davit arm is also available on request.

For larger diameter closures, where the weight of the door becomes a restraining factor, the door is supplied with three lifting eyes only for use with overhead lifting equipment.

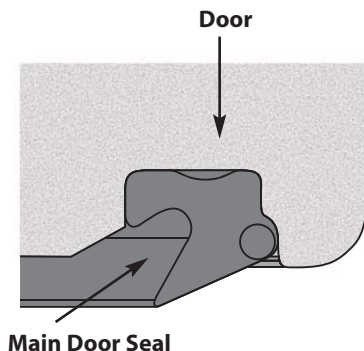
Product Overview

Size Range	10" to 72" nominal diameter (other sizes available upon request)
Design Pressures	Full vacuum to 3705 PSIG working pressure
Ratings	ANSI 150#, 300#, 600#, 900# and 1500#
Design Specifications	ASME Section VIII Division 1 'U' stamp ANSI B31.3, B31.4 & B31.8 Other international codes available on request
Configurations Available	Horizontal Vertical
Materials of Construction	Carbon steel (SA105, A694 F48) Low temp carbon steel (SA350 LF2 Cl 1) High yield carbon steel (A694 F56, A694 F60) Stainless steel Duplex stainless steel Clad / weld overlay alloys Specialty alloys
Sealing	Elastomeric pressure energized lip seal with encapsulated stainless steel anti-extrusion back up ring. Elastomeric seal available in: Nitrile, Viton and HNBR.
Optional Accessories	Protective weather covers Non-venting Pressure Alert Valve Key interlock systems Position indicators Tamper proof / lock out security device

Door Open

Door Open

Seal shown in neutral condition while the door is open.

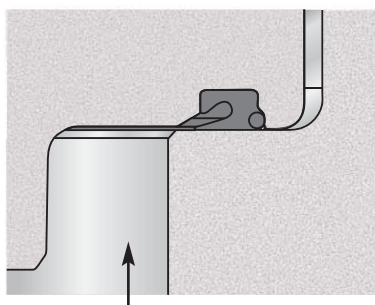


Main Door Seal

Door Closed

Door Closed

The closing action of the door compresses the lip of the seal to create the initial pressure boundary. The seal makes contact both within the door groove and across the length of the lip upper surface. It is capable of withstanding both vacuum and positive internal pressures.

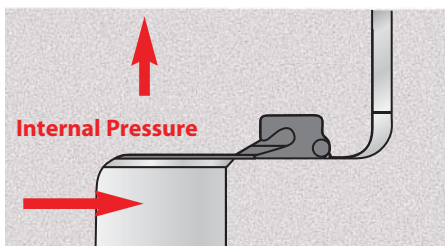


Closed Hub
(Horizontal Closure Shown)

Pressurized

Pressurized

The benefit of the SENTRY closure design is that when pressure is introduced, it bears against the internal 'U' cup surface of the seal. The pressure on the inside of the seal insures constant contact between the seal lip and the seal surface.





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