

R&M ENERGY SYSTEMS

A Unit of Robbins & Myers, Inc.



YALE[®]
HAMMER UNIONS

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Ordering Information

Information Required:

1. Size
2. Pressure
3. Type of Union (i.e. Figure 300™, Figure 800™, Figure 800R™, etc.)
4. Threaded or Butt Weld (wall schedule required)
5. Wing Nut or Hex Nut
6. Type of O-Ring (if required)
7. Special Service Conditions

Material Abbreviations

CS - Carbon Steel
AS - Alloy Steel
DI - Ductile Iron



Pressure Ratings (see pg. 12)

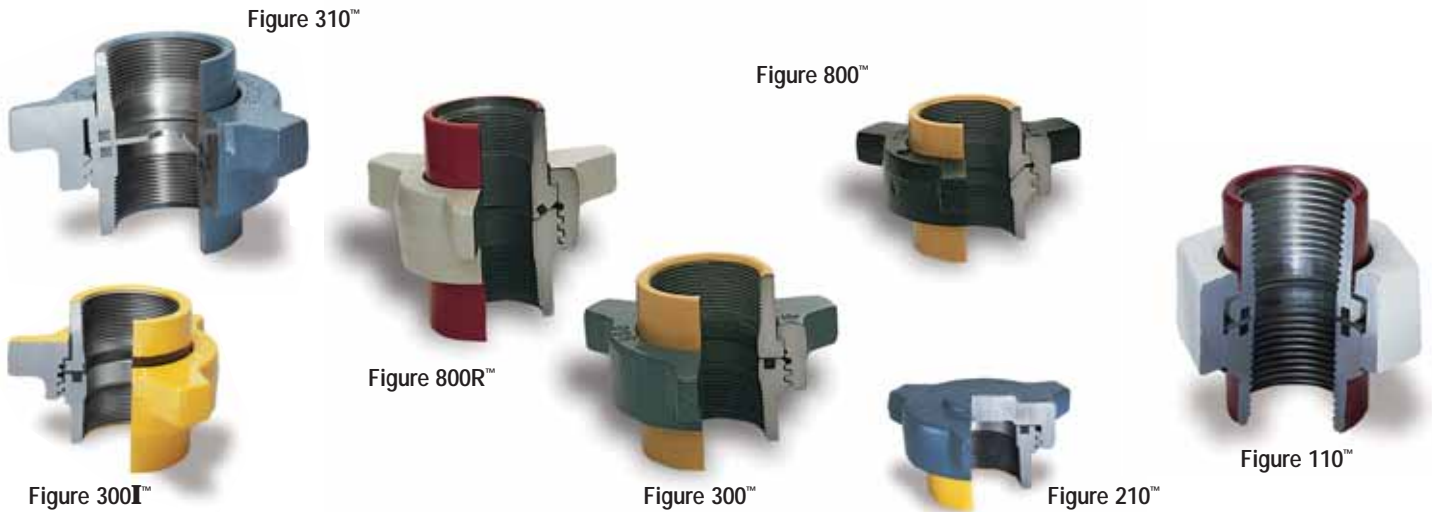
Test pressures indicate the union's capability in a factory, non-shock, cold, hydrostatic test with no external loads. To assure an adequate safety factor in service, **do not exceed the recommended cold working pressure.**

/!\ IMPORTANT WARNINGS /!\

Special care should be taken when working with pressurized equipment.

1. The maximum working pressure is **the cold working pressure**. All models are identified by cold working pressure.
2. **Do not hammer on union lugs when union is under pressure.** Hammering on pressurized unions could cause catastrophic failure.
3. **Do not over-tighten.** Over-tightening, indicated by deformed or flattened union lugs, can cause premature union failure. (Lubrication of threads is recommended to reduce wear and required tightening force).
4. **Replace unions that show excessive wear.** This is indicated by deformed lugs on the union nut or rounded/deformed threads.
5. **Use proper safety precautions with unions when temperatures are below freezing.** Freezing temperatures decrease the impact strength of the union materials.
6. **Use only recommended unions listed in the table on Page 12 for sour service.**
7. **Always wear protective equipment, including eye protection when working with unions.**

**FAILURE TO HEED THESE WARNINGS COULD RESULT IN PRODUCT FAILURE,
SEVERE PERSONAL INJURY OR DEATH.**

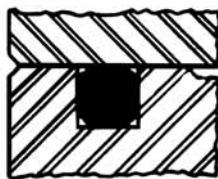


This chart demonstrates Yale's broad selection of unions with 8 Figure Models, sizes from 1/4" through 8", pressure ratings from 500 PSI to 12,500 PSI, threaded and butt weld and over 30 models by pressure.

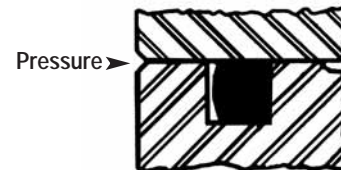
Figure & Size Ranges

Working Pressure	500 PSI	1000 PSI	2500 PSI	4000 PSI	6000 PSI	10,000 PSI	12,500 PSI
Test Pressure	750 PSI	1500 PSI	3750 PSI	6000 PSI	9000 PSI	15,000 PSI	18,750 PSI

Yale® Unions	500 PSI	1000 PSI	2500 PSI	4000 PSI	6000 PSI	10,000 PSI	12,500 PSI
110™ Insulating	2"-3"	1"-4"	1/4"-4"	1"-3"	1/4"-1/2"	N/A	N/A
210™ Blanking	N/A	2"-6"	2"-4"	2"-3"	2"-3"	N/A	N/A
300™ "Flat Face"	1"-8"	1"-7"	1/4"-6"	1"-6"	1"-4"	1"-3"	1/4"-1"
300I™ Insulating	N/A	2"	2"	N/A	N/A	N/A	N/A
310™ Choke	N/A	1"-2"	N/A	1/2"-1"	N/A	N/A	N/A
800™ "Quick Stab"	2"-6"	1"-6"	1"-6"	1"-4"	1"	1"	N/A
800R™ "Quick Stab"	N/A	8"	2"-6"	1-1/2"-7-5/8"	1-1/2"-6"	1-1/2"-3"	N/A



O-Rings For All Service



In its static condition, the O-ring fits in a precision machined groove, with its outer surfaces contacting the three sides of the groove and the lower surface of the mating part. Metal surfaces of the two mating parts securely enclose the O-ring within the groove. Sealing action of the union is not dependent upon metal-to-metal contact.

When pressure is applied, the O-ring conforms to the downstream shape of the groove, completely filling any minute crevice between the mating metal surfaces. Forced into sealing position by pressure alone, the O-ring seals at very low initial pressure and its sealing action increases as pressure increases. The ring cannot flow between the mating metal surfaces.

Standard rings are of oil and acid-resistant nitrile compound and are recommended for all pressures and temperatures up to 250° F. Special rings such as Viton®, neoprene, EPDM and other polymers are available for higher temperature service and other special applications. O-rings assure the utmost in safety, dependability and economy regardless of the service in which the union is placed. To standardize O-ring replacement, all Yale® unions of the same size use the same O-ring, regardless of the Figure number or pressure rating.

Unfailing Dependability

Of the various types of seal designs, the O-ring has proved to be the most dependable and satisfactory under numerous service conditions. Universally used in a wide variety of pressure applications, the O-ring seals equally well against low pressure, high pressure or vacuum for vapor, gas and liquid environments.

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Figure 300™ “Flat Face” Union

An outstanding feature of many Yale unions is provided by a “Flat Face” design. The Figure 300 (as well as Figures 300I, 110, 210 & 310) permits valves and other fittings to be removed easily from the line when equipped with two flat face unions as illustrated. This feature offers special advantages when the fitting is installed in a short section of line, since it is not necessary to “spread” or bend the line when removing the fitting.

Figure 300 unions employ an O-ring, which uses the force of the contained pressure to create a reliable seal. With the O-ring completely enclosed, the seal becomes more effective as additional pressure is applied.

Figure 300 unions come in CWP pressure ratings from 500 PSI to 12,500 PSI with threaded or butt weld sub options. Wing or hex nut is available as specified.

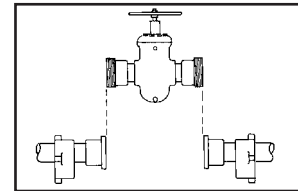


Figure 300™ Straight-Away Breakout

500 PSI CWP/750 PSI Test Pressure (threaded union)

Sub ends: Yellow • Nut: Black

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
2"	5-1/2 lbs.	3-3/4"	5-3/4"	4-7/8"	DI	DI
2-1/2"	9 lbs.	4-5/8"	7"	N/A	DI	DI
3"	11-3/4 lbs.	5"	8"	N/A	DI	DI
4"	20-1/2 lbs.	5-3/4"	8-7/8"	N/A	DI	DI
6"	27-3/8 lbs.	6-7/8"	11-1/2"	N/A	DI	DI
8"	76 lbs.	10-1/2"	16"	N/A	CS	DI

Also available in 1" & 2" all brass, and 2" with 316 stainless steel subs.

500 PSI CWP/750 PSI Test Pressure (wing nut-but weld union schedule 40)

Sub ends: Yellow • Nut: Black

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Nut
6"	38 lbs.	8-1/4"	11-1/2"	CS	DI

1000 PSI CWP/1500 PSI Test Pressure

Sub ends: Yellow • Nut: Gray

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
1"	2 lbs.	2-5/8"	4-1/4"	2-7/8"	CS	DI
1-1/4"	3 lbs.	3-5/8"	4-1/2"	N/A	DI	DI
1-1/2"	4-1/4 lbs.	3-5/8"	5"	N/A	DI	DI
2"	5-1/2 lbs.	3-3/4"	5-3/4"	4-7/8"	DI	DI
2-1/2"	9 lbs.	4-5/8"	7"	N/A	DI	DI
3"	11-3/4 lbs.	5"	8"	N/A	DI	DI
4"	20-1/2 lbs.	5-3/4"	8-7/8"	N/A	DI	DI
5-1/2" OD*	25-1/4 lbs.	7-7/8"	10-1/2"	N/A	DI	DI
5-9/16" OD	25-7/8"	7-7/8"	10-1/2"	N/A	DI	DI
6"	27-3/8 lbs.	6-7/8"	11-1/2"	N/A	DI	DI
7" OD*	40-3/4 lbs.	8-1/2"	13-1/4"	N/A	CS	CS

* 8rd thread
Also available in 2" with 316 stainless steel subs.

2500 PSI CWP/3750 PSI Test Pressure (threaded union)

Sub ends: Pearl Gray • Nut: Green

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
1/4"	5/8 lbs.	2"	N/A	1-3/4"	CS	CS
1/2"	3/4 lbs.	2-1/4"	3"	2-1/8"	CS	CS
3/4"	1 lbs.	2-3/8"	3-1/2"	N/A	CS	CS
1"	2-1/2 lbs.	3-1/4"	4-3/8"	3-1/4"	CS	CS
1-1/4"	3 lbs.	3-3/8"	4-3/4"	N/A	CS	DI
1-1/2"	4-3/4 lbs.	3-5/8"	6"	N/A	CS	DI
2"	7 lbs.	3-3/4"	6-1/8"	4-7/8"	CS	CS
2" EUE*	12-1/4 lbs.	5-5/8"	7-1/2"	N/A	CS	CS
2-1/2"	10 lbs.	4-1/2"	7-1/2"	N/A	CS	CS
2-1/2" EUE*	16-1/4 lbs.	5-1/8"	7-7/8"	N/A	CS	CS
3"	13-1/2 lbs.	5"	8"	N/A	CS	CS
4"	22-1/2 lbs.	5-3/4"	9-1/4"	N/A	CS	CS
6"	42-1/2 lbs.	7-1/2"	12-7/8"	N/A	CS	CS

* 8rd thread
1" complete assembly available in 316 stainless steel. 1/2" and 2" available with 316 stainless steel subs.

2500 PSI CWP/3750 PSI Test Pressure (butt weld union schedule 80)

Sub ends: Pearl Gray • Nut: Green

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
1"	2-1/2 lbs.	3-1/4"	4-3/8"	3-1/4"	CS	CS
1-1/2"	5-1/2 lbs.	4"	6"	4-1/8"	CS	DI
2"	8-3/4 lbs.	5-1/8"	6-1/8"	4-7/8"	CS	CS
2-1/2"	12 lbs.	5-3/8"	7-1/2"	N/A	CS	CS
3"	15-7/8 lbs.	5-1/2"	8"	N/A	CS	CS
4"	25-1/2 lbs.	5-3/4"	9-1/4"	N/A	CS	CS
6"	50 lbs.	7-5/8"	12-7/8"	N/A	CS	CS

Available with Hex Nut.

4000 PSI CWP/6000 PSI Test Pressure (threaded union)

Sub ends: Pearl Gray • Nut: Red

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
1/4"	1-1/2 lbs.	2-5/8"	3-1/4"	2-1/4"	AS	AS
1/2"	2 lbs.	3"	3-1/2"	2-5/8"	AS	AS
3/4"	2 lbs.	3"	3-1/2"	3"	AS	AS
1"	2-1/2 lbs.	3-1/4"	4-3/8"	3-1/4"	CS	CS
1-1/4"	10-1/2 lbs.	5"	6-1/2"	4-7/8"	CS	CS
1-1/2"	9-3/4 lbs.	5"	6-1/2"	4-7/8"	CS	CS
2"	10-3/8 lbs.	5-1/2"	6-7/8"	4-7/8"	CS	CS
2" EUE*	12-1/4 lbs.	5-5/8"	7-1/2"	N/A	CS	CS
2-1/2"	17-3/4 lbs.	6"	7-7/8"	N/A	CS	CS
2-1/2" EUE*	30-1/2 lbs.	7-1/8"	9"	N/A	CS	CS
3"	26-7/8 lbs.	7-1/8"	9"	N/A	CS	CS
4"	38-1/2 lbs.	7-1/2"	10-3/4"	N/A	AS	CS
6"	67-3/4 lbs.	9-1/8"	13-1/2"	N/A	CS	CS

* 8rd thread
 1" complete assembly available in 316 stainless steel. 2" available with 316 stainless steel subs.

4000 PSI CWP/6000 PSI Test Pressure (butt weld union schedule 80)

Sub ends: Pearl Gray • Nut: Red

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
1"	2-1/2 lbs.	3-1/4"	4-3/8"	3-1/4"	CS	CS
2"	11 lbs.	5-1/4"	6-7/8"	4-7/8"	CS	CS
2-1/2"	19-1/2 lbs.	6-1/8"	7-7/8"	N/A	CS	CS
3"	28-3/8 lbs.	7-1/8"	9"	N/A	CS	CS
4"	40-1/2 lbs.	7-3/8"	10-3/4"	N/A	CS	CS

4000 PSI CWP/6000 PSI Test Pressure (wing nut - butt weld XX heavy)

Sub ends: Pearl Gray • Nut: Red

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
5-9/16" OD*	92-1/2 lbs.	10-5/8"	12-1/2"	N/A	AS	AS

* Sch 160 or XXH

6000 PSI CWP/9000 PSI Test Pressure (threaded union)

Sub ends: Pearl Gray • Nut: Blue

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
1"	3-3/8 lbs.	3-1/4"	4-5/8"	3-1/2"	AS	CS
1-1/2"	9-3/4 lbs.	5"	6-1/2"	4-7/8"	CS	CS
2"	10-7/8"	5-5/8"	6-7/8"	N/A	CS	CS
2" EUE*	12-1/4 lbs.	5-5/8"	7-1/2"	N/A	CS	CS
2-1/2"	17-3/4 lbs.	6"	8"	N/A	CS	CS
2-1/2" EUE*	30-1/2 lbs.	7-1/8"	9"	N/A	CS	CS
3"	26-7/8 lbs.	7-1/8"	9"	N/A	AS	CS
4"	38-1/2 lbs.	7-1/2"	10-3/4"	N/A	AS	CS

* 8rd thread

Available with Hex Nut.

6000 PSI CWP/9000 PSI Test Pressure (butt weld union schedule 160 or XX heavy)

Sub ends: Pearl Gray • Nut: Blue

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
2"	13-1/4 lbs.	6"	6-7/8"	6-7/8"	CS	CS
2-1/2"	20-3/4 lbs.	6-1/2"	8"	8"	AS	CS
3"	30-1/2 lbs.	7-1/8"	9"	9"	AS	CS
4"	45-5/8 lbs.	7-3/8"	10-3/4"	10-3/4"	CS	CS

10,000 PSI CWP/15,000 PSI Test Pressure (wing nut - threaded union)

Sub ends: Pearl Gray • Nut: Orange

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
1"	4-1/2 lbs.	3-5/8"	5-1/8"	5-1/8"	AS	AS
2"	15 lbs.	6"	7-3/8"	7-3/8"	CS	CS

10,000 PSI CWP/15,000 PSI Test Pressure (butt weld union schedule XX heavy)

Sub ends: Pearl Gray • Nut: Orange

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
2"	18-1/4 lbs.	6-3/4"	7-3/8"	7-3/8"	CS	CS
3"	35 lbs.	7"	9"	9"	AS	AS

12,500 PSI CWP/18,750 PSI Test Pressure (threaded union)

Sub ends: Silver • Nut: Silver

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
1/4"	1-1/4 lbs.	2-3/4"	3-3/8"	2-1/4"	AS	CS
3/8"	2 lbs.	3"	3-5/8"	2-1/4"	AS	AS
1/2"	2 lbs.	3"	3-5/8"	2-1/4"	AS	AS
3/4"	2 lbs.	3-1/8"	3-3/4"	3"	AS	AS
1"	4-1/2 lbs.	3-5/8"	5-1/8"	3-1/2"	AS	AS

Best choice for steam applications



500 PSI CWP/750 PSI Test Pressure
(wing nut - threaded union)
Sub ends: Black • Nut: Yellow

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Material Nut
2"	5-3/4 lbs.	3-3/4"	5-3/4"	DI	DI
2-1/2"	9-1/2 lbs.	4-3/4"	6-3/4"	DI	DI
3"	12 lbs.	5"	8"	DI	DI
4"	21 lbs.	5-5/8"	9-3/4"	DI	DI
6"	42 lbs.	7"	13"	DI	DI

Also available in 2" 316 stainless steel (subs only)

1000 PSI CWP/1500 PSI Test Pressure (wing nut - threaded union)
Sub ends: Gray • Nut: Yellow

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Material Nut
1"	2 lbs.	2-5/8"	4-1/4"	DI	DI
1-1/4"	3-1/4 lbs.	3-3/8"	4-1/2"	DI	DI
1-1/2"	4-1/4 lbs.	3-5/8"	5"	DI	DI
2"	5-3/4 lbs.	3-3/4"	5-3/4"	DI	DI
2-1/2"	9-1/2 lbs.	4-3/4"	6-3/4"	DI	DI
3"	12 lbs.	5"	8"	DI	DI
4"	21 lbs.	5-5/8"	9-3/4"	DI	DI
6"	42 lbs.	7"	13"	DI	DI

Also available in 2" 316 stainless steel (subs only)

2500 PSI CWP/3750 PSI Test Pressure (wing nut - threaded union)
Sub ends: Green • Nut: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Material Nut
1"	3 lbs.	3-1/2"	4-3/8"	AS	AS
1-1/2"	4-1/2 lbs.	3-5/8"	5-3/4"	CS	DI
2"	10-1/2 lbs.	5-1/8"	7"	CS	CS
2-1/2"	17-3/8 lbs.	6-1/4"	8"	CS	CS
3"	26-3/8 lbs.	7"	9-1/8"	CS	CS
4"	39 lbs.	7-7/8"	10-1/4"	AS	CS
6"	49-1/2 lbs.	7"	12-1/2"	CS	AS

2500 PSI CWP/3750 PSI Test Pressure (wing nut - butt weld union schedule 80)
Sub ends: Green • Nut: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Material Nut
2"	11-1/4 lbs.	5-1/8"	7"	CS	CS
3"	27-1/2 lbs.	7-1/4"	9-1/8"	CS	CS
4"	39 lbs.	7"	10-1/4"	CS	CS

Figure 800™ "Quick-Stab" Unions

A long-time favorite in tank battery applications and production hook-ups, the Figure 800 union is made extremely rugged throughout. Mating metal parts seal on arcs of a common circle and provide a pressure tight seal against gas or liquid. This design - the convex nose and concave seat - makes it easy to align and stab the union and simplifies starting the wing nut threads.

4000 PSI CWP/6000 PSI Test Pressure
(wing nut - threaded union)
Sub ends: Red • Nut: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Material Nut
1"	3 lbs.	3-1/2"	4-3/8"	AS	CS
1-1/2"	9-1/2 lbs.	4-1/2"	6-5/8"	CS	CS
2"	10-1/2 lbs.	5-1/8"	7"	CS	CS
2-1/2"	17-3/8 lbs.	6-1/4"	8"	CS	CS
3"	26-3/8 lbs.	7"	9-1/8"	CS	CS
4"	39 lbs.	7-7/8"	10-1/4"	AS	CS

4000 PSI CWP/6000 PSI Test Pressure (wing nut - butt weld union schedule 80)
Sub ends: Red • Nut: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Material Nut
2"	11-1/4 lbs.	5-1/8"	7"	CS	CS
3"	27-1/2 lbs.	7"	9-1/8"	CS	CS

6000 PSI CWP/9000 PSI Test Pressure
(wing nut - threaded union)
Sub ends: Blue • Nut: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Material Nut
1"	3-1/8 lbs.	3-1/2"	4-5/8"	AS	CS

10,000 PSI CWP/15,000 PSI Test Pressure
(wing nut - threaded union)
Sub ends: Orange • Nut: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Material Nut
1"	4-1/2 lbs.	3-1/2"	5-1/8"	AS	AS



Figure 800R™ “Quick-Stab” Unions O-Ring Seal

This is a maximum service union designed for severe conditions where pressure extremes or vacuum occur. Also the Figure 800R is commonly used in drilling applications (e.g., standby manifolds). This union offers the double security of a metal-to-metal seal plus an O-ring seal, and is available for pressures from 1000 to 10,000 PSI CWP.



1000 PSI CWP/1500 PSI Test Pressure (wing nut - threaded union)
Sub ends: Gray • Nut: Yellow

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Nut
8"	91 lbs.	10-7/8"	16"	CS	DI

2500 PSI CWP/3750 PSI Test Pressure (wing nut - threaded union)
Sub ends: Green • Nut: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Nut
2"	10-1/2 lbs.	5-1/8"	7"	CS	CS
2-1/2"	17-3/8 lbs.	6-1/4"	8"	CS	CS
3"	26-3/8 lbs.	7"	9-1/8"	CS	CS
4"	39 lbs.	7-7/8"	10-1/4"	AS	CS
6"	49-1/2 lbs.	7"	12-1/2"	CS	AS

2500 PSI CWP/3750 PSI Test Pressure (wing nut - butt weld union schedule 80)
Sub ends: Green • Nut: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Nut
2"	11-1/4 lbs.	5-1/8"	7"	CS	CS
3"	27-1/2 lbs.	7-1/4"	9-1/8"	CS	CS
4"	39 lbs.	7"	10-1/4"	CS	CS
6"	55 lbs.	7"	12-1/2"	CS	AS

4000 PSI CWP/6000 PSI Test Pressure (wing nut - threaded union)
Sub ends: Red • Nut: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Nut
1-1/2"	9-1/2 lbs.	4-1/2"	6-5/8"	CS	CS
2"	10-1/2 lbs.	5-1/8"	7"	CS	CS
2-1/2"	17-3/8 lbs.	6-1/4"	8"	CS	CS
3"	26-3/8 lbs.	7"	9-1/8"	CS	CS
4"	39 lbs.	7-7/8"	10-1/4"	AS	CS
5-1/2" OD*	48-3/4 lbs.	10"	11-3/4"	CS	AS
5-9/16 OD	49 lbs.	10"	11-3/4"	CS	AS
7-5/8" OD*	112-1/2 lbs.	12-1/2"	15-1/2"	CS	DI

* 8rd thread

4000 PSI CWP/6000 PSI Test Pressure (wing nut - butt weld union schedule 80)
Sub ends: Red • Nut: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Nut
2"	10-1/2 lbs.	5-1/8"	7"	CS	CS
3"	27-1/2 lbs.	7-1/4"	9-1/8"	CS	CS
4"	39 lbs.	7"	10-1/4"	CS	CS

6000 PSI CWP/9000 PSI Test Pressure (wing nut - threaded union)
Sub ends: Blue • Nut: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Nut
1-1/2"	9-1/2 lbs.	4-1/2"	6-5/8"	CS	CS
2"	16-1/4 lbs.	5-5/8"	7-5/8"	CS	CS
2-1/2"	17-1/4 lbs.	6-1/4"	8"	AS	CS
3"	26 lbs.	7"	9-1/8"	AS	CS
4"	38-1/2 lbs.	7-3/4"	10-1/2"	AS	CS
5-1/2" OD*	77-1/2 lbs.	10-1/4"	12-1/2"	AS	AS

* 8rd thread

6000 PSI CWP/9000 PSI Test Pressure (wing nut - special combination union) For mudline stand pipe assembly
Sub ends: Blue • Nut: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Nut
**	93-3/4 lbs.	10-1/4"	12-1/2"	AS	AS

** 5-9/16" butt weld tail sub schedule 160 or XX hvy X 4" NPT threaded sub

6000 PSI CWP/9000 PSI Test Pressure (wing nut - butt weld union schedule XX hvy or 160)
Sub ends: Blue • Nut: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Nut
2"	18-1/2 lbs.	5-3/4"	7-5/8"	CS	CS
2-1/2"	21 lbs.	5-1/8"	8"	AS	CS
3"	30 lbs.	7-1/4"	9-1/8"	AS	CS
4"	44-1/4 lbs.	7"	10-1/2"	CS	CS
5-9/16" OD	91-1/2 lbs.	10-1/8"	12-1/2"	CS	AS
6"	97-5/8 lbs.	9"	14-1/2"	AS	CS

10,000 PSI CWP/15,000 PSI Test Pressure (wing nut - threaded union)
Sub ends: Orange • Nut: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Nut
1-1/2"	9-1/2 lbs.	4-1/2"	6-5/8"	CS	CS
2"	16-1/4 lbs.	5-5/8"	7-5/8"	CS	CS
3"	30-1/2 lbs.	7-1/8"	9-1/2"	AS	AS

10,000 PSI CWP/15,000 PSI Test Pressure (wing nut - butt weld union schedule XX hvy)
Sub ends: Orange • Nut: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Nut
2"	18-1/2 lbs.	5-3/4"	7-5/8"	CS	CS
3"	34-1/2 lbs.	6-3/8"	9-1/2"	AS	AS

Only Yale offers two models of insulating unions in either wing or hex nut configurations. Both unions feature the “flat-face” design for easy removal and prevent electrolytic corrosion in lines by breaking the flow of current through the system.

Figure 110™ Insulating Unions

Recommended for use in flow lines to isolate for cathodic protection. The metal parts are separated by non-conductor gaskets that are impervious to flow, seepage and resistant to acids, chemicals and temperatures encountered in normal service. Dual O-rings provide a pressure seal. Maximum temperature is 250° F.

500 PSI CWP/750 PSI Test Pressure
(threaded union)
Sub ends: Maroon • Nut: Maroon

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
2"	6-1/2 lbs.	3-3/4"	5-3/4"	4-3/4"	DI	DI
3"	11-1/4 lbs.	5"	8"	N/A	DI	DI

1000 PSI CWP/1500 PSI Test Pressure
(threaded union)
Sub ends: Maroon • Nut: White

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
1"	1-1/2 lbs.	2-5/8"	4-1/4"	2-3/4"	CS	DI
1-1/2"	4 lbs.	3-5/8"	5"	4-1/8"	DI	DI
2"	6-1/2 lbs.	3-3/4"	5-3/4"	4-3/4"	DI	DI
2-1/2"	8-3/8 lbs.	4-5/8"	7"	N/A	DI	DI
3"	11-1/4 lbs.	5"	8"	N/A	DI	DI
4"	19 lbs.	5-3/4"	10"	N/A	DI	DI

2500 PSI CWP/3750 PSI Test Pressure
(threaded union)
Sub ends: Orange • Nut: Orange

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
1/4"	1/2 lbs.	2-1/8"	N/A	1-5/8"	CS	CS
3/8"	3/4 lbs.	2-3/8"	N/A	2-1/4"	CS	CS
1/2"	3/4 lbs.	2-3/8"	N/A	2-1/4"	CS	CS
3/4"	1-1/4 lbs.	2-1/2"	N/A	2-3/8"	CS	CS
1"	2-1/2 lbs.	3-1/4"	4-5/8"	3-3/8"	CS	CS
1-1/4"	10 lbs.	5-1/8"	6-1/2"	N/A	CS	CS
1-1/2"	9-3/8 lbs.	5-1/8"	6-1/2"	N/A	CS	CS
2"	6-1/2 lbs.	3-3/4"	6-1/4"	4-7/8"	CS	CS
3"	12-1/2 lbs.	5-1/8"	8"	N/A	CS	CS
4"	21 lbs.	5-3/4"	9-1/2"	N/A	CS	CS

Figure 300I™ Insulating Unions

An “engineering” plastic is injection molded onto the tail sub of this union to separate the metal parts and prevent current flow. The plastic is an impact resistant material rated up to 120° F.

1000 PSI CWP/1500 PSI Test Pressure
(threaded union)
Sub ends: Yellow • Nut: Yellow

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
2"	5-1/2 lbs.	3-3/4"	5-3/4"	4-7/8"	DI	DI

2500 PSI CWP/3750 PSI Test Pressure
(threaded union)
Sub ends: Pearl Gray • Nuts: Pearl Gray

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
2"	7 lbs.	3-3/4"	6-1/8"	4-7/8"	CS	CS

Available with Hex Nut.



Figure 110™

4000 PSI CWP/6000 PSI Test Pressure (threaded union)
Sub ends: Brown • Nut: Brown

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
1"	2-1/2 lbs.	3-1/4"	4-5/8"	3-3/8"	CS	CS
2"	13-1/2 lbs.	6-1/8"	7-3/8"	N/A	CS	CS
3"	25-3/4 lbs.	7-1/4"	9"	N/A	CS	CS

6000 PSI CWP/9000 PSI Test Pressure (threaded union)
Sub ends: Blue • Nut: Blue

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
1/4"	1-1/4 lbs.	2-3/4"	N/A	2-1/4"	AS	AS
1/2"	2 lbs.	3-3/8"	N/A	3"	AS	AS



Figure 300I™

Figure 210™ Threaded Blanking Unions

Designed for use on manifolds, jumper assemblies and other installations where a blank cap connection is required. By using a tail sub and wing nut from a Figure 300, the Figure 210 is easily converted into a conventional union through which flow may be maintained. The cap is furnished blank as standard, but can be drilled and tapped for a 1/8"-1" NPT for a bleeder plug.



1000 PSI CWP/1500 PSI Test Pressure
Sub end: Yellow • Cap: Gray

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Material Nut
2"	5-3/8 lbs.	2-5/8"	5-3/4"	DI	CS
3"	11-3/8 lbs.	3-5/8"	8"	DI	AS
4"	21-1/2 lbs.	4-1/4"	9"	DI	CS
6"	28-3/8 lbs.	4-1/8"	11-1/2"	DI	CS

4000 PSI CWP/6000 PSI Test Pressure
Sub end: Pearl Gray • Cap: Red

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Material Nut
2"	9-1/4 lbs.	3-7/8"	6-1/2"	CS	CS
3"	27-1/8 lbs.	5"	9-1/4"	CS	CS

2500 PSI CWP/3750 PSI Test Pressure
Sub end: Pearl Gray • Cap: Green

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Material Nut
2"	5-1/2 lbs.	2-3/4"	5-3/4"	CS	CS
3"	11-7/8 lbs.	3-3/4"	8"	CS	CS
4"	22-1/8 lbs.	4-3/8"	9"	CS	CS

4000 PSI CWP/6000 PSI Test Pressure
(butt weld union schedule 80)
Sub end: Pearl Gray • Cap: Red

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Material Nut
2"	12 lbs.	4"	6-1/2"	CS	AS
3"	26 lbs.	4-1/2"	9-1/4"	CS	AS

2500 PSI CWP/3750 PSI Test Pressure
(butt weld union schedule 80)
Sub end: Pearl Gray • Cap: Green

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Material Nut
2"	7 lbs.	3-1/4"	5-3/4"	CS	CS
3"	15 lbs.	4-1/4"	8"	CS	CS
4"	27 lbs.	5"	9"	CS	CS

6000 PSI CWP/9000 PSI Test Pressure
Sub end: Pearl Gray • Cap: Blue

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Material Nut
2"	9-3/4 lbs.	3-7/8"	6-1/2"	CS	CS

6000 PSI CWP/9000 PSI Test Pressure
(butt weld union schedule XX hvy or 160)
Sub end: Pearl Gray • Cap: Blue

NPT Size	Approx. Weight	Length	Rotating Diameter	Material Subs	Material Nut
2"	14 lbs.	4"	6-1/2"	CS	AS
3"	29 lbs.	5"	9-1/4"	CS	AS



Figure 310™ Threaded Choke Unions

Permits reduction of downstream pressure or volume. Through use of different size orifice plates, pressure and/or volume can be regulated without the use of a more expensive orifice fitting. The union may be used upstream of a pressure reducing regulator in order to obtain a primary pressure reduction, or it may be used to control flow where metering is not required. Orifice plates are 304 stainless steel and are regularly furnished in sizes from 1/16" up to the full inside diameter of the pipe bore.

Notes: Figure 310 Threaded Choke Unions are sold without orifice plates. Orifice plates must be ordered separately.

1000 PSI CWP/1500 PSI Test Pressure (threaded union)

Sub ends: Gray • Nut: Gray

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
1"*	2 lbs.	2-5/8"	4-1/4"	2-7/8"	CS	DI
2"	6-1/2 lbs.	3-3/4"	5-3/4"	4-7/8"	DI	DI

* Cadmium plated.

4000 PSI CWP/6000 PSI Test Pressure (threaded union)

Sub ends: Cadmium Plated • Nut: Cadmium Plated

NPT Size	Approx. Weight	Length	Rotating Diameter		Material	
			Wing	Hex	Subs	Nut
1/2"	2 lbs.	3"	3-5/8"	2-1/4"	AS	AS
3/4"	2-1/8 lbs.	3-1/8"	3-3/4"	3"	AS	AS
1"	2-1/2 lbs.	3-1/2"	4-1/2"	N/A	AS	CS

Available with Hex Nut.

Butt Weld Bore Diameters

Nominal Size	Standard	Schedule 40	Extra Heavy (XH)	Schedule 80	Schedule 160	Double Extra Heavy (XXH)
1"	1.049"	1.049"	.957"	.957"	.815"	.599"
1-1/2"	1.610"	1.610"	1.500"	1.500"	1.338"	1.100"
2"	2.067"	2.067"	1.939"	1.939"	1.687"	1.503"
2-1/2"	2.469"	2.469"	2.323"	2.323"	2.125"	1.771"
3"	3.068"	3.068"	2.900"	2.900"	2.624"	2.300"
4"	4.026"	4.026"	3.826"	3.826"	3.438"	3.152"
5" (5-9/16" OD)	5.047"	5.047"	4.813"	4.813"	4.313"	4.063"
6"	6.065"	6.065"	5.761"	5.761"	5.187"	4.897"



Pressure Rating

No.	Standard Service		Sour Gas Service		NOMINAL PIPE SIZE														Notes
	Working Pressure	Test Pressure(1)	Working Pressure	Pressure	1/4"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	5"	6"	8"		
110™	500	750	NR	NR														7	
	1000	1500	NR	NR														7	
	2500	3750	NR	NR														7	
	4000	6000	NR	NR														7	
	6000	9000	NR	NR														7	
210™	1000	1500	NR	NR															
	2500	3750	1500	2250							SG		SG	SG		NR		4,5	
	4000	6000	2500	3750							SG		SG	SG				4	
	6000	9000	NR	NR															
300™	500	750	NR	NR															
	1000	1500	NR	NR															
	2500	3750	1500	2250	NR	NR	NR	NR	NR	NR	SG	SG	SG	SG		NR		4,5	
	4000	6000	2500	3750				NR	NR	SG	SG	SG	SG	SG	NR	NR		4,5	
	6000	9000	4000	6000				NR		NR	SG	SG	SG	SG	NR			3,4,6	
	10,000	15,000	5000	7500				NR			SG		SG					3,4,6	
	12,500	18,750	NR	NR															
300I™	1000	1500	NR	NR														8	
	2500	3750	NR	NR														8	
310™	1000	1500	NR	NR															
	4000	6000	2500	3750		NR	NR	NR			SG							4	
800™	500	750	NR	NR															
	1000	1500	NR	NR															
	2500	3750	NR	NR															
	4000	6000	NR	NR															
	6000	9000	NR	NR															
	10,000	15,000	NR	NR															
800R™	1000	1500	NR	NR															
	2500	3750	1500	2250							SG	SG	SG	SG		NR		4,5	
	4000	6000	2500	3750							SG	SG	SG	SG	SG	NR		4,5	
	6000	9000	4000	6000							NR	SG	SG	SG	SG	NR		3,4,6	
	10,000	15,000	5000	7500							NR	SG		SG				3,4,6	

NR-Not Recommended for Sour Gas Service

SG-Recommended for Sour Gas Service

Notes:

- (1) Test Pressure - Indicates a union's capability in a factory, non-shock, cold, hydrostatic test with no external loads.
- (2) Unions rated for sour gas service are manufactured of materials, at the hardness levels prescribed, as recommended in NACE MR-01-75 for use in sour environments.
- (3) Hardness test must be performed and be RC 22 or less prior to sale for sour gas service.

- (4) Viton O-rings are furnished with sour gas unions. However, R&M Energy Systems does not warrant the performance of any elastomer for sour gas service.
- (5) Line Pipe (NPT) threads are not recommended for sour gas service above 4 inches nominal pipe size. Specify butt weld end connections.
- (6) Butt weld only for sour gas service - line pipe threads are not recommended for sour gas service at this pressure rating.
- (7) Maximum temperature for Figure 110 insulating union is 250° F.
- (8) Maximum temperature for Figure 300I insulating union is 120° F.



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API ROD, TUBING & LINE PIPE SPECIFICATIONS

ROD & ROD COUPLING DIMENSIONS

Slimhole O.D.		Full Size O.D.	
Inches	Millimeters	Inches	Millimeters
N/A	N/A	N/A	N/A
1-1/4"	31.75	1-1/2"	38.10
1-1/2"	38.10	1-5/8"	41.28
1-5/8"	41.28	1-13/16"	46.04
2"	50.80	2-3/16"	55.56
—	—	2-3/8"	60.33

TEMPERATURE CONVERSION
 $^{\circ}\text{C} = 5/9 (^{\circ}\text{F} - 32)$
 To convert Fahrenheit degrees into Celsius, subtract 32, multiply by 5 and divide by 9.

WORKING PRESSURE

PSI	kPa
1500	10,340
2000	13,800
2500	17,250
3000	20,700
4000	27,600
6000	41,400

ROD O.D.	
Inches	Millimeters*
1/2"	13
5/8"	16
3/4"	19
7/8"	22
1"	25
1-1/8"	29
1-1/4"	32
1-3/8"	35
1-1/2"	38
1-3/4"	45

* Rounded to nearest millimeter.

API TUBING

Nominal Size	External Upset							Non-Upset						
	O.D.		I.D.		Lbs. Per Ft.	Kgs. Per Meter	Threads Per Inch	O.D.		I.D.		Lbs. Per Ft.	Kgs. Per Meter	Threads Per Inch
	In	MM	In	MM				In	MM	In	MM			
3/4"	1.050	26.7	.824	20.9	1.2	1.8	10rd	1.050	26.7	.824	20.9	1.1	1.7	10rd
1"	1.315	33.4	1.049	26.6	1.8	2.7	10rd	1.315	33.4	1.049	26.6	1.7	2.5	10rd
1-1/4"	1.660	42.2	1.380	35.0	2.4	3.6	10rd	1.660	42.2	1.380	35.0	2.3	3.4	10rd
1-1/2"	1.900	48.3	1.610	40.9	2.9	4.3	10rd	1.900	48.3	1.610	40.9	2.8	4.1	10rd
2"	2-3/8	60.3	1.995	50.7	4.7	7.0	8rd	2-3/8	60.3	1.995	50.7	4.6	6.8	10rd
2-1/2"	2-7/8	73.0	2.441	62.0	6.5	9.7	8rd	2-7/8	73.0	2.441	62.0	6.4	9.5	10rd
3"	Not Specified - See Note Below													
3-1/2"	3-1/2	88.9	2.992	76.0	9.3	13.8	8rd	3-1/2	88.9	2.992	76.0	9.2	13.7	10rd
4"	4.000	101.6	3.476	88.3	11.0	16.4	8rd	4.000	101.6	3.548	90.1	9.5	14.1	8rd
4-1/2"	4.500	114.3	3.958	100.5	12.8	19.0	8rd	4.500	114.3	3.958	100.5	12.6	18.8	8rd

API LINE PIPE (LP)

Standard Wall Thickness

Nominal Size	O.D.		I.D.		Lbs. Per Ft.	Kgs. Per Meter	Threads Per Inch
	In	MM	In	MM			
3/4"	1.050	26.7	.824	20.9	1.1	1.7	14V
1"	1.315	33.4	1.049	26.6	1.7	2.5	11-1/2V
1-1/4"	1.660	42.2	1.380	35.0	2.3	3.4	11-1/2V
1-1/2"	1.900	48.3	1.610	40.9	2.8	4.1	11-1/2V
2"	2-3/8	60.3	2.067	52.5	3.8	5.6	11-1/2V
2-1/2"	2-7/8	73.0	2.469	62.7	5.9	8.8	8V
3"	3-1/2	88.9	3.068	77.9	7.7	11.5	8V
3-1/2"	4.000	101.6	3.548	90.1	9.35	13.8	8V
4"	4.500	114.3	4.026	102.3	11.0	16.4	8V

Notes: • Round (rd) threads are used for casing & tubing.
 • V threads are used for line pipe.
 • EUE = External Upset

• NUE = Non-Upset
 • 3" tubing is not specified (N/S) by API, but 3" & 3-1/2" are frequently used interchangeably when referring to 3-1/2" API tubing.

MOST COMMON API CASING

Nominal O.D.		Lbs. Per Ft.	Kgs. Per Meter	I.D.		Long & Short Coupling O.D.		Short Coupling Length		Long Coupling Length	
In	MM			In	MM	In	MM	In	MM	In	MM
4-1/2"	114.3	9.50	14.1	4.090	103.9	5.000	127.0	6-1/4	158.8	7	177.8
		11.60	17.3	4.000	101.6						
		13.50	20.1	3.920	99.6						
		15.10	22.5	3.826	97.2						
5-1/2"	139.7	13.00	19.3	5.044	128.1	6.050	153.7	6-3/4	171.5	8	203.2
		14.00	20.8	5.012	127.3						
		15.50	23.1	4.950	125.7						
		17.00	25.3	4.892	124.3						
		20.00	29.8	4.778	121.4						
6-5/8"	168.3	23.00	34.2	4.670	118.6	7.390	187.7	7-1/4	184.2	8-3/4	222.3
		17.00	25.3	6.135	155.8						
		20.00	29.8	6.049	153.6						
		24.00	35.7	5.921	150.4						
		28.00	41.7	5.791	147.1						
7"	177.8	32.00	47.6	5.675	144.1	7.656	194.5	7-1/4	184.2	9	228.6
		17.00	25.3	6.538	166.1						
		20.00	29.8	6.456	164.0						
		23.00	34.2	6.366	161.7						
		26.00	38.7	6.276	159.4						
		29.00	43.2	6.184	157.1						
		32.00	47.6	6.094	154.8						
		35.00	52.1	6.004	152.5						
7-5/8"	193.7	38.00	56.6	5.920	150.4	8.500	215.9	7-1/2	190.5	9-1/4	235.0
		20.00	29.8	7.125	181.0						
		24.00	35.7	7.025	178.4						
		26.40	39.3	6.969	177.0						
		29.70	44.2	6.875	174.6						
8-5/8"	219.1	33.70	50.2	6.765	171.8	9.625	244.5	7-3/4	196.9	10	254.0
		39.00	58.0	6.625	168.3						
		24.00	35.7	8.097	205.7						
		28.00	41.7	8.017	203.6						
		32.00	47.6	7.921	201.2						
		36.00	53.6	7.825	198.8						
9-5/8"	244.5	40.00	59.5	7.725	196.2	10.625	269.9	7-3/4	196.9	10-1/2	266.7
		44.00	65.5	7.625	193.7						
		49.00	72.9	7.511	190.8						
		29.30	43.6	9.063	230.2						
		32.30	48.1	9.001	228.6						
		36.00	53.6	8.921	226.6						
10-3/4"	273.1	40.00	59.5	8.835	224.4	11.750	298.5	8	203.2	N/A	N/A
		43.50	64.7	8.755	222.4						
		47.00	69.9	8.681	220.5						
		53.50	79.6	8.535	216.8						
		32.75	48.7	10.192	258.9						
		40.50	60.3	10.050	255.3						

- Notes:
- All API casing threads are 8rd threads per inch.
 - Casing threads are either long thread or short thread.
 - Most Hercules® wellheads have short threads.
 - It is permissible to put short casing threads into long couplings, but not permissible to put long casing threads into short couplings.



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R&M ENERGY SYSTEMS

TERMS & CONDITIONS OF SALE

1. ACCEPTANCE

- 1.1 All orders are subject to final acceptance by R&M ENERGY SYSTEMS L.P. (DBA and hereinafter referred to as R&M ENERGY SYSTEMS).

2. F.O.B. POINT

- 2.1 All shipments are F.O.B. R&M ENERGY SYSTEMS Point of Origin or other designated shipping point.

3. PRICES

- 3.1 All quotations are made for prompt acceptance and any terms quoted therein are subject to change without notice after thirty (30) days from the date of quotation unless specifically stated otherwise on the quotation. Prices or escalation formulas in effect at time of shipment will apply unless otherwise stated in writing.
- 3.2 Prices are F.O.B. Point of Origin. R&M ENERGY SYSTEMS reserves the right to invoice customer for any and all finished material ready for shipment, when held at customer's request or for other reasons beyond R&M ENERGY SYSTEMS' control. Seller reserves the right to place a service charge on past due accounts at the highest rate permitted by law. Every Sales, Use, Excise or other tax and any charge imposed by law or Common practice to include custom duties, consular fees, insurance charges and other comparable charges to be borne by customer. Prices are in U.S. Dollars.
- 3.3 All orders are subject to any Federal, State or other Government Regulation that may be in effect or later become effective.
- 3.4 Charges for Field Installation of Equipment not available during manufacturing process will be borne by Customer unless otherwise stated in writing.

4. MINIMUM BILLING

- 4.1 Minimum billing of \$25 net will be charged per order on any partial shipment requested by customer.
- 4.2 Change orders and/or "add on" supplements are subject to additional billings commensurate with the cost and will receive individual consideration insofar as minimum billing, freight allowance and discount are concerned.

5. DELIVERIES

- 5.1 All promises of shipment are estimated as closely as possible based on the availability of materials and capacity at the time and are expressly subject to change due to delays resulting from strikes, differences with workmen, labor troubles, acts of God, Governmental acts and regulations, war or war conditions, riots or civil commotion, sabotage, fires, floods, explosions or other accidents, or to delays to carriers or of subcontractors or in receipt of materials, or to delays occasioned by or arising in connection with obligations to other cause or causes (whether or not of the same general character as those herein specifically enumerated) beyond R&M ENERGY SYSTEMS' reasonable control.
- 5.2 If additional information or drawing approval is required, promise of shipment will date from receipt of same.

6. DESIGN

- 6.1 R&M ENERGY SYSTEMS reserves the right to make changes in designs and/or materials without notice.

7. CANCELLATIONS

- 7.1 Orders accepted by R&M ENERGY SYSTEMS are not subject to cancellation by customer except with the consent of R&M ENERGY SYSTEMS and upon terms which will indemnify R&M ENERGY SYSTEMS against loss or damage occasioned by such cancellation.

8. INSPECTION

- 8.1 Final inspection and acceptance of products must be made at R&M ENERGY SYSTEMS' plant and shall be conclusive except as regards latent defects.

- 8.2 Customer's representatives may inspect at the plant during working hours prior to shipment in such manner as will not interfere with operations.

9. ENGINEERING AND SERVICE

- 9.1 Upon request, R&M ENERGY SYSTEMS may provide engineering and/or technical information about its products and their uses; and if feasible may provide personnel to assist buyer in effecting field installation and/or field service.
- 9.2 Such information service, or assistance so provided, whether with or without charge, shall be advisory only, and buyer agrees to hold R&M ENERGY SYSTEMS harmless from claims for loss from any cause resulting from such advisory or service activity.

10. WARRANTY

- 10.1 THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS.
- 10.2 R&M ENERGY SYSTEMS warrants that all products manufactured by it and all repair work performed by it shall be free from defects in workmanship and material when these products are used within the service and pressure range from which they were manufactured. Such warranty shall be binding upon R&M ENERGY SYSTEMS in respect to products for a period of one year from shipment of such products and in respect to repair work for a period of 60 days from completion of such repairs and applies only to materials furnished and work performed in the repair operation.
- 10.3 If, at any time within such periods, it is established to the satisfaction of R&M ENERGY SYSTEMS that any product manufactured by R&M ENERGY SYSTEMS was defective at time of shipment or any repair work performed by R&M ENERGY SYSTEMS was defective, R&M ENERGY SYSTEMS, at its option, shall repair or exchange such item, F.O.B. place of manufacture or repair or other R&M ENERGY SYSTEMS designated shipping point, or refund the price paid.
- 10.4 It is understood that the liability of R&M ENERGY SYSTEMS shall be limited to such repair or replacement and that R&M ENERGY SYSTEMS SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF ANY DEFECTS OR FROM ANY CAUSE WHATSOEVER.
- 10.5 This warranty does not cover deterioration by corrosion or aging of non-metallic parts, including stress corrosion or any other cause of failure other than defects in workmanship and materials.
- 10.6 Unless repairs to, alterations of, or work done on said products by the buyer shall be specifically authorized in writing by R&M ENERGY SYSTEMS, any warranty applicable thereto shall become null and void.
- 10.7 R&M ENERGY SYSTEMS does not warrant the performance of any elastomer subjected to severe service due to temperature and/or chemical environment.

11. FREIGHT

- 11.1 Any freight allowance applies to materials manufactured only by R&M ENERGY SYSTEMS. Delivery by carrier will be at customer's risk.

12. PATENT INFRINGEMENT

- 12.1 The seller shall not be liable for any damage or costs for any infringement of patents for products which are produced to buyer's specifications and buyer shall assume all responsibility for and save seller harmless from any and all damages, cost, royalties and claims arising out of charges of any infringement.

13. GENERAL

- 13.1 Acceptance of buyer's order is expressly conditional upon buyer's acceptance of the foregoing terms and conditions of sale. Any additional or different terms proposed by customer are not acceptable unless expressly agreed to in writing by R&M ENERGY SYSTEMS.



A Unit of Robbins & Myers, Inc.

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