



CASING RUNNING™

CASING DRILLING®

CASING & TUBING

TORQUE TABLES

API Round Thread
API Buttress

TESCO MLT™ Rings*

Imperial and Metric Units

FIELD MAKE-UP HANDBOOK

Third Edition

The Drilling Innovation Company™

www.tescocorp.com



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I. INTRODUCTION TO TORQUE TABLES

API Round Thread API Buttress Thread TESCO® MLT™ Rings

These Torque Tables and Recommended Practices provide performance ratings and field practices for power tight assembly of new API Round and Buttress threads. The torque values in the tables for Round thread casing and tubing without MLT™ rings are in accordance with API Recommended Practice 5C1. The torque values in the tables for TESCO MLT™ rings are in accordance with TESCO recommended practices when used with new API tubing and casing connections. Previously made-up threads, particularly tubing, may demonstrate reduced torques due to permanent deformation of pin and/or coupling.

Torque values and friction coefficients are affected by a large number of variables, such as variations in taper, lead, thread height and thread forms, surface finish, type of thread compound, length of thread, coatings and weight and grade of pipe. The torque values represented in the tables are for **API Modified thread compound**. Use of other compounds may result in different torques.

The API Round thread torque values (referred to as shoulder torques) included in the tables herein apply to connections with zinc-plated or phosphate-coated couplings. For API Round thread connections with other coupling coatings or platings, couplings with the modified feature (seal rings), or using thread compounds other than API Modified, the Round thread (shoulder) torques in the tables herein should be adjusted by multiplying torques by the following factors:

	Factor
Tin plated couplings:	0.80
Couplings with PTFE (Teflon) rings	0.70

Note: All round thread reflected in the text and following tables are 8 threads per inch, commonly referred to as 8-Round.

HOW TO USE THESE TABLES

Please refer to the recommended practices that accompany these tables.

- **API Round Thread (without MLT™ Rings).**

For API Round thread connections the recommended practice for power tight assembly includes using the API specified make-up torque as the primary criteria, and position of the pin end in the coupling as the secondary criteria for make-up.

Imperial Example: 7" 23# K-55 LTC

The torque for power tight make-up should fall between the minimum and maximum torques of **2,560 ft-lbs** and **4,260 ft-lbs**, respectively (Optimum = **3,410 ft-lbs**)

Metric Example: 177.80mm 34.23 Kg/m K-55 LTC

The torque for power tight make-up should fall between the minimum and maximum torques of **3,470 N·m** and **5,780 N·m**, respectively (Optimum = **4,620 N·m**)

- **API Buttress Thread (without MLT™ Rings).**

For API Buttress thread connections the recommended practice for power tight assembly includes using the position of the pin in the coupling as the primary criteria for make-up, then using the observed torque for that position as an aid to run the casing.

Imperial Example: 7" 23# K-55 BTC

The pin should be made up in the coupling until the end of the coupling reaches the base of the triangle stamped on the pin end. After making up several connections in this manner the observed torque should then be used to make up the rest of the string. (Note – estimates of the make-up shoulder torques for buttress are referenced in the table, i.e., approximately **7,000 ft-lbs** for this connection)

Metric Example: 177.80 mm 34.23 Kg/m K-55 BTC

The pin should be made up in the coupling until the end of the coupling reaches the base of the triangle stamped on the pin end. After making up

several connections in this manner the observed torque should then be used to make up the rest of the string. (Note – estimates of the make-up shoulder torques for buttress are referenced in the table, i.e., approximately 9,490 N·m for this connection)

- **API Round and Buttress Thread with MLT™ Rings**

The MLT™ ring provides a significant boost in torque capacity to round and buttress thread connections. The total torque capacity is determined as follows:

$$\text{Torque}_{\text{Total}} = \text{Torque}_{\text{Shoulder}} + \text{Torque}_{\text{Delta}}$$

Where,

$$\text{Torque}_{\text{Shoulder}} = \text{Torque to bring pin end into contact with the MLT™ ring}$$

Actual shoulder torques are determined during make-up in the field. They can be estimated with the tables herein using as the shoulder torque the **API Recommended Torques** for round thread or the tabulated estimated make-up torque shown for buttress threads.

and

$$\text{Torque}_{\text{Delta}} = \text{Additional torque capacity available from the contact of the pin end and MLT™ ring}$$

Delta Torques are calculated on the basis of predicted yield of the ring or pin end, whichever occurs first. The Delta Torques in the table are for **L-80 grade rings**. In cases where ring strength limits the torque, higher torque ratings may result from the use of higher strength rings.

Total Torques. Values for TorqueTotal are provided in the tables. For round thread the shoulder torque is conservatively assumed to be the minimum API recommended torque. Where the shoulder torque is higher then total torque will also be higher.

Imperial Example: 7" 23# N-80 LTC

For Shoulder Torque = API **Minimum** Torque
 $\text{Torque}_{\text{Shoulder}} = 3,320 \text{ ft-lbs from the LONG thread table (minimum)}$

$\text{Torque}_{\text{Delta}} = 4,400 \text{ ft-lbs from the LONG table}$

$\text{Torque}_{\text{Total}} = 3,320 + 4,400 = \mathbf{7,720 \text{ ft-lbs}}$

For Shoulder Torque = API **Optimum** Torque
 $\text{Torque}_{\text{Shoulder}} = 4,420 \text{ ft-lbs from the LONG thread table (optimum)}$

$\text{Torque}_{\text{Delta}} = 4,400 \text{ ft-lbs from the LONG table}$

$\text{Torque}_{\text{Total}} = 4,420 + 4,400 = \mathbf{8,820 \text{ ft-lbs}}$

Metric Example: 177.80 mm 34.23 Kg/m N-80 LTC

For Shoulder Torque = API **Minimum** Torque
 $\text{Torque}_{\text{Shoulder}} = 4,500 \text{ N}\cdot\text{m from the LONG thread table (minimum)}$

$\text{Torque}_{\text{Delta}} = 5,970 \text{ N}\cdot\text{m from the LONG table}$

$\text{Torque}_{\text{Total}} = 4,500 + 5,970 = \mathbf{10,470 \text{ N}\cdot\text{m}}$

For Shoulder Torque = API **Optimum** Torque
 $\text{Torque}_{\text{Shoulder}} = 5,990 \text{ N}\cdot\text{m from the LONG thread table (optimum)}$

$\text{Torque}_{\text{Delta}} = 5,970 \text{ N}\cdot\text{m from the LONG table}$

$\text{Torque}_{\text{Total}} = 5,990 + 5,970 = \mathbf{11,960 \text{ N}\cdot\text{m}}$

TECHNICAL SERVICES NOTE:

Higher torque performance using the MLT™ Ring may be available depending on the casing or tubing and the operator design requirements. Additional design assistance is available by contacting TESCO as noted below:

TESCO CORPORATION
Casing Accessory Products
11330 Brittmoore Park Drive
Houston, Texas 77041
713-849-5900

Email: casingaccessories@tescocorp.com

Notes to tables:

1. API Recommended Torques are from API RP 5C1, Eighteenth Edition, May 1999 and apply to **NEW** threads. Previously made-up threads, particularly tubing, may demonstrate reduced torques due to permanent deformation of pin and/or coupling.
2. Ring ID is prior to forming lobes, i.e., diameter equivalent to ring circumference. In some cases the ring ID is **less than** the pipe ID and for these cases the ring ID is highlighted in yellow.

Example 3.970 inches or 100.84 mm

$$3. \text{Torque}_{\text{Total}} = \text{Torque}_{\text{Shoulder}} + \text{Torque}_{\text{Delta}}$$

where:

a. $\text{Torque}_{\text{Shoulder}}$ for round thread is conservatively taken as the Minimum API Recommended Torque.

b. $\text{Torque}_{\text{Shoulder}}$ for buttress thread is the **estimated** make-up torque shown in the tables and is generally conservative. **Caution – Field torque values will vary and torque table values for buttress are approximation only.**

c. $\text{Torque}_{\text{Total}}$ is provided as a range of **Min** and **Max** for round thread depending on the actual shoulder torque observed in the field. A **Max** torque is provided for buttress thread.

4. Delta torque is the torque boost provided by the MLT™ ring and is added to the shoulder torque to provide the total torque. For buttress threads, the Delta torque is conservatively limited by the elastic limit of the ring or pin in compression. For round threads, the Delta torque is conservatively limited by the elastic limit of the ring or pin in compression, or a lower limit to retain sealing contact between the mated pin and coupling threads, whichever is lower.
5. The conservatism built into these ratings allows higher torque values depending on circumstances. Contact TESCO for specific applications.
6. MLT™ rings are made from API grade L-80 steel and have the mechanical properties of L-80. If desired, higher torque capacity is available by using higher strength rings.

IMPERIAL TABLES

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METRIC TABLES

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API Tubing EUE 8-ROUND Thread							with MLT™ Ring (L-80)			
Weight (lb/ft)	Grade	Wall (in)	ID (in)	API Recommended Torques			Ring ID (in)	Delta Torque (ft-lb)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(ft-lb)	(ft-lb)	(ft-lb)			(ft-lb)	(ft-lb)
2 3/8										
4.70	H-40	0.190	1.995	740	990	1,240	2.065	560	1,300	1,800
	J-55			970	1,290	1,610		620	1,590	2,230
	L-80			1,320	1,760	2,200		620	1,940	2,820
	N-80			1,350	1,800	2,250		620	1,970	2,870
	C-90			1,440	1,920	2,400		620	2,060	3,020
	T-95			1,520	2,030	2,540		620	2,140	3,160
	P-110			1,790	2,380	2,980		620	2,410	3,600
5.95	L-80	0.254	1.867	1,640	2,190	2,740	1.957	850	2,490	3,590
	N-80			1,680	2,240	2,800		850	2,530	3,650
	C-90			1,790	2,390	2,990		850	2,640	3,840
	T-95			1,890	2,520	3,150		850	2,740	4,000
	P-110			2,210	2,950	3,690		850	3,060	4,540
2 7/8										
6.50	H-40	0.217	2.441	940	1,250	1,560	2.521	900	1,840	2,460
	J-55			1,240	1,650	2,060		1,010	2,250	3,070
	L-80			1,690	2,250	2,810		1,010	2,700	3,820
	N-80			1,730	2,300	2,880		1,010	2,740	3,890
	C-90			1,850	2,460	3,080		1,010	2,860	4,090
	T-95			1,950	2,600	3,250		1,010	2,960	4,260
	P-110			2,280	3,040	3,800		1,010	3,290	4,810
7.90	L-80	0.276	2.323	2,030	2,710	3,390	2.413	1,350	3,380	4,740
	N-80			2,080	2,770	3,460		1,350	3,430	4,810
	C-90			2,230	2,970	3,710		1,350	3,580	5,060
	T-95			2,340	3,120	3,900		1,350	3,690	5,250
	P-110			2,750	3,660	4,580		1,350	4,100	5,930
8.70	L-80	0.308	2.259	2,210	2,950	3,690	2.349	1,540	3,750	5,230
	N-80			2,270	3,020	3,780		1,540	3,810	5,320
	C-90			2,420	3,230	4,040		1,540	3,960	5,580
	T-95			2,550	3,400	4,250		1,540	4,090	5,790
	P-110			2,990	3,980	4,980		1,540	4,530	6,520
3 1/2										
9.30	H-40	0.254	2.992	1,300	1,730	2,160	3.086	1,610	2,910	3,770
	J-55			1,710	2,280	2,850		1,890	3,600	4,740
	L-80			2,270	3,030	3,790		1,890	4,160	5,680
	N-80			2,400	3,200	4,000		1,890	4,290	5,890
	C-90			2,570	3,430	4,290		1,890	4,460	6,180
	T-95			2,720	3,620	4,530		1,890	4,610	6,420
	P-110			3,170	4,230	5,290		1,890	5,060	7,180
12.95	L-80	0.375	2.750	3,150	4,200	5,250	2.840	3,000	6,150	8,250
	N-80			3,220	4,290	5,360		3,000	6,220	8,360
	C-90			3,460	4,610	5,760		3,000	6,460	8,760
	T-95			3,640	4,850	6,060		3,000	6,640	9,060
	P-110			4,260	5,680	7,100		3,000	7,260	10,100

API Casing 8-ROUND SHORT Threads							with MLT™ Ring (L-80)			
Weight (lb/ft)	Grade	Wall (in)	ID (in)	API Recommended Torques			Ring ID (in)	Delta Torque (ft-lb)	Total Torque	
				MIN (ft-lb)	OPT (ft-lb)	MAX (ft-lb)			MIN (ft-lb)	MAX (ft-lb)
4 1/2										
9.50	H-40	0.205	4.090	580	770	960				
	J-55			760	1,010	1,260				
	K-55			840	1,120	1,400				
10.50	J-55	0.224	4.052	990	1,320	1,650				
	K-55			1,100	1,460	1,830				
	M-65			1,160	1,540	1,930				
11.60	J-55	0.250	4.000	1,160	1,540	1,930	3.970	1,590	2,750	3,520
	K-55			1,280	1,700	2,130				
5										
11.50	J-55	0.220	4.560	1,000	1,330	1,660				
	K-55			1,100	1,470	1,840				
	M-65			1,160	1,550	1,940				
13.00	J-55	0.253	4.494	1,270	1,690	2,110	4.460	1,970	3,240	4,080
	K-55			1,400	1,860	2,330				
	M-65			1,470	1,960	2,450				
15.00	J-55	0.296	4.408	1,550	2,070	2,590	4.408	2,580	4,130	5,170
	K-55			1,710	2,280	2,850				
5 1/2										
14.00	H-40	0.244	5.012	980	1,300	1,630				
	J-55			1,290	1,720	2,150				
	K-55			1,420	1,890	2,360				
15.50	J-55	0.275	4.950	1,520	2,020	2,530	4.950	2,540	4,060	5,070
	K-55			1,670	2,220	2,780				
	M-65			1,760	2,350	2,940				
17.00	J-55	0.304	4.892	1,720	2,290	2,860	4.892	3,240	4,960	6,100
	K-55			1,890	2,520	3,150				
6 5/8										
20.00	H-40	0.288	6.049	1,380	1,840	2,300				
	J-55			1,840	2,450	3,060				
	K-55			2,000	2,670	3,340				
	M-65			2,140	2,850	3,560				
24.00	J-55	0.352	5.921	2,360	3,140	3,930				
	K-55			2,570	3,420	4,280				
7										
17.00	H-40	0.231	6.538	920	1,220	1,530				
20.00	H-40	0.272	6.456	1,320	1,760	2,200				
	J-55			1,760	2,340	2,930				
	K-55			1,910	2,540	3,180				
	M-65			2,050	2,730	3,410				
23.00	J-55	0.317	6.366	2,130	2,840	3,550	6.366	5,070	7,200	9,120
	K-55			2,320	3,090	3,860				
26.00	J-55	0.362	6.276	2,510	3,340	4,180	6.276	5,950	8,460	11,170
	K-55			2,730	3,640	4,550				

API Casing 8-ROUND SHORT Threads							with MLT™ Ring (L-80)			
Weight (lb/ft)	Grade	Wall (in)	ID (in)	API Recommended Torques			Ring ID (in)	Delta Torque (ft-lb)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(ft-lb)	(ft-lb)	(ft-lb)			(ft-lb)	(ft-lb)
7 5/8										
24.00	H-40	0.300	7.025	1,590	2,120	2,650	6.969	5,610 6,110 6,570	7,970 8,680 9,330	10,810 11,150 11,480
26.40	J-55	0.328	6.969	2,360	3,150	3,940				
	K-55			2,570	3,420	4,280				
	M-65			2,760	3,680	4,600				
8 5/8										
24.00	J-55	0.264	8.097	1,830	2,440	3,050				
	K-55			1,970	2,630	3,290				
	M-65			2,140	2,850	3,560				
28.00	H-40	0.304	8.017	1,750	2,330	2,910	8.017	4,170	5,920	8,370
	M-65			2,720	3,620	4,530		6,490	9,210	11,690
32.00	H-40	0.352	7.921	2,090	2,790	3,490				
	J-55			2,790	3,720	4,650				
	K-55			3,020	4,020	5,030				
	M-65			3,260	4,350	5,440				
36.00	J-55	0.400	7.825	3,260	4,340	5,430	7.825	7,700	10,960	17,520
	K-55			3,510	4,680	5,850		8,290	11,800	17,940
	M-65			3,800	5,060	6,330		8,970	12,770	19,290
9 5/8										
32.30	H-40	0.312	9.001	1,910	2,540	3,180	8.921	5,250 7,020 7,520 8,190	7,460 9,980 10,690 11,640	12,420 16,630 17,630 18,430
36.00	H-40	0.352	8.921	2,210	2,940	3,680				
	J-55			2,960	3,940	4,930				
	K-55			3,170	4,230	5,290				
	M-65			3,450	4,600	5,750				
40.00	J-55	0.395	8.835	3,390	4,520	5,650	8.835	8,010	11,400	19,000
	K-55			3,650	4,860	6,080		8,620	12,270	20,450
	M-65			3,960	5,280	6,600		9,360	13,320	22,200
10 3/4										
32.75	H-40	0.279	10.192	1,540	2,050	2,560	10.050	5,610 7,480 8,030 8,740	7,970 10,630 11,410 12,420	13,280 17,720 19,010 20,730
40.50	H-40	0.350	10.050	2,360	3,140	3,930				
	J-55			3,150	4,200	5,250				
	K-55			3,380	4,500	5,630				
	M-65			3,680	4,910	6,140				
45.50	J-55	0.400	9.950	3,700	4,930	6,160	9.950	8,750	12,450	20,730
	K-55			3,960	5,280	6,600		9,370	13,330	22,220
	M-65			4,320	5,760	7,200		10,210	14,530	24,220
51.00	J-55	0.450	9.850	4,240	5,650	7,060	9.850	9,990	14,230	23,690
	K-55			4,550	6,060	7,580		10,720	15,270	25,440
	M-65			4,960	6,610	8,260		11,670	16,630	27,700
	L-80			5,960	7,940	9,930		14,020	19,980	33,290
	N-80			6,030	8,040	10,050		14,190	20,220	33,700
	C-90			6,590	8,790	10,990		15,510	22,100	35,790
	T-95			6,950	9,270	11,590		16,350	23,300	36,390
	P-110			8,090	10,790	13,490		19,040	27,130	38,290

API Casing 8-ROUND SHORT Threads							with MLT™ Ring (L-80)			
Weight (lb/ft)	Grade	Wall (in)	ID (in)	API Recommended Torques			Ring ID (in)	Delta Torque (ft-lb)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(ft-lb)	(ft-lb)	(ft-lb)			(ft-lb)	(ft-lb)
10 3/4 (continued)										
55.50	M-65	0.495	9.760	5,520	7,360	9,200	9.760	12,940	18,460	30,770
	L-80			6,630	8,840	11,050		15,540	22,170	36,960
	N-80			6,710	8,950	11,190		15,730	22,440	37,420
	C-90			7,340	9,790	12,240		17,210	24,550	40,940
	T-95			7,740	10,320	12,900		18,150	25,890	41,830
	P-110			9,020	12,020	15,030		21,150	30,170	43,960
	Q-125			10,130	13,500	16,880		23,750	33,880	45,810
60.70	C-90	0.545	9.660	8,170	10,890	13,610	9.660	19,060	27,230	45,360
	T-95			8,610	11,480	14,350		20,090	28,700	47,780
	P-110			10,030	13,370	16,710		23,400	33,430	50,140
	Q-125			11,270	15,020	18,780		26,290	37,560	52,210
65.70	C-90	0.595	9.560	8,990	11,980	14,980				
	T-95			9,470	12,630	15,790				
	P-110			11,030	14,710	18,390				
	Q-125			12,390	16,520	20,650				
11 3/4										
42.00	H-40	0.333	11.084	2,300	3,070	3,840	11.000			
47.00	J-55	0.375	11.000	3,580	4,770	5,960		8,500	12,080	20,100
	K-55			3,820	5,090	6,360		9,060	12,880	21,450
	M-65			4,180	5,570	6,960		9,910	14,090	23,460
54.00	J-55	0.435	10.880	4,260	5,680	7,100	10.880	10,050	14,310	23,860
	K-55			4,550	6,060	7,580		10,740	15,290	25,470
	M-65			4,980	6,640	8,300		11,750	16,730	27,890
60.00	J-55	0.489	10.772	4,870	6,490	8,110	10.772	11,440	16,310	27,160
	K-55			5,200	6,930	8,660		12,210	17,410	29,000
	M-65			5,690	7,590	9,490		13,370	19,060	31,780
	L-80			6,850	9,130	11,410		16,090	22,940	38,210
	N-80			6,930	9,240	11,550		16,280	23,210	38,680
	C-90			7,580	10,110	12,640		17,800	25,380	42,330
	T-95			8,000	10,660	13,330		18,790	26,790	44,640
	P-110			9,320	12,420	15,530		21,890	31,210	49,730
	Q-125			10,460	13,950	17,440		24,570	35,030	51,640
65.00	L-80	0.534	10.682	7,550	10,070	12,590	10.682	17,660	25,210	42,040
	N-80			7,640	10,190	12,740		17,870	25,510	42,540
	C-90			8,370	11,160	13,950		19,580	27,950	46,580
	T-95			8,830	11,770	14,710		20,650	29,480	49,120
	P-110			10,280	13,700	17,130		24,040	34,320	56,260
	Q-125			11,540	15,390	19,240		26,990	38,530	58,370

API Casing 8-ROUND SHORT Threads							with MLT™ Ring (L-80)			
Weight (lb/ft)	Grade	Wall (in)	ID (in)	API Recommended Torques			Ring ID (in)	Delta Torque (ft-lb)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(ft-lb)	(ft-lb)	(ft-lb)			(ft-lb)	(ft-lb)
13 3/8										
48.00	H-40	0.330	12.715	2,420	3,220	4,030				
54.50	J-55	0.380	12.615	3,860	5,140	6,430	12.575	9,140	13,000	21,660
	K-55			4,100	5,470	6,840		9,710	13,810	23,040
	M-65			4,520	6,020	7,530		10,710	15,230	25,370
61.00	J-55	0.430	12.515	4,460	5,950	7,440	12.575	10,570	15,030	25,070
	K-55			4,750	6,330	7,910		11,250	16,000	26,650
	M-65			5,230	6,970	8,710		12,390	17,620	29,340
68.00	J-55	0.480	12.415	5,060	6,750	8,440	12.575	11,990	17,050	28,430
	K-55			5,390	7,180	8,980		12,770	18,160	30,250
	M-65			5,930	7,910	9,890		14,050	19,980	33,320
	L-80			7,140	9,520	11,900		16,910	24,050	40,090
	N-80			7,220	9,630	12,040		17,100	24,320	40,560
	C-90			7,930	10,570	13,210		18,790	26,720	44,500
	T-95			8,360	11,140	13,930		19,800	28,160	45,580
	P-110			9,730	12,970	16,210		23,050	32,780	47,860
72.00	L-80	0.514	12.347	7,720	10,290	12,860	12.575	18,290	26,010	43,330
	N-80			7,800	10,400	13,000		18,480	26,280	43,800
	C-90			8,570	11,420	14,280		20,300	28,870	45,930
	T-95			9,030	12,040	15,050		21,390	30,420	46,700
	P-110			10,510	14,010	17,510		24,900	35,410	49,160
	Q-125			11,820	15,760	19,700		28,000	39,820	51,350
16										
65.00	H-40	0.375	15.250	4,390						
75.00	J-55	0.438	15.124	7,100						
	K-55			7,520						
	M-65			8,320						
84.00	J-55	0.495	15.010	8,170						
	K-55			8,650						
	M-65			9,570						
18 5/8										
87.50	H-40	0.435	17.755	5,590						
	J-55			7,540						
	K-55			7,940						
	M-65			8,840						
20										
94.00	H-40	0.438	19.124	5,810						
	J-55			7,840						
	K-55			8,240						
	M-65			9,190						
106.50	J-55	0.500	19.000	9,130						
	K-55			9,600						
133.00	J-55	0.635	18.730	11,920						
	K-55			12,530						
	M-65			13,980						

API Casing 8-ROUND LONG Threads							with MLT™ Ring (L-80)			
Weight (lb/ft)	Grade	Wall (in)	ID (in)	API Recommended Torques			Ring ID (in)	Delta Torque (ft-lb)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(ft-lb)	(ft-lb)	(ft-lb)			(ft-lb)	(ft-lb)
4 1/2										
11.60	J-55	0.250	4.000	1,220	1,620	2,030	3.970	1,520	2,740	3,550
	K-55			1,350	1,800	2,250		1,520	2,870	3,770
	M-65			1,410	1,880	2,350		1,550	2,960	3,900
	L-80			1,670	2,230	2,790		1,550	3,220	4,340
	N-80			1,710	2,280	2,850		1,550	3,260	4,400
	C-90			1,840	2,450	3,060		1,550	3,390	4,610
	T-95			1,940	2,580	3,230		1,550	3,490	4,780
	P-110			2,270	3,020	3,780		1,550	3,820	5,330
13.50	M-65	0.290	3.920	1,710	2,280	2,850	3.914	1,870	3,580	4,720
	L-80			2,030	2,710	3,390		1,870	3,900	5,260
	N-80			2,070	2,760	3,450		1,870	3,940	5,320
	C-90			2,230	2,970	3,710		1,870	4,100	5,580
	T-95			2,350	3,130	3,910		1,870	4,220	5,780
	P-110			2,750	3,660	4,580		1,870	4,620	6,450
15.10	P-110	0.337	3.826	3,300	4,400	5,500	3.826	2,540	5,840	8,040
	Q-125			3,680	4,910	6,140		2,540	6,220	8,680
5										
13.00	J-55	0.253	4.494	1,370	1,820	2,280	4.434	1,740	3,110	4,020
	K-55			1,510	2,010	2,510		1,740	3,250	4,250
	M-65			1,590	2,120	2,650		2,050	3,640	4,700
15.00	J-55	0.296	4.408	1,670	2,230	2,790	4.408	2,300	3,970	5,090
	K-55			1,850	2,460	3,080		2,300	4,150	5,380
	M-65			1,940	2,590	3,240		2,300	4,240	5,540
	L-80			2,310	3,080	3,850		2,300	4,610	6,150
	N-80			2,360	3,140	3,930		2,300	4,660	6,230
	C-90			2,540	3,380	4,230		2,300	4,840	6,530
	T-95			2,670	3,560	4,450		2,300	4,970	6,750
	P-110			3,130	4,170	5,210		2,300	5,430	7,510
18.00	M-65	0.362	4.276	2,480	3,310	4,140	4.276	3,540	6,020	7,680
	L-80			2,950	3,930	4,910		3,540	6,490	8,450
	N-80			3,000	4,000	5,000		3,540	6,540	8,540
	C-90			3,230	4,310	5,390		3,540	6,770	8,930
	T-95			3,410	4,550	5,680		3,540	6,950	9,220
	P-110			3,980	5,310	6,640		3,540	7,520	10,180
	Q-125			4,450	5,930	7,410		3,540	7,990	10,950
21.40	M-65	0.437	4.126	3,070	4,090	5,110	4.126	4,860	7,930	9,970
	L-80			3,650	4,860	6,080		4,860	8,510	10,940
	N-80			3,710	4,950	6,190		4,860	8,570	11,050
	C-90			4,010	5,340	6,680		4,860	8,870	11,540
	T-95			4,220	5,620	7,030		4,860	9,080	11,890
	P-110			4,940	6,580	8,230		4,860	9,800	13,090
23.20	Q-125	0.478	4.044	5,510	7,340	9,180	4.044	4,860	10,370	14,040
	L-80			4,010	5,350	6,690		5,540	9,550	12,230
	N-80			4,090	5,450	6,810		5,540	9,630	12,350
	C-90			4,410	5,880	7,350		5,540	9,950	12,890
	T-95			4,650	6,200	7,750		5,540	10,190	13,290
	P-110			5,440	7,250	9,060		5,540	10,980	14,600
24.10	Q-125	0.500	4.000	6,070	8,090	10,110	4.000	5,540	11,610	15,650
	L-80			4,210	5,610	7,010		5,900	10,110	12,910
	N-80			4,290	5,720	7,150		5,900	10,190	13,050
	C-90			4,630	6,170	7,710		5,900	10,530	13,610
	T-95			4,880	6,500	8,130		5,900	10,780	14,030
	P-110			5,700	7,600	9,500		5,900	11,600	15,400
	Q-125			6,370	8,490	10,610		5,900	12,270	16,510

API Casing 8-ROUND LONG Threads							with MLT™ Ring (L-80)			
Weight (lb/ft)	Grade	Wall (in)	ID (in)	API Recommended Torques			Ring ID (in)	Delta Torque (ft-lb)	Total Torque	
				MIN (ft-lb)	OPT (ft-lb)	MAX (ft-lb)			MIN (ft-lb)	MAX (ft-lb)
5 1/2										
15.50	J-55	0.275	4.950	1,630	2,170	2,710	4.935	2,360	3,990	5,070
	K-55			1,790	2,390	2,990		2,360	4,150	5,350
	M-65			1,900	2,530	3,160		2,360	4,260	5,520
17.00	J-55	0.304	4.892	1,850	2,470	3,090	4.892	2,870	4,720	5,960
	K-55			2,040	2,720	3,400		2,870	4,910	6,270
	M-65			2,150	2,870	3,590		2,870	5,020	6,460
	L-80			2,560	3,410	4,260		2,870	5,430	7,130
	N-80			2,610	3,480	4,350		2,870	5,480	7,220
	C-90			2,810	3,750	4,690		2,870	5,680	7,560
	T-95			2,970	3,960	4,950		2,870	5,840	7,820
	P-110			3,470	4,620	5,780		2,870	6,340	8,650
	Q-125			3,870	5,160	6,450		2,870	6,740	9,320
20.00	M-65	0.361	4.778	2,650	3,530	4,410	4.778	4,040	6,690	8,450
	L-80			3,150	4,200	5,250		4,040	7,190	9,290
	N-80			3,210	4,280	5,350		4,040	7,250	9,390
	C-90			3,470	4,620	5,780		4,040	7,510	9,820
	T-95			3,650	4,870	6,090		4,040	7,690	10,130
	P-110			4,270	5,690	7,110		4,040	8,310	11,150
23.00	M-65	0.415	4.670	3,110	4,150	5,190	4.670	5,230	8,340	10,420
	L-80			3,700	4,930	6,160		5,230	8,930	11,390
	N-80			3,770	5,020	6,280		5,230	9,000	11,510
	C-90			4,070	5,430	6,790		5,230	9,300	12,020
	T-95			4,290	5,720	7,150		5,230	9,520	12,380
	P-110			5,010	6,680	8,350		5,230	10,240	13,580
	Q-125			5,600	7,470	9,340		5,230	10,830	14,570
6 5/8										
20.00	J-55	0.288	6.049	2,000	2,660	3,330				
	K-55			2,180	2,900	3,630				
	M-65			2,320	3,090	3,860				
24.00	J-55	0.352	5.921	2,550	3,400	4,250				
	K-55			2,790	3,720	4,650				
	M-65			2,970	3,960	4,950				
	L-80			3,550	4,730	5,910				
	N-80			3,610	4,810	6,010				
	C-90			3,910	5,210	6,510				
	T-95			4,120	5,490	6,860				
	P-110			4,810	6,410	8,010				
28.00	M-65	0.417	5.791	3,620	4,830	6,040				
	L-80			4,320	5,760	7,200				
	N-80			4,400	5,860	7,330				
	C-90			4,760	6,350	7,940				
	T-95			5,020	6,690	8,360				
	P-110			5,860	7,810	9,760				
32.00	L-80	0.475	5.675	5,000	6,660	8,330				
	N-80			5,090	6,780	8,480				
	C-90			5,510	7,340	9,180				
	T-95			5,810	7,740	9,680				
	P-110			6,780	9,040	11,300				
	Q-125			7,580	10,110	12,640				

API Casing 8-ROUND LONG Threads							with MLT™ Ring (L-80)			
Weight (lb/ft)	Grade	Wall (in)	ID (in)	API Recommended Torques			Ring ID (in)	Delta Torque (ft-lb)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(ft-lb)	(ft-lb)	(ft-lb)			(ft-lb)	(ft-lb)
7										
23.00	J-55	0.317	6.366	2,350	3,130	3,910	6.366	4,400	6,750	8,310
	K-55			2,560	3,410	4,260		4,400	6,960	8,660
	M-65			2,730	3,640	4,550		4,400	7,130	8,950
	L-80			3,260	4,350	5,440		4,400	7,660	9,840
	N-80			3,320	4,420	5,530		4,400	7,720	9,930
	C-90			3,590	4,790	5,990		4,400	7,990	10,390
	T-95			3,790	5,050	6,310		4,400	8,190	10,710
26.00	J-55	0.362	6.276	2,750	3,670	4,590	6.276	6,050	8,800	10,640
	K-55			3,010	4,010	5,010		6,050	9,060	11,060
	M-65			3,210	4,280	5,350		6,050	9,370	11,510
	L-80			3,830	5,110	6,390		6,050	9,990	12,550
	N-80			3,890	5,190	6,490		6,050	10,050	12,650
	C-90			4,220	5,630	7,040		6,050	10,380	13,200
	T-95			4,450	5,930	7,410		6,050	10,610	13,570
P-110	5,200	6,930	8,660	6,050	11,360	14,820				
29.00	M-65	0.408	6.184	3,690	4,920	6,150	6.184	7,900	11,590	14,050
	L-80			4,400	5,870	7,340		7,900	12,300	15,240
	N-80			4,480	5,970	7,460		7,900	12,380	15,360
	C-90			4,860	6,480	8,100		7,900	12,760	16,000
	T-95			5,120	6,830	8,540		7,900	13,020	16,440
	P-110			5,980	7,970	9,960		7,900	13,880	17,860
32.00	M-65	0.453	6.094	4,160	5,540	6,930	6.094	9,550	13,710	16,480
	L-80			4,960	6,610	8,260		9,550	14,510	17,810
	N-80			5,040	6,720	8,400		9,550	14,590	17,950
	C-90			5,470	7,290	9,110		9,550	15,020	18,660
	T-95			5,760	7,680	9,600		9,550	15,310	19,150
	P-110			6,730	8,970	11,210		9,550	16,280	20,760
35.00	L-80	0.498	6.004	5,510	7,340	9,180	6.004	11,150	16,660	20,330
	N-80			5,600	7,460	9,330		11,150	16,750	20,480
	C-90			6,070	8,090	10,110		11,150	17,220	21,260
	T-95			6,400	8,530	10,660		11,150	17,550	21,810
	P-110			7,470	9,960	12,450		11,150	18,620	23,600
	Q-125			8,360	11,150	13,940		11,150	19,510	25,090
38.00	L-80	0.540	5.920	6,010	8,010	10,010	5.920	12,610	18,620	22,620
	N-80			6,110	8,140	10,180		12,610	18,720	22,790
	C-90			6,620	8,830	11,040		12,610	19,230	23,650
	T-95			6,980	9,310	11,640		12,610	19,590	24,250
	P-110			8,150	10,870	13,590		12,610	20,760	26,200
	Q-125			9,120	12,160	15,200		12,610	21,730	27,810
7 5/8										
26.40	J-55	0.328	6.969	2,600	3,460	4,330	6.969	5,490	8,090	9,820
	K-55			2,830	3,770	4,710		5,490	8,320	10,200
	M-65			3,030	4,040	5,050		5,490	8,520	10,540
	L-80			3,620	4,820	6,030		5,490	9,110	11,520
	N-80			3,680	4,900	6,130		5,490	9,170	11,620
	C-90			3,990	5,320	6,650		5,490	9,480	12,140
	T-95			4,200	5,600	7,000		5,490	9,690	12,490
29.70	M-65	0.375	6.875	3,560	4,740	5,930	6.875	7,670	11,230	13,600
	L-80			4,250	5,670	7,090		7,670	11,920	14,760
	N-80			4,310	5,750	7,190		7,670	11,980	14,860
	C-90			4,690	6,250	7,810		7,670	12,360	15,480
	T-95			4,940	6,590	8,240		7,670	12,610	15,910
	P-110			5,770	7,690	9,610		7,670	13,440	17,280

API Casing 8-ROUND LONG Threads							with MLT™ Ring (L-80)			
Weight (lb/ft)	Grade	Wall (in)	ID (in)	API Recommended Torques			Ring ID (in)	Delta Torque (ft-lb)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(ft-lb)	(ft-lb)	(ft-lb)			(ft-lb)	(ft-lb)
7 5/8 (continued)										
33.70	M-65	0.430	6.765	4,170	5,560	6,950	6.765	9,800	13,970	17,100
	L-80			4,980	6,640	8,300		10,150	15,130	18,450
	N-80			5,060	6,740	8,430		10,150	15,210	18,580
	C-90			5,500	7,330	9,160		10,150	15,650	19,310
	T-95			5,790	7,720	9,650		10,150	15,940	19,800
	P-110			6,760	9,010	11,260		10,150	16,910	21,410
39.00	L-80	0.500	6.625	5,900	7,860	9,830	6.625	13,200	19,100	23,030
	N-80			5,990	7,980	9,980		13,200	19,190	23,180
	C-90			6,500	8,670	10,840		13,200	19,700	24,040
	T-95			6,860	9,140	11,430		13,200	20,060	24,630
	P-110			8,000	10,660	13,330		13,200	21,200	26,530
	Q-125			8,960	11,940	14,930		13,200	22,160	28,130
42.80	L-80	0.562	6.501	6,680	8,910	11,140				
	N-80			6,800	9,060	11,330				
	C-90			7,380	9,840	12,300				
	T-95			7,780	10,370	12,960				
	P-110			9,080	12,100	15,130				
	Q-125			10,160	13,550	16,940				
45.30	L-80	0.595	6.435	7,100	9,470	11,840				
	N-80			7,220	9,620	12,030				
	C-90			7,840	10,450	13,060				
	T-95			8,260	11,010	13,760				
	P-110			9,640	12,850	16,060				
	Q-125			10,790	14,390	17,990				
47.10	L-80	0.625	6.375	7,480	9,970	12,460				
	N-80			7,600	10,130	12,660				
	C-90			8,250	11,000	13,750				
	T-95			8,690	11,590	14,490				
	P-110			10,150	13,530	16,910				
	Q-125			11,360	15,150	18,940				
8 5/8										
28.00	H-40	0.304	8.017	1,960	2,610	3,260	7.984	4,350	6,310	7,610
	M-65			3,050	4,060	5,080		6,290	9,340	11,370
32.00	J-55	0.352	7.921	3,130	4,170	5,210				
	K-55			3,390	4,520	5,650				
	M-65			3,650	4,870	6,090				
36.00	J-55	0.400	7.825	3,650	4,860	6,080	7.825	8,610	12,260	16,320
	K-55			3,950	5,260	6,580		9,320	13,270	16,820
	M-65			4,250	5,670	7,090		10,050	14,300	17,750
	L-80			5,090	6,780	8,480		10,660	15,750	19,140
	N-80			5,160	6,880	8,600		10,660	15,820	19,260
	C-90			5,620	7,490	9,360		10,660	16,280	20,020
	T-95			5,920	7,890	9,860		10,660	16,580	20,520
40.00	M-65	0.450	7.725	4,870	6,490	8,110	7.725	11,430	16,300	21,680
	L-80			5,820	7,760	9,700		13,570	19,390	23,270
	N-80			5,910	7,880	9,850		13,570	19,480	23,420
	C-90			6,440	8,580	10,730		13,570	20,010	24,300
	T-95			6,780	9,040	11,300		13,570	20,350	24,870
	P-110			7,910	10,550	13,190		13,570	21,480	26,760
44.00	L-80	0.500	7.625	6,560	8,740	10,930	7.625	15,290	21,850	27,340
	N-80			6,650	8,870	11,090		15,500	22,150	27,500
	C-90			7,240	9,650	12,060		16,410	23,650	28,470
	T-95			7,630	10,170	12,710		16,410	24,040	29,120
	P-110			8,900	11,860	14,830		16,410	25,310	31,240

API Casing 8-ROUND LONG Threads							with MLT™ Ring (L-80)			
Weight (lb/ft)	Grade	Wall (in)	ID (in)	API Recommended Torques			Ring ID (in)	Delta Torque (ft-lb)	Total Torque	
				MIN (ft-lb)	OPT (ft-lb)	MAX (ft-lb)			MIN (ft-lb)	MAX (ft-lb)
8 5/8 (continued)										
49.00	L-80 N-80 C-90 T-95 P-110 Q-125	0.557	7.511	7,370 7,480 8,140 8,580 10,010 11,220	9,830 9,970 10,850 11,440 13,350 14,960	12,290 12,460 13,560 14,300 16,690 18,700				
9 5/8										
36.00	J-55 K-55 M-65	0.352	8.921	3,400 3,670 3,970	4,530 4,890 5,290	5,660 6,110 6,610	8.921	8,080 8,720 9,200	11,480 12,390 13,170	14,860 15,310 15,810
40.00	J-55 K-55 M-65 L-80 N-80 C-90 T-95	0.395	8.835	3,900 4,210 4,550 5,450 5,530 6,030 6,350	5,200 5,610 6,070 7,270 7,370 8,040 8,470	6,500 7,010 7,590 9,090 9,210 10,050 10,590	8.835	9,230 9,970 10,750 12,450 12,450 12,450 12,450	13,130 14,180 15,300 17,900 17,980 18,480 18,800	18,620 19,130 20,040 21,540 21,660 22,500 23,040
43.50	M-65 L-80 N-80 C-90 T-95 P-110	0.435	8.755	5,090 6,100 6,190 6,740 7,110 8,290	6,790 8,130 8,250 8,990 9,480 11,050	8,490 10,160 10,310 11,240 11,850 13,810	8.755	11,980 14,360 14,570 15,420 15,420 15,420	17,070 20,460 20,760 22,160 22,530 23,710	23,910 25,580 25,730 26,660 27,270 29,230
47.00	M-65 L-80 N-80 C-90 T-95 P-110 Q-125	0.472	8.681	5,590 6,700 6,790 7,400 7,800 9,100 10,200	7,450 8,930 9,050 9,870 10,400 12,130 13,600	9,310 11,160 11,310 12,340 13,000 15,160 17,000	8.681	13,110 15,720 15,930 17,360 18,110 18,110 18,110	18,700 22,420 22,720 24,760 25,910 27,210 28,310	27,420 29,270 29,420 30,450 31,110 33,270 35,110
53.50	L-80 N-80 C-90 T-95 P-110 Q-125	0.545	8.535	7,850 7,970 8,680 9,150 10,670 11,960	10,470 10,620 11,570 12,200 14,220 15,950	13,090 13,280 14,460 15,250 17,780 19,940	8.535	18,250 18,530 20,180 21,280 23,300 23,300	26,100 26,500 28,860 30,430 33,970 35,260	36,390 36,580 37,760 38,550 41,080 43,240
58.40	L-80 N-80 C-90 T-95 P-110 Q-125	0.595	8.435	8,630 8,750 9,540 10,060 11,720 13,160	11,510 11,670 12,720 13,410 15,630 17,540	14,390 14,590 15,900 16,760 19,540 21,930				
20										
94.00	H-40 J-55 K-55 M-65	0.438	19.124	6,730 9,070 9,550 11,490						
106.50	J-55 K-55	0.500	19.000	10,570 11,130						
133.00	J-55 K-55 M-65	0.635	18.730	13,800 14,530 17,490						

API Casing BUTRESS Threads					with MLT™ Ring (L-80)		
Weight	Grade	Wall	ID	Estimated Torque (no rings) (ft-lb)	Ring ID (in)	Delta Torque (ft-lb)	Total Torque MAX (ft-lb)
4 1/2							
9.50	H-40	0.205	4.090	4,500	4.020	1,750	6,250
	J-55			4,500		2,410	6,910
	K-55			4,500		2,410	6,910
10.50	J-55	0.224	4.052	4,500	4.006	2,740	7,240
	K-55			4,500		2,740	7,240
	M-65			4,500		3,180	7,680
11.60	J-55	0.250	4.000	4,500	3.970	3,310	7,810
	K-55			4,500		3,310	7,810
	M-65			4,500		3,670	8,170
	L-80			4,500		3,670	8,170
	N-80			4,500		3,670	8,170
	C-90			4,500		3,670	8,170
	T-95			4,500		3,670	8,170
	P-110			4,500		3,670	8,170
13.50	M-65	0.290	3.920	4,500	3.914	4,420	8,920
	L-80			4,500		4,420	8,920
	N-80			4,500		4,420	8,920
	C-90			4,500		4,420	8,920
	T-95			4,500		4,420	8,920
	P-110			4,500		4,420	8,920
15.10	P-110	0.337	3.826	4,500	3.826	5,560	10,060
	Q-125			4,500		5,560	10,060
5							
11.50	J-55	0.220	4.560	5,000	4.518	3,140	8,140
	K-55			5,000		3,140	8,140
	M-65			5,000		3,560	8,560
13.00	J-55	0.253	4.494	5,000	4.494	3,890	8,890
	K-55			5,000		3,890	8,890
	M-65			5,000		3,890	8,890
15.00	J-55	0.296	4.408	5,000	4.408	5,130	10,130
	K-55			5,000		5,130	10,130
	M-65			5,000		5,340	10,340
	L-80			5,000		5,340	10,340
	N-80			5,000		5,340	10,340
	C-90			5,000		5,340	10,340
	T-95			5,000		5,340	10,340
	P-110			5,000		5,340	10,340
18.00	M-65	0.362	4.276	5,000	4.276	7,470	12,470
	L-80			5,000		7,470	12,470
	N-80			5,000		7,470	12,470
	C-90			5,000		7,470	12,470
	T-95			5,000		7,470	12,470
	P-110			5,000		7,470	12,470
	Q-125			5,000		7,470	12,470
21.40	M-65	0.437	4.126	5,000	4.126	9,770	14,770
	L-80			5,000		9,770	14,770
	N-80			5,000		9,770	14,770
	C-90			5,000		9,770	14,770
	T-95			5,000		9,770	14,770
	P-110			5,000		9,770	14,770
	Q-125			5,000		9,770	14,770

API Casing BUTRESS Threads					with MLT™ Ring (L-80)		
Weight	Grade	Wall	ID	Estimated Torque (no rings) (ft-lb)	Ring ID (in)	Delta Torque (ft-lb)	Total Torque MAX (ft-lb)
5 (continued)							
23.20	L-80	0.478	4.044	5,000	4.044	10,970	15,970
	N-80			5,000		10,970	15,970
	C-90			5,000		10,970	15,970
	T-95			5,000		10,970	15,970
	P-110			5,000		10,970	15,970
	Q-125			5,000		10,970	15,970
24.10	L-80	0.500	4.000	5,000	4.000	11,600	16,600
	N-80			5,000		11,600	16,600
	C-90			5,000		11,600	16,600
	T-95			5,000		11,600	16,600
	P-110			5,000		11,600	16,600
	Q-125			5,000		11,600	16,600
5 1/2							
15.50	J-55	0.275	4.950	5,500	4.935	5,490	10,990
	K-55			5,500		5,490	10,990
	M-65			5,500		5,870	11,370
17.00	J-55	0.304	4.892	5,500	4.892	6,430	11,930
	K-55			5,500		6,430	11,930
	M-65			5,500		6,740	12,240
	L-80			5,500		6,740	12,240
	N-80			5,500		6,740	12,240
	C-90			5,500		6,740	12,240
	T-95			5,500		6,740	12,240
	P-110			5,500		6,740	12,240
	Q-125			5,500		6,740	12,240
20.00	M-65	0.361	4.778	5,500	4.778	8,990	14,490
	L-80			5,500		8,990	14,490
	N-80			5,500		8,990	14,490
	C-90			5,500		8,990	14,490
	T-95			5,500		8,990	14,490
	P-110			5,500		8,990	14,490
23.00	M-65	0.415	4.670	5,500	4.670	11,050	16,550
	L-80			5,500		11,050	16,550
	N-80			5,500		11,050	16,550
	C-90			5,500		11,050	16,550
	T-95			5,500		11,050	16,550
	P-110			5,500		11,050	16,550
Q-125	5,500	11,050	16,550				
6 5/8							
20.00	H-40	0.288	6.049	6,630			
	J-55			6,630			
	K-55			6,630			
	M-65			6,630			
24.00	J-55	0.352	5.921	6,630			
	K-55			6,630			
	M-65			6,630			
	L-80			6,630			
	N-80			6,630			
	C-90			6,630			
	T-95			6,630			
P-110	6,630						

API Casing BUTTRESS Threads					with MLT™ Ring (L-80)		
Weight	Grade	Wall	ID	Estimated Torque (no rings) (ft-lb)	Ring ID (in)	Delta Torque (ft-lb)	Total Torque MAX (ft-lb)
6 5/8 (continued)							
28.00	M-65 L-80 N-80 C-90 T-95 P-110	0.417	5.791	6,630 6,630 6,630 6,630 6,630 6,630			
32.00	L-80 N-80 C-90 T-95 P-110 Q-125	0.475	5.675	6,630 6,630 6,630 6,630 6,630 6,630			
7							
20.00	H-40 J-55 K-55 M-65	0.272	6.456	7,000 7,000 7,000 7,000	6.439	5,950 8,180 8,180 8,670	12,950 15,180 15,180 15,670
23.00	J-55 K-55 M-65 L-80 N-80 C-90 T-95	0.317	6.366	7,000 7,000 7,000 7,000 7,000 7,000 7,000	6.366	10,580 10,580 11,120 11,120 11,120 11,120 11,120	17,580 17,580 18,120 18,120 18,120 18,120 18,120
26.00	J-55 K-55 M-65 L-80 N-80 C-90 T-95 P-110	0.362	6.276	7,000 7,000 7,000 7,000 7,000 7,000 7,000 7,000	6.276	12,930 12,930 14,080 14,080 14,080 14,080 14,080 14,080	19,930 19,930 21,080 21,080 21,080 21,080 21,080 21,080
29.00	M-65 L-80 N-80 C-90 T-95 P-110	0.408	6.184	7,000 7,000 7,000 7,000 7,000 7,000	6.184	17,050 17,050 17,050 17,050 17,050 17,050	24,050 24,050 24,050 24,050 24,050 24,050
32.00	M-65 L-80 N-80 C-90 T-95 P-110	0.453	6.094	7,000 7,000 7,000 7,000 7,000 7,000	6.094	19,880 19,880 19,880 19,880 19,880 19,880	26,880 26,880 26,880 26,880 26,880 26,880
35.00	L-80 N-80 C-90 T-95 P-110 Q-125	0.498	6.004	7,000 7,000 7,000 7,000 7,000 7,000	6.004	22,640 22,640 22,640 22,640 22,640 22,640	29,640 29,640 29,640 29,640 29,640 29,640
38.00	L-80 N-80 C-90 T-95 P-110 Q-125	0.540	5.920	7,000 7,000 7,000 7,000 7,000 7,000	5.920	25,170 25,170 25,170 25,170 25,170 25,170	32,170 32,170 32,170 32,170 32,170 32,170

API Casing BUTRESS Threads					with MLT™ Ring (L-80)		
Weight	Grade	Wall	ID	Estimated Torque (no rings) (ft-lb)	Ring ID (in)	Delta Torque (ft-lb)	Total Torque MAX (ft-lb)
7 5/8							
26.40	J-55	0.328	6.969	7,630	6.969	12,890	20,520
	K-55			7,630		12,890	20,520
	M-65			7,630		13,620	21,250
	L-80			7,630		13,620	21,250
	N-80			7,630		13,620	21,250
	C-90			7,630		13,620	21,250
	T-95			7,630		13,620	21,250
29.70	M-65	0.375	6.875	7,630	6.875	17,310	24,940
	L-80			7,630		17,310	24,940
	N-80			7,630		17,310	24,940
	C-90			7,630		17,310	24,940
	T-95			7,630		17,310	24,940
	P-110			7,630		17,310	24,940
33.70	M-65	0.430	6.765	7,630	6.765	21,520	29,150
	L-80			7,630		21,520	29,150
	N-80			7,630		21,520	29,150
	C-90			7,630		21,520	29,150
	T-95			7,630		21,520	29,150
	P-110			7,630		21,520	29,150
39.00	L-80	0.500	6.625	7,630	6.625	26,730	34,360
	N-80			7,630		26,730	34,360
	C-90			7,630		26,730	34,360
	T-95			7,630		26,730	34,360
	P-110			7,630		26,730	34,360
	Q-125			7,630		26,730	34,360
8 5/8							
24.00	J-55	0.264	8.097	8,630	8.056	10,970	19,600
	K-55			8,630		10,970	19,600
	M-65			8,630		12,610	21,240
28.00	H-40	0.304	8.017	8,630	8.017	10,400	19,030
	M-65			8,630		14,640	23,270
32.00	H-40	0.352	7.921	8,630			
	J-55			8,630			
	K-55			8,630			
	M-65			8,630			
36.00	J-55	0.400	7.825	8,630	7.825	22,030	30,660
	K-55			8,630		22,030	30,660
	M-65			8,630		22,030	30,660
	L-80			8,630		22,030	30,660
	N-80			8,630		22,030	30,660
	C-90			8,630		22,030	30,660
	T-95			8,630		22,030	30,660
40.00	M-65	0.450	7.725	8,630	7.725	29,340	37,970
	L-80			8,630		29,340	37,970
	N-80			8,630		29,340	37,970
	C-90			8,630		29,340	37,970
	T-95			8,630		29,340	37,970
	P-110			8,630		29,340	37,970
44.00	L-80	0.500	7.625	8,630	7.625	34,180	42,810
	N-80			8,630		34,180	42,810
	C-90			8,630		34,180	42,810
	T-95			8,630		34,180	42,810
	P-110			8,630		34,180	42,810

API Casing BUTTRESS Threads					with MLT™ Ring (L-80)		
Weight	Grade	Wall	ID	Estimated Torque (no rings) (ft-lb)	Ring ID (in)	Delta Torque (ft-lb)	Total Torque MAX (ft-lb)
9 5/8							
36.00	H-40	0.352	8.921	9,630	8.921	16,590	26,220
	J-55			9,630		22,800	32,430
	K-55			9,630		22,800	32,430
	M-65			9,630		24,530	34,160
40.00	J-55	0.395	8.835	9,630	8.835	27,130	36,760
	K-55			9,630		27,130	36,760
	M-65			9,630		29,990	39,620
	L-80			9,630		29,990	39,620
	N-80			9,630		29,990	39,620
	C-90			9,630		29,990	39,620
	T-95			9,630		29,990	39,620
43.50	M-65	0.435	8.755	9,630	8.755	33,580	43,210
	L-80			9,630		35,000	44,630
	N-80			9,630		35,000	44,630
	C-90			9,630		35,000	44,630
	T-95			9,630		35,000	44,630
	P-110			9,630		35,000	44,630
47.00	M-65	0.472	8.681	9,630	8.681	39,560	49,190
	L-80			9,630		39,560	49,190
	N-80			9,630		39,560	49,190
	C-90			9,630		39,560	49,190
	T-95			9,630		39,560	49,190
	P-110			9,630		39,560	49,190
	Q-125			9,630		39,560	49,190
53.50	L-80	0.545	8.535	9,630	8.535	48,390	58,020
	N-80			9,630		48,390	58,020
	C-90			9,630		48,390	58,020
	T-95			9,630		48,390	58,020
	P-110			9,630		48,390	58,020
	Q-125			9,630		48,390	58,020
10 3/4							
40.50	H-40	0.350	10.050	10,750	10.050	20,620	31,370
	J-55			10,750		28,350	39,100
	K-55			10,750		28,350	39,100
	M-65			10,750		30,460	41,210
45.50	J-55	0.400	9.950	10,750	9.950	34,690	45,440
	K-55			10,750		34,690	45,440
	M-65			10,750		38,460	49,210
51.00	J-55	0.450	9.850	10,750	9.850	40,930	51,680
	K-55			10,750		40,930	51,680
	M-65			10,750		46,330	57,080
	L-80			10,750		46,330	57,080
	N-80			10,750		46,330	57,080
	C-90			10,750		46,330	57,080
	T-95			10,750		46,330	57,080
	P-110			10,750		46,330	57,080
55.50	M-65	0.495	9.760	10,750	9.760	53,310	64,060
	L-80			10,750		53,310	64,060
	N-80			10,750		53,310	64,060
	C-90			10,750		53,310	64,060
	T-95			10,750		53,310	64,060
	P-110			10,750		53,310	64,060
	Q-125			10,750		53,310	64,060

API Casing BUTRESS Threads					with MLT™ Ring (L-80)		
Weight	Grade	Wall	ID	Estimated Torque (no rings) (ft-lb)	Ring ID (in)	Delta Torque (ft-lb)	Total Torque MAX (ft-lb)
10 3/4							
60.70	C-90	0.545	9.660	10,750	9.660	60,940	71,690
	T-95			10,750		60,940	71,690
	P-110			10,750		60,940	71,690
	Q-125			10,750		60,940	71,690
11 3/4							
47.00	J-55	0.375	11.000	11,750	11.000	37,830	49,580
	K-55			11,750		37,830	49,580
	M-65			11,750		41,370	53,120
54.00	J-55	0.435	10.880	11,750	10.880	46,910	58,660
	K-55			11,750		46,910	58,660
	M-65			11,750		52,830	64,580
60.00	J-55	0.489	10.772	11,750	10.772	54,950	66,700
	K-55			11,750		54,950	66,700
	M-65			11,750		62,970	74,720
	L-80			11,750		62,970	74,720
	N-80			11,750		62,970	74,720
	C-90			11,750		62,970	74,720
	T-95			11,750		62,970	74,720
	P-110			11,750		62,970	74,720
	Q-125			11,750		62,970	74,720
65.00	L-80	0.534	10.682	11,750	10.682	71,300	83,050
	N-80			11,750		71,300	83,050
	C-90			11,750		71,300	83,050
	T-95			11,750		71,300	83,050
	P-110			11,750		71,300	83,050
	Q-125			11,750		71,300	83,050
13 3/8							
54.50	J-55	0.380	12.615	13,380	12.575	50,250	63,630
	K-55			13,380		50,250	63,630
	M-65			13,380		59,380	72,760
61.00	J-55	0.430	12.515	13,380	12.575	60,210	73,590
	K-55			13,380		60,210	73,590
	M-65			13,380		60,210	73,590
68.00	J-55	0.480	12.415	13,380	12.575	60,210	73,590
	K-55			13,380		60,210	73,590
	M-65			13,380		60,210	73,590
	L-80			13,380		60,210	73,590
	N-80			13,380		60,210	73,590
	C-90			13,380		60,210	73,590
	T-95			13,380		60,210	73,590
	P-110			13,380		60,210	73,590
72.00	L-80	0.514	12.347	13,380	12.575	60,210	73,590
	N-80			13,380		60,210	73,590
	C-90			13,380		60,210	73,590
	T-95			13,380		60,210	73,590
	P-110			13,380		60,210	73,590
	Q-125			13,380		60,210	73,590

API Tubing EUE 8-ROUND Thread							with MLT™ Ring (L-80)			
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	API Recommended Torques			Ring ID (mm)	Delta Torque (N-m)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(N-m)	(N-m)	(N-m)			(N-m)	(N-m)
60.32 mm										
6.99	H-40	4.83	50.67	1,000	1,340	1,680	52.45	760	1,760	2,440
	J-55			1,320	1,750	2,180		840	2,160	3,020
	L-80			1,790	2,390	2,980		840	2,630	3,820
	N-80			1,830	2,440	3,050		840	2,670	3,890
	C-90			1,950	2,600	3,250		840	2,790	4,090
	T-95			2,060	2,750	3,440		840	2,900	4,280
	P-110			2,430	3,230	4,040		840	3,270	4,880
8.85	L-80	6.45	47.42	2,220	2,970	3,710	49.71	1,150	3,380	4,870
	N-80			2,280	3,040	3,800		1,150	3,430	4,950
	C-90			2,430	3,240	4,050		1,150	3,580	5,210
	T-95			2,560	3,420	4,270		1,150	3,710	5,420
	P-110			3,000	4,000	5,000		1,150	4,150	6,160
73.02 mm										
9.67	H-40	5.51	62.00	1,270	1,690	2,120	64.03	1,220	2,490	3,340
	J-55			1,680	2,240	2,790		1,370	3,050	4,160
	L-80			2,290	3,050	3,810		1,370	3,660	5,180
	N-80			2,350	3,120	3,900		1,370	3,710	5,270
	C-90			2,510	3,340	4,180		1,370	3,880	5,550
	T-95			2,640	3,530	4,410		1,370	4,010	5,780
	P-110			3,090	4,120	5,150		1,370	4,460	6,520
11.76	L-80	7.01	59.00	2,750	3,670	4,600	61.29	1,830		6,430
	N-80			2,820	3,760	4,690		1,830	4,650	6,520
	C-90			3,020	4,030	5,030		1,830	4,850	6,860
	T-95			3,170	4,230	5,290		1,830	5,000	7,120
	P-110			3,730	4,960	6,210		1,830	5,560	8,040
12.95	L-80	7.82	57.38	3,000	4,000	5,000	59.66	2,090	5,080	7,090
	N-80			3,080	4,090	5,120		2,090	5,170	7,210
	C-90			3,280	4,380	5,480		2,090	5,370	7,570
	T-95			3,460	4,610	5,760		2,090	5,550	7,850
	P-110			4,050	5,400	6,750		2,090	6,140	8,840
88.90 mm										
13.84	H-40	6.45	76.00	1,760	2,350	2,930	78.38	2,180	3,950	5,110
	J-55			2,320	3,090	3,860		2,560	4,880	6,430
	L-80			3,080	4,110	5,140		2,560	5,640	7,700
	N-80			3,250	4,340	5,420		2,560	5,820	7,990
	C-90			3,480	4,650	5,820		2,560	6,050	8,380
	T-95			3,690	4,910	6,140		2,560	6,250	8,700
	P-110			4,300	5,740	7,170		2,560	6,860	9,730
19.27	L-80	9.53	69.85	4,270	5,690	7,120	72.14	4,070	8,340	11,190
	N-80			4,370	5,820	7,270		4,070	8,430	11,330
	C-90			4,690	6,250	7,810		4,070	8,760	11,880
	T-95			4,940	6,580	8,220		4,070	9,000	12,280
	P-110			5,780	7,700	9,630		4,070	9,840	13,690

API Casing 8-ROUND SHORT Threads							with MLT™ Ring (L-80)			
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	API Recommended Torques			Ring ID (mm)	Delta Torque (N-m)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(N-m)	(N-m)	(N-m)			(N-m)	(N-m)
114.30 mm										
14.14	H-40	5.21	103.89	790	1,040	1,300				
	J-55			1,030	1,370	1,710				
	K-55			1,140	1,520	1,900				
15.63	J-55	5.69	102.92	1,340	1,790	2,240				
	K-55			1,490	1,980	2,480				
	M-65			1,570	2,090	2,620				
17.26	J-55	6.35	101.60	1,570	2,090	2,620	100.84	2,160	3,730	4,770
	K-55			1,740	2,300	2,890	100.84	2,160	3,890	5,040
127.00 mm										
17.11	J-55	5.59	115.82	1,360	1,800	2,250				
	K-55			1,490	1,990	2,490				
	M-65			1,570	2,100	2,630				
19.35	J-55	6.43	114.15	1,720	2,290	2,860	113.28	2,670	4,390	5,530
	K-55			1,900	2,520	3,160	113.28	2,670	4,570	5,830
	M-65			1,990	2,660	3,320	113.28	2,810	4,800	6,130
22.32	J-55	7.52	111.96	2,100	2,810	3,510	111.96	3,500	5,600	7,010
	K-55			2,320	3,090	3,860		3,500	5,820	7,360
139.70 mm										
20.83	H-40	6.20	127.30	1,330	1,760	2,210				
	J-55			1,750	2,330	2,910				
	K-55			1,930	2,560	3,200				
23.07	J-55	6.98	125.73	2,060	2,740	3,430	125.73	3,440	5,500	6,870
	K-55			2,260	3,010	3,770		3,440	5,710	7,210
	M-65			2,390	3,190	3,990		3,440	5,830	7,430
25.30	J-55	7.72	124.26	2,330	3,100	3,880	124.26	4,390	6,720	8,270
	K-55			2,560	3,420	4,270		4,390	6,960	8,660
168.28 mm										
29.76	H-40	7.32	153.64	1,870	2,490	3,120				
	J-55			2,490	3,320	4,150				
	K-55			2,710	3,620	4,530				
	M-65			2,900	3,860	4,830				
35.72	J-55	8.94	150.39	3,200	4,260	5,330				
	K-55			3,480	4,640	5,800				
177.80 mm										
25.30	H-40	5.87	166.07	1,250	1,650	2,070				
29.76	H-40	6.91	163.98	1,790	2,390	2,980				
	J-55			2,390	3,170	3,970				
	K-55			2,590	3,440	4,310				
	M-65			2,780	3,700	4,620				
34.23	J-55	8.05	161.70	2,890	3,850	4,810	161.70	6,870	9,760	12,360
	K-55			3,150	4,190	5,230		7,480	10,630	12,790
38.69	J-55	9.19	159.41	3,400	4,530	5,670	159.41	8,070	11,470	15,140
	K-55			3,700	4,940	6,170		8,770	12,470	15,650

API Casing 8-ROUND SHORT Threads							with MLT™ Ring (L-80)			
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	API Recommended Torques			Ring ID (mm)	Delta Torque (N-m)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(N-m)	(N-m)	(N-m)			(N-m)	(N-m)
193.68 mm										
35.72	H-40	7.62	178.44	2,160	2,870	3,590	177.01	7,610 8,280 8,910	10,810 11,770 12,650	14,660 15,120 15,560
39.29	J-55	8.33	177.01	3,200	4,270	5,340				
	K-55			3,480	4,640	5,800				
	M-65			3,740	4,990	6,240				
219.08 mm										
35.72	J-55	6.71	205.66	2,480	3,310	4,140				
	K-55			2,670	3,570	4,460				
	M-65			2,900	3,860	4,830				
41.67	H-40	7.72	203.63	2,370	3,160	3,950	203.63	5,650 8,800	8,030 12,490	11,350 15,850
	M-65			3,690	4,910	6,140				
47.62	H-40	8.94	201.19	2,830	3,780	4,730				
	J-55			3,780	5,040	6,300				
	K-55			4,090	5,450	6,820				
	M-65			4,420	5,900	7,380				
53.57	J-55	10.16	198.76	4,420	5,880	7,360	198.76	10,440 11,240 12,160	14,860 16,000 17,310	23,750 24,320 26,150
	K-55			4,760	6,350	7,930				
	M-65			5,150	6,860	8,580				
244.48 mm										
48.07	H-40	7.92	228.63	2,590	3,440	4,310				
53.57	H-40	8.94	226.59	3,000	3,990	4,990				
	J-55			4,010	5,340	6,680				
	K-55			4,300	5,740	7,170	226.59	7,120 9,520 10,200 11,100	10,110 13,530 14,490 15,780	16,840 22,550 23,900 24,990
	M-65			4,680	6,240	7,800				
59.53	J-55	10.03	224.41	4,600	6,130	7,660	224.41	10,860 11,690 12,690	15,460 16,640 18,060	25,760 27,730 30,100
	K-55			4,950	6,590	8,240				
	M-65			5,370	7,160	8,950				
273.05 mm										
48.74	H-40	7.09	258.88	2,090	2,780	3,470				
60.27	H-40	8.89	255.27	3,200	4,260	5,330				
	J-55			4,270	5,690	7,120				
	K-55			4,580	6,100	7,630	255.27	7,610 10,140 10,890 11,850	10,810 14,410 15,470 16,840	18,010 24,020 25,770 28,110
	M-65			4,990	6,660	8,320				
67.71	J-55	10.16	252.73	5,020	6,680	8,350	252.73	11,860 12,700 13,840	16,880 18,070 19,700	28,110 30,130 32,840
	K-55			5,370	7,160	8,950				
	M-65			5,860	7,810	9,760				
75.90	J-55	11.43	250.19	5,750	7,660	9,570	250.19	13,540 14,530 15,820 19,010 19,240 21,030 22,170 25,810	19,290 20,700 22,550 27,090 27,410 29,960 31,590 36,780	32,120 34,490 37,560 45,130 45,690 48,520 49,340 51,910
	K-55			6,170	8,220	10,280				
	M-65			6,720	8,960	11,200				
	L-80			8,080	10,770	13,460				
	N-80			8,180	10,900	13,630				
	C-90			8,930	11,920	14,900				
	T-95			9,420	12,570	15,710				
	P-110			10,970	14,630	18,290				

API Casing 8-ROUND SHORT Threads							with MLT™ Ring (L-80)			
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	API Recommended Torques			Ring ID (mm)	Delta Torque (N-m)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(N-m)	(N-m)	(N-m)			(N-m)	(N-m)
273.05 mm (continued)										
82.59	M-65	12.57	247.90	7,480	9,980	12,470	247.90	17,540	25,030	41,720
	L-80			8,990	11,990	14,980		21,070	30,060	50,110
	N-80			9,100	12,130	15,170		21,330	30,420	50,730
	C-90			9,950	13,270	16,590		23,330	33,280	55,510
	T-95			10,490	13,990	17,490		24,610	35,100	56,710
	P-110			12,230	16,300	20,380		28,680	40,900	59,600
	Q-125			13,730	18,300	22,890		32,200	45,930	62,110
90.33	C-90	13.84	245.36	11,080	14,760	18,450	245.36	25,840	36,920	61,500
	T-95			11,670	15,560	19,460		27,240	38,910	64,780
	P-110			13,600	18,130	22,660		31,730	45,320	67,980
	Q-125			15,280	20,360	25,460		35,640	50,920	70,790
97.77	C-90	15.11	242.82	12,190	16,240	20,310				
	T-95			12,840	17,120	21,410				
	P-110			14,950	19,940	24,930				
	Q-125			16,800	22,400	28,000				
298.45 mm										
62.50	H-40	8.46	281.53	3,120	4,160	5,210	279.40			
69.94	J-55	9.53	279.40	4,850	6,470	8,080		11,520	16,380	27,250
	K-55			5,180	6,900	8,620		12,280	17,460	29,080
	M-65			5,670	7,550	9,440	13,440	19,100	31,810	
80.36	J-55	11.05	276.35	5,780	7,700	9,630	276.35	13,630	19,400	32,350
	K-55			6,170	8,220	10,280		14,560	20,730	34,530
	M-65			6,750	9,000	11,250		15,930	22,680	37,810
89.29	J-55	12.42	273.61	6,600	8,800	11,000	273.61	15,510	22,110	36,820
	K-55			7,050	9,400	11,740		16,550	23,600	39,320
	M-65			7,710	10,290	12,870		18,130	25,840	43,090
	L-80			9,290	12,380	15,470		21,810	31,100	51,810
	N-80			9,400	12,530	15,660		22,070	31,470	52,440
	C-90			10,280	13,710	17,140		24,130	34,410	57,390
	T-95			10,850	14,450	18,070		25,480	36,320	60,520
	P-110			12,640	16,840	21,060		29,680	42,310	67,420
	Q-125			14,180	18,910	23,650		33,310	47,490	70,010
96.73	L-80	13.56	271.32	10,240	13,650	17,070	271.32	23,940	34,180	57,000
	N-80			10,360	13,820	17,270		24,230	34,590	57,680
	C-90			11,350	15,130	18,910		26,550	37,890	63,150
	T-95			11,970	15,960	19,940		28,000	39,970	66,600
	P-110			13,940	18,570	23,220		32,590	46,530	76,280
	Q-125			15,650	20,870	26,090		36,590	52,240	79,140
339.73 mm										
71.43	H-40	8.38	322.96	3,280	4,370	5,460	319.41			
81.10	J-55	9.65	320.42	5,230	6,970	8,720		12,390	17,630	29,370
	K-55			5,560	7,420	9,270		13,160	18,720	31,240
	M-65			6,130	8,160	10,210	14,520	20,650	34,400	
90.78	J-55	10.92	317.88	6,050	8,070	10,090	319.41	14,330	20,380	33,990
	K-55			6,440	8,580	10,720		15,250	21,690	36,130
	M-65			7,090	9,450	11,810		16,800	23,890	39,780

API Casing 8-ROUND SHORT Threads							with MLT™ Ring (L-80)			
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	API Recommended Torques			Ring ID (mm)	Delta Torque (N-m)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(N-m)	(N-m)	(N-m)			(N-m)	(N-m)
339.73 mm (continued)										
101.19	J-55	12.19	315.34	6,860	9,150	11,440	319.41	16,260	23,120	38,550
	K-55			7,310	9,730	12,180		17,310	24,620	41,010
	M-65			8,040	10,720	13,410		19,050	27,090	45,180
	L-80			9,680	12,910	16,130		22,930	32,610	54,350
	N-80			9,790	13,060	16,320		23,180	32,970	54,990
	C-90			10,750	14,330	17,910		25,480	36,230	60,330
	T-95			11,330	15,100	18,890		26,840	38,180	61,800
	P-110			13,190	17,580	21,980		31,250	44,440	64,890
107.15	L-80	13.06	313.61	10,470	13,950	17,440	319.41	24,800	35,260	58,750
	N-80			10,580	14,100	17,630		25,060	35,630	59,380
	C-90			11,620	15,480	19,360		27,520	39,140	62,270
	T-95			12,240	16,320	20,400		29,000	41,240	63,320
	P-110			14,250	18,990	23,740		33,760	48,010	66,650
	Q-125			16,030	21,370	26,710		37,960	53,990	69,620
406.40 mm										
96.73	H-40	9.53	387.35	5,950						
116.61	J-55	11.13	384.15	9,630						
	K-55			10,200						
	M-65			11,280						
125.01	J-55	12.57	381.25	11,080						
	K-55			11,730						
	M-65			12,980						
473.10 mm										
130.21	H-40	11.05	450.98	7,580						
	J-55			10,220						
	K-55			10,770						
	M-65			11,990						
508.00 mm										
139.89	H-40	11.13	485.75	7,880						
	J-55			10,630						
	K-55			11,170						
	M-65			12,460						
158.49	J-55	12.70	482.60	12,380						
	K-55			13,020						
197.93	J-55	16.13	475.74	16,160						
	K-55			16,990						
	M-65			18,950						

API Casing 8-ROUND LONG Threads							with MLT™ Ring (L-80)			
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	API Recommended Torques			Ring ID (mm)	Delta Torque (N-m)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(N-m)	(N-m)	(N-m)			(N-m)	(N-m)
114.30 mm										
17.26	J-55	6.35	101.60	1,650	2,200	2,750	100.64	2,060	3,710	4,810
	K-55			1,830	2,440	3,050		2,060	3,890	5,110
	M-65			1,910	2,550	3,190		2,100	4,010	5,290
	L-80			2,260	3,020	3,780		2,100	4,370	5,880
	N-80			2,320	3,090	3,860		2,100	4,420	5,970
	C-90			2,490	3,320	4,150		2,100	4,600	6,250
	T-95			2,630	3,500	4,380		2,100	4,730	6,480
P-110	3,080	4,090	5,120	2,100	5,180	7,230				
20.09	M-65	7.37	99.57	2,320	3,090	3,860	99.42	2,540	4,850	6,400
	L-80			2,750	3,670	4,600		2,540	5,290	7,130
	N-80			2,810	3,740	4,680		2,540	5,340	7,210
	C-90			3,020	4,030	5,030		2,540	5,560	7,570
	T-95			3,190	4,240	5,300		2,540	5,720	7,840
	P-110			3,730	4,960	6,210		2,540	6,260	8,740
22.47	P-110	8.56	97.18	4,470	5,970	7,460	97.18	3,440	7,920	10,900
	Q-125			4,990	6,660	8,320		3,440	8,430	11,770
127.00 mm										
19.35	J-55	6.43	114.15	1,860	2,470	3,090	112.62	2,360	4,220	5,450
	K-55			2,050	2,730	3,400		2,360	4,410	5,760
	M-65			2,160	2,870	3,590		2,780	4,940	6,370
22.32	J-55	7.52	111.96	2,260	3,020	3,780	111.96	3,120	5,380	6,900
	K-55			2,510	3,340	4,180		3,120	5,630	7,290
	M-65			2,630	3,510	4,390		3,120	5,750	7,510
	L-80			3,130	4,180	5,220		3,120	6,250	8,340
	N-80			3,200	4,260	5,330		3,120	6,320	8,450
	C-90			3,440	4,580	5,740		3,120	6,560	8,850
	T-95			3,620	4,830	6,030		3,120	6,740	9,150
P-110	4,240	5,650	7,060	3,120	7,360	10,180				
26.79	M-65	9.19	108.61	3,360	4,490	5,610	108.61	4,800	8,160	10,410
	L-80			4,000	5,330	6,660		4,800	8,800	11,460
	N-80			4,070	5,420	6,780		4,800	8,870	11,580
	C-90			4,380	5,840	7,310		4,800	9,180	12,110
	T-95			4,620	6,170	7,700		4,800	9,420	12,500
	P-110			5,400	7,200	9,000		4,800	10,200	13,800
	Q-125			6,030	8,040	10,050		4,800	10,830	14,850
31.85	M-65	11.10	104.80	4,160	5,550	6,930	104.80	6,590	10,750	13,520
	L-80			4,950	6,590	8,240		6,590	11,540	14,830
	N-80			5,030	6,710	8,390		6,590	11,620	14,980
	C-90			5,440	7,240	9,060		6,590	12,030	15,650
	T-95			5,720	7,620	9,530		6,590	12,310	16,120
	P-110			6,700	8,920	11,160		6,590	13,290	17,750
	Q-125			7,470	9,950	12,450		6,590	14,060	19,040
34.53	L-80	12.14	102.72	5,440	7,250	9,070	102.72	7,510	12,950	16,580
	N-80			5,550	7,390	9,230		7,510	13,060	16,740
	C-90			5,980	7,970	9,970		7,510	13,490	17,480
	T-95			6,300	8,410	10,510		7,510	13,820	18,020
	P-110			7,380	9,830	12,280		7,510	14,890	19,790
	Q-125			8,230	10,970	13,710		7,510	15,740	21,220
35.86	L-80	12.70	101.60	5,710	7,610	9,500	101.60	8,000	13,710	17,500
	N-80			5,820	7,760	9,690		8,000	13,820	17,690
	C-90			6,280	8,370	10,450		8,000	14,280	18,450
	T-95			6,620	8,810	11,020		8,000	14,620	19,020
	P-110			7,730	10,300	12,880		8,000	15,730	20,880
	Q-125			8,640	11,510	14,390		8,000	16,640	22,380

API Casing 8-ROUND LONG Threads							with MLT™ Ring (L-80)			
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	API Recommended Torques			Ring ID (mm)	Delta Torque (N-m)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(N-m)	(N-m)	(N-m)			(N-m)	(N-m)
139.70 mm										
23.07	J-55	6.98	125.73	2,210	2,940	3,670	125.35	3,200	5,410	6,870
	K-55			2,430	3,240	4,050		3,200	5,630	7,250
	M-65			2,580	3,430	4,280		3,200	5,780	7,480
25.30	J-55	7.72	124.26	2,510	3,350	4,190	124.26	3,890	6,400	8,080
	K-55			2,770	3,690	4,610		3,890	6,660	8,500
	M-65			2,910	3,890	4,870		3,890	6,810	8,760
	L-80			3,470	4,620	5,780		3,890	7,360	9,670
	N-80			3,540	4,720	5,900		3,890	7,430	9,790
	C-90			3,810	5,080	6,360		3,890	7,700	10,250
	T-95			4,030	5,370	6,710		3,890	7,920	10,600
	P-110			4,700	6,260	7,840		3,890	8,600	11,730
	Q-125			5,250	7,000	8,740		3,890	9,140	12,640
29.76	M-65	9.17	121.36	3,590	4,790	5,980	121.36	5,480	9,070	11,460
	L-80			4,270	5,690	7,120		5,480	9,750	12,600
	N-80			4,350	5,800	7,250		5,480	9,830	12,730
	C-90			4,700	6,260	7,840		5,480	10,180	13,310
	T-95			4,950	6,600	8,260		5,480	10,430	13,730
	P-110			5,790	7,710	9,640		5,480	11,270	15,120
34.23	M-65	10.54	118.62	4,220	5,630	7,040	118.62	7,090	11,310	14,130
	L-80			5,020	6,680	8,350		7,090	12,110	15,440
	N-80			5,110	6,810	8,510		7,090	12,200	15,610
	C-90			5,520	7,360	9,210		7,090	12,610	16,300
	T-95			5,820	7,760	9,690		7,090	12,910	16,780
	P-110			6,790	9,060	11,320		7,090	13,880	18,410
	Q-125			7,590	10,130	12,660		7,090	14,680	19,750
168.28 mm										
29.76	J-55	7.32	153.64	2,710	3,610	4,510				
	K-55			2,960	3,930	4,920				
	M-65			3,150	4,190	5,230				
35.72	J-55	8.94	150.39	3,460	4,610	5,760				
	K-55			3,780	5,040	6,300				
	M-65			4,030	5,370	6,710				
	L-80			4,810	6,410	8,010				
	N-80			4,890	6,520	8,150				
	C-90			5,300	7,060	8,830				
	T-95			5,590	7,440	9,300				
	P-110			6,520	8,690	10,860				
41.67	M-65	10.59	147.09	4,910	6,550	8,190				
	L-80			5,860	7,810	9,760				
	N-80			5,970	7,940	9,940				
	C-90			6,450	8,610	10,770				
	T-95			6,810	9,070	11,330				
47.62	P-110	12.06	144.15	7,940	10,590	13,230				
	L-80			6,780	9,030	11,290				
	N-80			6,900	9,190	11,500				
	C-90			7,470	9,950	12,450				
	T-95			7,880	10,490	13,120				
	P-110			9,190	12,260	15,320				
Q-125	10,280	13,710	17,140							
177.80 mm										
34.23	J-55	8.05	161.70	3,190	4,240	5,300	161.70	5,970	9,150	11,270
	K-55			3,470	4,620	5,780		5,970	9,440	11,740
	M-65			3,700	4,940	6,170		5,970	9,670	12,130
	L-80			4,420	5,900	7,380		5,970	10,390	13,340

API Casing 8-ROUND LONG Threads							with MLT™ Ring (L-80)			
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	API Recommended Torques			Ring ID (mm)	Delta Torque (N-m)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(N-m)	(N-m)	(N-m)			(N-m)	(N-m)
177.80 mm (continued)										
38.69	N-80	8.05	161.70	4,500	5,990	7,500	161.70	5,970	10,470	13,460
	C-90			4,870	6,490	8,120		5,970	10,830	14,090
	T-95			5,140	6,850	8,560		5,970	11,100	14,520
	J-55	9.19	159.41	3,730	4,980	6,220	159.41	8,200	11,930	14,430
	K-55			4,080	5,440	6,790		8,200	12,280	15,000
	M-65			4,350	5,800	7,250		8,350	12,700	15,610
	L-80			5,190	6,930	8,660		8,350	13,540	17,020
	N-80			5,270	7,040	8,800		8,350	13,630	17,150
	C-90			5,720	7,630	9,540		8,350	14,070	17,900
T-95	6,030			8,040	10,050	8,350		14,390	18,400	
P-110	7,050			9,400	11,740	8,350		15,400	20,090	
43.16	M-65	10.36	157.07	5,000	6,670	8,340	157.07	10,710	15,710	19,050
	L-80			5,970	7,960	9,950		10,710	16,680	20,660
	N-80			6,070	8,090	10,110		10,710	16,780	20,830
	C-90			6,590	8,790	10,980		10,710	17,300	21,690
	T-95			6,940	9,260	11,580		10,710	17,650	22,290
	P-110			8,110	10,810	13,500		10,710	18,820	24,210
47.62	M-65	11.51	154.79	5,640	7,510	9,400	154.79	12,950	18,590	22,340
	L-80			6,720	8,960	11,200		12,950	19,670	24,150
	N-80			6,830	9,110	11,390		12,950	19,780	24,340
	C-90			7,420	9,880	12,350		12,950	20,360	25,300
	T-95			7,810	10,410	13,020		12,950	20,760	25,960
	P-110			9,120	12,160	15,200		12,950	22,070	28,150
52.09	L-80	12.65	152.50	7,470	9,950	12,450	152.50	15,120	22,590	27,560
	N-80			7,590	10,110	12,650		15,120	22,710	27,770
	C-90			8,230	10,970	13,710		15,120	23,350	28,820
	T-95			8,680	11,560	14,450		15,120	23,790	29,570
	P-110			10,130	13,500	16,880		15,120	25,240	32,000
	Q-125			11,330	15,120	18,900		15,120	26,450	34,020
56.55	L-80	13.72	150.37	8,150	10,860	13,570	150.37	17,100	25,240	30,670
	N-80			8,280	11,040	13,800		17,100	25,380	30,900
	C-90			8,980	11,970	14,970		17,100	26,070	32,060
	T-95			9,460	12,620	15,780		17,100	26,560	32,880
	P-110			11,050	14,740	18,430		17,100	28,150	35,520
	Q-125			12,360	16,490	20,610		17,100	29,460	37,700
193.68 mm										
39.29	J-55	8.33	177.01	3,530	4,690	5,870	177.01	7,440	10,970	13,310
	K-55			3,840	5,110	6,390		7,440	11,280	13,830
	M-65			4,110	5,480	6,850		7,440	11,550	14,290
	L-80			4,910	6,530	8,180		7,440	12,350	15,620
	N-80			4,990	6,640	8,310		7,440	12,430	15,750
	C-90			5,410	7,210	9,020		7,440	12,850	16,460
	T-95			5,690	7,590	9,490		7,440	13,140	16,930
44.20	M-65	9.52	174.63	4,830	6,430	8,040	174.63	10,400	15,230	18,440
	L-80			5,760	7,690	9,610		10,400	16,160	20,010
	N-80			5,840	7,800	9,750		10,400	16,240	20,150
	C-90			6,360	8,470	10,590		10,400	16,760	20,990
	T-95			6,700	8,930	11,170		10,400	17,100	21,570
	P-110			7,820	10,430	13,030		10,400	18,220	23,430
50.15	M-65	10.92	171.83	5,650	7,540	9,420	171.83	13,290	18,940	23,180
	L-80			6,750	9,000	11,250		13,760	20,510	25,010
	N-80			6,860	9,140	11,430		13,760	20,620	25,190
	C-90			7,460	9,940	12,420		13,760	21,220	26,180
	T-95			7,850	10,470	13,080		13,760	21,610	26,840
	P-110			9,170	12,220	15,270		13,760	22,930	29,030

API Casing 8-ROUND LONG Threads							with MLT™ Ring (L-80)				
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	API Recommended Torques			Ring ID (mm)	Delta Torque (N-m)	Total Torque		
				MIN	OPT	MAX			MIN	MAX	
				(N-m)	(N-m)	(N-m)			(N-m)	(N-m)	
193.68 mm (continued)											
58.04	L-80	12.70	168.28	8,000	10,660	13,330	168.28	17,900	25,900	31,220	
	N-80			8,120	10,820	13,530		168.28	17,900	26,020	31,430
	C-90			8,810	11,750	14,700		168.28	17,900	26,710	32,590
	T-95			9,300	12,390	15,500		168.28	17,900	27,200	33,390
	P-110			10,850	14,450	18,070		168.28	17,900	28,740	35,970
	Q-125			12,150	16,190	20,240		168.28	17,900	30,040	38,140
63.69	L-80	14.27	165.13	9,060	12,080	15,100					
	N-80			9,220	12,280	15,360					
	C-90			10,010	13,340	16,680					
	T-95			10,550	14,060	17,570					
	P-110			12,310	16,410	20,510					
	Q-125			13,770	18,370	22,970					
67.41	L-80	15.11	163.45	9,630	12,840	16,050					
	N-80			9,790	13,040	16,310					
	C-90			10,630	14,170	17,710					
	T-95			11,200	14,930	18,660					
	P-110			13,070	17,420	21,770					
	Q-125			14,630	19,510	24,390					
70.09	L-80	15.88	161.93	10,140	13,520	16,890					
	N-80			10,300	13,730	17,160					
	C-90			11,190	14,910	18,640					
	T-95			11,780	15,710	19,650					
	P-110			13,760	18,340	22,930					
	Q-125			15,400	20,540	25,680					
219.08 mm											
41.67	H-40	7.72	203.63	2,660	3,540	4,420	202.79	5,900	8,560	10,320	
	M-65			4,140	5,500	6,890		8,530	12,660	15,420	
47.62	J-55	8.94	201.19	4,240	5,650	7,060					
	K-55			4,600	6,130	7,660					
	M-65			4,950	6,600	8,260					
53.57	J-55	10.16	198.76	4,950	6,590	8,240	198.76	11,670	16,620	22,130	
	K-55			5,360	7,130	8,920		12,640	17,990	22,800	
	M-65			5,760	7,690	9,610		13,630	19,390	24,070	
	L-80			6,900	9,190	11,500		14,450	21,350	25,950	
	N-80			7,000	9,330	11,660		14,450	21,450	26,110	
	C-90			7,620	10,150	12,690		14,450	22,070	27,140	
59.53	T-95	11.43	196.22	8,030	10,700	13,370	196.22	14,450	22,480	27,820	
	M-65			6,600	8,800	11,000		15,500	22,100	29,390	
	L-80			7,890	10,520	13,150		18,400	26,290	31,550	
	N-80			8,010	10,680	13,350		18,400	26,410	31,750	
	C-90			8,730	11,630	14,550		18,400	27,130	32,950	
	T-95			9,190	12,260	15,320		18,400	27,590	33,720	
65.48	P-110	12.70	193.68	10,720	14,300	17,880	193.68	18,400	29,120	36,280	
	L-80			8,890	11,850	14,820		20,730	29,620	37,070	
	N-80			9,020	12,030	15,040		21,010	30,030	37,280	
	C-90			9,820	13,080	16,350		22,250	32,060	38,600	
	T-95			10,340	13,790	17,230		22,250	32,590	39,480	
	P-110			12,070	16,080	20,110		22,250	34,320	42,360	
72.92	L-80	14.15	190.78	9,990	13,330	16,660					
	N-80			10,140	13,520	16,890					
	C-90			11,040	14,710	18,380					
	T-95			11,630	15,510	19,390					
	P-110			13,570	18,100	22,630					
	Q-125			15,210	20,280	25,350					

API Casing 8-ROUND LONG Threads							with MLT™ Ring (L-80)			
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	API Recommended Torques			Ring ID (mm)	Delta Torque (N-m)	Total Torque	
				MIN	OPT	MAX			MIN	MAX
				(N-m)	(N-m)	(N-m)			(N-m)	(N-m)
244.48 mm										
53.57	J-55	8.94	226.59	4,610	6,140	7,670	226.59	10,950	15,560	20,150
	K-55			4,980	6,630	8,280		11,820	16,800	20,760
	M-65			5,380	7,170	8,960		12,470	17,860	21,440
59.53	J-55	10.03	224.41	5,290	7,050	8,810	224.41	12,510	17,800	25,240
	K-55			5,710	7,610	9,500		13,520	19,230	25,940
	M-65			6,170	8,230	10,290		14,570	20,740	27,170
	L-80			7,390	9,860	12,320		16,880	24,270	29,200
	N-80			7,500	9,990	12,490		16,880	24,380	29,370
	C-90			8,180	10,900	13,630		16,880	25,060	30,510
	T-95			8,610	11,480	14,360		16,880	25,490	31,240
64.73	M-65	11.05	222.38	6,900	9,210	11,510	222.38	16,240	23,140	32,420
	L-80			8,270	11,020	13,770		19,470	27,740	34,680
	N-80			8,390	11,190	13,980		19,750	28,150	34,880
	C-90			9,140	12,190	15,240		20,910	30,040	36,150
	T-95			9,640	12,850	16,070		20,910	30,550	36,970
	P-110			11,240	14,980	18,720		20,910	32,150	39,630
69.94	M-65	11.99	220.50	7,580	10,100	12,620	220.50	17,770	25,350	37,180
	L-80			9,080	12,110	15,130		21,310	30,400	39,680
	N-80			9,210	12,270	15,330		21,600	30,800	39,890
	C-90			10,030	13,380	16,730		23,540	33,570	41,280
	T-95			10,580	14,100	17,630		24,550	35,130	42,180
	P-110			12,340	16,450	20,550		24,550	36,890	45,110
	Q-125			13,830	18,440	23,050		24,550	38,380	47,600
79.62	L-80	13.84	216.79	10,640	14,200	17,750	216.79	24,740	35,390	49,340
	N-80			10,810	14,400	18,010		25,120	35,930	49,600
	C-90			11,770	15,690	19,600		27,360	39,130	51,200
	T-95			12,410	16,540	20,680		28,850	41,260	52,270
	P-110			14,470	19,280	24,110		31,590	46,060	55,700
	Q-125			16,220	21,630	27,030		31,590	47,810	58,620
86.91	L-80	15.11	214.25	11,700	15,610	19,510				
	N-80			11,860	15,820	19,780				
	C-90			12,930	17,250	21,560				
	T-95			13,640	18,180	22,720				
	P-110			15,890	21,190	26,490				
	Q-125			17,840	23,780	29,730				
508.00 mm										
139.89	H-40	11.13	485.75	9,120						
	J-55			12,300						
	K-55			12,950						
	M-65			15,580						
158.49	J-55	12.70	482.60	14,330						
	K-55			15,090						
197.93	J-55	16.13	475.74	18,710						
	K-55			19,700						
	M-65			23,710						

API Casing BUTRESS Threads					with MLT™ Ring (L-80)		
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	Estimated Torque (no rings) (N-m)	Ring ID (mm)	Delta Torque (N-m)	Total Torque MAX (N-m)
114.30 mm							
14.14	H-40	5.21	103.89	6,100	102.11	2,370	8,470
	J-55			6,100		3,270	9,370
	K-55			6,100		3,270	9,370
15.63	J-55	5.69	102.92	6,100	101.75	3,710	9,820
	K-55			6,100		3,710	9,820
	M-65			6,100		4,310	10,410
17.26	J-55	6.35	101.60	6,100	100.84	4,490	10,590
	K-55			6,100		4,490	10,590
	M-65			6,100		4,980	11,080
	L-80			6,100		4,980	11,080
	N-80			6,100		4,980	11,080
	C-90			6,100		4,980	11,080
	T-95			6,100		4,980	11,080
	P-110			6,100		4,980	11,080
20.09	M-65	7.37	99.57	6,100	99.42	5,990	12,090
	L-80			6,100		5,990	12,090
	N-80			6,100		5,990	12,090
	C-90			6,100		5,990	12,090
	T-95			6,100		5,990	12,090
	P-110			6,100		5,990	12,090
22.47	P-110	8.56	97.18	6,100	97.18	7,540	13,640
	Q-125			6,100		7,540	13,640
127.00 mm							
17.11	J-55	5.59	115.82	6,780	114.76	4,260	11,040
	K-55			6,780		4,260	11,040
	M-65			6,780		4,830	11,610
19.35	J-55	6.43	114.15	6,780	114.15	5,270	12,050
	K-55			6,780	5,270	12,050	
	M-65			6,780	114.15	5,270	12,050
22.32	J-55	7.52	111.96	6,780	111.96	6,960	13,730
	K-55			6,780		6,960	13,730
	M-65			6,780		7,240	14,020
	L-80			6,780		7,240	14,020
	N-80			6,780		7,240	14,020
	C-90			6,780		7,240	14,020
	T-95			6,780		7,240	14,020
	P-110			6,780		7,240	14,020
26.79	M-65	9.19	108.61	6,780	108.61	10,130	16,910
	L-80			6,780		10,130	16,910
	N-80			6,780		10,130	16,910
	C-90			6,780		10,130	16,910
	T-95			6,780		10,130	16,910
	P-110			6,780		10,130	16,910
31.85	Q-125	11.10	104.80	6,780	104.80	10,130	16,910
	M-65			6,780		13,250	20,030
	L-80			6,780		13,250	20,030
	N-80			6,780		13,250	20,030
	C-90			6,780		13,250	20,030
	T-95			6,780		13,250	20,030
	P-110			6,780		13,250	20,030
	Q-125			6,780		13,250	20,030
34.53	L-80	12.14	102.72	6,780	102.72	14,870	21,650
	N-80			6,780		14,870	21,650
	C-90			6,780		14,870	21,650

API Casing BUTRESS Threads					with MLT™ Ring (L-80)		
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	Estimated Torque (no rings) (N-m)	Ring ID (mm)	Delta Torque (N-m)	Total Torque MAX (N-m)
127.00 mm (continued)							
35.86	T-95	12.14	102.72	6,780	102.72	14,870	21,650
	P-110			6,780		14,870	21,650
	Q-125			6,780		14,870	21,650
	L-80	12.70	101.60	6,780	101.60	15,730	22,510
	N-80			6,780		15,730	22,510
	C-90			6,780		15,730	22,510
	T-95			6,780		15,730	22,510
	P-110			6,780		15,730	22,510
	Q-125			6,780		15,730	22,510
139.70 mm							
23.07	J-55	6.98	125.73	7,460	125.35	7,440	14,900
25.30	K-55			7,460		7,440	14,900
	M-65			7,460		7,960	15,420
	J-55	7.72	124.26	7,460	124.26	8,720	16,170
	K-55			7,460		8,720	16,170
	M-65			7,460		9,140	16,590
	L-80			7,460		9,140	16,590
	N-80			7,460		9,140	16,590
	C-90			7,460		9,140	16,590
	T-95			7,460		9,140	16,590
P-110	7,460			9,140		16,590	
Q-125	7,460	9,140	16,590				
29.76	M-65	9.17	121.36	7,460	121.36	12,190	19,650
L-80	7,460			12,190		19,650	
N-80	7,460			12,190		19,650	
C-90	7,460			12,190		19,650	
T-95	7,460			12,190		19,650	
P-110	7,460			12,190		19,650	
34.23	M-65	10.54	118.62	7,460	118.62	14,980	22,440
L-80	7,460			14,980		22,440	
N-80	7,460			14,980		22,440	
C-90	7,460			14,980		22,440	
T-95	7,460			14,980		22,440	
P-110	7,460			14,980		22,440	
Q-125	7,460			14,980		22,440	
168.28 mm							
29.76	H-40	7.32	153.64	8,990			
35.72	J-55			8,990			
	K-55			8,990			
	M-65			8,990			
	J-55	8.94	150.39	8,990			
	K-55			8,990			
	M-65			8,990			
	L-80			8,990			
	N-80			8,990			
	C-90			8,990			
T-95	8,990						
P-110	8,990						
41.67	M-65	10.59	147.09	8,990			
L-80	8,990						
N-80	8,990						
C-90	8,990						
T-95	8,990						
47.62	P-110	8,990					
	L-80	12.06	144.15	8,990			

API Casing BUTRESS Threads					with MLT™ Ring (L-80)		
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	Estimated Torque (no rings) (N-m)	Ring ID (mm)	Delta Torque (N-m)	Total Torque MAX (N-m)
168.28 mm (continued)							
	N-80 C-90 T-95 P-110 Q-125	12.06	144.15	8,990 8,990 8,990 8,990 8,990			
177.80 mm							
29.76	H-40 J-55 K-55 M-65	6.91	163.98	9,490 9,490 9,490 9,490	163.55	8,070 11,090 11,090 11,750	17,560 20,580 20,580 21,250
34.23	J-55 K-55 M-65 L-80 N-80 C-90 T-95	8.05	161.70	9,490 9,490 9,490 9,490 9,490 9,490 9,490	161.70	14,340 14,340 15,080 15,080 15,080 15,080 15,080	23,830 23,830 24,570 24,570 24,570 24,570 24,570
38.69	J-55 K-55 M-65 L-80 N-80 C-90 T-95 P-110	9.19	159.41	9,490 9,490 9,490 9,490 9,490 9,490 9,490 9,490	159.41	17,530 17,530 19,090 19,090 19,090 19,090 19,090 19,090	27,020 27,020 28,580 28,580 28,580 28,580 28,580 28,580
43.16	M-65 L-80 N-80 C-90 T-95 P-110	10.36	157.07	9,490 9,490 9,490 9,490 9,490 9,490	157.07	23,120 23,120 23,120 23,120 23,120 23,120	32,610 32,610 32,610 32,610 32,610 32,610
47.62	M-65 L-80 N-80 C-90 T-95 P-110	11.51	154.79	9,490 9,490 9,490 9,490 9,490 9,490	154.79	26,950 26,950 26,950 26,950 26,950 26,950	36,440 36,440 36,440 36,440 36,440 36,440
52.09	L-80 N-80 C-90 T-95 P-110 Q-125	12.65	152.50	9,490 9,490 9,490 9,490 9,490 9,490	152.50	30,700 30,700 30,700 30,700 30,700 30,700	40,190 40,190 40,190 40,190 40,190 40,190
56.55	L-80 N-80 C-90 T-95 P-110 Q-125	13.72	150.37	9,490 9,490 9,490 9,490 9,490 9,490	150.37	34,130 34,130 34,130 34,130 34,130 34,130	43,620 43,620 43,620 43,620 43,620 43,620
193.68 mm							
39.29	J-55 K-55 M-65 L-80 N-80 C-90	8.33	177.01	10,340 10,340 10,340 10,340 10,340 10,340	177.01	17,480 17,480 18,470 18,470 18,470 18,470	17,480 17,480 18,470 18,470 18,470 18,470

API Casing BUTTRESS Threads					with MLT™ Ring (L-80)		
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	Estimated Torque (no rings) (N-m)	Ring ID (mm)	Delta Torque (N-m)	Total Torque MAX (N-m)
193.68 mm (continued)							
44.20	T-95	8.33	177.01	10,340	177.01	18,470	18,470
	M-65	9.52	174.63	10,340	174.63	23,470	23,470
	L-80			10,340		23,470	23,470
	N-80			10,340		23,470	23,470
	C-90			10,340		23,470	23,470
	T-95			10,340		23,470	23,470
50.15	P-110			10,340		23,470	23,470
	M-65	10.92	171.83	10,340	171.83	29,180	29,180
	L-80			10,340		29,180	29,180
	N-80			10,340		29,180	29,180
	C-90			10,340		29,180	29,180
	T-95			10,340		29,180	29,180
58.04	P-110			10,340		29,180	29,180
	L-80	12.70	168.28	10,340	168.28	36,240	36,240
	N-80			10,340		36,240	36,240
	C-90			10,340		36,240	36,240
	T-95			10,340		36,240	36,240
	P-110			10,340		36,240	36,240
219.08 mm							
35.72	J-55	6.71	205.66	11,700	204.62	14,870	26,570
	K-55			11,700		14,870	26,570
	M-65			11,700		17,100	28,800
41.67	H-40	7.72	203.63	11,700	203.63	14,100	25,800
	M-65			11,700		19,850	31,550
47.62	H-40	8.94	201.19	11,700			
	J-55			11,700			
	K-55			11,700			
	M-65			11,700			
53.57	J-55	10.16	198.76	11,700	198.76	29,870	41,570
	K-55			11,700		29,870	41,570
	M-65			11,700		33,080	44,780
	L-80			11,700		33,080	44,780
	N-80			11,700		33,080	44,780
	C-90			11,700		33,080	44,780
	T-95			11,700		33,080	44,780
59.53	M-65	11.43	196.22	11,700	196.22	39,780	51,480
	L-80			11,700		39,780	51,480
	N-80			11,700		39,780	51,480
	C-90			11,700		39,780	51,480
	T-95			11,700		39,780	51,480
	P-110			11,700		39,780	51,480
65.48	L-80	12.70	193.68	11,700	193.68	46,340	58,040
	N-80			11,700		46,340	58,040
	C-90			11,700		46,340	58,040
	T-95			11,700		46,340	58,040
	P-110			11,700		46,340	58,040
244.48 mm							
53.57	H-40	8.94	226.59	13,060	226.59	22,490	35,550
	J-55			13,060		30,910	43,970
	K-55			13,060		30,910	43,970
	M-65			13,060		33,260	46,310
59.53	J-55	10.03	224.41	13,060	224.41	36,780	49,840

API Casing BUTRESS Threads					with MLT™ Ring (L-80)		
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	Estimated Torque (no rings) (N-m)	Ring ID (mm)	Delta Torque (N-m)	Total Torque MAX (N-m)
244.48 mm (continued)							
	K-55	10.03	224.41	13,060	224.41	36,780	49,840
	M-65			13,060		40,660	53,720
	L-80			13,060		40,660	53,720
	N-80			13,060		40,660	53,720
	C-90			13,060		40,660	53,720
	T-95			13,060		40,660	53,720
64.73	M-65	11.05	222.38	13,060	222.38	45,530	58,580
	L-80			13,060		47,450	60,510
	N-80			13,060		47,450	60,510
	C-90			13,060		47,450	60,510
	T-95			13,060		47,450	60,510
	P-110			13,060		47,450	60,510
69.94	M-65	11.99	220.50	13,060	220.50	53,640	66,690
	L-80			13,060		53,640	66,690
	N-80			13,060		53,640	66,690
	C-90			13,060		53,640	66,690
	T-95			13,060		53,640	66,690
	P-110			13,060		53,640	66,690
	Q-125			13,060		53,640	66,690
79.62	L-80	13.84	216.79	13,060	216.79	65,610	78,660
	N-80			13,060		65,610	78,660
	C-90			13,060		65,610	78,660
	T-95			13,060		65,610	78,660
	P-110			13,060		65,610	78,660
	Q-125			13,060		65,610	78,660
273.05 mm							
60.27	H-40	8.89	255.27	14,570	255.27	27,960	42,530
	J-55			14,570		38,440	53,010
	K-55			14,570		38,440	53,010
	M-65			14,570		41,300	55,870
67.71	J-55	10.16	252.73	14,570	252.73	47,030	61,610
	K-55			14,570		47,030	61,610
	M-65			14,570		52,140	66,720
75.90	J-55	11.43	250.19	14,570	250.19	55,490	70,070
	K-55			14,570		55,490	70,070
	M-65			14,570		62,810	77,390
	L-80			14,570		62,810	77,390
	N-80			14,570		62,810	77,390
	C-90			14,570		62,810	77,390
	T-95			14,570		62,810	77,390
	P-110			14,570		62,810	77,390
82.59	M-65	12.57	247.90	14,570	247.90	72,280	86,850
	L-80			14,570		72,280	86,850
	N-80			14,570		72,280	86,850
	C-90			14,570		72,280	86,850
	T-95			14,570		72,280	86,850
	P-110			14,570		72,280	86,850
	Q-125			14,570		72,280	86,850
90.33	C-90	13.84	245.36	14,570	245.36	82,620	97,200
	T-95			14,570		82,620	97,200
	P-110			14,570		82,620	97,200
	Q-125			14,570		82,620	97,200
298.45 mm							
69.94	J-55	9.53	279.40	15,930	279.40	51,290	67,220
	K-55			15,930		51,290	67,220

API Casing BUTTRESS Threads					with MLT™ Ring (L-80)		
Weight (kg/m)	Grade	Wall (mm)	ID (mm)	Estimated Torque (no rings) (N-m)	Ring ID (mm)	Delta Torque (N-m)	Total Torque MAX (N-m)
298.45 mm (continued)							
80.36	M-65	9.53	279.40	15,930	279.40	56,090	72,020
	J-55	11.05	276.35	15,930	276.35	63,600	79,530
	K-55			15,930		63,600	79,530
	M-65			15,930		71,630	87,560
89.29	J-55	12.42	273.61	15,930	273.61	74,500	90,430
	K-55			15,930		74,500	90,430
	M-65			15,930		85,370	101,310
	L-80			15,930		85,370	101,310
	N-80			15,930		85,370	101,310
	C-90			15,930		85,370	101,310
	T-95			15,930		85,370	101,310
	P-110			15,930		85,370	101,310
	Q-125			15,930		85,370	101,310
	96.73			L-80		13.56	271.32
N-80		15,930	96,670	112,600			
C-90		15,930	96,670	112,600			
T-95		15,930	96,670	112,600			
P-110		15,930	96,670	112,600			
Q-125		15,930	96,670	112,600			
339.73 mm							
81.10	J-55	9.65	320.42	18,140	319.41	68,130	86,270
	K-55			18,140		68,130	86,270
	M-65			18,140		80,510	98,650
90.78	J-55	10.92	317.88	18,140	319.41	81,630	99,770
	K-55			18,140		81,630	99,770
	M-65			18,140		81,630	99,770
101.19	J-55	12.19	315.34	18,140	319.41	81,630	99,770
	K-55			18,140		81,630	99,770
	M-65			18,140		81,630	99,770
	L-80			18,140		81,630	99,770
	N-80			18,140		81,630	99,770
	C-90			18,140		81,630	99,770
	T-95			18,140		81,630	99,770
	P-110			18,140		81,630	99,770
107.15	L-80	13.06	313.61	18,140	319.41	81,630	99,770
	N-80			18,140		81,630	99,770
	C-90			18,140		81,630	99,770
	T-95			18,140		81,630	99,770
	P-110			18,140		81,630	99,770
	Q-125			18,140		81,630	99,770

II. RECOMMENDED PRACTICES

API Casing and Tubing Threads

The following recommendations include selected highlights from API publications listed in Appendix B. (REFERENCES) of this manual as well as generally accepted industry practices. For proprietary products and services it is recommended the reader consult the manufacturer's recommended practices.

a. Storage and Handling Casing

1. Casing should always be handled with thread protectors in place. Casing should be handled on racks or on wooden or metal surfaces free from rocks, sand, or dirt other than normal drilling mud.
2. The storage life of pipe threads may be improved by cleaning coupling and pipe threads and applying a water displacing pipe storage compound. If a storage compound is used, care should be taken to clean threads and remove the storage compound and replace with running compound prior to running casing downhole. (Storage compounds lack sealing performance required for API threads.)
3. Pipe stacked in layers should be separated with wooden runners to facilitate rolling or picking up with a forklift.
4. For safety, durable chocks should be used on pipe runners to prevent unwanted pipe movement.

b. Preparation for Running Casing

The following precautions should be taken in the preparation for running casing and power tight assembly of threads.

1. Equipment to be used should be inspected and tested.
2. The traveling and crown blocks should have the proper number of lines to support the expected casing load.

3. Slip-type elevators are recommended. Both floor and elevator slips should be clean, have proper dies and should fit properly. Care should be taken to ensure the floor slip is level.
4. Casing handling equipment and slips should be checked for proper size and examined to see that all segments lower together. If they lower unevenly there is danger of denting or slip-cutting the pipe.
5. Verify each pipe joint as to weight, grade and thread type and ensure it is in the proper running order. Identify all crossover joints and the first joint of each weight, grade or thread type with easy-to-see paint or chalk.
6. Immediately before running casing, remove thread protectors from both field and coupling ends and clean the threads thoroughly, repeating as additional rows become uncovered.
7. Carefully inspect the threads. Those found damaged should be laid aside unless satisfactory means are available for correcting thread damage.
8. Number and tally each joint of casing as it is loaded on the rack. While running casing, number each joint as it goes in the hole (1,2,3, ...etc) taking care to identify joints not being run. A steel tape calibrated in: A) decimal feet to the nearest tenth of a foot B) decimal meter to the nearest tenth of a meter should be used. The threads off measurement should be made from the outer most face of the coupling to the position on the externally threaded end where the coupling stops when made up power tight. On round-thread pipe, this position is to the plane of the vanish point on the pipe (also known as "last scratch"; on buttress thread pipe, this position is to the base of the triangle steel stamp on the pipe.) The total of the individual lengths so measured will represent the unloaded length of the pipe string. If the pipe tally is made with "threads on" (full length of pipe) then the running footage can be calculated using adjustment factors found in Appendix. C. The actual length under tension will be greater due to stretch of the pipe under load.

9. Couplings on the mill end of the pipe should be made-up power-tight. Check each coupling for make-up. If the standoff is abnormally great, tighten the coupling before pulling the pipe into the derrick. (For round threads, refer to the appropriate torque tables.)
10. Before stabbing, apply thread compound to the entire internally and externally threaded areas. It is recommended that a thread compound that meets the performance objectives of API Bulletin 5A2 be used. The brush or utensil used in applying thread compound should be kept free of foreign matter, and the compound should never be thinned.
11. Place a clean thread protector on the field end (pin end) of the pipe to protect the thread while rolling pipe on the rack and raising it into the derrick. It is recommended that thread protectors from field ends of pipe not be removed until ready to stab.
12. It is recommended that each length of pipe be drifted its entire length before running downhole. Care should be taken to ensure the drift mandrels conform to the requirements of API 5CT by measuring the drift's length and diameter before each job.

c. General Practices for Field Make-Up, API ROUND and BUTTRESS threads (without MLT™ Rings)

1. API round thread make-up torque guidelines are included in the enclosed tables and are the primary reference for checking make-up.
2. API buttress thread make-up uses position as the primary reference but an estimate of the make-up (shoulder) torque is provided in the tables for information and use with MLT™ Ring total torque calculations.
3. The torque values represented in the tables are for make-up with API modified thread compound. Use of other compounds may result in higher or lower torques. Torque values for some widely used compounds with Teflon particles will usually be approximately 10% less, and for these compounds multiplying the API recommended torque numbers by a factor of 0.9 is recommended.

4. Torque values are affected by a large number of variables, such as variations in taper, lead, thread height and thread forms, surface finish, type of thread compound, length of thread, weight and grade of pipe, etc.
5. The torque values included in the Torque Tables herein apply to casing with zinc-plated or phosphate-coated couplings. For API connections with other coupling coatings or platings, couplings with the modified feature (seal rings), or using other than API Modified, the torques in the included tables should be adjusted by multiplying torques by the following factors:

	Factor
Tin plated couplings	0.80
Couplings with PTFE (Teflon) rings	0.70

6. As a visual aid to the make-up operator the first joints of pipe run should have a reference mark put on them to locate the run out of 8-round threads or the triangle make-up reference mark for buttress and large diameter casing.
7. In stabbing, lower pipe carefully to avoid damaging threads. Stab vertically and rotate very slowly at first to ensure that threads are engaging properly and not cross-threading.

d. Practices for ROUND Thread Casing, Sizes 4-1/2" through 13-3/8" OR 114mm through 340mm

1. Primary reference to proper make-up is to apply torque with cross-reference to position.
2. It is advisable when starting to run casing from each particular mill shipment to make up sufficient joints to determine the torque necessary to provide proper makeup. Thread dimensions can vary from lot to lot. See API Spec 5B for the proper number of turns beyond hand-tight position. These values may indicate that a departure from the values listed in the torque tables is advisable. If other values are chosen, the minimum torque should be not less than 75% of the value selected and the maximum torque should not be more than 125% of the selected torque.

3. The top drive (or power tong) should be provided with a reliable torque-measuring gauge of known accuracy. In the initial stages of makeup, any irregularities of makeup or in speed of makeup should be observed, since these may be indicative of crossed threads, dirty or damaged threads, or other unfavorable conditions. Unexpectedly high torque and/or excessive heat build up in the coupling are indications of cross-threading or galling. To prevent galling when making up connections in the field, the connections should be made up at a speed not to exceed 25 rpm.
4. Continue the makeup, observing both the torque gauge and the approximate position of the coupling face with respect to the thread vanish point position (also known as “last scratch”).
5. The torque values shown in the attached tables have been selected to give recommended makeup under normal conditions and should be considered as satisfactory providing the face of the coupling is flush with the thread vanish point or within plus or minus two thread turns.
6. If the makeup is such that the thread vanish point is buried two thread turns and the minimum torque shown in torque tables is not reached, the joint should be treated as a questionable joint as provided for in paragraph “g” below. If several threads remain exposed when the listed torque is reached, apply additional torque up to the maximum torque shown in the torque tables. If the standoff (distance from the face from the coupling to the thread vanish point, also referred to as “last scratch”) is greater than three thread turns when this additional torque is reached, the joint should be treated as questionable as provided in paragraph “g” below.
7. Questionable joints should be laid down. When this is done, the mating coupling should be carefully inspected for damaged threads. (Parted joints should never be reused without rethreading or re-gauging, even though the joints may have little appearance of damage.)

e. Practices for BUTTRESS Thread Casing, Sizes 4-1/2" through 13-3/8" OR 114.30mm through 339.73mm

1. Primary reference to proper make-up is to position with respect to the 3/8" high die-stamped triangle with cross-reference to torque.
2. Make-up torque values should be determined by carefully noting the torque required to make-up several connections to the base of the triangle; then using the torque value thus established, make-up the balance of the pipe of that particular weight and grade in the string. Periodically check to ensure proper position is being maintained.
3. The tolerance for make-up position places the face of the coupling between the apex of the triangle and one thread pitch (0.200") below the base of the triangle, for a total make-up window of 0.575" (2.9 turns).
4. The top drive (or power tong) should be capable of attaining high torques as maximum torques values could be five times the minimum experience in makeup to the recommended position.

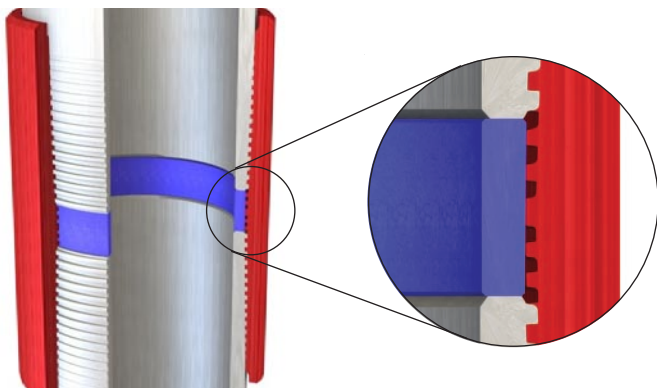
f. Practices for ROUND and BUTTRESS Thread Casing, Sizes 16", 18-5/8" and 20" OR 406.45mm, 473.10mm and 508mm

1. Primary reference to proper make-up is position. Variations in torque are much greater on large diameter casing due to the influence of pipe ovality.
2. Make-up shall be to a position on each connection represented by the thread vanish point on 8-round threads and the base of the triangle on buttress threads, using the torques shown in the tables as a guide.
3. On 8-round thread casing a 3/8" (9.5mm) high equilateral triangle is die stamped at a distance of $L1 + 1/16"$ ($L1 + 1.6\text{mm}$) from each end. The base of the triangle will aid in locating the thread vanish point for basic power-tight make-up. Extra care should be taken to avoid cross-threading in starting these larger connections.

Note: L1 is the length of end of the pipe to the hand-tight plane. (Ref. API 5B)

- g.** Joints that are questionable as to their proper tightness should be unscrewed and the casing laid down for inspection and repair. When this is done, the mating coupling should be carefully inspected for damaged threads. Parted joints should never be reused without a shop check or regauging, even though the joints may have little appearance of damage.
- h.** Casing wobble indicates the thread may not be in line with the axis of the casing and is usually minimized when using a top drive. If casing has a tendency to wobble unduly at its upper end when making-up with a tong the speed of rotation should be decreased to prevent galling of threads. If wobbling should persist despite reduced rotational speed, the casing should be laid down for inspection. Serious consideration should be given before using such casing in a position in the string where heavy tensile load is imposed.
- i.** In making up the field joint, it is possible for the coupling to make up slightly on the mill end. This does not indicate that the coupling on the mill end is too loose but simply that the field end has reached the tightness with which the coupling was screwed on at the manufacturer's facility.
- j.** If possible, fill casing as it is being run. If automatic float/fill equipment is used, stop and check to ensure they are operating. Floating the casing in is a poor practice and should be avoided.
- k.** It is recommended to break circulation slowly just prior to tagging bottom and before any pipe reciprocating is carried out.
- l.** Tag bottom carefully. Excess slack-off will buckle the string and damage the connections.

III. TESCO MLT™ (Multi-Lobe Torque) Rings



a. **APPLICATIONS** – MLT™ Rings are steel rings inserted into the couplings of standard API threaded and coupled tubing and casing connections. The ring provides a number of benefits, including a mechanical shoulder for the ends of the pin ends to increase torque capacity. TESCO Corporation has designed MLT™ Rings for use in drilling and production operations with both casing and tubing. Applications include:

- ***Tubing 2-3/8", 2-7/8" & 3-1/2"***
OR 60.32mm, 73.02mm & 88.90mm
 - Production tubing and work strings
 - Gas wells
 - Progressive Cavity Pump (PCP) strings
 - Well abandonment
- ***Casing 4-1/2" thru 13-3/8"***
OR 114.30mm through 339.73mm
 - Casing drilling®
 - Liners
 - Casing Running™ for strings or applications requiring rotation under high torque and drag

b. **FEATURES** – MLT™ Rings

- **Steel rings** - Rings are machined from steel that meets API grade requirements and designed to fit standard API Round and Buttress thread connections. No special pipe or coupling threading specification is required.
- **Engineering** - MLT™ Rings are engineered to fit precisely against API connection surfaces. The rings are designed with a unique non-circular shape or lobes. After installation, the lobed sections of the MLT™ Rings press firmly across the tapered threads

of API connections to retain them in place and ID becomes circular.

- **Secure** – MLT™ Rings stay firmly in place during transportation, handling, and use.
- **Easy installation** – Rings are inserted into couplings using a simple hydraulic installation tool. Easy to use ring selection gauge is used to determine which length ring is required for each connection.

c. PERFORMANCE and APPLICATIONS

1. **Torque Capacity of MLT™ Rings** provide a significant boost to API torque ratings, referred to as the “Delta Torque”. Delta torques and total torques are provided in the Torque Tables.
2. **Tubing and Casing**
 - a) High torsional strength for drilling and/or rotating applications using standard API threads.
 - b) Blocks sand and debris from entering threads.
3. **Tubing - Work Strings**
 - a) Prolongs string life.
 - b) Increases durability of API tubing threads by reducing over penetration of the pin into the coupling.
4. **Tubing - Gas Wells**
 - a) Reduces turbulence and erosion in connections
 - b) Increases durability of API tubing threads by reducing coupling and pin stresses that occur from over-penetration of the pin into the coupling.
5. **Tubing - Progressing Cavity Pump (PCP) Strings**
 - a) Reduces incidence of connection back-off when rotor becomes stuck. Increases durability of API tubing threads by reducing coupling and pin stresses that occur from over-penetration of the pin into the coupling.
 - b) Eliminates tubing anchor.
6. **Casing Liners** - Enhances running of long liners in deviated wells by increasing torsional capacity of connections.

d. RING IDENTIFICATION

Proper identification of rings includes the following:

1. OD of pipe
2. Weight per foot of the pipe
3. Grade of steel
4. Color - **GREEN** or **RED** or **BLUE** or **YELLOW**
identifying the respective ring length from shortest to longest. Red and blue rings will dominate usage.

Example: 7" 23# L-80 Red
177.80 mm 34.23 Kg/m L-80 Red



Note: As an added aid in identifying MLT™ Rings, each ring has one to four grooves lightly machined into the ID of the ring on the outboard end. One groove = green, two grooves = red; three grooves = blue and four grooves = yellow.

e. RECOMMENDED Field Make-up Practices API Threads with MLT™ Rings

The following recommended practices are for use with MLT™ Rings and are ***in addition*** to the recommended practices described in the previous Section II. Care should also be taken to follow the preparation and running procedures in Section II.

Running Procedure

- Remove protectors and visually inspect the pin and coupling threads. Threads should be clean and free of defects.
- Ensure the MLT™ Ring is installed properly and is seated in the center of the coupling against the mill end pin. Ring installation is easily performed with a hydraulic installation tool. For proper ring installation procedures, contact TESCO.
- Apply a thin even coat of thread compound to the coupling and pin threads.
- Refer to the torque tables and select the appropriate maximum torque for the casing or tubing and the ring being used.
- Set the pressure relief valve, or dump valve, on the tong to relieve at the specified make-up torque.
- Apply back-up jaws to the mill end pipe body during make-up.
- Make-up the first connection to the target torque as specified. make-up speed at the point the pin contacts the ring should not exceed 15 RPM.
- Ensure “Acceptance Criteria” are met (see following table).
- Record the torque just prior to the pin shouldering on the ring. At the shoulder point, the torque will increase sharply.
- If necessary, adjust the tong torque setting so as not to exceed the delta torque but ensuring the pin shoulders on the ring.
- Continue to make up the remainder of the string.

CRITERIA	CORRECTIVE ACTION if criterion not met:
<p>1. Pin must shoulder on ring Note – Shouldering should be accompanied by a sharp increase in torque relative to rotation. It may be useful to initially mark the first few pin ends with a paint stick indicating the position of pin contact with the ring as a visual reference.</p>	<ol style="list-style-type: none"> 1) Back off one turn. 2) Re-make the connection, increasing the maximum applied torque for this connection only, then resetting the torque. 3) Re-check acceptance criteria.
<p>2. For round threads, shoulder torque should exceed a MINIMUM value of 40% (approximate) of delta torque.</p>	<ol style="list-style-type: none"> 1) Break out the connection and inspect pin. 2) Change out the coupling and install a new MLT™ ring. (See ring installation section) 3) Drift each component of the connection. Lay down joints that do not drift. If both components drift, proceed to step four. 4) Re-make the connection, ensuring minimum shoulder torque is met and maximum delta torque is not exceeded. 5) If shoulder torque is still less than minimum acceptable value after the second make-up, lay down pin joint. 6) Re-check acceptance criteria.

CRITERIA	CORRECTIVE ACTION if criterion not met:
<p>3. Maximum delta torque must not be exceeded during make-up.</p> <p>AND</p> <p>Connection rotation must not exceed 1/8 turn after shouldering (avoids forcing the ring to encroach on the drift diameter).</p>	<ol style="list-style-type: none"> 1) Check that the connection is made up to position. (Last thread not visible on field end) 2) If the connection is made up to position, check drift. If connection drifts and is at position, make-up is acceptable. 3) If drift mandrel will not pass or connection is not at position, break out connection and inspect for visual damage, galling, etc. If undamaged, proceed to step four. Otherwise, lay down joints. 4) After breakout, drift the coupling and pin ends. <ol style="list-style-type: none"> a) If the drift requirement is not met in one or both components, it is a sign of excessive deformation during makeup, lay down joints. b) If both pin and coupling drift, install a new MLT™ Ring and remake with proper Delta torque and re-drift. (See ring installation section.) If the connection still does not drift set aside both joints. This rare occurrence indicates undesirable geometry and will compromise torsion capacity.

CRITERIA	CORRECTIVE ACTION if criterion not met:
	<p>c) If pin drifts and coupling does not, change out the coupling and install a new MLT™ Ring. (See Field Ring Installation Par.III-f)</p> <p>d) If coupling drifts and pin does not, lay down joint and re-use the coupling and ring.</p> <p>e) If similar damage is observed on the new part during the next make-up, lay down both joints. This also indicates an unfavorable geometry.</p>

CRITERIA

f. FIELD Ring Installation (Floating rings without install kit)

For tubing only, if an installation kit is not readily available, the rings can be installed by letting the connection make-up press the ring into place with the following procedure.

Thread the coupling on the mill end hand tight. Install a RED MLT™ Ring in the coupling by hand with the color facing up. Float the connection make-up not exceeding 10 RPM during make-up. In the unlikely event that the shoulder torque is below MINIMUM acceptable noted in the acceptance criteria above, remove the coupling, install a GREEN MLT™ Ring and re-make. If the shoulder torque is again below the MINIMUM then the joint should be set aside.

IV. Breaking Out Connections

If it is necessary to break out connections, the following procedures are recommended.

- a. For breaking out connections on the field end on rig floor, the backup tong should be placed on the coupling to help preclude deforming the pipe, particularly important for lighter wall thickness pipe, and preclude backing off the connection on the mill side. Slips can be used for backup as long as the weight on string is adequate and the pipe does not turn in the slips cutting the pipe. It is preferred to apply back-out torque with the top drive or power tongs as these will distribute the applied forces better than rig tongs.
- b. If the pipe is not breaking-out easily it is acceptable to use the manual tongs and recommended they be used in combination with the top drive or power tongs.
- c. If tongs are used to break-out connections, the grips should be positioned close to the coupling. Tong grips should be clean and have proper dies.
- d. Connection break-out torque typically is **10 % to 30 %** higher than make-up torque. Higher break-out torque up to **double** the make-up torque can be influenced by factors such as use of compounds with Teflon and / or drill string vibration encountered during casing drilling.
- e. After connections are broken out, both pin and coupling threads should be cleaned and inspected for thread damage. Any metal whiskers found should be removed and galled spots should be carefully repaired.

APPENDIX A. DEFINITIONS

Delta Torque

The boost in torque capacity of a connection with MLT™ Rings installed. Delta torque is added to shoulder torque to obtain total torque capacity.

Shoulder Torque

A term applicable for use with MLT™ rings. During power tight connection make-up it is the torque just before the pin contacts the face of the installed MLT™ ring. It is observed as the pin contacts the ring followed by a sharp increase in torque. It can be estimated by the API recommended torques for round thread and by the approximations in the tables for buttress.

MLT™ Ring

Multi-Lobe Torque Ring, trade marked name of TESCO's torque rings

APPENDIX B. REFERENCES

- | | |
|---------------------|--|
| API Bul 5A2 | Bulletin on Thread Compounds for Casing, Tubing, and Line Pipe |
| API Bul 5C2 | Bulletin on Performance Properties of Casing, Tubing, and Drill Pipe |
| API Bul 5C3 | Bulletin on Formulas and Calculations for Casing, Tubing, Drill Pipe, and Line Pipe Properties |
| API RP 7G | Recommended Practice for Drill Stem Design and Operating Limits |
| API Spec 5B | Specification for Threading, Gauging, and Thread Inspection of Casing, Tubing, and Line Pipe Threads |
| API Spec 5CT | Specification for Casing and Tubing |
| TESCO Corp. | Specifications and recommended practices |

APPENDIX C. THREAD MAKE-UP LOSS

IMPERIAL - API THREAD LENGTH FOR MAKE-UP LOSS				
O.D. (in)	EUE Thread Length (in)	Short Thread Length (in)	Long Thread Length (in)	Buttress Thread Length (in)
2 3/8	1.938			
2 7/8	2.125			
3 1/2	2.375			
4 1/2		2.625	3.000	3.938
5		2.750	3.375	4.063
5 1/2		2.875	3.500	4.125
6 5/8		3.125	3.875	4.313
7		3.125	4.000	4.500
7 5/8		3.250	4.125	4.688
8 5/8		3.375	4.500	4.813
9 5/8		3.375	4.750	4.813
10 3/4		3.500		4.813
11 3/4		3.500		4.813
13 3/8		3.500		4.813
16		4.000		4.813
18 5/8		4.000		4.813
20		4.000	5.250	4.813

METRIC - API THREAD LENGTH FOR MAKE-UP LOSS				
O.D. (mm)	EUE Thread Length (mm)	Short Thread Length (mm)	Long Thread Length (mm)	Buttress Thread Length (mm)
60.32	49.2			
73.02	54.0			
88.90	60.3			
114.30		66.7	76.2	100.0
127.00		69.9	85.7	103.2
139.70		73.0	88.9	104.8
168.28		79.4	98.4	109.6
177.80		79.4	101.6	114.3
193.68		82.6	104.8	119.1
219.08		85.7	114.3	122.3
244.48		85.7	120.7	122.3
273.05		88.9		122.3
298.45		88.9		122.3
339.73		88.9		122.3
406.40		101.6		122.3
473.10		101.6		122.3
508.00		101.6	133.4	122.3

Reference: **API Spec 5B** - Specification for Threading, Gauging, and Thread Inspection of Casing, Tubing, and Line Pipe Threads

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APPENDIX D CONVERSION FACTORS

COMMON METRIC CONVERSION FACTORS

Length:	$\text{in} \times 2.54 = \text{cm}$ $\text{cm} \times 0.3937 = \text{inch}$ $\text{ft} \times 0.3048 = \text{metre}$ $\text{m} \times 3.281 = \text{ft}$ $\text{miles} \times 1.609 = \text{km}$ $\text{km} \times 0.6214 = \text{miles}$
Area:	$\text{acres} \times 0.4047 = \text{hectares}$ $\text{hectares} \times 2.471 = \text{acres}$ $\text{km}^2 \times 100 = \text{hectares}$ $\text{hectares} \times 0.01 = \text{km}^2$
Volume (Gas):	$\text{scf} \times 0.02832 = \text{scm}$ $\text{scm} \times 35.314 = \text{scf}$
Volume (Fluid):	$\text{gal} \times 3.7854 = \text{litre}$ $\text{BBL} \times 0.159 = \text{m}^3$ $\text{ft}^3 \times 0.0283 = \text{m}^3$ $\text{in}^3 \div 231 = \text{US Gallons}$
Pressure:	$\text{psi} \times 6.8947 = \text{kPa}$ $\text{kPa} \times 0.145 = \text{psi}$
Mass:	$\text{lbm} \times 0.4536 = \text{kg}$ $\text{kg} \times 2.2 = \text{lbm}$ $\text{tonne} \times 2,205 = \text{lbm}$
Force:	$\text{lbs} \times 0.4448 = \text{daN}$ $\text{ft-lbs} \times 0.13558 = \text{daN-m}$
Density (Fluid):	$\text{lb/gal} \times 119.9 = \text{kg/m}^3$
Power:	$\text{HHP} \times 0.746 = \text{kW}$
Gas-Liquid Ratio:	$\text{scf/BBL} \times 0.1781 = \text{m}^3/\text{m}^3$ $\text{m}^3/\text{m}^3 \times 5.613 = \text{scf/BBL}$
Temperature:	$(^{\circ}\text{F} - 32) \times 0.556 = ^{\circ}\text{C}$ $(1.8 \times ^{\circ}\text{C}) + 32 = ^{\circ}\text{F}$

TESCO MLT™ Rings



The Drilling Innovation Company™

CASING DRILLING®



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