



**November 2012**

## **1 - SCOPE OF APPLICATION**

This document contains the torque values applicable for VAM® TOP HT mill and field ends.

## **2 - Type of material**

In the torque table below, the column where the torque shall be extracted depends upon the material. There is a different torque column for Mill end torques and Field Liner max applying to the following materials:

- **CRA** (i.e. > 13%Cr, Austenitic, Duplex, Super Duplex, Nickel based alloys) with yield strength  $\geq$  100 ksi (Corresponding to cold-worked CRA)
- **Super 13%Cr (S13% Cr)**: VM95 13CrSS and VM110 13CrSS; and SM13CRS (90 ksi, 95 ksi, 110 ksi).
- **Modified 13% Cr for yield strength  $\geq$  90 ksi**: SM13CRM (95 ksi – 110 ksi)

## **3 - Field torques**

This torque values shall only be applied on the rig site, and the maximum torque will be depending upon the application.

**For Liner (rotational) applications.** – Recommended Make-up should be close to “Field Liner max” torque value, but **shall never exceed this value.**

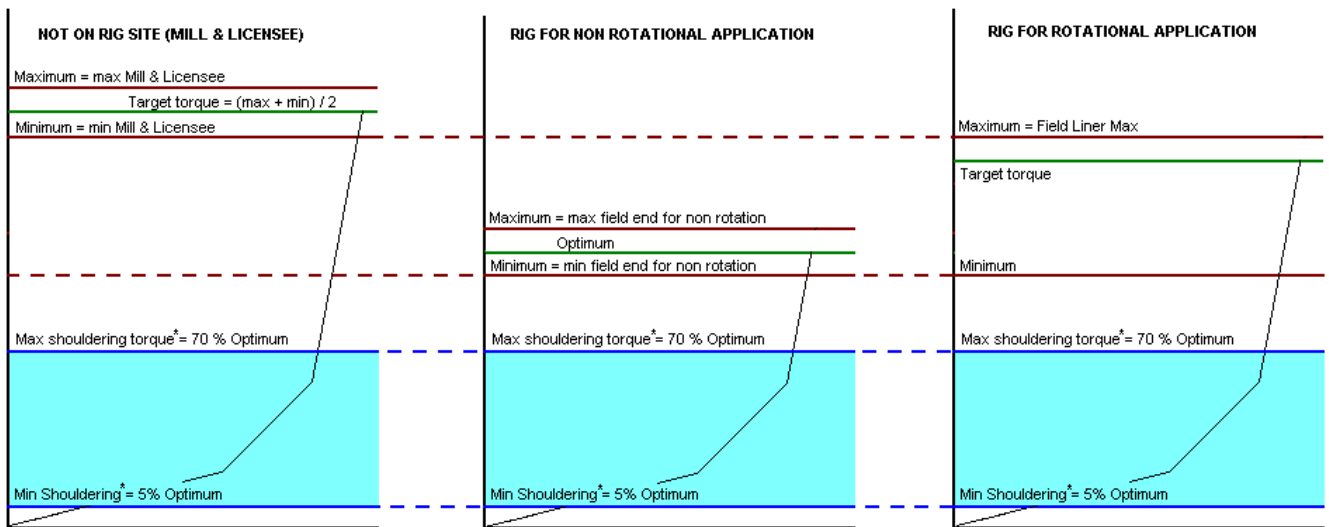
**For non-rotational applications.** – Recommended make-up torque range is defined by the “Field min” and “Field max for non-rotation”.

## **4 - Mill & Licensee torques**

This torques shall be applied when the connection is made-up in either of the following cases:

- at the licensees premises with the make-up equipment of the licensee.
- at the licensee premises with the equipment of a make –up sub-contractor, under the responsibility of the licensee.
- at another location than the licensee premises but not on the rig site:
- with the make-up equipment of the licensee, which will be supervised by the make-up operator of the licensee;
- with the equipment of a make-up sub-contractor. In this case, the supervision of the licensee is required.

## 5 - Illustration of the 3 different applications for VAM® TOP HT



**\*IMPORTANT\***  
**FOR ALL APPLICATIONS MIN AND MAX SHOULDERING ARE ALWAYS CALCULATED FROM NON-ROTATIONAL OPTIMUM TORQUE.**

## 6 - DOPE

**MINIMUM DOPE QUANTITY FOR MAKE - UP**

Nominal O.D.	Dope volume		
	(in.)	(cm <sup>3</sup> )	(in. <sup>3</sup> )
4 ½	10	0.6	
5	14	0.9	
5 ½	16	1.0	
6 5/8	19	1.2	
7	25	1.5	
7 5/8	28	1.7	

## 7 – TORQUE TABLE



			65 ksi				
			All Materials			All Materials	
SIZE (OD)	Nominal Weight	Wall Thickness	Field end for non rotation			Mill & licensee	
			min.	Opti.	max.	min & Field Liner max	max
in. mm	lb/ft	in. mm	ft.lb. N.m.				
4 1/2" 114,30	10,50	0,224 5,69	2220 3010	2460 3340	2700 3670	2890 3920	3170 4300
	11,60	0,250 6,35	2800 3800	3110 4220	3420 4640	3760 5100	4130 5600
	12,60	0,271 6,88	3260 4410	3620 4900	3980 5390	4410 6000	4850 6600
	13,50	0,290 7,37	3710 5000	4120 5600	4530 6200	5060 6900	5560 7500
	15,10	0,337 8,56	4630 6300	5140 7000	5650 7700	6370 8600	7000 9500
	17,00	0,380 9,65	5600 7600	6220 8400	6840 9200	6840 9300	7520 10200
	17,70	0,402 10,21	6120 8300	6800 9200	7480 10100	7480 10100	8240 11200
	18,90	0,430 10,92	6840 9300	7590 10300	8340 11300	8340 11300	9140 12400
	21,50	0,500 12,70	8150 11100	9050 12300	9950 13500	9950 13500	10890 14800
	23,70	0,560 14,22	9150 12400	10150 13800	11150 15200	11150 15100	12320 16700
5" 127,00	15,00	0,296 7,52	4370 5900	4850 6600	5330 7300	5930 8000	6510 8800
	18,00	0,362 9,19	6190 8400	6870 9300	7550 10200	8700 11800	9500 12900
	20,30	0,408 10,36	7470 10200	8300 11300	9130 12400	9230 12500	10240 13900
	20,80	0,422 10,72	7830 10600	8700 11800	9570 13000	9750 13200	10810 14700
	21,40	0,437 11,10	8460 11400	9400 12700	10340 14000	10340 14000	11200 15200
	23,20	0,478 12,14	9500 12800	10500 14200	11500 15600	11500 15600	11850 16100
	29,70	0,562 14,27	13050 17600	14450 19600	15850 21600	15850 21500	17400 23600
5 1/2" 139,70	17,00	0,304 7,72	5220 7000	5790 7800	6360 8600	7230 9800	7960 10800
	20,00	0,361 9,17	6840 9300	7590 10300	8340 11300	9750 13200	10800 14600
	23,00	0,415 10,54	8780 11900	9750 13200	10720 14500	12300 16700	13500 18300
	26,00	0,476 12,09	10850 14600	11950 16200	13050 17800	13550 18400	14450 19600
	29,70	0,562 14,27	13050 17600	14450 19600	15850 21600	15850 21500	17400 23600



		75-80-85 ksi					
		All Materials			All Materials		
SIZE (OD)	Nominal Weight	Wall Thickness	Field end for non rotation			Mill & licensee	
			min.	opti	max.	min & Field Liner max	max
in. mm	lb/ft	in. mm	ft.lb. N.m.				
4 1/2" 114,30	10,50	0,224 5,69	2540 3440	2820 3820	3100 4200	3470 4700	3810 5200
	11,60	0,250 6,35	3260 4410	3620 4900	3980 5390	4560 6200	5010 6800
	12,60	0,271 6,88	3710 5000	4120 5600	4530 6200	5420 7300	5960 8100
	13,50	0,290 7,37	4170 5700	4630 6300	5090 6900	6150 8300	6760 9200
	15,10	0,337 8,56	5220 7000	5790 7800	6360 8600	7670 10400	8430 11400
	17,00	0,380 9,65	6390 8600	7090 9600	7790 10600	8160 11100	9050 12300
	17,70	0,402 10,21	6840 9300	7590 10300	8340 11300	8920 12100	9900 13400
	18,90	0,430 10,92	7830 10600	8700 11800	9570 13000	9900 13400	10970 14900
	21,50	0,500 12,70	9500 12800	10500 14200	11500 15600	12030 16300	13350 18100
	23,70	0,560 14,22	10850 14600	11950 16200	13050 17800	13600 18400	15100 20500
5" 127,00	15,00	0,296 7,52	4950 6800	5500 7500	6050 8300	7090 9600	7800 10600
	18,00	0,362 9,19	7170 9700	7960 10800	8750 11900	10150 13800	11100 15000
	20,30	0,408 10,36	8460 11400	9400 12700	10340 14000	11050 15000	12260 16600
	20,80	0,422 10,72	9150 12400	10150 13800	11150 15200	11650 15800	12950 17600
	21,40	0,437 11,10	9500 12800	10500 14200	11500 15600	11850 16100	13150 17800
	23,20	0,478 12,14	10850 14600	11950 16200	13050 17800	13050 17700	14300 19400
	29,70	0,562 14,27	15050 20300	16650 22600	18250 24900	19100 25900	21200 28700
5 1/2" 139,70	17,00	0,304 7,72	5930 8000	6580 8900	7230 9800	8700 11800	9500 12900
	20,00	0,361 9,17	7830 10600	8700 11800	9570 13000	11950 16200	13100 17800
	23,00	0,415 10,54	9850 13200	10850 14700	11850 16200	15200 20600	16700 22600
	26,00	0,476 12,09	12100 16400	13400 18200	14700 20000	15650 21200	17350 23500
	29,70	0,562 14,27	15050 20300	16650 22600	18250 24900	19100 25900	21200 28700



90-95-100 ksi											
			All Materials			Carbon & 13% Cr		Cold Worked CRA & S13% Cr & 13% Cr modified			
SIZE (OD)	Nominal Weight	Wall Thickness	Field end for non rotation			Mill & licensee		Mill & licensee			
			min.	opti	max.	min	max	min	max		
						& Field Liner max			& Field Liner max		
in. mm	lb/ft	in. mm	ft.lb.							N.m.	
4 1/2" 114,30	10,50	0,224	2800	3110	3420	4120	4530	3620	3980		
		5,69	3800	4220	4640	5600	6100	4900	5400		
	11,60	0,250	3650	4050	4450	5350	5880	4560	5010		
		6,35	5000	5500	6100	7300	8000	6200	6800		
	12,60	0,271	4110	4560	5010	6370	7000	5420	5960		
		6,88	5600	6200	6800	8600	9500	7300	8100		
	13,50	0,290	4690	5210	5730	7230	7950	6220	6840		
		7,37	6400	7100	7800	9800	10800	8400	9300		
	15,10	0,337	5860	6510	7160	9050	9950	7740	8510		
		8,56	7900	8800	9700	12300	13500	10500	11500		
5"	15,00	0,296	5480	6080	6680	8300	9200	7020	7720		
		7,52	7400	8200	9000	11300	12500	9500	10500		
	18,00	0,362	7830	8700	9570	11950	13100	9900	10800		
		9,19	10600	11800	13000	16200	17800	13400	14600		
	20,30	0,408	9500	10500	11500	12900	14300	11850	12950		
		10,36	12800	14200	15600	17500	19400	16100	17600		
	20,80	0,422	10100	11200	12300	13600	15100	12300	13500		
		10,72	13700	15200	16700	18400	20500	16700	18300		
	21,40	0,437	10850	11950	13050	13800	15300	13050	14100		
		11,10	14600	16200	17800	18700	20700	17700	19100		
5 1/2" 139,70	17,00	0,304	6510	7230	7950	10500	11500	8700	9570		
		7,72	8800	9800	10800	14200	15600	11800	13000		
	20,00	0,361	8780	9750	10720	13750	15100	11200	12300		
		9,17	11900	13200	14500	18600	20500	15200	16700		
	23,00	0,415	11100	12300	13500	16350	18150	13750	15050		
		10,54	15000	16700	18400	22200	24600	18600	20400		
	26,00	0,476	13700	15200	16700	21200	23400	16700	17900		
		12,09	18500	20600	22700	28700	31700	22600	24300		
	29,70	0,562	17000	18800	20600	25700	28400	20600	21200		
		14,27	23000	25500	28100	34800	38500	27900	28700		



			105-110-115 ksi								
			All Materials			Carbon & 13% Cr		Cold Worked CRA & S13% Cr & 13% Cr modified			
SIZE (OD)	Nominal Weight	Wall Thickness	Field end for non rotation			Mill & licensee		Mill & licensee			
			min.	opti	max.	min	max	min	max		
						& Field Liner max		& Field Liner max			
in. mm	lb/ft	in. mm	ft.lb. N.m.								
4 1/2" 114,30	10,50	0,224 5,69	3130 4230	3470 4700	3810 5170	4770 6500	5240 7100	4120 5600	4530 6100		
	11,60	0,250 6,35	4040 5500	4480 6100	4920 6700	6150 8300	6760 9200	5280 7200	5800 7900		
	12,60	0,271 6,88	4560 6200	5060 6900	5560 7600	7310 9900	8040 10900	6220 8400	6840 9300		
	13,50	0,290 7,37	5220 7000	5790 7800	6360 8600	8300 11300	9130 12400	7090 9600	7790 10600		
	15,10	0,337 8,56	6450 8700	7160 9700	7870 10700	10400 14100	11400 15500	8900 12100	9790 13300		
	17,00	0,380 9,65	7830 10600	8700 11800	9570 13000	10970 14900	12150 16500	10650 14400	11650 15800		
	17,70	0,402 10,21	8460 11400	9400 12700	10340 14000	12000 16300	13300 18000	11550 15700	12650 17200		
	18,90	0,430 10,92	9500 12800	10500 14200	11500 15600	12750 17300	14100 19100	12650 17200	13850 18800		
	21,50	0,500 12,70	11700 15800	13000 17600	14300 19400	15800 21400	17500 23700	15200 20600	16700 22600		
	23,70	0,560 14,22	13700 18500	15200 20600	16700 22700	17900 24300	19850 26900	16800 22800	18400 24900		
5" 127,00	15,00	0,296 7,52	6060 8200	6730 9100	7400 10000	9400 12700	10300 14000	7960 10800	8750 11900		
	18,00	0,362 9,19	8780 11900	9750 13200	10720 14500	13750 18600	15100 20500	11300 15300	12400 16800		
	20,30	0,408 10,36	10850 14600	11950 16200	13050 17800	14150 19200	15700 21300	13500 18300	14800 20100		
	20,80	0,422 10,72	11100 15000	12300 16700	13500 18400	14950 20300	16550 22400	14100 19100	15500 21000		
	21,40	0,437 11,10	11700 15800	13000 17600	14300 19400	15750 21400	17500 23700	14800 20100	16200 22000		
	23,20	0,478 12,14	13450 18100	14850 20100	16250 22100	17650 23900	19600 26600	16500 22400	18100 24500		
5 1/2" 139,70	17,00	0,304 7,72	7470 10200	8300 11300	9130 12400	11950 16200	13100 17800	10000 13600	11000 14900		
	20,00	0,361 9,17	9850 13200	10850 14700	11850 16200	15900 21600	17500 23700	12800 17400	14000 19000		
	23,00	0,415 10,54	12450 16700	13750 18600	15050 20500	17900 24300	19800 26800	15700 21300	17200 23300		
	26,00	0,476 12,09	15050 20300	16650 22600	18250 24900	23100 31300	25500 34600	18700 25400	20500 27800		
	29,70	0,562 14,27	18900 25700	21000 28500	23200 31400	25700 34800	28400 38500	23200 31500	24300 32900		



120-125-130 ksi											
			All Materials			Carbon & 13% Cr		Cold Worked CRA & S13% Cr			
SIZE (OD)	Nominal Weight	Wall Thickness	Field end for non rotation			Mill & licensee		Mill & licensee			
			min.	opti	max.	min	max	min	max		
in. mm	lb/ft	in. mm	ft.lb.							N.m.	
4 1/2" 114,30	10,50	0,224	3450	3830	4210	4770	5240	4630	5090		
		5,69	4700	5200	5700	6500	7100	6300	6900		
	11,60	0,250	4500	4990	5480	6150	6760	5930	6520		
		6,35	6100	6800	7500	8300	9200	8000	8800		
	12,60	0,271	5020	5570	6120	7310	8040	7020	7720		
		6,88	6800	7600	8400	9900	10900	9500	10500		
	13,50	0,290	5740	6370	7000	8300	9130	8030	8830		
		7,37	7700	8600	9500	11300	12400	10900	12000		
	15,10	0,337	7170	7960	8750	10400	11400	10050	11050		
		8,56	9700	10800	11900	14100	15500	13600	15000		
	17,00	0,380	8780	9750	10720	12400	13750	12000	13200		
		9,65	11900	13200	14500	16800	18600	16300	17900		
	17,70	0,402	9500	10500	11500	13000	14400	13000	14300		
		10,21	12800	14200	15600	17600	19500	17600	19400		
	18,90	0,430	10450	11550	12650	14350	15950	14250	15650		
		10,92	14100	15700	17300	19500	21600	19300	21200		
	21,50	0,500	13050	14450	15850	17800	19750	17050	18750		
		12,70	17600	19600	21600	24100	26800	23100	25400		
	23,70	0,560	15050	16650	18250	20350	22600	19000	20900		
		14,22	20300	22600	24900	27600	30600	25800	28300		
5" 127,00	15,00	0,296	6510	7230	7950	9400	10300	9050	9950		
		7,52	8800	9800	10800	12700	14000	12300	13500		
	18,00	0,362	9500	10500	11500	13750	15100	13000	14300		
		9,19	12800	14200	15600	18600	20500	17600	19400		
	20,30	0,408	11700	13000	14300	15950	17700	15100	16600		
		10,36	15800	17600	19400	21600	24000	20500	22500		
	20,80	0,422	12450	13750	15050	16850	18650	15800	17300		
	10,72	16700	18600	20500	22800	25300	21400	23500			
	21,40	0,437	13050	14450	15850	17750	19700	16600	18200		
		11,10	17600	19600	21600	24100	26700	22500	24700		
	23,20	0,478	14400	15900	17400	19850	22050	18500	20300		
		12,14	19400	21600	23800	26900	29900	25100	27500		
5 1/2" 139,70	17,00	0,304	8150	9050	9950	11950	13100	11300	12400		
		7,72	11100	12300	13500	16200	17800	15300	16800		
	20,00	0,361	10850	11950	13050	15900	17500	14400	15800		
		9,17	14600	16200	17800	21600	23700	19500	21400		
	23,00	0,415	13700	15200	16700	20000	22100	17600	19300		
		10,54	18500	20600	22700	27100	30000	23900	26200		
	26,00	0,476	15650	17350	19050	23100	25500	21000	23100		
		12,09	21200	23500	25900	31300	34600	28500	31300		
	29,70	0,562	20850	23150	25450	25700	28400	25450	27300		
		14,27	28300	31400	34500	34800	38500	34500	37000		



			135-140 ksi							
			All Materials			Carbon		Cold Worked CRA		
SIZE (OD)	Nominal Weight	Wall Thickness	Field end for non rotation			Mill & licensee		Mill & licensee		
			min.	opti	max.	min	max	min	max	
						& Field Liner max		& Field Liner max		
in. mm	lb/ft	in. mm	ft.lb. N.m.							
4 1/2" 114,30	10,50	0,224 5,69	3710 5000	4120 5600	4530 6200	5240 7100	5810 7900	5140 7000	5650 7700	
	11,60	0,250 6,35	4820 6600	5350 7300	5880 8000	6600 8900	7320 9900	6510 8800	7160 9700	
	12,60	0,271 6,88	5400 7300	6000 8100	6600 8900	7820 10600	8670 11800	7740 10500	8510 11500	
	13,50	0,290 7,37	6120 8300	6800 9200	7480 10100	8920 12100	9900 13400	8800 11900	9680 13100	
	15,10	0,337 8,56	7830 10600	8700 11800	9570 13000	11150 15100	12350 16700	11000 14900	12100 16400	
	17,00	0,380 9,65	9500 12800	10500 14200	11500 15600	13600 18400	15100 20500	13150 17800	14450 19600	
	17,70	0,402 10,21	10100 13700	11200 15200	12300 16700	14250 19300	15800 21400	14250 19300	15650 21200	
	18,90	0,430 10,92	11450 15500	12650 17200	13850 18900	15750 21400	17450 23700	15600 21100	17100 23200	
	21,50	0,500 12,70	14050 19000	15550 21100	17050 23200	19500 26400	21650 29400	18650 25300	20450 27700	
	23,70	0,560 14,22	15300 20700	17000 23000	18700 25300	22450 30400	24900 33800	20900 28300	22900 31000	
	5" 127,00	15,00	0,296 7,52	7170 9700	7960 10800	8750 11900	10150 13800	11250 15300	9800 13300	10700 14500
		18,00	0,362 9,19	10450 14100	11550 15700	12650 17300	14300 19400	15900 21600	13900 18800	15200 20600
20,30		0,408 10,36	12450 16700	13750 18600	15050 20500	17450 23700	19350 26200	16600 22500	18200 24700	
20,80		0,422 10,72	13050 17600	14450 19600	15850 21600	18450 25000	20450 27700	17300 23500	19000 25800	
21,40		0,437 11,10	14050 19000	15550 21100	17050 23200	19450 26400	21600 29300	18100 24500	19900 27000	
23,20		0,478 12,14	15050 20300	16650 22600	18250 24900	21750 29500	24100 32700	20200 27400	22200 30100	
5 1/2" 139,70		17,00	0,304 7,72	8780 11900	9750 13200	10720 14500	12450 16900	13800 18700	12300 16700	13500 18300
	20,00	0,361 9,17	11700 15900	13000 17700	14300 19500	16500 22400	18300 24800	15800 21400	17300 23500	
	23,00	0,415 10,54	14400 19400	15900 21600	17400 23800	20000 27100	22100 30000	19400 26300	21300 28900	
	26,00	0,476 12,09	16300 22000	18100 24500	19900 27000	24500 33200	27200 36900	23000 31200	25300 34300	
	29,70	0,562 14,27	20850 28300	23150 31400	25450 34500	30500 41400	33800 45800	27100 36700	29800 40400	





145-150-155 ksi											
			All Materials			Carbon		Cold worked CRA			
SIZE (OD)	Nominal Weight	Wall Thickness	Field end for non rotation			Mill & licensee		Mill & licensee			
			min.	opti	max.	min	max	min	max		
in. mm	lb/ft	in. mm	ft.lb. N.m.							= Field Liner max	= Field Liner max
4 1/2" 114,30	10,50	0,224	3970	4410	4850	5710	6330	5570	6120		
		5,69	5400	6000	6600	7700	8600	7600	8300		
	11,60	0,250	5220	5790	6360	7190	7970	7090	7790		
		6,35	7000	7800	8600	9700	10800	9600	10600		
	12,60	0,271	5800	6440	7080	8520	9450	8400	9240		
		6,88	7800	8700	9600	11600	12800	11400	12500		
	13,50	0,290	6510	7230	7950	9720	10800	9600	10560		
		7,37	8800	9800	10800	13200	14600	13000	14300		
	15,10	0,337	8150	9050	9950	12150	13450	12000	13200		
		8,56	11100	12300	13500	16500	18200	16300	17900		
5"	15,00	0,296	7470	8300	9130	11050	12250	10700	11700		
		7,52	10200	11300	12400	15000	16600	14500	15900		
	18,00	0,362	11100	12300	13500	15500	17200	15100	16600		
		9,19	15000	16700	18400	21000	23300	20500	22500		
	20,30	0,408	13450	14850	16250	19000	21000	17900	19600		
		10,36	18100	20100	22100	25800	28500	24300	26600		
	20,80	0,422	14050	15550	17050	20000	22200	18800	20600		
		10,72	19000	21100	23200	27100	30100	25500	27900		
	21,40	0,437	15050	16650	18250	21100	23400	19700	21600		
		11,10	20300	22600	24900	28600	31700	26700	29300		
5 1/2" 139,70	17,00	0,304	9500	10500	11500	13600	15000	13400	14700		
		7,72	12800	14200	15600	18400	20300	18200	19900		
	20,00	0,361	12450	13750	15050	17950	19900	17100	18800		
		9,17	16700	18600	20500	24300	27000	23200	25500		
	23,00	0,415	15050	16650	18250	21500	23900	21000	23100		
		10,54	20300	22600	24900	29100	32400	28500	31300		
26,00	0,476	17000	18800	20600	26700	29600	24950	27350			
		12,09	22900	25500	28100	36200	40100	33800	37100		
	29,70	0,562	20850	23150	25450	33200	36800	29400	32300		
		14,27	28300	31400	34500	45000	49900	39900	43800		



			65 ksi				
			All Material			All Material	
SIZE (OD)	Nominal Weight	Wall Thickness	Field end for non rotation			Mill & licensee	
			min.	opti	max.	min	max
in. mm	lb/ft	in. mm	ft.lb. N.m.				
6 5/8" 168.28	23.20	0.330 8.38	7830 10600	8700 11800	9570 13000	11950 16200	13100 17800
	24.00	0.352 8.94	8780 11900	9750 13200	10720 14500	13400 18200	14800 20100
	28.00	0.417 10.59	10100 13700	11200 15200	12300 16700	17700 24000	19500 26400
	32.00	0.475 12.07	14050 19000	15550 21100	17050 23200	22050 29900	24250 32900
	36.70	0.562 14.27	15650 21200	17350 23500	19050 25900	23400 31700	25900 35100
	7" 177.80	26.00	0.362 9.19	9500 12800	10500 14200	11500 15600	14100 19100
29.00		0.408 10.36	11700 15800	13000 17600	14300 19400	18100 24500	19900 27000
32.00		0.453 11.51	13050 17600	14450 19600	15850 21600	20600 27900	22700 30800
35.00		0.498 12.65	14400 19400	15900 21600	17400 23800	25100 34000	27700 37600
38.00		0.540 13.72	16300 22100	18100 24500	19900 27000	25100 34000	27700 37600
41.00		0.590 14.99	18250 24800	20250 27500	22250 30300	27100 36700	30050 40700
7 5/8" 193.68	29.70	0.375 9.53	11100 15000	12300 16700	13500 18400	14500 19700	16000 21700
	33.70	0.430 10.92	13700 18500	15200 20600	16700 22700	18600 25200	20700 28100
	35.80	0.465 11.81	14400 19400	15900 21600	17400 23800	20100 27300	22300 30200
	39.00	0.500 12.70	15650 21200	17350 23500	19050 25900	21500 29100	23800 32300
	42.80	0.562 14.27	18250 24800	20250 27500	22250 30300	25100 34000	27800 37700
	45.30	0.595 15.11	19600 26500	21700 29400	23800 32300	26400 35800	29200 39600
	47.10	0.625 15.88	20850 28300	23150 31400	25450 34500	26400 35800	29200 39600



75-80-85 ksi								
			All Material			All Material		
SIZE (OD)	Nominal Weight	Wall Thickness	Field end for non rotation			Mill & licensee		
			min.	opti	max.	min	max	
in. mm	lb/ft	in. mm	ft.lb. N.m.					& Field Liner max
6 5/8" 168.28	23.20	0.330	9150	10150	11150	14800	16300	
		8.38	12400	13800	15200	20100	22100	
	24.00	0.352	10100	11200	12300	16650	18300	
		8.94	13700	15200	16700	22600	24800	
	28.00	0.417	13050	14450	15850	21700	23850	
		10.59	17600	19600	21600	29400	32300	
	32.00	0.475	14400	15900	17400	27000	29650	
		12.07	19400	21600	23800	36600	40200	
	36.70	0.562	18000	19900	21800	28800	31900	
		14.27	24300	27000	29700	39000	43200	
7" 177.80	26.00	0.362	10850	11950	13050	17350	19100	
		9.19	14600	16200	17800	23500	25900	
	29.00	0.408	13450	14850	16250	22050	24250	
		10.36	18100	20100	22100	29900	32900	
	32.00	0.453	14050	15550	17050	25450	28000	
		11.51	19000	21100	23200	34500	38000	
	35.00	0.498	16300	18100	19900	30600	33750	
		12.65	22100	24500	27000	41500	45800	
	38.00	0.540	18600	20600	22600	30600	33750	
		13.72	25100	27900	30700	41500	45800	
	41.00	0.590	20850	23150	25450	33350	37000	
		14.99	28300	31400	34500	45200	50200	
7 5/8" 193.68	29.70	0.375	13050	14450	15850	17600	19500	
		9.53	17600	19600	21600	23900	26400	
	33.70	0.430	14400	15900	17400	22700	25100	
		10.92	19400	21600	23800	30800	34000	
	35.80	0.465	16300	18100	19900	24400	27100	
		11.81	22100	24500	27000	33100	36700	
	39.00	0.500	18000	19900	21800	26000	28900	
		12.70	24300	27000	29700	35200	39200	
	42.80	0.562	20850	23150	25450	30500	33800	
		14.27	28300	31400	34500	41400	45800	
	45.30	0.595	20850	23150	25450	32300	35800	
		15.11	28300	31400	34500	43800	48500	
	47.10	0.625	20850	23150	25450	33300	36900	
		15.88	28300	31400	34500	45100	50000	



**90-95-100 ksi**

			90-95-100 ksi						
			All Material			Carbon & 13% Cr		Cold Worked CRA + S13% Cr & 13% Cr modified	
SIZE (OD)	Nominal Weight	Wall Thickness	Field end for non rotation			Mill & licensee		Mill & licensee	
			min.	opti	max.	min	max	min	max
in. mm	lb/ft	in. mm	ft.lb. N.m.						
			& Field Liner max			& Field Liner max		& Field Liner max	
6 5/8" 168.28	23.20	0.330 8.38	10100 13700	11200 15200	12300 16700	17350 23500	19100 25900	13500 18300	14800 20100
	24.00	0.352 8.94	11450 15500	12650 17200	13850 18900	19500 26400	21500 29100	14900 20200	16300 22100
	28.00	0.417 10.59	13700 18500	15200 20600	16700 22700	25600 34700	28200 38200	18450 25000	20250 27500
	32.00	0.475 12.07	16300 22100	18100 24500	19900 27000	32100 43500	35350 47900	21700 29400	23800 32300
	36.70	0.562 14.27	20600 27800	22800 30900	25000 34000	34200 46400	37900 51400	25350 34400	27900 37800
	7" 177.80	26.00	0.362 9.19	12450 16700	13750 18600	15050 20500	20600 27900	22700 30800	15700 21300
29.00		0.408 10.36	15300 20700	17000 23000	18700 25300	26050 35300	28650 38800	18800 25500	20600 27900
32.00		0.453 11.51	16000 21600	17700 24000	19400 26400	31400 42600	33050 44800	20900 28300	22900 31000
35.00		0.498 12.65	18600 25100	20600 27900	22600 30700	36150 49000	39800 54000	24000 32500	26400 35800
38.00		0.540 13.72	20850 28300	23150 31400	25450 34500	36150 49000	39800 54000	26050 35300	28650 38800
41.00		0.590 14.99	20850 28300	23150 31400	25450 34500	39650 53800	43950 59600	28000 38000	30800 41800
7 5/8" 193.68	29.70	0.375 9.53	14400 19400	15900 21600	17400 23800	20800 28200	23000 31200	18800 25500	20700 28100
	33.70	0.430 10.92	16300 22100	18100 24500	19900 27000	26800 36300	27900 37800	22800 30900	25100 34000
	35.80	0.465 11.81	18250 24800	20250 27500	22250 30300	28800 39000	31900 43200	24600 33400	27100 36700
	39.00	0.500 12.70	20150 27400	22400 30400	24650 33400	30700 41600	34000 46100	26400 35800	29000 39300
	42.80	0.562 14.27	20850 28300	23150 31400	25450 34500	35900 48700	39800 54000	29300 39700	32200 43700
	45.30	0.595 15.11	20850 28300	23150 31400	25450 34500	38200 51800	42400 57500	30500 41400	33600 45600
47.10	0.625 15.88	20850 28300	23150 31400	25450 34500	39500 53600	43800 59400	31400 42600	34500 46800	



**105-110-115 ksi**

				All Material			Carbon & 13% Cr		Cold Worked CRA + S13% Cr & 13% Cr modified		
SIZE (OD)	Nominal Weight	Wall Thickness	Field end for non rotation			Mill & licensee		Mill & licensee			
			min.	opti	max.	min	max	min	max		
in.	lb/ft	in.	ft.lb.								
mm		mm	N.m.								
6 5/8" 168.28	23.20	0.330	11450	12650	13850	20250	22300	15500	17000		
		8.38	15500	17200	18900	27500	30200	21000	23000		
	24.00	0.352	13050	14450	15850	22800	25100	17100	18800		
		8.94	17600	19600	21600	30900	34000	23200	25500		
	28.00	0.417	14650	16250	17850	29600	32650	21200	23300		
		10.59	19800	22000	24200	40100	44300	28700	31600		
	32.00	0.475	18000	19900	21800	37150	40850	24900	27290		
		12.07	24300	27000	29700	50400	55400	33800	37000		
	36.70	0.562	20850	23150	25450	37700	41800	28950	31850		
		14.27	28300	31400	34500	51100	56700	39200	43200		
7" 177.80	26.00	0.362	13700	15200	16700	24000	26450	18000	19800		
		9.19	18500	20600	22700	32500	35900	24400	26800		
	29.00	0.408	16000	17700	19400	30100	33150	21600	23700		
		10.36	21600	24000	26400	40800	44900	29300	32100		
	32.00	0.453	17650	19550	21450	34700	38200	23950	26250		
		11.51	23900	26500	29200	47000	51800	32500	35600		
	35.00	0.498	20600	22800	25000	41800	46050	27500	30200		
		12.65	27800	30900	34000	56700	62400	37300	40900		
	38.00	0.540	20850	23150	25450	41800	46050	29800	32700		
		13.72	28300	31400	34500	56700	62400	40400	44300		
	41.00	0.590	20850	23150	25450	44050	48850	32100	35300		
		14.99	28300	31400	34500	59700	66200	43500	47900		
7 5/8" 193.68	29.70	0.375	15050	16650	18250	24000	26600	21650	23800		
		9.53	20300	22600	24900	32500	36100	29400	32300		
	33.70	0.430	18250	20250	22250	30900	34300	26200	28800		
		10.92	24800	27500	30300	41900	46500	35500	39000		
	35.80	0.465	20150	22400	24650	33200	36900	28300	31100		
		11.81	27400	30400	33400	45000	50000	38400	42200		
	39.00	0.500	20850	23150	25450	35300	39200	30200	33300		
		12.70	28300	31400	34500	47900	53100	40900	45100		
	42.80	0.562	20850	23150	25450	41300	45800	33500	36800		
		14.27	28300	31400	34500	56000	62100	45400	49900		
	45.30	0.595	20850	23150	25450	44000	48800	34900	38400		
		15.11	28300	31400	34500	59700	66200	47300	52100		
	47.10	0.625	20850	23150	25450	45700	50700	36100	39700		
		15.88	28300	31400	34500	62000	68700	48900	53800		



**120-125-130 ksi**

			120-125-130 ksi						
			All Material			Carbon & 13% Cr		Cold Worked CRA + S13% Cr & 13% Cr modified	
SIZE (OD)	Nominal Weight	Wall Thickness	Field end for non rotation			Mill & licensee		Mill & licensee	
			min.	opti	max.	min	max	min	max
in. mm	lb/ft	in. mm	ft.lb. N.m.						
6 5/8" 168.28	23.20	0.330	12700	14100	15500	20250	22300	17500	19200
		8.38	17200	19100	21000	27500	30200	23700	26000
	24.00	0.352	14400	15900	17400	22800	25100	19400	21300
		8.94	19400	21600	23800	30900	34000	26300	28900
	28.00	0.417	16000	17700	19400	29600	32650	23900	26300
		10.59	21600	24000	26400	40100	44300	32400	35700
	32.00	0.475	19850	22050	24250	37150	40850	28100	30900
		12.07	26900	29900	32900	50400	55400	38100	41900
	36.70	0.562	20850	23150	25450	42700	47300	32600	35900
		14.27	28300	31400	34500	57900	64100	44200	48700
7" 177.80	26.00	0.362	15050	16650	18250	24000	26450	20400	22400
		9.19	20300	22600	24900	32500	35900	27700	30400
	29.00	0.408	16300	18100	19900	30100	33150	24400	26800
		10.36	22100	24500	27000	40800	44900	33100	36300
	32.00	0.453	19600	21700	23800	34700	38200	27100	29800
		11.51	26500	29400	32300	47000	51800	36700	40400
	35.00	0.498	20850	23150	25450	41800	46050	31000	34100
		12.65	28300	31400	34500	56700	62400	42000	46200
	38.00	0.540	20850	23150	25450	47300	52150	33600	36900
		13.72	28300	31400	34500	64100	70700	45600	50000
	41.00	0.590	20850	23150	25450	53750	59150	36200	39800
		14.99	28300	31400	34500	72900	80200	49100	54000
7 5/8" 193.68	29.70	0.375	15650	17350	19050	27300	30300	24500	27000
		9.53	21200	23500	25900	37000	41100	33200	36600
	33.70	0.430	20150	22400	24650	35100	38900	29650	32600
		10.92	27400	30400	33400	47600	52700	40200	44200
	35.80	0.465	20850	23150	25450	37700	41800	32000	35200
		11.81	28300	31400	34500	51100	56700	43400	47700
	39.00	0.500	20850	23150	25450	40100	44400	34100	37600
		12.70	28300	31400	34500	54400	60200	46200	51000
	42.80	0.562	20850	23150	25450	46800	51900	37800	41500
		14.27	28300	31400	34500	63400	70400	51200	56300
	45.30	0.595	20850	23150	25450	49800	55200	39300	43200
		15.11	28300	31400	34500	67500	74800	53300	58600
	47.10	0.625	20850	23150	25450	51700	57400	40600	44600
		15.88	28300	31400	34500	70100	77800	55000	60500



**135-140 ksi**

			135-140 ksi						
			All Material			Carbon		Cold Worked CRA	
SIZE (OD)	Nominal Weight	Wall Thickness	Field end for non rotation			Mill & licensee		Mill & licensee	
			min.	opti	max.	min	max	min	max
in. mm	lb/ft	in. mm	ft.lb. N.m.						
6 5/8" 168.28	23.20	0.330 8.38	13700 18500	15200 20600	16700 22700	20600 27900	22900 31000	19200 26000	21100 28600
	24.00	0.352 8.94	15050 20300	16650 22600	18250 24900	23300 31600	25900 35100	21350 28900	23450 31800
	28.00	0.417 10.59	17250 23400	19150 26000	21050 28600	30300 41100	33600 45600	26250 35600	28850 39100
	32.00	0.475 12.07	20850 28300	23150 31400	25450 34500	37500 50800	41600 56400	30800 41800	33800 45800
	36.70	0.562 14.27	20850 28300	23150 31400	25450 34500	46900 63600	52000 70500	35700 48400	39200 53100
	7" 177.80	26.00	0.362 9.19	16000 21600	17700 24000	19400 26400	24500 33200	27200 36900	22300 30200
29.00		0.408 10.36	17650 23900	19550 26500	21450 29200	30800 41800	34100 46200	26750 36300	29350 39800
32.00		0.453 11.51	20850 28300	23150 31400	25450 34500	35100 47600	38900 52700	29650 40200	32550 44100
35.00		0.498 12.65	20850 28300	23150 31400	25450 34500	42700 57900	47400 64300	34000 46100	37400 50700
38.00		0.540 13.72	20850 28300	23150 31400	25450 34500	48400 65600	53600 72700	36750 49800	40350 54700
41.00		0.590 14.99	20850 28300	23150 31400	25450 34500	55000 74600	61000 82700	39550 53600	43450 58900
7 5/8" 193.68	29.70	0.375 9.53	16900 23000	18800 25500	20700 28100	30000 40700	33300 45100	27000 36600	29700 40300
	33.70	0.430 10.92	20850 28300	23150 31400	25450 34500	38700 52500	42900 58200	32600 44200	35800 48500
	35.80	0.465 11.81	20850 28300	23150 31400	25450 34500	41500 56300	46000 62400	35100 47600	38600 52300
	39.00	0.500 12.70	20850 28300	23150 31400	25450 34500	44100 59800	48900 66300	37500 50800	41200 55900
	42.80	0.562 14.27	20850 28300	23150 31400	25450 34500	51500 69800	57100 77400	41400 56100	45500 61700
	45.30	0.595 15.11	20850 28300	23150 31400	25450 34500	54700 74200	60700 82300	43000 58300	47300 64100
	47.10	0.625 15.88	20850 28300	23150 31400	25450 34500	56800 77000	63000 85400	44400 60200	48800 66200



145-150-155 ksi											
			All Material			Carbon		Cold worked CRA			
SIZE (OD)	Nominal Weight	Wall Thickness	Field end for non rotation			Mill & licensee		Mill & licensee			
			min.	opti	max.	min	max	min	max		
in. mm	lb/ft	in. mm	ft.lb. N.m.							= Field Liner max	= Field Liner max
6 5/8" 168.28	23.20	0.330	15050	16650	18250	22500	25000	20950	22950		
		8.38	20300	22600	24900	30500	33900	28400	31100		
	24.00	0.352	15650	17350	19050	25400	28200	23200	25500		
		8.94	21100	23500	25900	34400	38200	31500	34600		
	28.00	0.417	18600	20600	22600	33100	36700	28650	31450		
		10.59	25100	27900	30700	44900	49800	38800	42600		
	32.00	0.475	20850	23150	25450	40900	45400	33500	36800		
		12.07	28300	31400	34500	55500	61600	45400	49900		
	36.70	0.562	20850	23150	25450	51100	56700	38800	42600		
		14.27	28300	31400	34500	69300	76900	52600	57800		
7" 177.80	26.00	0.362	16300	18100	19900	26800	29700	24400	26800		
		9.19	22000	24500	27000	36300	40300	33100	36300		
	29.00	0.408	18900	21000	23100	33600	37200	29150	32050		
		10.36	25600	28400	31200	45600	50400	39500	43500		
	32.00	0.453	20850	23150	25450	38200	42400	33250	36550		
		11.51	28300	31400	34500	51800	57500	45100	49600		
	35.00	0.498	20850	23150	25450	46600	51700	36900	40500		
		12.65	28300	31400	34500	63200	70100	50000	54900		
	38.00	0.540	20850	23150	25450	52700	58500	39900	43800		
		13.72	28300	31400	34500	71400	79300	54100	59400		
	41.00	0.590	20850	23150	25450	59900	66400	42950	47150		
		14.99	28300	31400	34500	81200	90000	58200	63900		
7 5/8" 193.68	29.70	0.375	20850	23150	25450	32800	36400	29400	32300		
		9.53	28300	31400	34500	44500	49300	39900	43800		
	33.70	0.430	20850	23150	25450	42200	46800	35500	39000		
		10.92	28300	31400	34500	57200	63400	48100	52900		
	35.80	0.465	20850	23150	25450	45300	50300	38200	42100		
		11.81	28300	31400	34500	61400	68200	51800	57100		
	39.00	0.500	20850	23150	25450	48100	53300	40800	44800		
		12.70	28300	31400	34500	65200	72300	55300	60700		
	42.80	0.562	20850	23150	25450	56100	62200	45000	49500		
		14.27	28300	31400	34500	76100	84300	61000	67100		
	45.30	0.595	20850	23150	25450	59600	66100	46700	51400		
		15.11	28300	31400	34500	80800	89600	63300	69700		
	47.10	0.625	20850	23150	25450	61900	68700	48200	53000		
		15.88	28300	31400	34500	83900	93100	65300	71900		