

## Drill Collar Connection Make-Up Torque

Connection		OD in	Minimum Make-up Torque (lb-ft)							
Size	Type		1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 13/16
API	NC23	3	*2,508	*2,508	*2,508					
		3 1/8	*3,330	*3,330	2,647					
		3 1/4	4,000	3,387	2,647					
2 3/8	Regular	3		*2,241	*2,241	1,749				
		3 1/8		*3,028	2,574	1,749				
		3 1/4		3,285	2,574	1,749				
2 7/8	PAC <sup>3</sup>	3		*3,797	*3,797	2,926				
		3 1/8		*4,966	4,151	2,926				
		3 1/4		5,206	4,151	2,926				
2 3/8	API IF	3 1/2		*4,606	*4,606	3,697				
API	NC26	3 3/4		5,501	4,668	3,697				
2 7/8	Slim Hole									
2 7/8	Regular	3 1/2		*3,838	*3,838	*3,838				
		3 3/4		5,766	4,951	4,002				
		3 7/8		5,766	4,951	4,002				
2 7/8	Extra Hole	3 3/4		*4,089	*4,089	*4,089				
3 1/2	Dbf. Streamline	3 7/8		*5,352	*5,352	*5,352				
2 7/8	Mod. Open	4 1/8		*8,059	*8,059	7,433				
2 7/8	API IF	3 7/8		*4,640	*4,640	*4,640	*4,640			
API	NC31	4 1/8		*7,390	*7,390	*7,390	6,853			
3 1/2	Regular	4 1/8		*6,466	*6,466	*6,466	*6,466	5,685		
		4 1/4		*7,886	*7,886	*7,886	7,115	5,685		
		4 1/2		10,471	9,514	8,394	7,115	5,685		
3 1/2	Slim Hole	4 1/4		*8,858	*8,858	8,161	6,853	5,391		
		4 1/2		10,286	9,307	8,161	6,853	5,391		
API	NC35	4 1/2				*9,038	*9,038	*9,038	7,411	
		4 3/4				12,273	10,826	9,202	7,411	
		5				12,273	10,826	9,202	7,411	
3 1/2	Extra Hole	4 1/4				*5,161	*5,161	*5,161	*5,161	
4	Slim Hole	4 1/2				*8,479	*8,479	*8,479	8,311	
3 1/2	Mod. Open	4 3/4				*12,074	11,803	10,144	8,311	
		5				13,283	11,803	10,144	8,311	
		5 1/4				13,283	11,803	10,144	8,311	
3 1/2	API IF	4 3/4				*9,986	*9,986	*9,986	*9,986	8,315
API	NC 38	5				*13,949	*13,949	12,907	10,997	8,315
4 1/2	Slim Hole	5 1/4				16,207	14,643	12,907	10,997	8,315
		5 1/2				16,207	14,643	12,907	10,997	8,315

Size	Type	OD	1 1/2	1 3/4	2	2 1/4	2 1/2	2 13/16	3	3 1/4
		in								
3 1/2	H-90°	4 3/4		*8,786	*8,786	*8,786	*8,786	*8,786		
		5		*12,794	*12,794	*12,794	*12,794	10,408		
		5 1/4		*17,094	16,929	15,137	13,151	10,408		
		5 1/2		18,522	16,929	15,137	13,151	10,408		
4	Full Hole	5		*10,910	*10,910	*10,910	*10,910	*10,910		
API	NC40	5 1/4		*15,290	*15,290	*15,290	14,969	12,125		
4	Mod. Open	5 1/2		*19,985	18,886	17,028	14,969	12,125		
4 1/2	Dbl. Streamline	5 3/4		20,539	18,886	17,028	14,969	12,125		
		6		20,539	18,886	17,028	14,969	12,125		
4	H-90°	5 1/4		*12,590	*12,590	*12,590	*12,590	*12,590		
		5 1/2		*17,401	*17,401	*17,401	*17,401	16,536		
		5 3/4		*22,531	*22,531	21,714	19,543	16,536		
		6		25,408	23,671	21,714	19,543	16,536		
		6 1/4		25,408	23,671	21,714	19,543	16,536		
4 1/2	API Regular	5 1/2		*15,576	*15,576	*15,576	*15,576	*15,576		
		5 3/4		*20,609	*20,609	*20,609	19,601	16,629		
		6		25,407	23,686	21,749	19,601	16,629		
		6 1/4		25,407	23,686	21,749	19,601	16,629		
API	NC44	5 3/4		*20,895	*20,895	*20,895	*20,895	18,161		
		6		*26,453	25,510	23,493	21,257	18,161		
		6 1/4		27,300	25,510	23,493	21,257	18,161		
		6 1/2		27,300	25,510	23,493	21,257	18,161		
4 1/2	API Full Hole	5 1/2			*12,973	*12,973	*12,973	*12,973	*12,973	
		5 3/4			*18,119	*18,119	*18,119	*18,119	17,900	
		6			*23,605	*23,605	22,028	19,921	17,900	
		6 1/4			27,294	25,272	22,028	19,921	17,900	
		6 1/2			27,294	25,272	22,028	19,921	17,900	
4 1/2	Extra Hole	5 3/4				*17,738	*17,738	*17,738	*17,738	
API	NC46	6				*23,422	*23,422	22,426	20,311	
4	API IF	6 1/4				28,021	25,676	22,426	20,311	
4 1/2	Semi IF	6 1/2				28,021	25,676	22,426	20,311	
	Dbl. StreamlineMod. Open	6 3/4				28,021	25,676	22,426	20,311	
4 1/2	H-90°	5 3/4				*18,019	*18,019	*18,019	*18,019	
		6				*23,681	*23,681	23,159	21,051	
		6 1/4				28,732	26,397	23,159	21,051	
		6 1/2				28,732	26,397	23,159	21,051	
		6 3/4				28,732	26,397	23,159	21,051	
5	H-90°	6 1/4				*25,360	*25,360	*25,360	*25,360	23,988
		6 1/2				*31,895	*31,895	29,400	27,167	23,988
		6 3/4				35,292	32,825	29,400	27,167	23,988
		7				35,292	32,825	29,400	27,167	23,988

Size	Type	OD	2	2 1/4	2 1/2	2 13/16	3	3 1/4	3 1/2	3 3/4
		in								
4 1/2	API IF	6 1/4		*23,004	*23,004	*23,004	*23,004	*23,004		
	API NC50	6 1/2		*29,679	*29,679	*29,679	*29,679	26,675		
5	Extra Hole	6 3/4		*36,742	35,824	32,277	29,966	26,675		
5	Mod. Open	7		38,397	35,824	32,277	29,966	26,675		
5 1/2	Dbl. Streamline	7 1/4		38,397	35,824	32,277	29,966	26,675		
5	Semi IF	7 1/2		38,397	35,824	32,277	29,966	26,675		
5 1/2	H-90 <sup>4</sup>	6 3/4		*34,508	*34,508	*34,508	34,142	30,781		
		7		*41,993	40,117	36,501	34,142	30,781		
		7 1/4		42,719	40,117	36,501	34,142	30,781		
		7 1/2		42,719	40,117	36,501	34,142	30,781		
5 1/2	API Regular	6 3/4		*31,941	*31,941	*31,941	*31,941	30,495		
		7		*39,419	*39,419	36,235	33,868	30,495		
		7 1/4		42,481	39,866	36,235	33,868	30,495		
		7 1/2		42,481	39,866	36,235	33,868	30,495		
5 1/2	API Full Hole	7		*32,762	*32,762	*32,762	*32,762	*32,762		
		7 1/4		*40,998	*40,998	*40,998	*40,998	*40,998		
		7 1/2		*49,661	*49,661	47,756	45,190	41,533		
		7 3/4		54,515	51,687	47,756	45,190	41,533		
API	NC56	7 1/4			*40,498	*40,498	*40,498	*40,498		
		7 1/2			*49,060	48,221	45,680	42,058		
		7 3/4			52,115	48,221	45,680	42,058		
		8			52,115	48,221	45,680	42,058		
6 5/8	API Regular	7 1/2			*46,399	*46,399	*46,399	*46,399		
		7 3/4			*55,627	53,346	50,704	46,936		
		8			57,393	53,346	50,704	46,936		
		8 1/4			57,393	53,346	50,704	46,936		
6 5/8	H-90 <sup>4</sup>	7 1/2			*46,509	*46,509	*46,509	*46,509		
		7 3/4			*55,708	*55,708	53,629	49,855		
		8			60,321	56,273	53,629	49,855		
		8 1/4			60,321	56,273	53,629	49,855		
API	NC61	8			*55,131	*55,131	*55,131	*55,131		
		8 1/4			*65,438	*65,438	*65,438	61,624		
		8 1/2			72,670	68,398	65,607	61,624		
		8 3/4			72,670	68,398	65,607	61,624		
		9			72,670	68,398	65,607	61,624		
5 1/2	API IF	8			*56,641	*56,641	*56,641	*56,641	*56,641	
		8 1/4			*67,133	*67,133	*67,133	63,381	59,027	
		8 1/2			74,626	70,277	67,436	63,381	59,027	
		8 3/4			74,626	70,277	67,436	63,381	59,027	
		9			74,626	70,277	67,436	63,381	59,027	
		9 1/4			74,626	70,277	67,436	63,381	59,027	

Size	Type	OD in			2 1/2	2 13/16	3	3 1/4	3 1/2	3 3/4
6 5/8	API Full Hole	8 1/2			*67,789	*67,789	*67,789	*67,789	*67,789	67,184
		8 3/4			*79,544	*79,544	*79,544	76,706	72,102	67,184
		9			88,582	83,992	80,991	76,706	72,102	67,184
		9 1/4			88,582	83,992	80,991	76,706	72,102	67,184
		9 1/2			88,582	83,992	80,991	76,706	72,102	67,184
	API NC70	9			*75,781	*75,781	*75,781	*75,781	*75,781	*75,781
		9 1/4			*88,802	*88,802	*88,802	*88,802	*88,802	*88,802
		9 1/2			*102,354	*102,354	*102,354	101,107	96,214	90,984
		9 3/4			113,710	108,841	105,657	101,107	96,214	90,984
		10			113,710	108,841	105,657	101,107	96,214	90,984
		10 1/4			113,710	108,841	105,657	101,107	96,214	90,984
	API NC77	10			*108,194	*108,194	*108,194	*108,194	*108,194	*108,194
		10 1/4			*124,051	*124,051	*124,051	*124,051	*124,051	*124,051
		10 1/2			*140,491	*140,491	*140,491	140,488	135,119	129,375
		10 3/4			154,297	148,965	145,476	140,488	135,119	129,375
		11			154,297	148,965	145,476	140,488	135,119	129,375
7	H-90 <sup>4</sup>	8			*53,454	*53,454	*53,454	*53,454	*53,454	*53,454
		8 1/4			*63,738	*63,738	*63,738	*63,738	60,971	56,382
		8 1/2			*74,478	72,066	69,265	65,267	60,971	56,382
7 5/8	API Regular	8 1/2			*60,402	*60,402	*60,402	*60,402	*60,402	*60,402
		8 3/4			*72,169	*72,169	*72,169	*72,169	*72,169	*72,169
		9			*84,442	*84,442	*84,442	84,221	79,536	74,529
		9 1/4			96,301	91,633	88,580	84,221	79,536	74,529
		9 1/2			96,301	91,633	88,580	84,221	79,536	74,529
7 5/8	H-90 <sup>4</sup>	9			*73,017	*73,017	*73,017	*73,017	*73,017	*73,017
		9 1/4			*86,006	*86,006	*86,006	*86,006	*86,006	*86,006
		9 1/2			*99,508	*99,508	*99,508	*99,508	*99,508	96,285
8 5/8	API Regular	10			*109,345	*109,345	*109,345	*109,345	*109,345	*109,345
		10 1/4			*125,263	*125,263	*125,263	*125,263	*125,263	125,034
		10 1/2			*141,767	*141,767	141,134	136,146	130,777	125,034
8 5/8	H-90 <sup>4</sup>	10 1/4			*113,482	*113,482	*113,482	*113,482	*113,482	*113,482
		10 1/2			*130,063	*130,063	*130,063	*130,063	*130,063	*130,063
7	H-90 <sup>4</sup>	8 3/4				*68,061	*68,061	67,257	62,845	58,131
	(with low torque face)	9				74,235	71,361	67,257	62,845	58,131
7 5/8	API Regular	9 1/4					*73,099	*73,099	*73,099	*73,099
	(with low torque face)	9 1/2					*86,463	*86,463	82,457	77,289
		9 3/4					91,789	87,292	82,457	77,289
		10					91,789	87,292	82,457	77,289
7 5/8	H-90 <sup>4</sup>	9 3/4				*91,667	*91,667	*91,667	*91,667	*91,667
	(with low torque face)	10				*106,260	*106,260	*106,260	104,171	98,804
		10 1/4				117,112	113,851	109,188	104,171	98,804
		10 1/2				117,112	113,851	109,188	104,171	98,804

Size	Type	OD in			2 1/2	2 13/16	3	3 1/4	3 1/2	3 3/4
8 5/8	API Regular	10 3/4					*112,883	*112,883	*112,883	*112,883
	(with low torque face)	11					*130,672	*130,672	*130,672	*130,672
		11 1/4					147,616	142,430	136,846	130,871
8 5/8	H-90 <sup>†</sup>	10 3/4					*92,960	*92,960	*92,960	*92,960
	(with low torque face)	11					*110,781	*110,781	*110,781	*110,781
		11 1/4					*129,203	*129,203	*129,203	*129,203

† Recommended Make-Up Torque<sup>1</sup> For Rotary Shouldered Drill Collar Connections

Notes:

- 1 Torque figures preceded by an asterisk (\*) indicate that the weaker member for the corresponding outside diameter (OD) and bore is the BOX; For all other torque values the weaker member is the PIN.
- 2 In each connection size and type group, torque values apply to all connection types in the group, when used with the same drill collar outside diameter and bore, i.e. 2 3/8 API IF, API NC26, and 2 7/8 Slim Hole connections used with 3 1/2 x 1 1/4 drill collars all have the same minimum make-up torque of 4,600 ft.lb., and The BOX is the weaker member.
- 3 Stress-relief features are disregarded for make-up torque.

Footnotes:

- 1 Basis of calculations for recommended make-up torque assumed the use of a thread compound containing 40-60% by weight of finely powered metallic zinc or 60% by weight of finely powered metallic lead, with not more than 0.3% total active sulfur applied thoroughly to all threads and shoulders and using the modified screw jack formula in API RP7G (16th edition) Appendix A, paragraph A.8, and a unit stress of 62,500 psi in the box or pin, whichever is weaker.
- 2 Normal torque range is tabulated value plus 10%. Higher torque values may be used under extreme conditions.
- 3 Make-up torque for 2 7/8 PAC connection is based on 87,500 psi stress and other factors listed in footnote 1.
- 4 Make-up torque for H-90 connection is based on 56,200 psi stress and other factors listed in footnote 1.