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## ASTM A307

Bolt Size	TPI	Proof Load	Clamp Load	Tightening Torque (ft lbs)		
				Waxed	Galv	Plain
1/4	20	1145	859	2	4	4
5/16	18	1886	1415	4	9	7
3/8	16	2790	2093	7	16	13
7/16	14	3827	2870	10	26	21
1/2	13	5108	3831	16	40	32
9/16	12	6552	4914	23	58	46
5/8	11	8136	6102	32	79	64
3/4	10	12024	9018	56	141	113
7/8	9	15200	11400	83	208	166
1	8	20000	15000	125	313	250
1 1/8	7	25200	18900	177	443	354
1 1/4	7	32000	24000	250	625	500
1 3/8	6	38100	28575	327	819	655
1 1/2	6	46400	34800	435	1088	870
1 3/4	5	68400	51300	748	1870	1496
2	4 1/2	90000	67500	1125	2813	2250
2 1/4	4 1/2	117000	87750	1645	4113	3291
2 1/2	4	144000	108000	2250	5625	4500
2 3/4	4	177480	133110	3050	7626	6101
3	4	214920	161190	4030	10074	8060
3 1/4	4	255600	191700	5192	12980	10384
3 1/2	4	299880	224910	6560	16400	13120
3 3/4	4	347760	260820	8151	20377	16301
4	4	398880	299160	9972	24930	19944

## SAE GRADE 2

Bolt Size	TPI	Proof Load	Clamp Load	Tightening Torque (ft lbs)		
				Waxed	Galv	Plain
1/4	20	1750	1313	3	7	5
5/16	18	2900	2175	6	14	11
3/8	16	4250	3188	10	25	20
7/16	14	5850	4388	16	40	32
1/2	13	7800	5850	24	61	49
9/16	12	10000	7500	35	88	70
5/8	11	12400	9300	48	121	97
3/4	10	18400	13800	86	216	173
7/8	9	15200	11400	83	208	166
1	8	20000	15000	125	313	250
1 1/8	7	25200	18900	177	443	354
1 1/4	7	32000	24000	250	625	500
1 3/8	6	38100	28575	327	819	655
1 1/2	6	46400	34800	435	1088	870

## ASTM A325

Bolt Size	TPI	Tension lbs		Torque range ft lbs	
		Min	Max	Waxed	Plain
1/2	13	12000	14000	50 - 58	100 - 117
5/8	11	19000	23000	99 - 120	198 - 240
3/4	10	28000	34000	175 - 213	350 - 425
7/8	9	39000	47000	284 - 343	569 - 685
1	8	51000	61000	425 - 508	850 - 1017
1 1/8	7	56000	67000	525 - 625	1050 - 1256
1 1/4	7	71000	85000	740 - 885	1479 - 1771
1 3/8	6	85000	102000	974 - 1169	1948 - 2338
1 1/2	6	103000	124000	1288 - 1550	2575 - 3100

# ASTM A449 / SAE GRADE 5

Bolt Size	TPI	Tension lbs		Tightening Torque (ft lbs)		
		Proof Load	Clamp Load	Waxed	Galv	Plain
1/4	20	2700	2025	4	11	8
5/16	18	4450	3338	9	22	17
3/8	16	6600	4950	15	39	31
7/16	14	9050	6788	25	62	49
1/2	13	12050	9038	38	94	75
9/16	12	15450	11588	54	136	109
5/8	11	19200	14400	75	188	150
3/4	10	28400	21300	133	333	266
7/8	9	39250	29438	215	537	429
1	8	51500	38625	322	805	644
1 1/8	7	56450	42338	397	992	794
1 1/4	7	71700	53775	560	1400	1120
1 3/8	6	85450	64088	734	1836	1469
1 1/2	6	104000	78000	975	2438	1950
1 3/4	5	104500	78375	1143	2857	2286
2	4 1/2	137500	103125	1719	4297	3438
2 1/4	4 1/2	178750	134063	2514	6284	5027
2 1/2	4	220000	165000	3438	8594	6875
2 3/4	4	271150	203363	4660	11651	9321
3	4	328350	246263	6157	15391	12313

*SAE J429 grade 5 bolts do not exceed 1-1/2" diameter.*

# ASTM A193 B7

Bolt Size	TPI	Tension lbs		Tightening Torque (ft lbs)		
		Proof Load	Clamp Load	Waxed	Galv	Plain
1/4	20	3,350	2,513	5	13	10
5/16	18	5,500	4,125	11	27	21
3/8	16	8,150	6,113	19	48	38
7/16	14	11,150	8,363	30	76	61
1/2	13	14,900	11,175	47	116	93
9/16	12	19,100	14,325	67	168	134
5/8	11	23,750	17,813	93	232	186
3/4	10	35,050	26,288	164	411	329
7/8	9	48,500	36,375	265	663	530
1	8	63,650	47,738	398	995	796
1 1/8	7	80,100	60,075	563	1,408	1,126
	8	82,934	62,201	583	1,458	1,166
1 1/4	7	101,750	76,313	795	1,987	1,590
	8	105,006	78,754	820	2,051	1,641
1 3/8	6	121,300	90,975	1,042	2,606	2,085
	8	129,492	97,119	1,113	2,782	2,226
1 1/2	6	147,550	110,663	1,383	3,458	2,767
	8	156,687	117,515	1,469	3,672	2,938
1 3/4	5	199,500	149,625	2,182	5,455	4,364
	8	218,400	163,800	2,389	5,972	4,778
2	4 1/2	262,500	196,875	3,281	8,203	6,563
	8	290,850	218,138	3,636	9,089	7,271
2 1/4	4 1/2	341,250	255,938	4,799	11,997	9,598
	8	373,801	280,351	5,257	13,141	10,513
2 1/2	4	420,000	315,000	6,563	16,406	13,125
	8	466,200	349,650	7,284	18,211	14,569
2 3/4	4	468,500	351,263	8,050	20,124	16,100
	8	515,851	386,888	8,866	22,165	17,732
3	4	567,150	425,363	10,634	26,585	21,268
	8	618,451	463,838	11,596	28,990	23,192
3 1/4	4	674,500	505,875	13,701	34,252	27,402
	8	730,550	547,913	14,839	37,098	29,679
3 1/2	4	791,350	593,513	17,311	43,277	34,622
	8	851,201	638,401	18,620	46,550	37,240
3 3/4	4	917,700	688,275	21,509	53,771	43,017
	8	982,300	736,725	23,023	57,557	46,045
4	4	1,052,600	789,450	26,315	65,788	52,630
	8	1,121,950	841,463	28,049	70,122	56,098

## ASTM A490

Bolt Size	TPI	Tension lbs		Torque range ft lbs	
		Min	Max	Waxed	Plain
1/2	13	15000	18000	63 - 75	125 - 150
5/8	11	24000	29000	125 - 151	250 - 302
3/4	10	35000	42000	219 - 263	438 - 525
7/8	9	49000	59000	357 - 430	715 - 860
1	8	64000	77000	533 - 642	1067 - 1283
1 1/8	7	80000	96000	750 - 900	1500 - 1800
1 1/4	7	102000	122000	1063 - 1271	2125 - 2542
1 3/8	6	121000	145000	1386 - 1661	2773 - 3323
1 1/2	6	148000	178000	1850 - 2225	3700 - 4450

## ASTM A354-BD / SAE GRADE 8

Bolt Size	TPI	Tension lbs		Torque range ft lbs	
		Min	Max	Lubed	Plain
1/4	20	3800	2850	6	12
5/16	18	6300	4725	12	25
3/8	16	9300	6975	22	44
7/16	14	12750	9563	35	70
1/2	13	17050	12788	53	107
9/16	12	21850	16388	77	154
5/8	11	27100	20325	106	212
3/4	10	40100	30075	188	376
7/8	9	55450	41588	303	606
1	8	72700	54525	454	909
1 1/8	7	91550	68663	644	1287
1 1/4	7	120000	90000	938	1875
1 3/8	6	138600	103950	1191	2382
1 1/2	6	168600	126450	1581	3161
1 3/4	5	228000	171000	2494	4988
2	4 1/2	300000	225000	3750	7500
2 1/4	4 1/2	390000	292500	5484	10969
2 1/2	4	480000	360000	7500	15000
2 3/4	4	517650	388238	8897	17794
3	4	626850	470138	11753	23507
3 1/4	4	745500	559125	15143	30286
3 1/2	4	874650	655988	19133	38266
3 3/4	4	1014300	760725	23773	47545
4	4	1163400	872550	29085	58100

