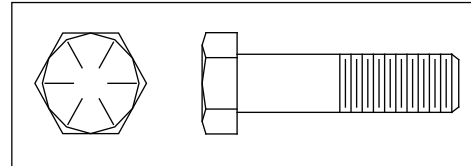
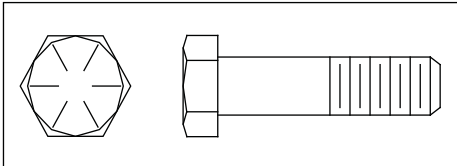


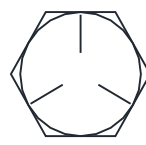
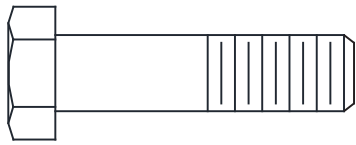
Torque Specification Chart

The following torque values are to be used on all fasteners unless otherwise specified. Lubricated refers to fasteners in the "As Received" condition, which is normally a light preservative oil coating on unplated fasteners and no oil coating on plated fasteners. No special steps are taken to add further lubrication prior to assembly. Anti-seize refers to parts that have had an anti-seize lubricant applied just prior to assembly.



GRADE 8 COURSE THREAD				
BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
1/4"-20	129	15	86	10
	ft-lbs	Nm	ft-lbs	Nm
5/16"-18	23	31	15	20
3/8"-16	40	54	27	37
7/16"-14	63	85	42	57
1/2"-13	96	130	64	87
9/16"-12	140	190	93	126
5/8"-11	195	264	130	176
3/4"-10	340	461	230	312
7/8"-9	550	746	365	495
1"-8	820	1,112	550	746
1 1/8"-7	1,160	1,573	775	1,051
1 1/4"-7	1,640	2,224	1,100	1,491
1 3/8"-6	2,150	2,915	1,430	1,939
1 1/2"-6	2,850	3,864	1,900	2,576
1 3/4"-5	4,490	6,088	3,000	4,067
2"-4.5	6,750	9,152	4,500	6,101
2 1/4"-4.5	9,870	13,382	6,580	8,921
2 1/2"-4	13,500	18,304	9,000	12,202
2 3/4"-4	18,400	24,947	12,300	16,677
3"-4	24,200	32,811	16,200	21,964

GRADE 8 FINE THREAD				
BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
1/4"-28	147	17	98	11
	ft-lbs	Nm	ft-lbs	Nm
5/16"-24	25	34	17	23
3/8"-24	45	61	30	41
7/16"-20	71	96	47	64
1/2"-20	108	146	72	98
9/16"-18	155	210	105	142
5/8"-18	220	298	145	197
3/4"-16	380	515	255	346
7/8"-14	605	820	405	549
1"-14	920	1,247	615	834
1 1/8"-12	1,300	1,763	870	1,180
1 1/4"-12	1,820	2,468	1,210	1,641
1 3/8"-12	2,450	3,322	1,630	2,210
1 1/2"-12	3,210	4,352	2,140	2,901

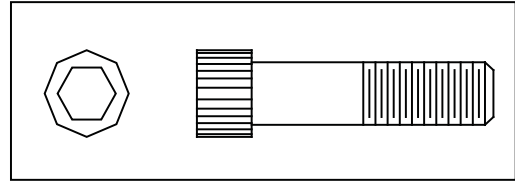
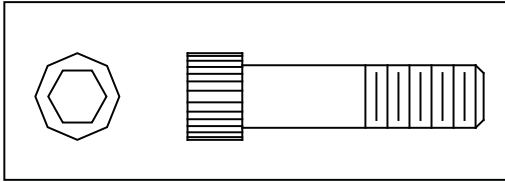


GRADE 5 COURSE THREAD

BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
1/4"-20	91	10	61	7
	ft-lbs	Nm	ft-lbs	Nm
5/16"-18	16	22	11	15
3/8"-16	28	38	19	26
7/16"-14	45	61	30	41
1/2"-13	68	92	46	62
9/16"-12	98	133	66	89
5/8"-11	140	190	91	123
3/4"-10	240	325	160	217
7/8"-9	390	529	260	353
1"-8	580	786	390	529
1 1/8"-7	715	969	480	651
1 1/4"-7	1,010	1,369	675	915
1 3/8"-6	1,330	1,803	885	1,200
1 1/2"-6	1,760	2,386	1,170	1,586
1 3/4"-5	2,770	3,756	1850	2,508
2"-4.5	4,160	5,640	2780	3,769
2 1/4"-4.5	6,090	8,257	4060	5,505
2 1/2"-4	8,330	11,294	5550	7,525
2 3/4"-4	11,300	15,321	7540	10,223
3"-4	15,000	20,337	9,940	13,477

GRADE 5 FINE THREAD

BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
1/4"-28	105	12	70	8
	ft-lbs	Nm	ft-lbs	Nm
5/16"-24	18	24	12	16
3/8"-24	32	43	21	28
7/16"-20	50	68	34	46
1/2"-20	77	104	51	69
9/16"-18	110	149	73	99
5/8"-18	155	210	105	142
3/4"-16	270	366	180	244
7/8"-14	430	583	285	386
1"-14	655	888	435	590
1 1/8"-12	805	1,091	535	725
1 1/4"-12	1,120	1,519	745	1,010
1 3/8"-12	1,510	2,047	1,010	1,369
1 1/2"-12	1,980	2,685	1,320	1,790



SOCKETHEAD COARSE THREAD

BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
1/4"-20	150	17	100	11
	ft-lbs	Nm	ft-lbs	Nm
5/16"-18	26	35	18	24
3/8"-16	46	62	31	42
7/16"-14	74	100	49	66
1/2"-13	115	156	75	102
9/16"-12	160	217	105	142
5/8"-11	215	292	145	197
3/4"-10	385	522	255	346
7/8"-9	615	834	410	556
1"-8	920	1,247	615	834
1 1/8"-7	1,305	1,769	870	1,180
1 1/4"-7	1,840	2,495	1,230	1,668
1 3/8"-6	2,415	3,274	1,610	2,183
1 1/2"-6	3,205	4,345	2,135	2,895
1 3/4"-5	5,050	6,847	3,370	4,569
2"-4.5	7,590	10,291	5,060	6,860
2 1/4"-4.5	11,100	15,050	7,400	10,033
2 1/2"-4	15,185	20,588	10,125	13,728
2 3/4"-4	20,610	27,943	13,740	18,629
3"-4	27,190	36,865	18,130	24,581

SOCKETHEAD FINE THREAD

BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
1/4"-28	172	19	115	13
	ft-lbs	Nm	ft-lbs	Nm
5/16"-24	29	39	20	27
3/8"-24	52	71	35	47
7/16"-20	82	111	55	75
1/2"-20	130	176	84	114
9/16"-18	175	237	120	163
5/8"-18	245	332	165	224
3/4"-16	425	576	285	386
7/8"-14	680	922	455	617
1"-14	1,035	1,403	690	936
1 1/8"-12	1,465	1,986	975	1,322
1 1/4"-12	2,040	2,766	1,360	1,844
1 3/8"-12	2,750	3,728	1,835	2,488
1 1/2"-12	3,605	4,888	2,405	3,261



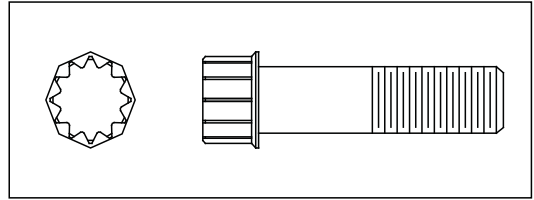
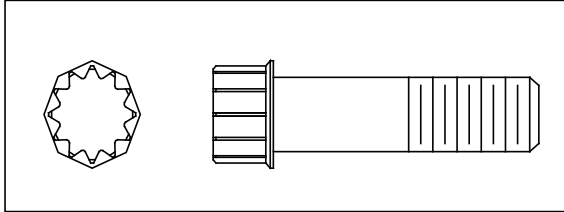
316 SS OR F593 G & H COURSE THREAD

BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
1/4"-20	59	7	40	5
	ft-lbs	Nm	ft-lbs	Nm
5/16"-18	11	15	7	9
3/8"-16	19	26	13	18
7/16"-14	29	39	20	27
1/2"-13	45	61	30	41
9/16"-12	64	87	43	58
5/8"-11	88	119	59	80
3/4"-10	110	149	72	98
7/8"-9	175	237	116	157
1"-8	265	359	174	236
1 1/8"-7	370	502	247	335
1 1/4"-7	525	712	348	472
1 3/8"-6	685	929	456	618
1 1/2"-6	910	1,234	605	820
1 3/4"-5	1440	1,952	954	1,293
2"-4.5	2160	2,929	1440	1,952
2 1/4"-4.5	3150	4,271	2100	2,847
2 1/2"-4	4310	5,844	2870	3,891
2 3/4"-4	5840	7,918	3900	5,288
3"-4	7710	10,453	5140	6,969

316 SS OR F593 G & H FINE THREAD

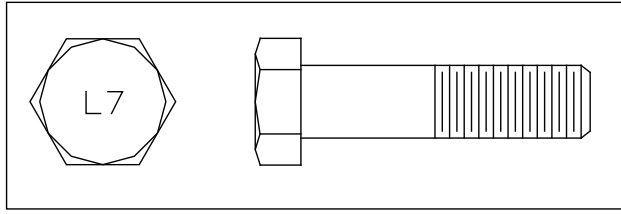
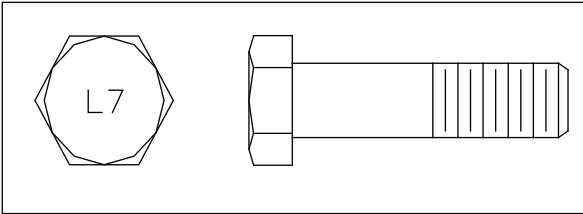
BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
1/4"-28	68	8	45	5
	ft-lbs	Nm	ft-lbs	Nm
5/16"-24	12	16	8	11
3/8"-24	21	28	14	19
7/16"-20	33	45	22	30
1/2"-20	50	68	34	46
9/16"-18	71	96	48	65
5/8"-18	100	136	67	91
3/4"-16	125	169	81	110
7/8"-14	195	264	130	176
1"-14	295	400	200	271
1 1/8"-12	415	563	280	380
1 1/4"-12	580	786	385	522
1 3/8"-12	780	1,058	520	705
1 1/2"-12	1,030	1,396	685	929

Unless otherwise specified, anti-seize shall be used on SS/SS connections.



12 POINT FERRY HEAD COURSE THREAD				
BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
1/4"-20	150	17	100	11
	ft-lbs	Nm	ft-lbs	Nm
5/16"-18	26	35	18	24
3/8"-16	46	62	31	42
7/16"-14	74	100	49	66
1/2"-13	115	156	75	102
9/16"-12	165	224	110	149
5/8"-11	225	305	150	203
3/4"-10	400	542	265	359
7/8"-9	640	868	425	576
1"-8	955	1,295	640	868
1 1/8"-7	1,310	1,776	870	1,180
1 1/4"-7	1,840	2,495	1,230	1,668
1 3/8"-6	2,420	3,281	1,610	2,183
1 1/2"-6	3,210	4,352	2,140	2,901
1 3/4"-5	5,050	6,847	3,370	4,569
2"-4.5	7,590	10,291	5,060	6,860
2 1/4"-4.5	11,100	15,050	7,400	10,033
2 1/2"-4	15,200	20,608	10,200	13,829
2 3/4"-4	20,700	28,065	13,800	18,710
3"-4	27,200	36,878	18,200	24,676

12 POINT FERRY HEAD FINE THREAD				
BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
1/4"-28	172	19	115	13
	ft-lbs	Nm	ft-lbs	Nm
5/16"-24	29	39	20	27
3/8"-24	52	71	35	47
7/16"-20	82	111	55	75
1/2"-20	130	176	84	114
9/16"-18	180	244	120	163
5/8"-18	255	346	170	230
3/4"-16	445	603	295	400
7/8"-14	705	956	470	637
1"-14	1,080	1,464	715	969
1 1/8"-12	1,470	1,993	980	1,329
1 1/4"-12	2,040	2,766	1,360	1,844
1 3/8"-12	2,750	3,728	1,840	2,495
1 1/2"-12	3,610	4,895	2,410	3,268

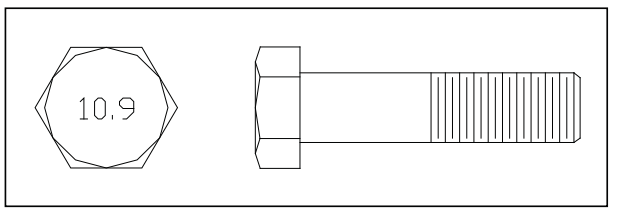
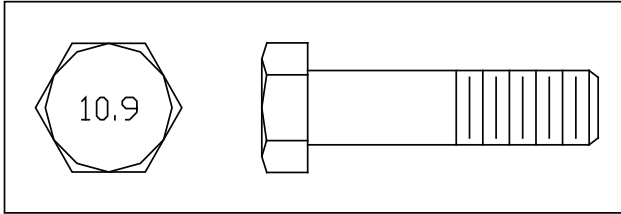


ASTM A320-7 COURSE THREAD

BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
1/4"-20	96	11	64	7
	ft-lbs	Nm	ft-lbs	Nm
5/16"-18	17	23	11	15
3/8"-16	30	41	20	27
7/16"-14	47	64	32	43
1/2"-13	72	98	48	65
9/16"-12	105	142	69	94
5/8"-11	145	197	95	129
3/4"-10	255	346	170	230
7/8"-9	410	556	275	373
1"-8	610	827	410	556
1 1/8"-7	865	1,173	575	780
1 1/4"-7	1,220	1,654	815	1,105
1 3/8"-6	1,600	2,169	1,070	1,451
1 1/2"-6	2,120	2,874	1,420	1,925
1 3/4"-5	3,340	4,528	2,230	3,023
2"-4.5	5,020	6,806	3,350	4,542
2 1/4"-4.5	7,340	9,952	4,900	6,644
2 1/2"-4	10,100	13,694	6,700	9,084
2 3/4"-4	13,700	18,575	9,090	12,324
3"-4	18,000	24,405	12,000	16,270

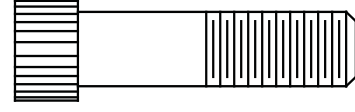
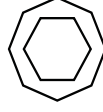
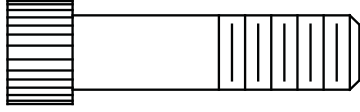
ASTM A320-7 FINE THREAD

BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
1/4"-28	110	12	73	8
	ft-lbs	Nm	ft-lbs	Nm
5/16"-24	19	26	13	18
3/8"-24	34	46	23	31
7/16"-20	53	72	35	47
1/2"-20	81	110	54	73
9/16"-18	115	156	77	104
5/8"-18	165	224	110	149
3/4"-16	285	386	190	258
7/8"-14	450	610	300	407
1"-14	685	929	460	624
1 1/8"-12	970	1,315	645	875
1 1/4"-12	1,350	1,830	900	1,220
1 3/8"-12	1,820	2,468	1,220	1,654
1 1/2"-12	2,390	3,240	1,590	2,156



METRIC GRADE 10.9 COARSE THREAD				
BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
6-1.00	119	13	80	9
	ft-lbs	Nm	ft-lbs	Nm
8-1.25	25	34	17	23
10-1.50	48	65	32	43
12-1.75	84	114	56	76
14-2.00	135	183	89	121
16-2.00	210	285	140	190
20-2.50	405	549	270	366
22-2.50	550	746	370	502
24-3.00	700	949	465	630
27-3.00	1,030	1,396	685	929
30-3.50	1,390	1,885	925	1,254
36-4.00	2,430	3,295	1,620	2,196
42-4.50	3,880	5,261	2,590	3,512
48-5.00	5,830	7,904	3,890	5,274
56-5.50	9,370	12,704	6,250	8,474
64-6.00	14,200	19,253	9,410	12,758
72-6.00	20,600	27,930	13,700	18,575
80-6.00	28,700	38,912	19,100	25,896
90-6.00	41,500	56,266	27,700	37,556
100-6.00	57,700	78,231	38,500	52,199

METRIC GRADE 10.9 FINE THREAD				
BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
6-0.75	131	15	87	10
	ft-lbs	Nm	ft-lbs	Nm
8-1.00	26	35	18	24
10-1.25	51	69	34	46
12-1.50	88	119	59	80
14-1.50	145	197	96	130
16-1.50	225	305	150	203
18-1.50	360	488	240	325
20-1.50	495	671	330	447
22-1.50	660	895	440	597
24-2.00	860	1,166	575	780
27-2.00	1,230	1,668	820	1,112
30-1.50	1,850	2,508	1,230	1,668

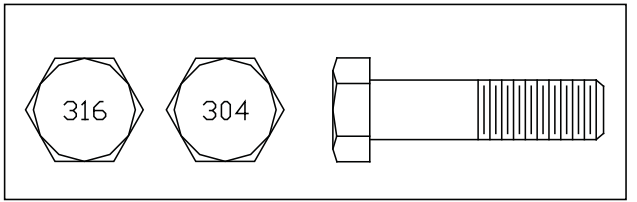
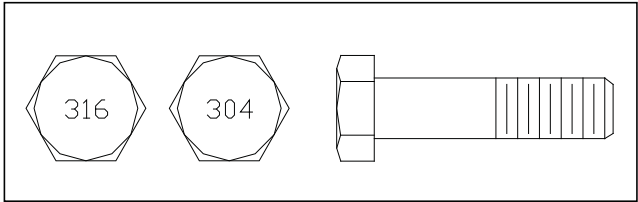


METRIC GRADE 12.9 SOCKET HEAD COARSE THREAD

BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
6-1.00	135	15	90	10
	ft-lbs	Nm	ft-lbs	Nm
8-1.25	28	38	19	26
10-1.50	54	73	36	49
12-1.75	95	129	63	85
14-2.00	155	210	105	142
16-2.00	235	319	160	217
20-2.50	460	624	305	414
22--2.50	625	847	415	563
24-3.00	790	1,071	525	712
27-3.00	1,160	1,573	770	1,044
30-3.50	1,570	2,129	1,050	1,424
36-4.00	2,740	3,715	1,830	2,481
42-4.50	4,390	5,952	2,930	3,973
48-5.00	6,590	8,935	4,390	5,952
56-5.50	10,600	14,372	7,060	9,572
64-6.00	16,000	21,693	10,700	14,507
72-6.00	23,200	31,455	15,500	21,015
80-6.00	32,400	43,929	21,600	29,286
90-6.00	46,900	63,588	31,300	42,437
100-6.00	65,200	88,399	43,500	58,978

METRIC GRADE 12.9 SOCKET HEAD FINE THREAD

BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
6-0.75	148	17	98	11
	ft-lbs	Nm	ft-lbs	Nm
8-1.00	30	41	20	27
10-1.25	57	77	38	52
12-1.50	99	134	66	89
14-1.50	165	224	110	149
16-1.50	250	339	170	230
18-1.50	405	549	270	366
20-1.50	560	759	375	508
22-1.50	745	1,010	500	678
24-2.00	970	1,315	645	875
27-2.00	1,390	1,885	925	1,254
30-1.50	2,090	2,834	1,390	1,885



METRIC 316 OR 304 SS COURSE THREAD				
BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
6-1.00	55	6	37	4
	ft-lbs	Nm	ft-lbs	Nm
8-1.25	12	16	8	11
10-1.50	23	31	15	20
12-1.75	39	53	26	35
14-2.00	62	84	41	56
16-2.00	96	130	64	87
20-2.50	190	258	125	169
22-2.50	255	346	170	230
24-3.00	325	441	215	292
27-3.00	475	644	315	427
30-3.50	640	868	430	583
36-4.00	1,120	1,519	750	1,017
42-4.50	1,800	2,440	1,195	1,620
48-5.00	2,700	3,661	1,800	2,440
56-5.50	4,330	5,871	2,890	3,918
64-6.00	6,520	8,840	4,350	5,898
72-6.00	9,480	12,853	6,320	8,569
80-6.00	13,300	18,032	8,820	11,958
90-6.00	19,200	26,032	12,770	17,314
100-6.00	26,700	36,200	17,800	24,134

METRIC 316 OR 304 SS FINE THREAD				
BOLT size-pitch	LUBRICATED		WITH ANTI-SEIZE	
	in-lbs	Nm	in-lbs	Nm
6-0.75	60	7	40	5
	ft-lbs	Nm	ft-lbs	Nm
8-1.00	12	16	8	11
10-1.25	24	33	16	22
12-1.50	41	56	27	37
14-1.50	67	91	45	61
16-1.50	102	138	68	92
18-1.50	165	224	110	149
20-1.50	230	312	155	210
22-1.50	305	414	205	278
24-2.00	395	536	265	359
27-2.00	570	773	380	515
30-1.50	855	1,159	570	773