Engineering Center

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Minimum Thread Engagement (for Bolt Failure) - Coarse Threads

Thread Size	Nominal Diameter	Stress Area	Nut Material: Low Carbon Steel			Nut Material: Nodular Iron			Nut Material: A356-T6		
			Yield Strength (ksi): 48			Yield Strength (ksi): 52.5			Yield Strength (ksi): 24		
			Grade 2	Grade 5	Grade 8	Grade 2	Grade 5	Grade 8	Grade 2	Grade 5	Grade 8
	(in)	(in^2)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
1/4 - 20	0.250	0.0318	0.14	0.23	0.29	0.13	0.21	0.27	0.29	0.47	0.58
5/16 - 18	0.313	0.0524	0.19	0.31	0.38	0.17	0.28	0.35	0.38	0.61	0.77
3/8 - 16	0.375	0.0775	0.23	0.38	0.47	0.21	0.35	0.43	0.47	0.76	0.95
7/16 - 14	0.438	0.1063	0.27	0.44	0.56	0.25	0.41	0.51	0.55	0.89	1.11
1/2 - 13	0.500	0.1419	0.32	0.52	0.65	0.29	0.47	0.59	0.64	1.04	1.30
5/8 - 11	0.625	0.2260	0.41	0.66	0.83	0.37	0.61	0.76	0.82	1.32	1.65
3/4 - 10	0.750	0.3340	0.50	0.82	1.02	0.46	0.75	0.93	1.01	1.63	2.04
7/8 - 9	0.875	0.4620	0.60	0.97	1.21	0.54	0.88	1.10	1.19	1.93	2.42
1 - 8	1.000	0.6060	0.68	1.11	1.39	0.63	1.01	1.27	1.37	2.22	2.77

Minimum Thread Engagement (for Bolt Failure) - Fine Threads

Thread Size	Nominal Diameter	Stress Area	Nut Material: Low Carbon Steel			Nut Material: Nodular Iron			Nut Material: A356-T6		
			Yield Strength (ksi): 48			Yield Strength (ksi): 52.5			Yield Strength (ksi): 24		
			Grade 2	Grade 5	Grade 8	Grade 2	Grade 5	Grade 8	Grade 2	Grade 5	Grade 8
	(in)	(in^2)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
1/4 - 28	0.250	0.0364	0.16	0.27	0.33	0.15	0.24	0.30	0.33	0.53	0.67
5/16 - 24	0.313	0.0580	0.21	0.34	0.42	0.19	0.31	0.39	0.42	0.68	0.85
3/8 - 24	0.375	0.0878	0.26	0.43	0.54	0.24	0.39	0.49	0.53	0.86	1.07
7/16 - 20	0.438	0.1187	0.31	0.50	0.62	0.28	0.45	0.57	0.61	0.99	1.24
1/2 - 20	0.500	0.1599	0.36	0.59	0.73	0.33	0.54	0.67	0.72	1.17	1.46
5/8 - 18	0.625	0.2560	0.46	0.75	0.94	0.42	0.69	0.86	0.92	1.50	1.87
3/4 - 16	0.750	0.3730	0.56	0.91	1.14	0.51	0.83	1.04	1.12	1.82	2.28
7/8 - 16	0.875	0.5090	0.66	1.06	1.33	0.60	0.97	1.22	1.31	2.13	2.66
1/8 - 12	1.000	0.6630	0.75	1.21	1.52	0.68	1.11	1.39	1.50	2.43	3.03

Based on the formula: $F=\pi d(.75t)S_{SY}$ where: F=Tensil force to yield screw d=Screw diameter t=Length of thread engagement
S_{SY} =Shear strength of nut member (.58 times yield strength) Reference: Fundamentals of Machine Component Design, Juvinall/Marshek 1991

Standard Thread