

TABLE 14.1 CYCLIC STRESS-STRAIN AND STRAIN-LIFE CONSTANTS FOR SELECTED ENGINEERING METALS.¹

Material	Source	Tensile Properties				Cyclic σ - ϵ Curve ²			Strain-Life Curve			
		σ_o	σ_u	$\bar{\sigma}_{fB}$	% RA	E	H'	n'	σ'_f	b	ϵ'_f	c
<i>(a) Steels</i>												
SAE 1015 (normalized)	(8)	227 (33.0)	415 (60.2)	725 (105)	68	206,000 (29,900)	1058 (153)	0.24	976 (142)	-0.14	0.76	-0.59
Man-Ten ² (hot rolled)	(7)	322 (46.7)	557 (80.8)	990 (144)	67	203,000 (29,500)	1096 (159)	0.187	1089 (158)	-0.115	0.912	-0.606
RQC-100 (roller Q & T)	(2)	683 (99.0)	758 (110)	1186 (172)	64	200,000 (29,000)	903 (131)	0.0905	938 (136)	-0.0648	1.38	-0.704
SAE 1045 (HR & norm.)	(6)	382 (55.4)	621 (90.1)	985 (143)	51	202,000 (29,400)	1258 (182)	0.208	948 (137)	-0.092	0.260	-0.445
SAE 4142 (As Q, 670 HB)	(1)	1619 (235)	2450 (355)	2580 (375)	6	200,000 (29,000)	2810 (407)	0.040	2550 (370)	-0.0778	0.0032	-0.436
SAE 4142 (Q & T, 560 HB)	(1)	1688 (245)	2240 (325)	2650 (385)	27	207,000 (30,000)	4140 (600)	0.126	3410 (494)	-0.121	0.0732	-0.805
SAE 4142 (Q & T, 450 HB)	(1)	1584 (230)	1757 (255)	1998 (290)	42	207,000 (30,000)	2080 (302)	0.093	1937 (281)	-0.0762	0.706	-0.869
SAE 4142 (Q & T, 380 HB)	(1)	1378 (200)	1413 (205)	1826 (265)	48	207,000 (30,000)	2210 (321)	0.133	2140 (311)	-0.0944	0.637	-0.761
AISI 4340 ² (Aircraft Qual.)	(3)	1103 (160)	1172 (170)	1634 (237)	56	207,000 (30,000)	1655 (240)	0.131	1758 (255)	-0.0977	2.12	-0.774
AISI 4340 (409 HB)	(1)	1371 (199)	1468 (213)	1557 (226)	38	200,000 (29,000)	1910 (277)	0.123	1879 (273)	-0.0859	0.640	-0.636
Ausformed H-11 (660 HB)	(1)	2030 (295)	2580 (375)	3170 (460)	33	207,000 (30,000)	3475 (504)	0.059	3810 (553)	-0.0928	0.0743	-0.7144
<i>(b) Other Metals</i>												
2024-T351 Al	(1)	379 (55.0)	455 (66.0)	558 (81.0)	25	73,100 (10,600)	662 (96.0)	0.070	927 (134)	-0.113	0.409	-0.713
2024-T4 Al ³ (Prestrained)	(4)	303 (44.0)	476 (69.0)	631 (91.5)	35	73,100 (10,600)	738 (107)	0.080	1294 (188)	-0.142	0.327	-0.645
7075-T6 Al	(5)	469 (68.0)	578 (84)	744 (108)	33	71,000 (10,300)	977 (142)	0.106	1466 (213)	-0.143	0.262	-0.619
Ti-6Al-4V (soln. tr. & age)	(1)	1185 (172)	1233 (179)	1717 (249)	41	117,000 (17,000)	1772 (257)	0.106	2030 (295)	-0.104	0.841	-0.688
Inconel X (Ni base, annl.)	(1)	703 (102)	1213 (176)	1309 (190)	20	214,000 (31,000)	1855 (269)	0.120	2255 (327)	-0.117	1.16	-0.749

Notes: ¹The tabulated values either have units of MPa (ksi), or they are dimensionless. ²Test specimens prestrained except at short lives, also periodically overstrained at long lives. ³For nonprestrained tests, use same constants except $\sigma'_f = 900(131)$ and $b = -0.102$.

Sources: Data in (1) [Conle 84]; (2) author's data on the ASTM Committee E9 material; (3) [Dowling 73]; (4) [Dowling 89] and [Topper 70]; (5) [Endo 69] and [Raske 72]; (6) [Leese 85]; (7) [Wetzel 77] pp. 41 and 66; (8) [SAE 89].