Appendix B

Fatigue Data Obtained for *Tmin*

B1: Aluminum 1100

B2: Aluminum 3003-0

B3: Aluminum 6061-T6

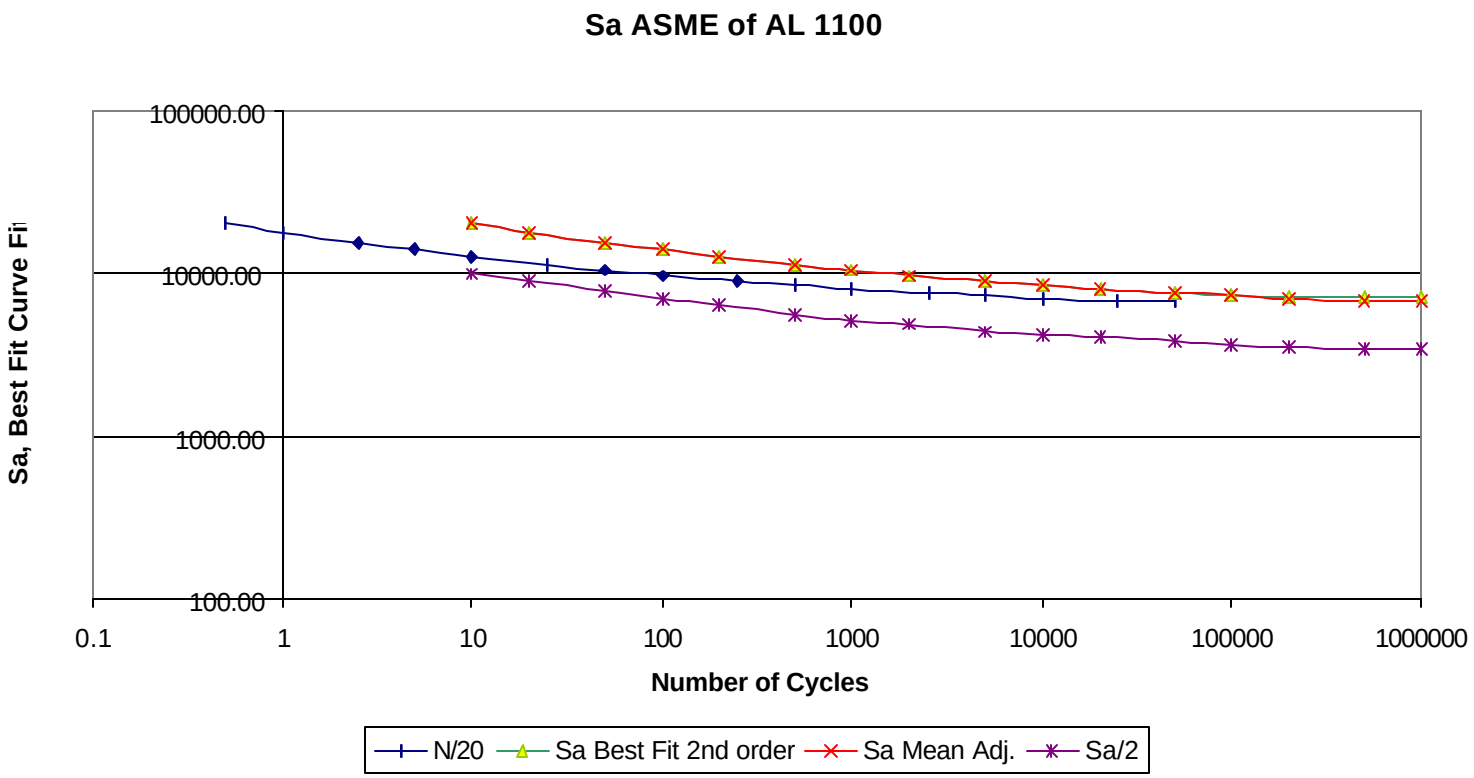
B4: Nickel 200

B1: AL 1100

AL 1100

N	S
5	21210.0
11	21210.0
27	18180.0
73	15150.0
282	12120.0
784	10605.0
2120	9090.0
6320	9090.0
12800	8585.0
104000	7575.0
205000	7575.0
417000	7575.0
1000000	7070.0

N	N/20	Log (N)	Sa Best Fit 2nd order	Sa Mean Adj.	Sa/2
10	0.5	1.000	20286.17	20286.17	10143.08
20	1	1.301	18114.68	18114.68	9057.34
50	2.5	1.699	15715.00	15715.00	7857.50
100	5	2.000	14200.38	14200.38	7100.19
200	10	2.301	12904.78	12904.78	6452.39
500	25	2.699	11477.79	11477.79	5738.89
1000	50	3.000	10582.79	10582.79	5291.39
2000	100	3.301	9824.17	9824.17	4912.09
5000	250	3.699	9002.78	9002.78	4501.39
10000	500	4.000	8501.59	8501.59	4250.79
20000	1000	4.301	8092.21	8092.21	4046.10
50000	2500	4.699	7678.37	7678.37	3839.19
100000	5000	5.000	7454.18	7402.01	3701.00
200000	10000	5.301	7302.37	7086.89	3543.44
500000	25000	5.699	7210.02	6902.10	3451.05
1000000	50000	6.000	7222.71	6927.19	3463.59


Sa ASME of AL 1100
100000.00
10000.00
1000.00
100.00
Sa, Best Fit Curve Fi
0.1
1
10
100
1000
10000
100000
1000000
Number of Cycles
N/20
Sa Best Fit 2nd order
Sa Mean Adj.
Sa/2

B2: Aluminum 3003-0

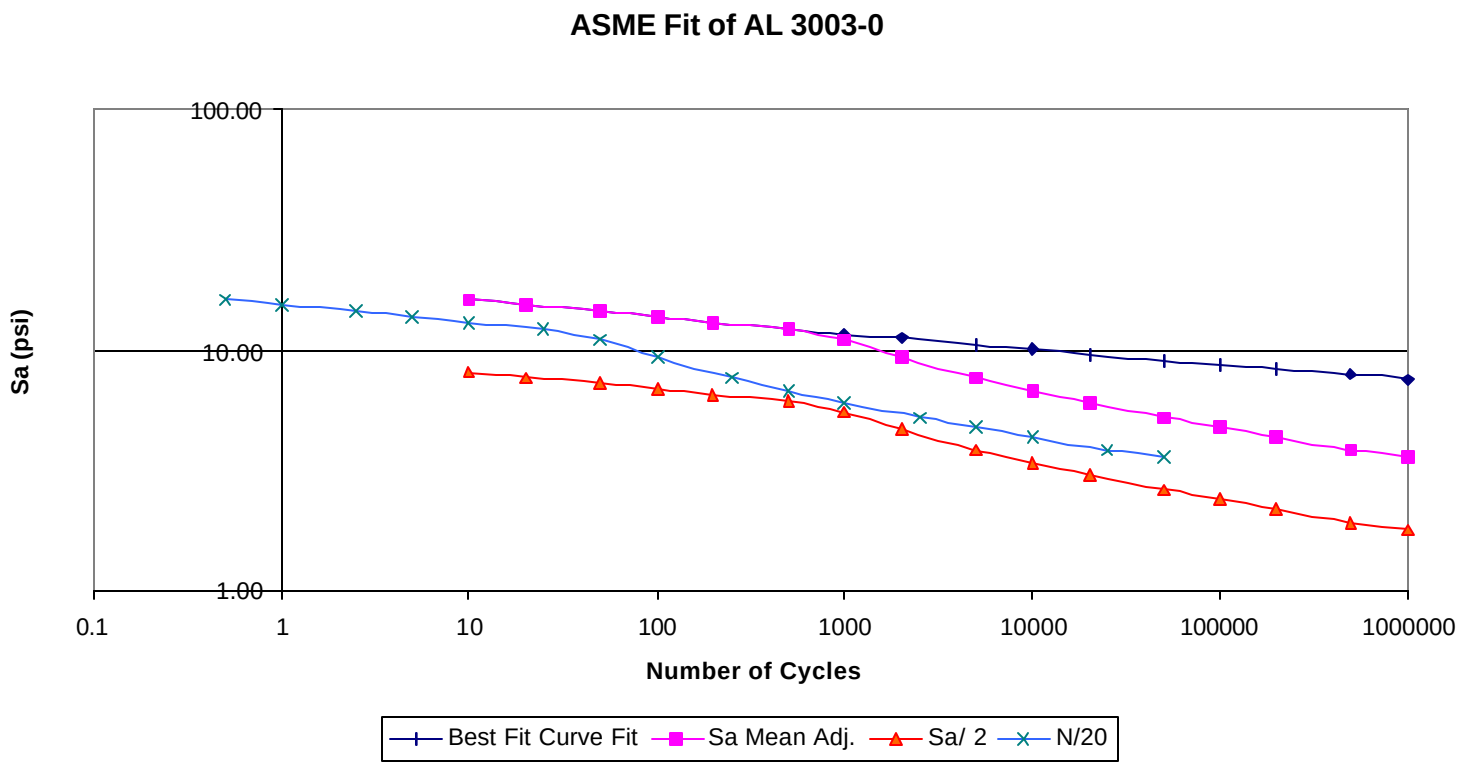
3003-0

Apply the Von-Phillips transformation

N	S_a	log(N)	Log(S)	S	S_{mean}
1000	11.80	3	1.072	11.76793	11.11412
10000	10.03	4	1.001	10.04616	6.718622
100000	8.56	5	0.932	8.711642	4.751241
1000000	7.91	6	0.898	7.631326	3.621213
10000000	6.49	7	0.812	6.715835	2.870679
100000000	5.90	8	0.771	5.904729	2.320073

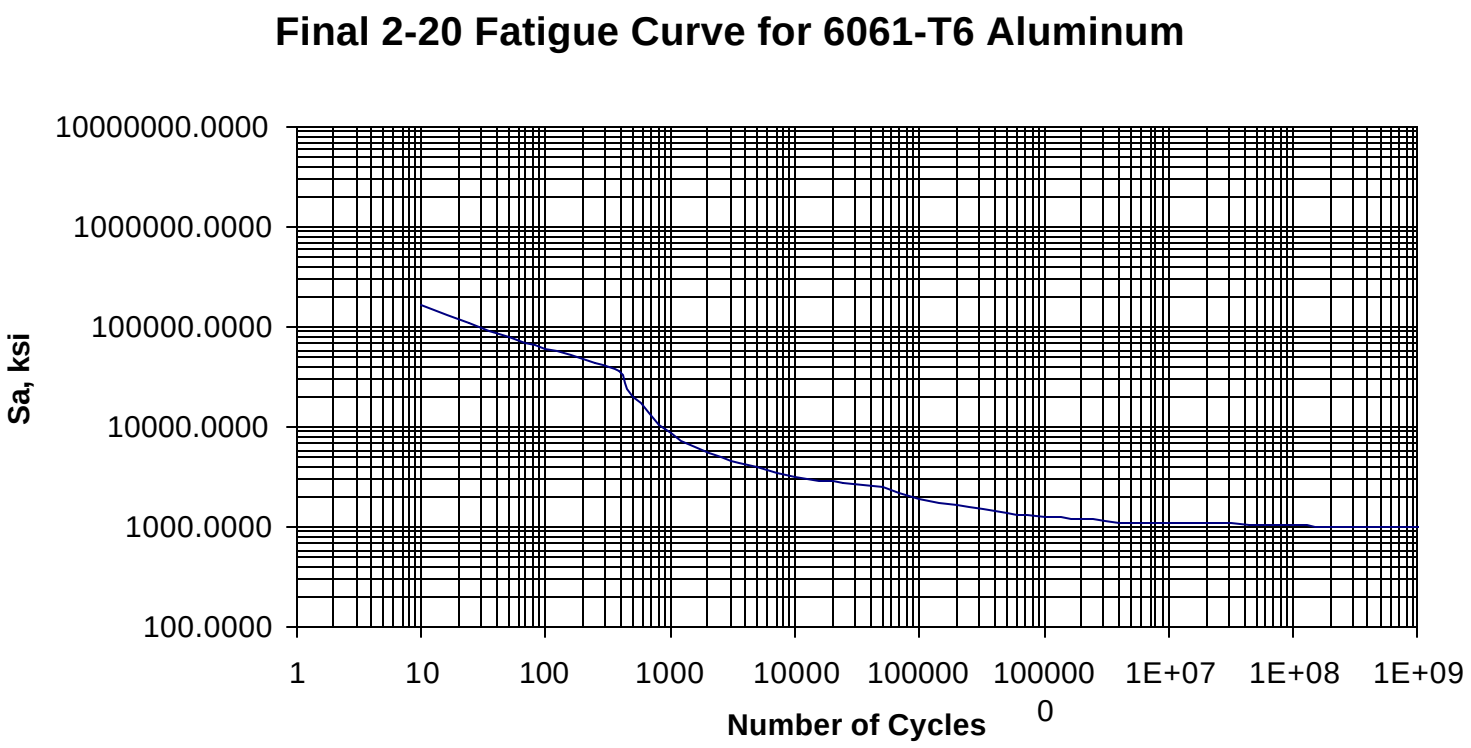
Su=	15.9
Sy=	12.0

N	N/20	log(N)	Sa Best	Sa Mean Adj.	Sa/ 2
10	0.5	1.0000	16.21	16.21	8.11
20	1	1.3010	15.42	15.42	7.71
50	2.5	1.6990	14.44	14.44	7.22
100	5	2.0000	13.75	13.75	6.87
200	10	2.3010	13.10	13.10	6.55
500	25	2.6990	12.30	12.30	6.15
1000	50	3.0000	11.73	10.99	5.49
2000	100	3.3010	11.20	9.31	4.66
5000	250	3.6990	10.54	7.70	3.85
10000	500	4.0000	10.08	6.78	3.39
20000	1000	4.3010	9.64	6.03	3.02
50000	2500	4.6990	9.10	5.24	2.62
100000	5000	5.0000	8.71	4.75	2.38
200000	10000	5.3010	8.35	4.34	2.17
500000	25000	5.6990	7.90	3.87	1.94
1000000	50000	6.0000	7.58	3.58	1.79


ASME Fit of AL 3003-0
100.00
10.00
1.00
Sa (psi)
0.1
1
10
100
1000
10000
100000
1000000
Number of Cycles
Best Fit Curve Fit
Sa Mean Adj.
Sa/ 2
N/20

B3: Aluminum 6061-T6

N	Sa	Sa	Fit Curve
10	1625	162490.0000	1.6249
25	1079	107910.0000	1.0791
50	804	80410.0000	0.8041
100	610	60960.0000	0.6096
250	437	43700.0000	0.437
387.5	365	36525.0000	3.6525
500	200	20000.0000	2
1000	88	8775.0000	0.8775
2500	50	5028.0000	0.5028
5000	39	3865.0000	0.3865
10000	32	3209.0000	3.209
25000	27	2711.9000	2.7119
50000	25	2486.5000	2.4865
100000	19	1932.7000	1.9327
200000	16	1604.5000	1.6045
500000	14	1356.0000	1.356
1000000	12	1243.2000	1.2432
2000000	12	1168.0000	1.168
5000000	11	1104.1000	1.1041
10000000	11	1072.9000	1.0729
100000000	10	1022.7000	1.0227
200000000	10	1016.0000	1.016
500000000	10	1010.1	1.0101
1000000000	10	1007.1	1.0071
2000000000	10	1005	1.005
5000000000	10	1003.2	1.0032


Final 2-20 Fatigue Curve for 6061-T6 Aluminum
10000000.0000
1000000.0000
100000.0000
10000.0000
1000.0000
100.0000
Sa, ksi
1
10
100
1000
10000
100000
1000000
1E+07
1E+08
1E+09
Number of Cycles

B4: Nickel 200

Nickel 200

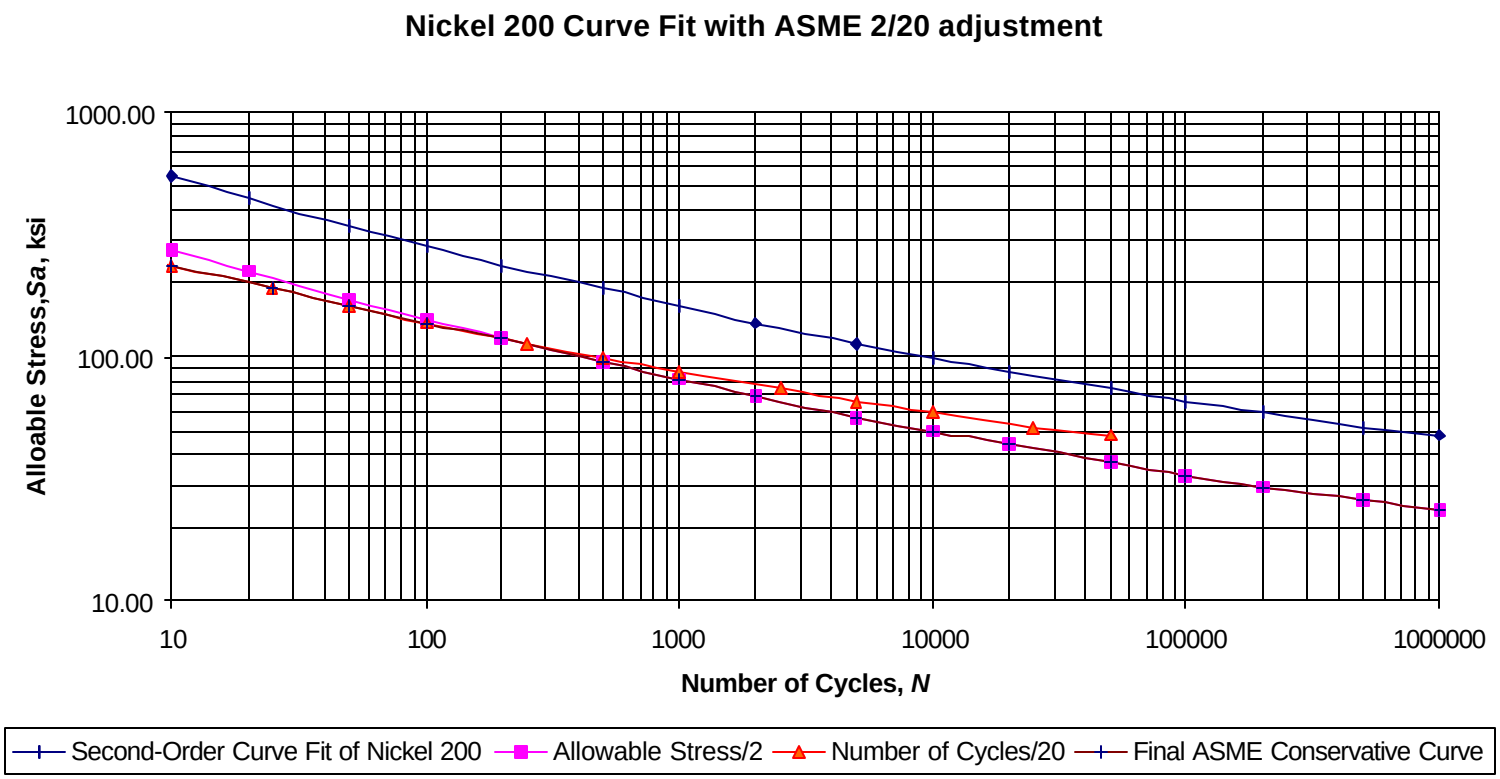
N	Stress, ksi
1.00E+05	109
1.00E+06	84
1.00E+07	63
1.00E+08	52
1.00E+09	50
1.00E+10	50

apply von philips 0.59 to S *Do best-fit*

N	S	log10(N)	Log10(S)	2nd order fit	3rd order S	4th order S
				Sa	Sa	Sa
1.00E+05	64.31	5	1.80827851	65.69	64.28357187	68.28101998
1.00E+06	49.56	6	1.695131298	47.44	47.75292737	56.18236281
1.00E+07	37.17	7	1.570192561	37.18	36.85530419	46.41945102
1.00E+08	30.68	8	1.486855355	31.63	30.38085556	45.20640796
1.00E+09	29.5	9	1.469822016	29.21	27.49792987	54.23754207
1.00E+10	29.5	10	1.469822016	29.28	28.09312166	74.61050852

Sy	22
Sut	95.2

N	N/20	Log (N)	2nd order fit	Sa Mean Adj.	Sa/2
10	0.5	1.000	548.40	-88.58	274.20
20	1	1.301	446.60	-93.03	223.30
50	2.5	1.699	344.34	-101.17	172.17
100	5	2.000	285.30	-109.86	142.65
200	10	2.301	238.14	-121.95	119.07
500	25	2.699	189.70	-146.94	94.85
1000	50	3.000	161.10	-178.94	80.55
2000	100	3.301	137.83	-236.65	68.92
5000	250	3.699	113.44	-455.32	56.72
10000	500	4.000	98.74	-2040.87	49.37
20000	1000	4.301	86.59	736.25	43.30
50000	2500	4.699	73.63	249.83	36.81
100000	5000	5.000	65.69	162.95	32.85
200000	10000	5.301	59.05	119.55	29.52

500000	25000	5.699	51.87	87.63	25.94
1000000	50000	6.000	47.44	72.69	23.72

N	Sa Fit Curve
10	238.14
25	189.70
50	161.10
100	137.83
200	119.07
500	94.85
1000	80.55
2000	68.92
5000	56.72
10000	49.37
20000	43.30
50000	36.81
100000	32.85
200000	29.52
500000	25.94
1000000	23.72