

Table of Contents

VOLUME 1

<u>Chapter</u>		<u>Page</u>
1	Handbook Organization and Content	1-1
1.0	Overview	1-1
1.1	Organization	1-2
1.2	Data Ordering and Abbreviations	1-5
	1.2.1 Sorting Order	1-5
	1.2.2 Abbreviations	1-5
1.3	Material Chapter Summaries	1-5
	1.3.1 Available Data Summary	1-12
	1.3.2 Plane Strain Fracture Toughness Material Data Summary	1-12
	1.3.3 Plane Stress and Transitional Fracture Material Data Summary	1-15
	1.3.4 Fatigue Crack Growth Rate Material Data Summary	1-15
	1.3.5 Stress Corrosion Cracking Threshold Material Data Summary	1-19
1.4	Alloy Section Summaries	1-21
1.5	Alloy Fracture Toughness Subsection Formats	1-23
	1.5.1 Plane Strain Fracture Toughness Data	1-25
	1.5.2 Plane Stress Fracture Toughness Data	1-25
	1.5.3 R-Curve Data	1-29
1.6	Subcritical Crack Growth Subsection Formats	1-29
	1.6.1 Fatigue Crack Growth Rate Data	1-31
	1.6.2 Sustained Load Crack Growth Rate	1-36
	1.6.3 Stress Corrosion Cracking Threshold	1-38
2	Methods of Calculation	2-1
2.0	Overview	2-1
	2.0.1 Data Review and Acceptance Criteria	2-1
	2.0.2 Fracture Mechanics Basis	2-3
	2.0.3 Test Specimen Geometries	2-4

2.1	Plane-Strain Fracture Toughness (K_{Ic})	2-12
2.2	Critical Plane Stress Fracture Toughness	2-20
2.2.1	Plane Stress and Transitional Fracture Toughness	2-20
2.2.2	Plane Stress and Transitional Fracture Toughness Testing	2-23
2.2.3	Critical Stress-Intensity Factor (K_c)	2-23
2.3	The Apparent Fracture Toughness	2-26
2.4	R-Curve (K_R Versus Δa_{eff})	2-26
2.5	Fatigue Crack Growth Rate	2-30
2.5.1	Fatigue Crack Growth Behavior	2-30
2.5.2	Data Acceptance Criteria	2-32
2.5.3	Data Reduction Procedures	2-33
2.5.4	Data Reporting Procedures	2-35
2.6	Sustained-Load Crack Growth Rates	2-38
2.6.1	Sustained-Load Crack Growth Behavior	2-38
2.6.2	Data Acceptance Criteria	2-40
2.6.3	Data Reduction Procedures	2-40
2.6.4	Data Reporting Procedures	2-40
2.7	Threshold Stress Intensity (K_{Isc})	2-41
2.7.1	The Threshold	2-41
2.7.2	Conditions for Validity of Data	2-43
3	Alloy Steel Sections	3-1
3.0	Alloy Steel Material Summaries	3-3
3.0.1	Available Data Summary	3-3
3.0.2	K_{Ic} Summary	3-20
3.0.3	K_c Summary (Without Buckling Constraints)	3-27
3.0.4	FCGR at Defined ΔK Levels	3-28
3.0.5	K_{Isc} Summary	3-33
3.1	10Ni Steel	3-39
3.2	12-9-2(MAR)	3-48
3.3	12Ni-5Cr-3Mo	3-51
3.4	18Ni(180)(MAR)	3-52
3.5	18Ni(200)(MAR)	3-53
3.6	18Ni(250)	3-56
3.7	18Ni(250)(MAR)	3-59
3.8	18Ni(280)(MAR)	3-67
3.9	18Ni(300)	3-68
3.10	18Ni(300)(MAR)	3-70

3.11	18Ni(350)	3-88
3.12	18Ni(350)(MAR)	3-89
3.13	300M	3-90
3.14	300M(AM)	3-134
3.15	300M(VAR)	3-136
3.16	300M(VM)	3-138
3.17	4140	3-140
3.18	4330V	3-143
3.19	4330V(MOD)	3-144
3.20	4340	3-149
3.21	4340(AM)	3-194
3.22	4340(DH)	3-196
3.23	4340(EFM)	3-198
3.24	4340(MOD)	3-199
3.25	4340(VAR)	3-200
3.26	4340V	3-202
3.27	A286	3-204
3.28	AF1410	3-212
3.29	AF1410(VIM-VAR)	3-222
3.30	D6AC	3-233
3.31	H11	3-300
3.32	HP9-4-.20	3-308
3.33	HP9-4-.20(CEVM)	3-348
3.34	HP9-4-.25(VAR)	3-354
3.35	HP9-4-.30	3-356
3.36	HP9-4-.45	3-423
3.37	HY-150	3-424
3.38	HY-180	3-425
3.39	HY-80	3-428
3.40	HY-TUF	3-431
3.41	Alloy Steel References	3-433

4 Stainless Steel Sections 4-1

4.0	Stainless Steel Material Summaries	4-3
4.0.1	Available Data Summary	4-3
4.0.2	K_{Ic} Summary	4-9
4.0.4	FCGR at Defined ΔK Levels	4-11
4.0.5	K_{Isc} Summary	4-15
4.1	15-5PH	4-17
4.2	15-5PH(AM)	4-47
4.3	15-5PH(VM)	4-48
4.4	17-4PH	4-49
4.5	17-7PH	4-61
4.6	21-6-9 NI40	4-69
4.7	304	4-72
4.8	316	4-86

4.9	347	4-92
4.10	AFC 260	4-97
4.11	AFC 77	4-98
4.12	AFC 77(VAR)	4-103
4.13	AM 355	4-106
4.14	AM 362	4-107
4.15	AM 364	4-108
4.16	CUSTOM 455	4-109
4.17	PH13-8Mo	4-119
4.18	PH14-8Mo	4-193
4.19	PH15-7Mo	4-194
4.20	Stainless Steel References	4-197

VOLUME 2

5	Nickel Based Super Alloys Sections	5-1
5.0	Nickel Based Super Alloys Material Summaries	5-3
5.0.1	Available Data Summary	5-3
5.0.2	K_{Ic} Summary	5-6
5.0.3	K_c Summary (Buckling not Constrained)	5-7
5.0.4	FCGR at Defined ΔK Levels	5-8
5.0.5	K_{Isc} Summary	5-12
5.1	ASTROLOY 901	5-13
5.2	ASTROLOY P/M-H	5-24
5.3	ASTROLOY P/M-W	5-26
5.4	IN100	5-28
5.5	IN100 P/M-G	5-52
5.6	INCOLOY 901	5-54
5.7	INCONEL 600	5-56
5.8	INCONEL 625	5-63
5.9	INCONEL 718	5-68
5.10	NASA IIB-7 P/M	5-162
5.11	P/M RENE 95	5-163
5.12	RENE 95 (H&F)	5-170
5.13	WASPALLOY	5-171
5.14	Nickel Based Super Alloys Reference	5-198
6	Titanium Alloys Sections	6-1
6.0	Titanium Alloys Material Summaries	6-3
6.0.1	Available Data	6-3
6.0.2	K_{Ic} Summary	6-15
6.0.3.1	K_c Summary (Buckling not Constrained)	6-18
6.0.3.2	K_c Summary (Buckling Constrained)	6-19
6.0.4	FCGR at Defined ΔK Levels	6-20
6.0.5	K_{Isc} Summary	6-35

6.1	BETA	6-38
6.2	BETA C	6-39
6.3	BETA III	6-47
6.4	BETA Ti	6-59
6.5	CORONA 5	6-61
6.6	IMI-834	6-62
6.7	Ti-*	6-68
6.8	Ti-10-2-3	6-69
6.9	Ti-4Al-3Mo-1V	6-72
6.10	Ti-5-2.5 ELI	6-73
6.11	Ti-5Al-2.5Sn	6-102
6.12	Ti-6-2-2-2-2	6-126
6.13	Ti-6-2-4-2	6-134
6.14	Ti-6-2-4-2 ELI	6-141
6.15	Ti-6-2-4-6	6-154
6.16	Ti-6Al-4V	6-169
6.17	Ti-6Al-4V ELI	6-433
6.18	Ti-6Al-6V-2Sn	6-473
6.19	Ti-6Al-6V-2.5Sn	6-515
6.20	Ti-6Al2Sn4Zr6Mo	6-516
6.21	Ti-8Al-1Mo-1V	6-518
6.22	Ti-Mo8V2Fe3Al	6-567
6.23	Ti-5Al2.5Sn ELI	6-569
6.24	Ti-6Al6V2Sn ELI	6-571
6.25	Titanium Alloys References	6-573

VOLUME 3

7	Aluminum 2000/6000 Series Alloys Sections	7-1
7.0	Aluminum 2000/6000 Series Material Summaries	7-3
7.0.1	Available Data	7-3
7.0.2	K_{Ic} Summary	7-8
7.0.3.1	K_{Ic} Summary (Buckling not Constrained)	7-10
7.0.3.2	K_{Ic} Summary (Buckling Constrained)	7-12
7.0.4	FCGR at Defined ΔK Levels	7-13
7.0.5	K_{Isec} Summary	7-25
7.1	2014	7-27
7.2	2020	7-65
7.3	2020 (ALCLAD)	7-78
7.4	2021	7-79
7.5	2024	7-82
7.6	2024 (ALCLAD)	7-378
7.7	2048	7-397
7.8	2091	7-416
7.9	2124	7-451

7.10	2214	7-556
7.11	2219	7-561
7.12	2324	7-654
7.13	2419	7-657
7.14	2618	7-668
7.15	6061	7-674
7.16	A201	7-682
7.17	A357	7-686
7.18	AL905XL	7-691
7.19	IN905XL	7-704
7.20	Aluminum 2000/6000 Series References	7-719

VOLUME 4

8	Aluminum 7000/8000 Series Alloys Sections	8-1
8.0	Aluminum 7000/8000 Series Material Summaries	8-3
8.0.1	Available Data	8-3
8.0.2	K_{Ic} Summary	8-12
8.0.3.1	K_{Ic} Summary (Buckling not Constrained)	8-16
8.0.3.2	K_{Ic} Summary (Buckling Constrained)	8-19
8.0.4	FCGR at Defined ΔK Levels	8-20
8.0.5	K_{Isc} Summary	8-41
8.1	7001	8-45
8.2	7005	8-53
8.3	7007	8-62
8.4	7010	8-63
8.5	7039	8-80
8.6	7049	8-81
8.7	7050	8-136
8.8	7050 (ALCLAD)	8-435
8.9	7075	8-452

VOLUME 5

8.10	7075 (ALCLAD)	8-745
8.11	7079	8-766
8.12	7079 (ALCLAD)	8-833
8.13	7080	8-836
8.14	7149	8-837
8.15	7150	8-849
8.16	7175	8-877
8.17	7178	8-969
8.18	7178 (ALCLAD)	8-1019
8.19	7475	8-1020
8.20	7475 (ALCLAD)	8-1292

8.21	8009	8-1323
8.22	8090	8-1328
8.23	X7090	8-1344
8.24	X7091	8-1348
8.25	Aluminum 7000/8000 Series References	8-1354