

Subject Index

A

ADINA computer program, 74, 77
 Aircraft landing wheels, fatigue crack growth,
 872–874
 analysis verification, 875–876
 depth direction of, 881
 fatigue life prediction, 874–875
 flange wheel damage characterization
 curves, 879–881
 fracture surface observations, 876–878
 stress-intensity factors, 869–872
 Airworthiness regulations, stiffened-skin
 structures, 170–177
 Alloys
 22Ni-Mo-37Cr compact specimens, 74
 2024-T3 skins stiffened with 7075-T6 alloy,
 182–199
 aluminum
 2014-T6, 868
 6066-T6, 787
 7075, 433–436
 superalloys
 Inconel 718, 800, 883, 907
 René 95, 637
 Ti-15-3, 604
 Aluminum
 H-1100, three-dimensional crack-tip de-
 formation, 284–288
 weldments, *R*-curves and maximum load
 toughness, 298–310
 American Welding Society, D1.1 code, 387–
 388
 ANSI standards, B31.3: 375, 387
 Application-mode dynamic analyses, wide-
 plate crack arrest tests, 714–717
 Approximate methods, for dynamic crack
 propagation and arrest, 524
 ARREST program for residual strength, 177–
 199
 ASME Boiler and Pressure Vessel Code
 Section III, 240
 Section XI, 725, 777, 830

ASME standards, B31.3: 387

ASTM standards

A 508-81: 832
 A 533-82: 834
 B 645-84: 88
 E 8-85: 575
 E 208-84a: 547
 E 208-85: 88, 570
 E 319-85: 393
 E 399: 89
 E 399-83: 266, 273, 467, 476, 478, 480, 548,
 563, 570, 575, 598, 600, 601, 605, 610
 E 561-81: 437
 E 606-80: 228
 E 647-81: 908
 E 647-83: 820
 E 647-86: 228, 385, 803
 E 740-80(86): 43
 E 813-81: 331, 336, 337, 437
 E 1221: 507, 510, 511, 518–520, 522, 533,
 539, 543, 544, 547, 548, 569
 Automotive structure, mechanical durability
 assurance, 220

B

Bending

 equation for surface cracks, 597
 surface crack growth, 38–39
 Birefringent coatings, dynamic fracture be-
 havior of compact crack arrest spec-
 imens, 508–511
 Boiling water reactor piping, intergranular
 stress-corrosion cracking, 235–239
 BOND program for residual strength, 177–
 199
 Boundary conditions, displacement-con-
 trolled, determination, 542–544
 Boundary element solution technique for
 cracks (BEST/CRX), 23
 Boundary integral equation
 modeling of three-dimensional surface
 cracks, 21–26

Boundary integral equation—(*cont.*)
 traction, three-dimensional surface crack modeling, 26–29
 Boundary-layer effects, stress-intensity factors for corner cracks in rectangular bars, 51

British standards, BS 5447: 88

Brittle fracture, warm prestressing effects, 772–773

Brittle materials, residual strength, 212–213

C

Chemical composition, A533B Class 1 and A508 Class 3 steels, table, 549

Clean steel practice, rail economic life and, 274–275

Closure effects

K -dependent and K -independent, 901–904
 prior amplitude effects and, 825

Collapse controlled failure, critical tearing modulus and, 310–312

Compact crack arrest specimens

with birefringent coatings, dynamic fracture behavior, 507

displacement controlled boundary condition determination, 542–544

dynamic fracture properties during propagation and arrest, 532

Component analysis, mechanical durability analysis and, 226

Composition effects, fracture toughness of stainless steel welds, 341–346

Computational modeling, boundary integral equation for surface cracks, 21–29

Constraint, local, three-dimensional elastic-plastic finite-element analysis, 73–86

Contour integral method

edge-cracked panels, 117–121

extraction of stress-intensity factors, 111–113

L-shaped plane elastic bodies, 114–117

Cooperative Test Program for crack arrest, 571

round robin results and, 581–582

Corner cracks, in rectangular bars, stress-intensity factors, 43

CORPUS program for crack growth, 199–211

GARTEUR program and, 205–207

Crack arrest

compact specimens, 418–423

compact specimens with birefringent coatings, 507

double cantilever beam specimens, 409–417

dynamic fracture properties of A533-B steel, 532

under elastic-plastic conditions, 427

finite-element and line spring models, comparison, 529–531

nuclear reactor vessel steels

analysis and HEDIG gage results, 741–744

analysis and strain gage results, 744–748

stress-intensity factor at arrest, 749–751

pressurized ductile pipe, 441

thick pressure vessels, 772–776

Crack arrestors

deformation history, effect on J -resistance curves, 430–437

toughness values for steels and aluminum alloys, 438

weld-in steel, assessment and design procedure, 436–437

Crack arrest testing, dynamic effects, 586–589

Crack-arrest testing, wide-plate

dynamic finite-element fracture analyses

application-mode dynamic analysis, 714–717

generation-mode dynamic analysis, 717–718

posttest static and stability analysis, 706–714

posttest three-dimensional static analysis, 704–706

specimen geometry, material properties, and instrumentation, 698–701

test conditions, 704

Heavy Section Steel Technology Program data acquisition, 686

dynamic finite-element fracture analyses, 691

instrumentation, 683–685

loading procedures, 686–688

objectives, 679

specimen configurations, 682–683

test conditions, 681–682

Crack arrest toughness

ASTM-proposed method, 553, 547

crack jump length and, 559–560

- ESSO test, 547, 553, 560–561
 - plane-strain
 - crack jump length and, 559–560
 - plane-strain fracture toughness and, 563
 - temperature effects, 556–557
 - round robin tests
 - arrest toughness determination, 573–575
 - loading arrangement, 571
 - loading procedure, 572–573
 - rapid fracture initiation, 571–572
 - recommended modifications, 589–592
 - results, 575–589
 - specimen geometry, 571
 - validity requirements, 575
 - stress-intensity factors at initiation and, 557–559
 - temperature effects, 553–556, 576
 - thickness effects, 561–563
 - Crack curving, in pressurized ductile pipe, 441
 - Crack extension, *R*-curves for predicting, 294–307
 - Crack front
 - free surface intersection stress behavior, boundary integral equation method, 29–33
 - straight, mixed-mode stress-intensity factor computation, 157–158
 - Crack growth, fatigue (*see* Fatigue crack growth)
 - Crack initiation
 - local crack-tip loading and constraint factor, 78–86
 - in thick pressure vessels, 772–776
 - Crack jump length, crack arrest toughness and, 559–560
 - Crack propagation
 - diagrams in damage tolerance analysis, 173
 - dynamic fracture properties, 532
 - effect of reflected stress waves, 512–513
 - finite-element and line spring models, comparison, 529–531
 - local crack tip loading and constraint factor, 78–86
 - mixed-mode dynamic, finite-element model, 406–408
 - Cracks
 - amplitude of stress singular terms, computation, 101
 - bolt hole, in rail, 270–271
 - elliptical (*see* Elliptical cracks)
 - internal, line spring model, 133–137
 - multiple, line spring model, 133–137
 - part-through in plates and shells, line spring model, 125
 - threshold and nonpropagation under service loading, 818
 - Crack-tip deformation, three-dimensional, in plastically deformed three-point bending aluminum, 281
 - Crack-tip diffraction, moiré interferometry, 494–499
 - Crack-tip opening angle, measurement from displacement record, 475
 - Crack-tip opening displacement
 - ductile fracture analyses and, 291–292
 - measurement with laser-based interferometric strain/displacement gage, 466
 - Crack velocity
 - alternate experimental procedures, 423–425
 - critical stress-intensity data generation, 405, 409–423
 - measurement techniques, comparison, 685
 - standard and ESSO specimens, 563–567
 - stress-intensity factors and, 520–521
 - Critical dynamic stress intensity, generation by combined experiments and analysis, 405, 409–423
 - Critical tearing modulus, determination, 310–312
 - CRKGRO computer program, 869, 874–875, 877, 881
 - Crossover behavior, fatigue crack growth in nickel-based superalloys, 901–904
 - Cutoff function method
 - edge-cracked panels, 117–121
 - extraction of stress-intensity factors, 113
 - L-shaped plane elastic bodies, 114–117
 - Cycle-dependent crack growth
 - Inconel 718 at high temperature, 914
 - modeling, 919
 - prediction of growth rates, 920–921
 - Cylindrical holes in plates, thickness effect on stress concentration factor, 57–64
- D**
- Damage accumulation, in aluminum alloy 6066-T6 cylindrical fatigue specimens, 787

- Damage analysis, automotive structures, 228–232
- Damage characterization curves, aircraft wheel flanges, 879–881
- Damage tolerance
 - in power generation industry, 235
 - residual strength and crack propagation diagrams, 173
 - stiffened-skin structures, 169
 - analytical verification, 176–177
 - compliance requirements, 171–174
- Data acquisition, in mechanical durability analysis, 223
- Defects
 - acceptance criteria, 387–389
 - welds, fitness-for-purpose defect acceptance criteria, 374
- Deformation history, effect on *J*-resistance curve of crack arrestors, 430–437
- Delta ferrite particles, effect on fracture toughness of stainless steel welds, 347–351
- Detail fracture, in rail, 263–270
- Displacements, displacement controlled boundary condition, 542–544
- Double-cantilever beams, wedge-loaded, for crack growth monitoring, 253–254
- Ductile fracture
 - analysis with *R*-curves and maximum load toughness, 291, 294–307
 - crack arrest in pressurized pipe, 441
 - crack-tip opening displacement and, 291–292
 - in thick pressure vessels, 774
- Ductile materials, residual strength, 214–217
- Durability, mechanical (*see* Mechanical Durability)
- Dynamic fracture, in compact crack arrest specimens with birefringent coatings, 507
- Dynamic strain aging, effects on A533B Class 1 pressure vessel steel, 392, 400–401

E

- Eisenberg model, 325–328
- Elastic-plastic fracture
 - ductile fracture analysis with single toughness value, 291
 - R*-curves and, 356

- three-dimensional crack-tip deformation, 281
- Electric Power Research Institute method, *R*-curves and maximum load prediction, 356
- Elliptical cracks
 - in bending, stress-intensity factors, 633–636
 - three-dimensional weight function method, 620, 621–626
 - approximate method, 626–630
 - exact solutions, 623–626
- Embrittlement, radiation (*see* Radiation embrittlement)
- EnJ method, *R*-curves and maximum load prediction, 356
- ESSO test for crack arrest toughness
 - calculation, 553
 - data, 560–561
- Extraction methods, stress singular terms for cracks and reentrant methods, 111–113

F

- Fatigue analysis, automotive structures, 228–232
- Fatigue behavior, defect-containing welds, 374
- Fatigue crack growth
 - aircraft landing wheels, 868
 - in aluminum alloy 6066-T6 cylindrical fatigue specimens, 787
 - CORPUS program, 199–211
 - environmentally enhanced cycle-dependent, 914, 920
 - environmental, Type 304 stainless steel
 - hydrogen water chemistry effects, 249
 - oxygen water chemistry effects, 245–249
 - frequency effects at high temperature, 907
 - micromechanisms, 917
 - at high load ratios in time-dependent regime, 800
 - in large-scale yielding, *J*-integral and, 318
 - modeling in cycle- and time-dependent regimes, 919
 - near-threshold, in nickel-based superalloys, 883
 - crossover behavior, 889–892
 - grain-size effects, 892–901

I

- Inelastic fracture, dynamic, generation of critical stress intensity data, 405
- Integrated methods, frozen stress-moiré interferometric analysis, 7–9, 13–16
- Interferometric strain/displacement gage, crack-tip opening displacement measurement, 468–469, 471, 474–479
- Interferometry
 - frozen stress-moiré interferometric analysis, 7–9, 13–16
 - sandwich holospeckle, three-dimensional crack-tip deformation, 282–288
- Intergranular stress-corrosion cracking, in boiling water reactor piping, 235–238
 - laboratory monitoring, 239–240
 - modeling, 255–256
 - remedies, 239
 - smart monitors, 256–258
 - surface crack testing methods, 240–244
 - water chemistry effects, 245–250
 - wedge-loaded double-cantilever beam monitors, 253–254
- Interstitial impurities, effect on fracture of A533B Class 1 pressure vessel steel, 392

J

- J*-curves
 - J*-resistance, crack arrestors, deformation history effect, 430–437
 - three-dimensional elastic-plastic finite-element analyses, 73–86
- J*-integral
 - delta *J* determination, 798–799
 - ductile fracture analysis with, 291–293
 - fatigue crack growth in large-scale yielding and, 318
 - fracture toughness of stainless-steel welds, 336–340
 - R*-curve data beyond *J*-controlled growth, 357–362

L

- Large-break loss-of-collant accidents, 752–755, 764
- Lifetime predictions
 - automotive structures, damage analysis and, 228–232

- crack growth in nickel-based superalloys, 904
- mechanical durability in automotive structures, 220
- residual life estimation in nickel-based superalloy René 95, 645–655
- smart monitors for intergranular stress-corrosion cracking, 256–258
- surface cracks in aircraft landing wheels under service loading, 874–875
- three-dimensional effects, 73
- Linear elastic fracture mechanics
 - fatigue crack growth in aircraft landing wheels, 869–875
 - pressurized thermal shock loading of pressurized water reactor steels, 752–755
 - three-dimensional problems, integrated optical measurement method, 7–9, 13–16
 - two-dimensional technology and, 88

Line spring model

- coplanar multiple cracks, 137–149
- crack propagation and arrest, finite-element methods and, 529–531
- cracks in plates under thermal and residual stresses, 660–664
- internal and multiple cracks, 133–137
- limitations, 150, 657–658
- part-through cracks, 664–667
- part-through cracks in plates and shells, 125
- theory, 658–660

Load history, effect on fatigue threshold, 818

- Loading, crack tip, three-dimensional elastic-plastic finite-element analysis, 73–86

Loads

- bending or tensile, equation for surface cracks, 597
- vehicle, analysis, 223–225
- wheel, effect on rail, 275–276
- L-shaped plane elastic bodies, stress-intensity factors, 114–117

M

- Manganese silicide particles, effect on fracture toughness of stainless steel welds, 347–351

Material properties

- A533-B steel compact crack arrest specimens, 539–542
 - in mechanical durability analysis, 226–228
- Maximum load toughness, *R*-curve prediction for maximum stress and crack extension, 291
- Maximum pressure, pressure vessels, *R*-curve data, 362–368
- Mechanical durability, automotive structures component analysis, 226
 - design, 212–223
 - material properties, 226–228
 - service data, 223
 - vehicle loads analysis, 223–225
- Mesh refinement, effect on stress-intensity factors for corner cracks in rectangular bars, 51–52
- Microstructure, effect on fatigue crack growth of Alloy 718, 892–901
- Microvoid coalescence, fracture toughness of stainless steel welds and, 347–351
- Models
 - computational, boundary integral equation for surface cracks, 21–29
 - constraint-loss, for surface fatigue crack growth, 637
 - dual-Walker exponent mean-stress, 643–644
 - intergranular stress-corrosion cracking in piping, 255–256
 - linear cumulative damage, fatigue crack growth, 801–803, 807–812
 - line spring (*see* Line spring model)
 - one-dimensional, crack propagation and arrest, 525–531
- Modulus of elasticity, apparent
 - damage accumulation plot, 793
 - damage determination from changes in, 795
- Moiré interferometry, 601, 604
 - applied stress-intensity factor and critical stress-intensity factor, determination, 610–611
 - dynamic, stress wave and crack-tip diffraction events, 482
 - experimental evaluation of critical stress-intensity factor, 606–610
 - static, 484–485
 - stress-intensity factor estimates, 7–9, 13–16

Moment-modified compact-tension test specimens, 724

Monitoring

- crack growth in piping, 250–254
- laboratory, stress-corrosion cracking in welding pipe, 239–240
- smart monitors for intergranular stress-corrosion cracking, 256–258

N

- Neutron irradiation, effect on fracture toughness of pressure vessel steel, 400
- Nodal-force method, mixed-mode stress-intensity factor determination, 154–157
- Numerical methods
 - J* concept applicability to fatigue crack growth, 325–328
 - SAMCR, 507, 511–521

O

- Offshore structures, tubular joints, mixed-mode stress-intensity factors, 669
- Optical methods, integrated, three-dimensional effects measurement, 5
- Oxygen level in water, stress-corrosion cracking and, 245–249

P

- Panels, edge-cracked, stress-intensity factors, 117–121
- p*-extension, 103
- Piping
 - boiling water reactor, intergranular stress-corrosion cracking
 - laboratory monitoring, 239–240
 - modeling, 255–256
 - monitoring, 250–254
 - remedies, 239
 - smart monitors for, 256–258
 - surface crack testing methods, 240–244
 - water chemistry and, 245–250
 - pressurized, ductile crack bifurcation and arrest, 441
- PLASCOR computer program, 217
- Plates
 - cylindrical-hole weakened, thickness effect on stress concentration factor, 57–64

Plates—(cont.)

part-through cracks, line spring model, 125
under randomly distributed stress, line spring model, 660–664

wide

dynamic finite-element fracture analyses, 691

maximum stress and crack extension prediction, 294–307

R-curves and maximum load toughness, 294–310

Poison's ratio, effect on stress-intensity factors for corner cracks in rectangular bars, 52–53

Pressure vessels

fatigue crack growth in pressurized water environment, 830

initiation and maximum pressure, *R*-curve data, 362–368

upper shelf fracture behavior, 392

Pressurized thermal shock transients, analysis, 752–755

Pressurized water, fatigue crack growth in pressure vessels steels and submerged-arc weldments, 830

Pressurized water reactors

crack extension and arrest in reactor vessel steels, 724

thermal shock studies, review, 752

PRETUBE computer program, 672

PROBE computer program, 114

R

R-6 method, *R*-curves and maximum load prediction, 356

Radiation embrittlement, dynamic strain aging effect on A533B Class 1 pressure vessel steel, 392, 400–401

Rail

bolt hole cracks, 270–271

clean steel practice, 274–275

detail fractures, 263–270

fracture resistance, 272–273

residual stress, 272–273

structural integrity, 260

vertical split heads, 271–272

wheel load effects, 275–276

R-curves

in elastic-plastic fracture mechanics, 356

maximum load toughness for maximum stress and crack extension and, 291

Reentrant corners, amplitude of stress singular terms, computation, 101

Repeat inspection interval, for stiffened-skin structures, 176

Residual strength

ARREST and BOND programs, 177–199
diagrams in damage tolerance analysis, 173
unstiffened-skin materials, 212–217

Residual stress

plate surface cracks, line spring model for stress-intensity factor, 657

in rail, 272–273

R ratio

constraint-loss and dual-Walker exponent models, 643–645, 655

effects on crack growth

AISI 316 compact tension specimens, 323, 329

nickel-based superalloys, 901–904

high values, time-dependent crack growth rate, 800

Rupture, pressurized pipe, ductile propagation and arrest, 441

S

Safe inspection period, for stiffened-skin structures, 174–176

Sandwich holospeckle interferometry, three-dimensional crack-tip deformation, 282–288

Scanning electron microscopy, fracture surfaces in aircraft landing wheels, 876–878

Scattered light photoelasticity, 6, 10–11

Shells

part-through cracks, line spring model, 125
under randomly distributed stress, line spring model, 660–664

Shielded-metal-arc welds, fracture toughness, 330

Smart monitors, for intergranular stress-corrosion cracking, 256–258

Speckle photography, sandwich holospeckle interferometry, 282–288

Split heads, vertical, in rail, 271–272

Steel

1010, 443

1018, 494–499
 4340 compact specimens, 418–423, 507
 A106 Grade B, 374
 A508 Class 2
 thick vessels, 767
 thick wall cylinders, 752
 A508 Class 3, 547
 A514 bridge, 569
 A533B
 compact crack arrest specimens, 532
 R-curve data, 359–363
 wide-plate crack-arrest testing, 679
 wide plates, 298–307
 A533B Class 1, 547
 dynamic finite-element fracture analyses, 691
 reactor pressure vessel, 569
 upper shelf fracture behavior, 392
 A588 bridge, 569
 API 5LX56 wide plates, 298–307
 HY-130, *R*-curve data, 359–363
 HY-80, crack arrest analysis, 433–436
 SA333 Grade 6 carbon, 244
 SA508 Class 2a, 830
 SA508 Class 3a, 830
 SA533 B-1, 244
 SA533 Grade A, 830
 SA533 Grade B, Class 2, 830
 SAE-01 tool, 469–474
 stainless
 316 wide plates, 298–307
 AISI 316, 322–325
 Type 16-8-2 welds, 330
 Type 304, 244
 Type 308 welds, 330
 Stiffened-skin structures
 airworthiness regulations, 170–177
 damage tolerance, 169
 repeat inspection period, 176
 safe inspection period, 172, 174–175
 threshold inspection period, 176
 Strain amplitude, aluminum alloy 6066-T6
 cylindrical fatigue specimens, 790
 Strain rate, effect on upper shelf fracture
 behavior of A533B Class 1 steel, 392
 Stress analysis of moving cracks (SAMCR),
 507, 511–521
 Stress concentration factor, specimen thick-
 ness effect, 57–64

Stress fields, corner point of cylindrical-hole-
 weakened plates, 67–68
 Stress-intensity factors
 aircraft wheel flange during service load-
 ing, 869–872
 applied, moiré interferometric determi-
 nation, 610–611
 boundary-layer effect, 51
 compact crack arrest specimens, dynamic
 effects, 537–539
 computation from crack-tip opening dis-
 placement data, 475–480
 contour integral extraction method, 111–
 113
 corner cracks in rectangular bars, 46–53
 crack and hole problems and, 68–69
 critical
 experimental moiré interferometric
 evaluation, 606–610
 generation by combined experiments and
 analysis, 405, 409–423
 plane-strain fracture toughness and, 604–
 606, 611–617
 cutoff function method, 113
 dynamic
 ASTM, photoelastic data, and SAMCR
 calculations, table, 518
 calculation from isochromatic fringe
 patterns in compact crack arrest spec-
 imens, 508–511
 crack velocity and, 520–521
 localized displacement equations, 499–
 501
 edge-cracked panels, 117–121
 at initiation, crack arrest toughness and,
 557–559
 integrated frozen stress-moiré interfero-
 metric method, 7–9, 13–16
 L-shaped plane elastic bodies, 114–117
 measurement with boundary integral
 equation and finite-element methods,
 21–26
 mesh refinement effect, 51–52
 mixed-mode solutions
 offshore structural tubular joints, 669
 three-dimensional crack fronts, 153
 weld-toe surface flaw of an X-joint, 672–
 675
 moiré interferometric determination, 610–
 611

Stress-intensity factors—(*cont.*)

moment-modified compact-tension test specimen at arrest, 749–751

plate surface cracks under randomly distributed stress, line spring model, 657

Poisson's ratio effect, 52–53

prior amplitudes, effect on fatigue tolerance range, 818

range for nonpropagation of fatigue cracks, 823, 826

semielliptical cracks

in bending, 633–636

in a flat plate, 798

Stress, maximum, *R*-curves for predicting, 294–307

Stress waves

propagation, dynamic moiré interferometry, 482

reflected, effect on crack propagation, 512–513

Submerged-arc welds

fatigue crack growth rate, 830

fracture toughness, 330

Sulfur-bearing inclusions, in base and weld metals, 845, 866

Superalloys

Inconel 718, 800, 883, 907

René 95, 883

Surface cracks

aircraft wheel flanges, analysis, 869–875

under bending or tensile loads, equation for, 597

in boiling water reactor piping, test methods, 240–244

corner cracks in rectangular bars, stress-intensity factors, 43

part-through, line spring model analysis, 664–667

small, life predictions in nickel-based superalloy René 95, 654–655

three-dimensional

boundary integral equation analysis, 19

traction boundary integral equation, 26–29

X-joint weld-toe, stress-intensity factor, 672–675

Surface flaws, growth, constraint-loss model in nickel-based superalloy, 637

T

Temperature effects

crack arrest toughness, 553–556, 576

fracture toughness of stainless steel welds, 341–346

nonlinear material behavior of A533-B steel, 539–542

plane-strain crack arrest toughness, 556–557

upper shelf fracture behavior of pressure vessel steel, 392

Temperature gradients, in wide-plate crack-arrest testing, 681, 686–688

Tensile loads, equation for surface cracks, 597

Tensile properties, pressure vessel steels at room temperature, 833

Tension, surface crack growth, 35–37

Thermal shock

crack extension and arrest in nuclear reactor vessel steels, 724

internal pressure loading of thick pressure vessels and, 769–777

pressurized water reactor-related, review, 752

Thermal stress, plate surface cracks, line spring model for stress-intensity factor, 657

Thickness effects

crack arrest toughness, 561–563

stress concentration factor, 57–64

Three-dimensional effects

crack-tip deformation in plastically deformed three-point bending aluminum, 281

elastic surface crack modeling, 19

frozen stress-moiré interferometric analysis, 7–9, 13–16

lifetime predictions and, 73

local crack-tip loading and constraint factor, 73–86

mixed-mode stress-intensity factor calculation, 153

part-through cracks in plates and shells, line spring model, 125

specimen thickness effects on stress concentration factor, 57–64

two-dimensional technology and, 88

Three-dimensional weight function method
(*see* Weight function method)
Threshold inspection interval, for stiffened-
skin structures, 176
Time-dependent crack growth, 802–803
Inconel 718 at high temperature, 914
micromechanisms, 917–919
modeling, 919
prediction of growth rates, 919–920
Titus system, 325–328
Traction boundary integral equation, three-
dimensional surface crack modeling,
26–29
Transmission electron microscopy, fracture
surfaces in aircraft landing wheels, 876–
878
Triaxiality of stress-strain state (*see* Con-
straint)
Tubular joints offshore structures, mixed-
mode stress-intensity factors, 669
TUJAP computer program, 673–674
Two-dimensional technology, linear elastic
fracture mechanics and, 88

V

Viscoplasticity
A533-B steel compact crack arrest speci-
mens, 539–542
equations for rate-dependent plasticity, 545

W

Wave propagation, one-dimensional model,
525–531
Weight function method
line spring model and, 660–661, 667
three-dimensional, for elliptical cracks, 620,
621–626
approximate method, 626–630, 632–633
exact solutions, 623–626
Welding processes, effect on fracture tough-
ness of stainless steel welds, 341–346
Weldments, submerged-arc, fatigue crack
growth, 830
Welds (*see also specific welds*)
aluminum, *R*-curves and maximum load
toughness, 298–310
with defects, fitness-for-purpose defect ac-
ceptance criteria, 374
stainless steel Types 308 and 16-8-2
chemical composition, 332
delta ferrite morphology, 339
fracture toughness, 330
tensile properties, 335
Weld toe, X-joint surface flaw, mixed-mode
stress-intensity factor, 672–675
Wheels
aircraft (*see* Aircraft landing wheels)
loads, effect on rail, 275–276
Wide-plate tests
crack arrest
application-mode dynamic analysis, 714–
717
generation-mode dynamic analysis, 717–
718
dynamic finite-element fracture analyses,
691
R-curves and maximum load toughness,
294–310

Warm prestressing
brittle fracture initiation and, 772–773
incipient, 754–755, 759, 764
Water chemistry, effect on intergranular
stress-corrosion cracking, 245–250