Subject Index

A
Adhesive fracture testing, 307
Adhesive, structural, 307

B
Biaxial loading, 195
Boundary collocation method, 594
Boundary integral element method, 594
Brittle-ductile transition, 215
Brittle fracture, 178, 215, 238

C
Carbon steels, 339
Caustics technique, 44, 144
Cleavage, 215, 238, 264
fracture, 361
Convergence study, 509
Crack analysis, short, 3
Crack closure, 421
measurements, 563
Crack depth, 3
Cracked pipe, 448
Cracked structures, assessing, 525
Crack, elliptical, 490
Crack extension, 581
stable initiation, 178
Crack front, 470
Crack growth, 56, 85, 289
calculations, 490
ductile metal, 581
estimation procedures, 448
fatigue, 421, 490, 563
simulation, 421
stable, 378
unstable, 339
Crack, intergranular, 396
Crack loading history, 144
Cracks, elastic, 509
Cracks, shallow, 3, 157
Cracks, surface, 3, 178, 322
Crack tip
deformation, 525
elements, 509
integral parameters, 448
opening displacement (CTOD), 3, 109, 195, 322
stress, 3
Cyclic loading, 421
Cylindrical singularity, 470

D
Data reduction, 545
Deformation pattern, 3
plastic, 24
Direct current electric potential method, 581
Displacement measurements, 322
Ductile-brittle transition region, 195, 238, 264
Ductile fracture, 85, 157, 178, 238, 361
Ductile fracture toughness value ($J_c$), 238, 378
Ductile tearing, 378
failure mode, 56
Dynamic fracture, 126, 157
initiation, 109
key curves, 144
Dynamic key curves, 144
Dynamic strain key curves, 339

E
Elastic-plastic fracture mechanics, 56, 525
adhesive, 307
caustics technique, 44, 144
crack growth and closure, 421
instability calculation method, 545
$J$ integral and modified $J$, 85
$J$-$R$ curves analysis, 24, 56, 289
predicting, 448
surface flaw behavior, 322
Electric potential, 581
Elliptical crack, 490
Embrittlement, 339
Energy separation, 307
Explosive tests, 157

F

Failure analysis, 525
Failure assessment diagram, 525
Failure behavior estimation schemes, 448
Fatigue crack growth, 421, 490
curves, 563
Fatigue thresholds, 563
Ferromagnetic materials, 178
Finite element analysis, 3, 109, 157, 594
comparison with surface displacement
measurement, 322
meshing criteria, 509
model, 322, 421
three-dimensional, 470
Fracture criterion, local, 361
Fracture mechanics (See specific types)
Fracture toughness, 24, 594
adhesive testing, 307
analysis in ductile-to-brittle transition
regime, 238
biaxial loading, 195
crack tip opening displacement, 3, 109,
195, 322
dynamic key curves, 144
dynamic strain aging effect on, 339
impact, 109, 144, 396
large crack extension, 85
predicting, 361, 448
prediction by local fracture criterion, 361
size and geometry effect on, 289
transition regime, 215
ultra-high-strength low alloy steel, 396

G

Geometric effects on fracture toughness, 289
Geometric moiré, 322
Geometric normalization, 24

I

Impact fracture, 109
toughness, 144, 396
Impact test, 144
Inclusions, microstructural, 126, 378
Inconel 617, 563
Influence function, 490
Initiation toughness ($J_{Ic}$), 238, 378
Instability calculation method, 545
Intergranular crack, 396
Irwin's equation, 594

J

$J_{lc}$, 238, 378
$J$ integral, 109, 157, 525
application to nonlinear elastic material
behavior, 307
correlation with caustic diameter, 44
ductile tearing resistance, 378
estimation techniques, 448
modified, 85
normalization method, 24
stress intensity and cleavage toughness
calculations, 264
surface displacement measurements, 322
yield load identification, 525
Johnson equation, 581
$J$-$R$ curve, 24, 56, 85, 289, 339, 545

K

Key-curves, dynamic, 144
$K_{lc}$, 215, 238

L

Least dimension concept, 509
Linear elastic fracture mechanics, 509, 545
Load displacement, 24, 56, 421
curves, 563
Load-line compliance, 594
Load-point compliance, 594
Local fracture criterion, 361
Logarithmic signal processor, 178

M

Macrostructure heterogeneity, 396
Magnetic detector, 178
Magnetic emission, 178
Magnetic field, 178
Manganese sulfide inclusions, 126
Mechanical behavior, 126
Microstructure, 126, 378, 396
Models, R-curve instability, 545
Modified $J$, 85

N

Neat bonded fracture, 307
Nickel-based superalloy, 421
Nonlinear fracture mechanics parameters,
448
Normalization method, 24
Numerical stress analysis, 594

O
Optical caustics method, 44, 144
Optical electron microscopy, 126

P
Photography, high-speed, 144
Pipe steels, 56, 339
Plain strain crack problems, 509
Plain strain fracture toughness (K_{ic}), 215, 238
Plastic deformation pattern, 24
Plastic strain, 157, 361
Polar singularity, 470
Pressure vessel steel, 195, 238, 264, 339
Pre-stressing, warm, 264
Propagation/nonpropagation criterion, 563

R
R6 approach, 448, 525
R curve, 289, 378, 545
R dependence, 563
Resistance curve, 85
RKR model, 361

S
Scanning electron microscopy, 126
Sidgrooving, 215
Signal processor, logarithmic, 178
Simulation, full-scale, 157
Singularity, 509
Size effects on toughness, 289
Specimens
  arc-bend/arc-support, 594
  Charpy, 178
  compact, 24, 85, 215, 264, 378
  cracked plate, 322
  cruciform, 195
  C(T), 56, 307
  middle-crack tension, 470
  notched round bars, 126
  planform, 56, 581
  precracked bend, 144
  sidgrooved, 215
  single edge notched, 421
  standard bend, 44
  three-point bend, 3, 178, 195
Steels
  304 stainless, 56, 581
  3-Ni, 85
  A106, 85
  A508, 238
  A516, 56
  A533B, 85, 195, 215, 264
  AISI 4340, 396
  Alloy 718, 421
  austenitic stainless, 581
  carbon, 339
  high strength, 44, 126
  HSLA-80, 85
  low alloy, 126, 238
  low carbon, 361
  martensitic, 126
  pipe, 56, 339
  SA508, 238
  stainless, 378
  structural, 126
  ultra-high strength, 396
Strain aging, 264
dynamic, 339
Strain, critical plastic, 361
Strain energy release rate, 470, 490, 594
Stress analysis, numerical, 594
Stress, cleavage fracture, 361
Stress intensity factors, 109, 144, 396, 490, 509, 594
calculated with J integral, 264
Stress intensity range, effective, 563
Stress intensity solution, 594
Stress-strain curves, serrated, 339
Stress waves, 109, 126
Structural adhesive, 307
Surface displacement measurements, 322
Surface flaws, 525

T
Three-dimensional analysis, 470
Three-point bend tests, 3, 178, 195
Threshold concept, generalized, 563
T* integral, 448
Toughness (See Fracture toughness)
Transition fracture, 195, 215, 238, 264
Transition times, 144
Two-dimensional analysis, 470

U
Unloading compliance method, 581

V
Vertex singularity, 470
Void coalescence, 378
VR curve, 448
<table>
<thead>
<tr>
<th>Warm pre-stressing, 264</th>
<th>Yield loads, 525</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight function, 490</td>
<td>Yield stress, 361</td>
</tr>
</tbody>
</table>