Index

A
applied stress, 13, 93, 158
critical, 127
approximation technique,
61, 63, 65, 70
area scaling, 80
atomic size, 13, 73
atomic strength, 1

B
brittle materials, 8, 30, 33,
71

C
confidence level, 74, 144
corrosion fatigue, 34
crack branches, 146
crack stability, 26–27, 127
crack tips, 13
cracks, 1, 3, 30, 38
critical depth, 2
critical stress intensity
factor, 13
cyclic fatigue, 33, 145

determined strength
reliability, 74
ductile materials, 21, 145
dynamic fatigue, 57, 60, 154

E
edge failure, 89
edge finishing, 135
edge stress, 88, 95, 157
edge support, 103
energy, 14, 16, 34, 146

F
factor of safety, 65
failure modes, 2, 67
flaw distribution, 58
flaw growth, 26, 127, 158
flaw growth factor, 129
flaw growth parameter, 45
flaw growth susceptibility
factor, 37, 45, 51, 69, 109,
118, 151
flaw shape, 2, 22
flaws, 2, 5, 7, 67, 133
four-point bend, 86, 139, 141
fracture toughness, 13, 20
free-surface correction factor, 16

**G**
grain size, 21, 73
gravity, 95
grinding, 1, 7, 133, 135, 159

**H**
half-penny flaw, 19
humidity, 34, 117

**I**
inert strength, 14, 45, 58, 62, 73, 77, 85, 111, 157

**L**
line crack, 6
line flaw, 7, 26, 28

**M**
mode I, 3
modulus of elasticity, 103
modulus of rupture, 14
moisture, 14, 33, 38, 62, 76, 107, 111, 120, 127, 129–130, 158

**P**
partial crack, 4
penny crack, 5, 68, 152
point flaw, 6, 8, 17, 25, 28, 152
power law, 37, 68
proof test, 107, 111–112, 115, 155, 158

**R**
residual stress, 8, 25, 67–68, 124, 127, 152
residual stress intensity, 26
residual stress intensity factor, 25
ring-on-ring testing, 88, 91, 141, 151

**S**
safety factor, 113
scratches, 6, 8, 90, 145
shape factor, 14, 17, 68
shear and moment diagrams, 87
slow crack growth, 33–34, 41, 123
stable grow, 28
strength, 1, 3, 27, 29, 67, 120, 135
strength determination reliability, 71, 83
strength theory, 11
stress, 95, 153

Index
stress corrosion, 33
stress intensity, 38, 68, 127
stress intensity factor, 13, 68
stress intensity, unstable, 39
stress rate, 57–58
subcritical crack growth, 33
support, kinematic, 97, 101
support, simple, 86, 94, 97

T
temperature, 34, 36, 120
thermal stress, 103
threshold strength, 77
threshold value, 39

through crack, 4–5, 14
through flaw, 17

V
velocity, 37–38, 68, 130
velocity curves, 35

W
water, 34, 36, 68, 117, 139
Weibull A-basis value, 74
Weibull analysis, 58
three-parameter, 77, 143
two-parameter, 77
Weibull distribution, 71, 157
Weibull modulus, 73
windows, 94–95, 137, 151
John W. Pepi received his undergraduate education from Tufts University, graduating with a Bachelor of Science degree in Civil Engineering in 1967. He obtained a Master of Science degree in Structural Engineering in 1968 from Northwestern University.

He has been employed with L-3 Integrated Optical Systems for the past fifteen years as a lead staff mechanical engineer for precision, lightweight, space-based optical systems. Prior to his employment at L-3 he was employed at Lockheed Martin and was extensively involved as lead engineer for the successfully launched AIRS satellite program for JPL/NASA Goddard Space Flight Center. Prior to that assignment, he held the positions of lead engineer, chief engineer, department manager, and program manager for large optical systems at ITEK Optical Systems, where he worked for 22 years directing the work of up to 55 individuals. His last assignment for the Keck Telescope led to the discovery of delayed elasticity effects in certain ceramics.

John is an internationally recognized authority on lightweight mirror design and a member of several international ground-based large-telescope oversight committees. He is the author of more than one dozen papers on lightweight optics and mirror design principles, and has been an instructor for SPIE at its international meetings.