Subject Index

A

Aerospace material, differences from structural steels, 5 ASME code, 46–47 ASTM E 399, 5–6 ASTM E 647, 26 ASTM E 1820, 22 ASTM E 1921, 2, 6, 10–11, 13, 15, 20, 22–24, 26–27, 31, 35, 38–40, 48

B

Bend bar fixtures, 22, 24 Bend bar specimens, 18–20

С

Calibration, checking, 28-29 Charpy specimen, pre-cracked, 42-43 Charpy V curve, reference temperatures, 34 Multi-temperature determination, 59 offset constants. 33 Charpy V upper shelf energy, low, 48 Cleavage fracture, 6 Clevis design, 22–23 Pre-cracking, 26 Clip gages, 18, 20, 22-25 Commercial applications, Master Curve, 47-48 Compact specimen fixtures, 22 Compact specimens, 18–21 Crack growth, slow-stable K_{1c} limit, 16–17 Multi-temperature reference temperature determination, 59

Cryogenic cooling chambers, 23–25 Cumulative probability method, tolerance bounds, 39–40 Cumulative failure probability distribution, 7–8

D

Data censoring, using maximum likelihood method, 56–57 Design application problems, 48–49 Disk-shaped compact specimens, 18–20 Displacement gage, 18 Ductile tearing, 5 Ductile-to-brittle transition temperature, 5

Е

Elastic-plastic stress intensity factor, fracture toughness and, 8

F

Flaw geometry, 49 Fracture mechanics application to round robin data, 10–11 concept discovery, 6–8 engineering adaptation, 8–10 Fracture toughness crack mouth data, 32 elastic-plastic stress intensity factor and, 8 lower bound curves, 5, 12 specimen size effect, 8 versus temperature, 5–6

G

Greek symbols, 4

Η

Historical aspect, 5-6

J

Japan Society for the Promotion of Science, 10 J-integral, 5–6 calculation, 30 elastic component, 30–31 plastic component, 30

K

K_{Jc} data duplication needs, 15 limit value, 28 side-grooving effect, 27 slow-stable crack growth limit, 16–17 specimen size requirements, 15–16

М

Master Curve, 11–12 application to other grades of steel, 48 commercial applications, 47-48 design application problems, 48-49 example applications, 46 fit to data, 57-58 median versus scale parameter, 12-13 supporting evidence, 13-14 units of measure, 32 use of tolerance bounds, 46-47 Materials Property Council, 10 Maximum likelihood method data censoring using, 56-57 random homogeneity, 44-45 Median, versus scale parameter, 12-13 Monte Carlo simulations, 15-16 Multi-temperature method, reference temperature determination, 36 - 37

Ν

Nomenclature, 2-4

0

"Over-the-top" clip gage, 18, 20

P

Pre-cracked Charpy specimen, 42–43 Pre-cracking, 26 in servo-hydraulic machines, 28

R

Rand homogeneity, maximum likelihood estimate, 44–45 Razor blades, on specimens, 18, 20 Reference temperature calculation, 60 Charpy V curve, 34 determination, 36–37 margin adjustment, 40–41 multi-temperature determination, 59–61 offset constants, Charpy V curve, 33 Round robin, 10–11

S

Scale parameter determination, 55-56 equations, 35 versus median, 12-13 testing at test temperature, 33-34 Side-grooving, 26–27 Single temperature method, reference temperature determination, 36 SINTAP system 3 analysis, 44-45 Specimens, 18-21 pre-cracking, 26 side-grooving, 26-27 Specimen size, 4 K_{Ic} requirements, 15-16 Specimen size effect, 6 fracture toughness, 8 Standard deviation method, tolerance bounds, 38-39

SUBJECT INDEX

Steels

application to other grades, 48 macroscopically inhomogeneous, 42-43 structural, differences from aerospace material, 5 Stress analysis, 49 Stress intensity factors, 1 standard deviation method, 38–39 use in Master Curve, 46–47

U

USNRC NUREG/CR-5504, 1

W

Weakest-link based model, 10 Weibull cumulative probability, 39 Weibull fitting of data, 55–57 Weibull model description, 55 three-parameter, 9 two-parameter, 7 Weibull slopes, 10–11 best fit, 9 Welding Institute round robin, 43

Т

Test equipment, 22–25 Test practices, 28–29 Thermocouple wires, 24–25 Tolerance bounds, 38–41 calculation, 62–64 coefficients, 39 cumulative probability method, 39–40 margin adjustment, 40–41, 62, 64