

INDEX

- Accelerations, building, 187, 194, 208, 209, 279
 - and human discomfort 208, 209, 279
- Across-wind response, 183, 214, 261
- Admittance, mechanical, 187, 195
- Aeroelastic behavior, 203, 265
- Aerodynamic damping, 205, 206, 237
 - negative, 206
 - positive, 206
- Aerodynamic derivatives
 - flutter, 210
 - motional, 213
 - Scanlan, 213
 - steady-state, 209
- Aerodynamics, 163
 - bluff body, 163
 - bridge deck, improvement of, 166
- Aerodynamic testing, 173
- Aeroelastic testing, 173, 265, 278
- Along-wind response, 261, 280
- Analytical procedure, ASCE
 - Standard, 10
- Animation, wind pressures, 171
- ASCE 7–10 Standard
 - list of numerical examples, 20
 - overview, 10
 - regular approach, 13
 - simplified approach, 18
- Atmospheric boundary layer, 110, 117
- Atmospheric flow, moderate winds, 117, 136
- Atmospheric turbulence, 130, 307
- Averaging times, wind speeds, 118
- Background response, 198, 249
- Basic wind speeds, ASCE Standard, 22
- Baseball aerodynamics, 167
- Bernoulli equation, 164
- Blockage, wind tunnel, 180
- Bluff body aerodynamics, 163
- Boundary layers, 110, 121, 166, 301
 - internal, 12
- Brancusi, 268
- Bridge response in turbulent flow, 214
- Brighton Chain Pier failure, 204
- Buffeting, 211, 214
- Burj Khalifa, 268
- C&C, see Components and Cladding
- Calibration of MRIs for dynamic effects, 232
- Chimneys, ASCE Standard, 74
- Chinook winds, 114

- Coherent fluctuations, 135
- Colorado State University wind tunnel, 174
- Comparisons, pressures,
 - ASCE Standard, 19
 - of pressure peaks, 179
 - among laboratories, 180
- Components and cladding, ASCE Standard, 10, 95
- Computational fluid dynamics, 163, 184
- Coriolis force, 110
- Cross-spectra, 295
 - of turbulence fluctuations, 134
- Cumulative distribution functions, 141
- Damage estimation, 238
- Dampers, tall buildings, 268, 279
- Damping, aerodynamic, 205, 206, 237
- Damping ratio, 187
- Database-assisted design
 - rigid buildings, 252
 - interpolation procedures, 257
 - flexible buildings, 262
 - NIST database, 255
 - Tokyo Polytechnic University database, 255, 278
- Debris, wind-borne, ASCE Standard, 23
- Demand-to-capacity indexes, 217, 276
- Diaphragm buildings, ASCE Standard, 11, 81
- Directional data, simulation of, 153, 155
- “Directional procedure,” ASCE Standard, regular approach, 11, 37
- Directionality factor, ASCE Standard, 33, 258
- Directionality, effects of wind, 149, 258
 - simple and rigorous approach, 160, 163
 - outcrossing approach, 311
 - sector-by-sector approach, 313
- Directional wind speed data, 138
 - database development, 154
- Domed roofs, ASCE 7 Standard, 51
- Dot (differentiation symbol), 186
- Drag force, 166
 - coefficient, 172, 214
 - effect of Reynolds number on, 172
- Dynamics, structural, 185
- Eave height, ASCE Standard, 96
- Eddies, turbulent, 132, 135
- Effective wind areas, ASCE Standard, Ekman spiral, 112
- Elastic center, eccentricity of, 199, 261, 273, 284
- Enclosed simple diaphragm buildings, simplified approach, ASCE Standard, 81
- Enclosure classification, ASCE Standard, 23
- Endless Column, Brancusi, 268
- “Envelope procedure,” ASCE Standard, 11, 57
- Epochal approach, estimation of extreme speeds, 144
- Error estimates, extreme wind effects, 159
- Escarments, ASCE Standard, 27
- Estimates, extreme wind speeds, EV I distribution, 146
- EV III distribution, 146
- Exceedance probabilities, 141
- Exposure, ASCE Standard
 - categories, 24, 129
 - requirements, 25
- Extratropical storms, 113
- Extreme wind speeds, 137
 - non-parametric methods for estimating, 157
 - parametric methods for estimating, 143
- Extreme wind effects, 137
- Eye of the storm, 113
- Eye wall, 113
- Fastest-mile speeds, 120
- Fetch, 117, 121, 129
- Flexible buildings, 249, 261
 - preliminary response estimates, 279
- Florida International University, wall of wind, 182

- First-order second moment reliability, 220
- Flachsbart, 173
- Flow
 - reattachment, 169
 - reversal, 166, 172
 - separation, 166, 169, 172
- Flutter, 210
 - aerodynamic derivatives, flutter, 210, 213
 - analysis, three-dimensional, 215
 - critical velocity, 210
 - formulation of problem for
 - two-dimensional bridge, 211
 - turbulent flow-induced flutter, 214
 - Scanlan flutter derivatives, 213
 - torsional, 214
 - vortex-induced oscillation and flutter, 211
- Foehn winds, 114
- Force coefficients, aerodynamic, 170
- Fragility curves, 240
- Freestanding solid walls, ASCE Standard, 65
- Frequency
 - natural, 190, 199
 - reduced, 175, 205, 211
- Friction velocity, 134
- Froude number, 175
- Galloping, 206
- Glauert-Den Hartog necessary condition for, 207
- Generalized coordinates, 190
- Generalized force, 191
- Generalized mass, 191
- Generalized Pareto distributions, 146
- Geostrophic height, 110
- Gradient height, 110, 124
- Gradient velocity, 110
- Gumbel distribution, 146
- Gust effect factor
 - ASCE Standard, 34
 - tall buildings, closed form, 280
- HFFB, 263
- High-frequency force balance, 263
- Hills, 130, 166
 - ASCE Standard, 27
- Hourly wind speed, 119
- H-shaped cross section, 214
- Hurricanes,
 - definition of,
 - record of wind speeds in, 119
 - wind flows in, 115
 - wind profile measurements, 131
- Institute for Business and Home Safety, multi-peril facility, 181
- Integral turbulence scale, 132
- Intensity, turbulence, 131
- Internal boundary layer, 129
- Internal pressures, 32, 171
- Inter-story drift, 217, 263, 270, 278
- Isobars, 109
- Jet-effect winds, 115
- John Hancock building, 211, 267
- Large-scale testing facilities,
- Lattice frameworks, ASCE Standard, 69
- Lift, 169
- Load and resistance factor design (LRFD), 220
 - Limitations of, 225
- Load effects space, 220
- Load factors, wind, 224
- Lock-in, vortex-induced, 205
- Logarithmic law, wind profiles, 121
 - range of validity, 123, 130
- Loss estimation, 237, 245
- Low-frequency turbulence and flow simulation, 183
- Low-rise buildings
 - ASCE Standard, 137, 143
- Main wind-force resisting systems, 10
- Mean recurrence intervals, 141
- Mean return period, 141
- Meyer-Kiser Building,
 - hurricane-induced damage to, 268
- Minimum design wind loads, ASCE Standard, 12
- Mixed extreme wind climates, 143
- Modal shapes, 190
- Moderate winds, 117, 136

- Modes of vibration, 190, 199
- Monin coordinate, 134, 309
- Multi-hazard regions, design criteria for, 228
- Multi-peril facility, Inst. of Building and Home Safety, 182
- MRI, 141
 - calibration of, 233
- MWFRS, 10
- Natural frequencies of vibration, 190, 199
- Net pressures, ASCE Standard, 12
- Nonlinear response, 219, 226
- Non-coincident mass and elastic centers, 199
- Nondirectional wind speeds, 138, 149
- Non-parametric statistics, extreme winds and effects, 157, 259
- Numerical examples, list of, 20
- Occupant comfort, tall buildings, 279
- Open buildings, ASCE Standard, 92, 135
- Outcrossing approach to wind directionality, 259, 311
- Overhangs, roof, ASCE Standard, 37, 57, 81
- Quasi-static response, 198
- Parapets, ASCE Standard, 37, 57, 81
- Parametric estimates of extreme values, 143
- Partially enclosed buildings, ASCE Standard,
 - Standard,
- Peak gust speed, 117, 118
- Peaks-over-threshold approach,
 - estimation of extreme speeds, 144
- Peak pressures, comparisons between measurements of,
- Penultimate extreme value distributions, 146
- Power law, wind profiles, 124
- Pressure, 164
 - coefficients, 170
 - comparisons, ASCE Standard, 19
 - defect in hurricanes, 113
 - distributions on bluff bodies, 170
 - gradient force, 109
 - internal, 171
 - measurements, 179
 - sign convention, 13
- Profiles, wind speed, 121
 - near a change of terrain roughness, 129
- Pseudo-pressures, ASCE 7 Standard, 253
- Reattachment, flow, 166
- Reduced frequency, 175, 205, 211
- Reduced velocity, 175
- Regular approach, ASCE Standard
 - “directional procedure,” 11, 37
 - “envelope procedure,” 11, 57
 - gust effect factor, 34
 - internal pressure coefficient, 32
 - low-rise buildings, MWFRS, 57
 - velocity pressure, 32, 33
 - wind directionality factor, 33, 258
- Reliability, structural, 217
- Reserve, strength, 226
- Residential homes, pressures on, 183
- Resonance, 187
- Resonant response, 187, 249
- Response
 - databases, 273
 - in frequency domain, 195
 - in time domain, 199
 - background, 198, 249
 - fluctuating, 197
 - nonlinear, 219, 226
 - quasi-static, 198
 - resonant, 187
 - static, 198
 - tall buildings, preliminary estimates, 209
- Reversal, flow, 166, 172
- Reverse Weibull distributions, 144, 146
- Reynolds number
 - definition, 165
 - dependence of Strouhal number on, 169
 - effect on aerodynamics, bodies with sharp edges, 178, 179

- effect on drag, bodies with round edges, 172
- violation of, in the wind tunnel, 173
- Ridges, ASCE Standard, 25
- Rigid buildings, 249
- Risk category, ASCE Standard, 21
- Roof overhangs, ASCE Standard, 37, 57, 81
- Rooftop equipment, ASCE Standard, 74, 78
- Rossby number similarity, 177
- Roughness length, 121
- Roughness regimes, wind speeds in different, 126
- Safety indexes, limitations of, 221
- Saffir-Simpson scale, 114
 - conversion to speeds over open terrain, 128
- Sampling errors in extreme speeds estimation, 149
 - non-hurricane wind speeds, 160
 - hurricane wind speeds, 161
- Scale, integral turbulence, 132
- Scaling, in aerodynamic testing, 175
- Scanlan flutter derivatives, 213
- Self-excited motions, 203, 210
- Separation, flow, 172
- Serviceability requirements, tall buildings, 278
- Shear stress, 165
- Signs, ASCE Standard,
 - solid attached, 75
 - solid freestanding, MWFRS, 65
 - open, MWFRS, 69
- Similarity requirements, 174
- Simplified approach, ASCE Standard, 13, 18, 81
- Skidmore Owings and Merrill
 - Burj Khalifa, 266
 - World Trade Center, 315
- Solid freestanding walls, ASCE Standard, 65
- Spatial coherence, 34
- Spectral density function, 133, 292
- Speed-up effects, 130
- Stable stratification, turbulence in, 136
- Stationarity, statistical, 119, 289
- Storm surge, 114, 229
- Straight winds, 110, 113
- Stratification, flow, 109, 134, 136
- Strength reserve, 226
- Strouhal number, 169
- Structural dynamics, 185
- Structural reliability, 217
- Super-stations, 140
- Surface layer, wind profile, 121, 123
- Surface roughness categories, ASCE Standard, 24
- Sustained wind speeds, 120
- Synoptic storms, 113
- Tacoma Narrows bridge, 203, 204, 214
- Tall buildings, 261
- Three Little Pigs project (hybrid testing), 181
- Thunderstorms, 115, 119, 137, 143
 - averaging time, simplified model, 120
- Time domain dynamic calculations, 199
- Topographic effects, ASCE Standard, 27
- Tornadoes, 115
- Torsion, ASCE Standard, 46, 50, 51
- Torsional
 - flutter, 214
 - response, flexible buildings, 261, 264, 266, 268
 - tuned mass dampers, 269
- Totwasser, 169
- Tropical cyclones, 113
 - integrated kinetic energy, 114
- Trussed towers, ASCE Standard, 69
- Tuned mass dampers, 279
- Turbulence, atmospheric, 130
 - cross-spectra, 134
 - in flows with stable stratification, 136
 - intensities, 131
 - integral scales, 132
 - spectra, 133, 307
- Type I Extreme Value distribution, 146
- Type III Extreme Value distribution, 146

- Uncertainties/errors
 - in wind effects estimation, 159, 180, 229, 259
 - in pressure coefficients, 179
- Ultimate structural capacity, 226
- Veering angle, 125, 278, 303
- Velocity pressure, ASCE Standard, 22, 23, 32, 33
- Viscosity, 165
- Vortex shedding, 169
- Vortex-induced
 - lift, 205
 - lock-in, 205
 - oscillations, 205
- Vulnerability curves, 239
- Wall of wind, 181
- Walls, freestanding, ASCE Standard, 65
- Wind climates, mixed, 143
- Wind directionality factor, ASCE Standard, 33, 258
- Wind-borne debris, ASCE Standard, 23
- Wind profiles, 121
 - hurricane, 130
 - logarithmic law, 121
 - moderate wind speeds, 117, 136
 - near a change of surface roughness, 129
 - non-horizontal terrain, 130
 - power law, 127
- Wind speed data, 138
 - data sets, description and access to, 138
 - directional, 138
 - micrometeorological homogeneity of, 138
 - nondirectional, 138
- Wind speeds in different roughness regimes, relation between, 128
- Windstorms, 113
- Wind tunnel procedure, ASCE Standard, 11
- Wind tunnel testing, 163, 275, 278
 - variation of results among laboratories, 180, 315
 - violation of Reynolds number in, 173
- World Trade Center
 - aeroelastic response, 265
 - discrepancies in estimates of response, 315
- Zero plane displacement, 123